GREEN WAY FOR AMBULANCE BY AUTOMATIC CONTROL OF TRAFFIC LIGHTS

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ABSTRACT

Traffic congestion on roads has become a major problem in highly crowded smart cities especially in countries like India, being the second most populous country in the world and also having a rapidly paced growing economy. In order to reduce congestion on the roads, and to save lives of people who are in emergency, our project, "Greenway for Ambulance by Automatic Control of Traffic Lights" is helpful. The system uses technologies like RFID. The model proposes a "GREEN WAY" in which the ambulance moves swiftly without any traffic delay. An incoming signal from both the RFID reader and the sound sensor is sent to the Arduino board. If an ambulance passes the RFID reader and the siren of the ambulance triggers the sound sensor, an interrupt signal is sent to the system to make only that lane green. The system checks for the density at other roads once the ambulance passes the junction, and releases the traffic in descending order of density.

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Introduction

In today's world, we all have experienced traffic related problems, which has resulted as a downside of modern urban planning. It could lead to someone's death in emergency situations. So, there is a need to tackle this issue. Here, in this 21st century era, every nation is on the track of establishing a complete developed nation. In this race, there are many developing nations, like India on the extent of new technologies, economy, and growth. In this race, there are new series of problems developing, which the majority are not paying attention to such as wide spread of population, deforestation, wildlife extinction, climate changes, water security, etc… Traffic density, which is rising gradually every year, is also turning out to be a headache. Some factors that lead to this issue have been identified like substandard road conditions, exponential rise of vehicles on road, and even sometimes, fraudulent activities by traffic personnel, are amongst the few. One of the critical concerns with this type of traffic congestion is the delay that will be created in the services of the ambulances.

In 2017, it was reported that 20% of the major emergency deaths of patients were caused by the traffic jams, since the time taken by the hospitals is delayed and the other major reason reported was due to the negligent driving of ambulance drivers in chaotic traffic conditions causing crashes. The situation might aggravate in the future. Hence, immediate action is required. There is a need to have an efficient system to help the ambulance reach on time, a system where it can identify the ambulance and make the lane less dense by switching the signal to green. Many schemes, systems, and models have been proposed to address this issue.

Traffic lights were being used as early as 1868, to maintain the traffic flow in the intersections. Congestion at the intersection creates a delay, thereby decreasing the efficiency of the system. In order to increase the efficiency, many researchers have worked out clever algorithms to schedule traffic lights. They have considered secluded intersections, and the period of each traffic light is set according to the simulated traffic movement. Many aspects were considered like the number of vehicles, the traffic speed, and the traffic volume of each flow, to mention a few. The lesser the mean delay at each road intersection is higher the throughput of the road metacenter is, the more efficient the scheduling algorithm becomes.

Related Work

In 2018, Prof. Manjiri M. Kokate & team [1] developed a website called" Health Card" where users can register about the medical history of all citizens. This data is used to help save time in hospitals to become ready for the

treatment. This data can be retrieved by using unique id and fingerprint authentication. This generated data would be sent to the particular hospital before the ambulance reaches over there. They are trying to initiate the green signals for an ambulance by turning the signals with the help of technologies like GPS and RFID.

In [2] & [6] Maram Bani Younes & Azzedine Boukerche introduced Intelligent Traffic Light Controlling (ITLC) algorithm, where it works in real-time based on traffic characteristics of each traffic flow at main centers of road, scheduling traffic in phases. They aimed in decreasing the wait time at the road intersections. In [4] Their work is based on priority approach for High Priority vehicles like Ambulances, Fire brigades, etc., Their results involve algorithm tested through SUMO (simulation of Urban mobility) with positive results 50 percent more in various traffic intensities.

[3] related study through bus priority at traffic signals by N.B. Hounsell & team gave intuition on priority facilities for passenger service vehicles through new technologies of Automatic Vehicle Location (AVL). Their analysis was based on consideration of the traffic by transportation of London (TfL). [5] Speaks mainly on the delay involved in every stage of the Accident. The system proposed to solve the delay through accident management system where the accident detection module reports the incident to a main server and dispatches nearest ambulance to the spot. The Android Application build helps in navigating the ambulance to the nearest hospital available & [7] majorly solve traffic problems for high-priority vehicles using RFID-Based approach. Furthermore, they explain the difficulties the system solves based on multiple scenarios at the intersections.

Proposed Framework

Our project design involves the use of radio frequency identification (RFID) receiver and RFID tag reader technology to identify only the HPVs and instruct the following signal system on the lane's intersection ahead of time to clear the path by making a greenway for the ambulance. The signal system is programmed with an algorithms based on number of

intersections it holds and manage time delay and also works in cooperation with any signal from RFID receiver whenever it encounters ambulances and HPVs.

Hardware used in this proposed project is Arduino Mega & Arduino Nano - as microcontroller, sound sensor – to detect the sound of the ambulance and notify to the controller, RFID reader – to read any radio frequency card is nearby to the reader and notifies to the controller, RFID card, IR Sensor - which is used in finding out the density of traffic in each lane, LCD display – used to display the output, traffic lights – when an RFID reader or sound sensor detects the lights in the traffic signal changes from red to green.
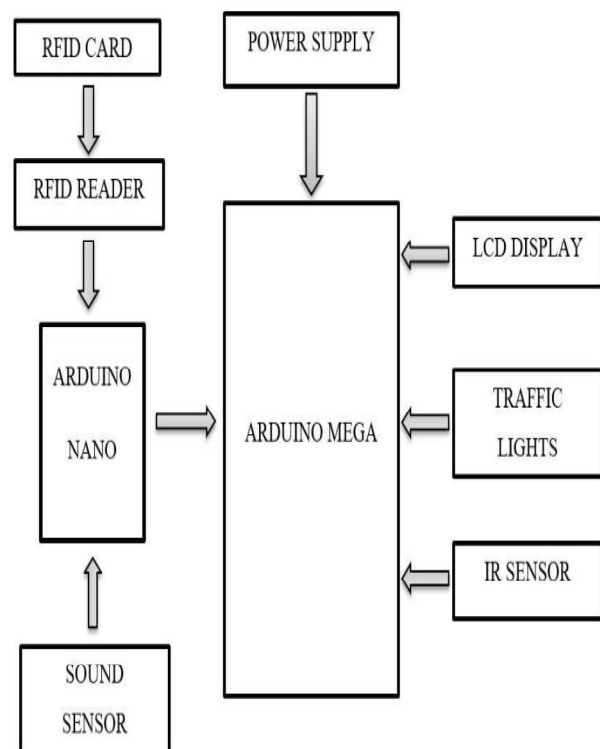

Fig. 1: Block Diagram of Proposed Framework

Methodology

Initially, once the power supply given to the microcontroller, all the devices connected switches on and starts working according to the program written. Power supply is the basic requirement for any of the microcontroller. Without the power supply, no microcontroller can be used. Each microcontroller has its own power ranges, basically it may vary from 3.3V to 12V it may differ in these ranges. Here the microcontroller which we are using has a

power supply of 12V and 5V and even 3.3V also the input voltage given to the microcontroller is 12V. The Sound sensor which is interfaced to the microcontroller to any of the digital pins in Arduino mega gives an output of 0 or 1 once the sound is detected in sensor it gives an output of 1 else 0. Sound sensor is mainly used to clear the way for ambulance, which changes the traffic light if it is RED to GREEN.

To make a way for ambulance here two methods are used one is using a sound sensor and another is using a RFID reader. RFID reader works same as a sound sensor, when an radio frequency signal is detected to the RFID reader then it notifies to the Arduino Nano controller and then an Interrupt signal is sent to the Arduino mega to change the signal colour to GREEN. Once the signal colour changes to Green, A Green-way is created for the ambulance and the traffic at the intersection is cleared before the ambulance reaches the junction, thus result in Less delay and conjunction. During the same, the LCD Displays an emergency message to all the lane stating that there is an emergency for the Ambulance and to show some patience till the ambulance clears the path.

Once the Path is cleared, we've used another RFID Reader to detect if the Ambulance has passed the intersection completely. This works just like an ON and OFF switch. Once the RFID Reader 2 reads. It sends a signal to the Arduino Nano and again this in turn sends an interrupt signal to the Arduino mega controller to make the Lane's signal colour RED. on the same time the IR sensors are activated to check the density of the other lanes Here, 2 IR sensors are used in each lane at a distance of 50 m from one another. The 2 IR sensors are checked, and the density is calculated by comparing them with the other lane. The lane having the highest density is sorted in descending order and is given a GREEN signal first following the next highest density lane.

In this way, the other lane vehicles which were waiting in traffic when the ambulance was given a greenway in an emergency are also considered and their traffic is also maintained. Once all three lanes have been given green signals, then the traffic signals revert to their original working condition.
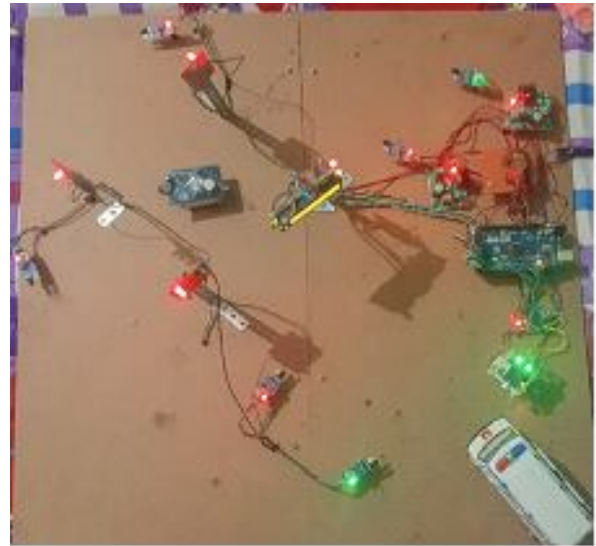

Fig. 2: Aerial View of the Project Model

With this working understanding of our model, we can take 2 scenarios where the efficient working of the model can be shown.

Scenario 1 - when an Ambulance is passing with no patient inside. Then the Ambulance does not switch on their siren. Now since the Ambulance driver has the RFID Tag/card the RFID reader detects the card but since the sound sensor doesn't activate as its range of acoustic frequency is set to 800-1 KHz range which is the frequency range of siren. The signal is not made a Greenway. Here we can understand that both the RFID Reader and the sound sensor condition should be satisfied in order to make it a Greenway for the Ambulance.

Scenario 2 - when ambulance is carrying a patient and is in emergency. Then the Ambulance driver switches on the Siren and when the ambulances pass through the RFID Reader, both the conditions are satisfied to make the lane signals to Greenway. By the time ambulance reaches, the intersection the traffic would have been cleared and the ambulances crosses effortlessly. Again when the RFID card is read by RFID reader 2 then the current lane is made RED and the IR sensors are checked for highest density traffic and that lane is make GREEN. This way ambulance faced less delay and traffic and also the vehicles waiting on other lanes are also face less traffic conjunction.

Results

Fig. 3 Shows the Arduino Mega and the Power Supply circuit on the kit.
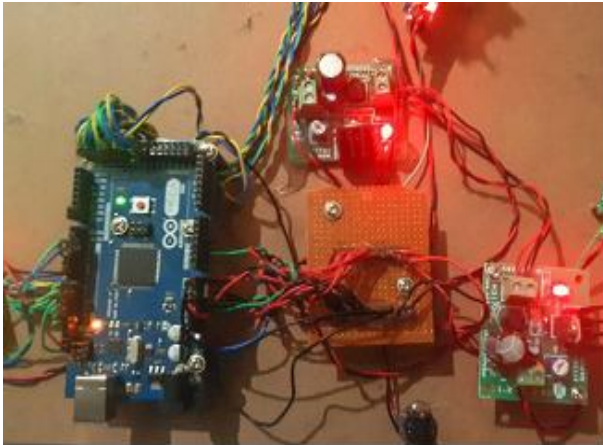

Fig. 3: Arduino Mega & Power supply

Fig. 4 shows the LCD Screen displaying the emergency message.

Fig. 4: LCD Display

Fig. 5 shows the RFID Reader & Sound sensor placed along with it.

Fig. 5: RFID Reader & Sound Sensor

Fig. 6 shows the IR Sensor module used to check the density of the lane.

Fig. 6: IR Sensor

Fig. 7 Shown below show the Ambulance with the RFID Tag approaching towards the road intersection and reaching near the RFID Reader the Sound Sensor.

Fig. 7: Ambulance approaching RFID 1 & Sound Sensor

Fig.8 shows that the RFID Reader verifies the RFID Tag while the Sound sensor receives the Ambulance siren frequency and matches with their range and allows the Signal on the lane to go Green.

Fig. 8: RFID Reader & Sound sensor activated by RFID Tag & Ambulance siren frequency

Fig. 9: Ambulance approaching the intersection

Fig.10 shows the Greenway and the Ambulance clearing the intersection with ease

Fig. 10: Ambulance passing through RFID Reader 2

Conclusion

In this world full of busy roads, traffic signal plays the vital factor in saving person's life. In this project, we tried to provide a way for ambulances to do the treatment of patients in time. We implemented two solutions like making a way for the ambulance and saving the patient's life. Here two ways of clearing a way for the ambulance are used one is using RFID technology and the other is using a sound sensor. This system detects the occurrence of ambulances and switches the signals to green. The entire system is automated; thus it requires less human intervention. "Intelligent Traffic Signals Control System for Ambulance" increase of saving lives.

In India, a person on average spends around 2 - 3 hours in traffic, which is not good looking in prospect to one's health. Due to all the traffic congestion and poor maintenance of roads, it has become a traumatic experience for those whose families are in need of emergency vehicles. So, in a way to resolve these issues.

A part of our project deals with making a "greenway" for the ambulance using RFID technology & sound sensor. With the help of both, our system detects the presence of an ambulance, which is in an emergency & makes way for it. Later, when the ambulance passes the signal junction, a message is sent back to the microcontroller acknowledging the movement of the ambulance, it has passed through the junction.

The later part deals with the traffic density situation. As soon as the ambulance passes, the path in which the ambulance had passed turns back to red. It then checks for the traffic density in other lanes with the help of the OR sensor placed & gives way for those lanes which have higher traffic density. Once the congestion issue is resolved, the system reverts back to its original pattern. Since the entire system is completely automated, it requires less or zero human intervention. Hence by our approach, the probability of saving human lives in emergency situations increases.

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THE HUMAN MIGRATION MODELLING AND ANALYSIS

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ABSTRACT

The term "human migration" refers to a type of human movement that entails a journey with the goal of moving away from one's birthplace. Data on human migration can be utilised to gain crucial insights in conservation planning, public policy development, and ecological development. Global trade, the spread of infectious diseases, and city planning Simple human migration models, such as the gravity model or the more recent radiation model, predict human mobility based solely on population and distance characteristics. We frequently avoid including the potential genuine causes connected with migration in these static approaches. These models had the disadvantage of being static, and we wanted to change that. unable to represent the complexities of migration dynamics The machine learning model that was suggested is capable of adding any amount of external features. In order to forecast the flow of human migration in the origin destination. We'll focus on three stages of migration in this article. The possible development and concepts are described at each phase. The first face is concerned with the voyage, the second with the stay in the destination country, and the third with the migrants' source or origin.

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Keywords: Spc,spcd,rmse,SVM,Logistics,XGboost, ANN,Global.

Introduction

Human movement is described using a gravity model that describes the probability of migration between two zones decades as a function of distance between them[4,8]. Several types, on the other hand, were presented in their contemporary form in 1946[4,8,25] and have been utilised in a variety of applications since then[5]. Recent models, such as radiation model [16] and the XGBoost model [20], have shown that long-distance journeys are better described than the gravity-based model, which is regarded as the "universal model of migration patterns."

The chance of a journey decays inversely with distance and directly with the amount of intervening opportunity, according to the radiation model.

Stouffer was the one who proposed it first. Since the advent of the radiation model. It has been used and expanded on numerous occasions, including in 2012 [13]. compared to the gravity model, which is the best fit for replicating commuting flows on a small scale[21]. And the radiation model is better for replicating large-scale migration processes incorporating human mobility[17]. These models depicted the linear link between the independent factors and the interdependent characteristics of each zone. Here is a data resource from the United Nations' World Migration Report 2020[]. UN DESA 2020[30,31], as well as the worldwide migration data portal. Data on migration relating to the COVID-19 pandemic. In a nonlinear tree, which are algorithmically bound. In a nonlinear tree or neural network model, which are algorithmically bound.

The following are our major contributions:

1: To determine human migration projections, we built a machine learning framework.
2: We train linked machine learning models to evaluate prediction issues involving partial datasets, hyperparameter resolution, and efficiency determination.
3: To train artificial neural networks that are closest to predicting migration problems, we employ a bespoke loss function.
4: We analyze and crassly verify the efficacy of over machine learning models with a basic model over a variety of data sets to show the exceptional performance.

Deterministic Methods

In order to compare and contrast the numerous alternative models and their results. We employ the four metrics that forecast migration metrics T (predicted migration) to duplicate the genuine migration, T. (ground truth).

Commuters' common parts (CPC) and commuters' common portion of commuter distance-variant The route The mean square

error is going to be utilised as a result standard metric for regression Upon your exit from the over model.

1. Similar Parts of Commuters (SPC):

SPC compares the ground metrics and prediction metrics; if the entries in both matrices match, SPC evaluates as 1, indicating that they are identical; if their entries do not match, SPC evaluates as zero, indicating that they are not identical. Which bears striking resemblance to the BrayCurtis contrast found in ecological research [9,15].

The formula below can be used to compare genuine and anticipated metrics.

SPC 2= (T, T) Ín 1 min(Tij,T I j) I j=1Ín I ,j=1 Tij + Ín i,j=1

2. SPCD (Similar Distance Variable for Commuters)

Method is used to calculate the ground truth from anticipated trip migration metrics and ground truth data. The between 2k-2 and 2k kilometres of migration was represented by a histogram, with bin Nk is a number that ranges between 2k-2 and 2k kilometres. The SPCd continuing to do so to exist. The When all entries are within the same distance, SPCd will evaluate 1; otherwise, it will evaluate 0.

Below is the mathematical formula for calculating SPCd.

SPCd T= 2 (T, T) Í∞ 1 minute= k (Nk , N.k.) Í∞ k=1

Nk + Í∞ N k=1 k=1 k=1 k=1 k=1 k

Where, I,j are different migration zones.

3. RMSE (Meaning of Root Square Fallacy)

The RMSE stands for "Reduced Mean Square Error." typical regulation method that eliminates significant degrees of error in comparison to tiny errors. When predicting the worstcase scenario, its value ranges from 0 to any arbitrarily large(infinity) value.The zero represents a perfect match.

$$RMSE = \sqrt{\frac{\sum_{i=1}^{N}\left(Predicted_i - Actual_i\right)^2}{N}}$$

4. Determination Coefficient (r2)

This score indicates how well a group of forecasts matches the ideals that are closest to reality for a perfect match for arbitrarily negative values, such as the fit deteriorates, and it when the is 0 forecasts equal in value to ground truth values' expectation.

We use mean absolute error (MAE) and r 2 to comparing the amount of people who are in the know with the number of people who aren' entering migration, as well as the estimated amount of arriving migrants in each zone, in addition to the preceding four measures. vi = n j=1 Tji calculates the expected a zone's total number of arriving migrants,

Model	Equation
Radiation	$\hat{T}_{ij} = M(m_i)\frac{m_i m_j}{(m_i+s_{ij})(m_i+m_j+s_{ij})}$
Extended Radiation	$\hat{T}_{ij} = M(m_i)\frac{[(m_i+m_j+s_{ij})^\beta - (m_i+s_{ij})^\beta](m_i^\beta+1)}{[(m_i+s_{ij})^\beta+1][(m_i+m_j+s_{ij})^\beta+1]}$
Gravity with Power Law	$\hat{T}_{ij} = M(m_i)\frac{m_i m_j d_{ij}^{-\beta}}{\sum_{k=1}^{n} m_k d_{ik}^{-\beta}}$
Gravity with Exponential Law	$\hat{T}_{ij} = M(m_i)\frac{m_i m_j e^{-\beta d_{ij}}}{\sum_{k=1}^{n} m_k e^{-\beta d_{ik}}}$

Table 1: Traditional migration models
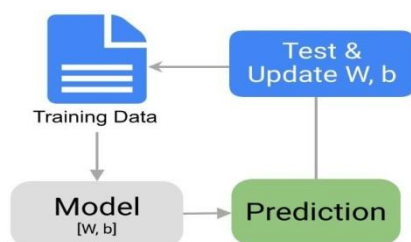
System Design

FIG1: System Architecture

The system design depicted above is a standard machine learning method to target prediction. Here, we're putting various data pieces into the model in order to train it to evaluate the likely outcomes in terms of human migrations. To make the feed data the best training data possible, our model preprocesses the data and checks for imbalances in the dataset. The

techniques, which we utilize here to separate it from existing models by combining ANN and

SVM, are then used. INCLUDING XGBOOST models.

Hyperparameters

Hyperparameters are parameters that directly or indirectly influence human migration prediction.

Because there are other related characteristics that appear to be unrelated to migration prediction. However, they are of minor relevance. If not taken into account, it will have an impact on the overall migration projection outcome. As a result, it is critical to consider the

2020: Information and information about migrants [31] In 2019, there were 272 million foreign migrants (3.5% of the global population).

Normal regions in the Migrations analysis.

Insignificant parameters in order to achieve absolute performance. The table above lists the numerous factors that influence human migration forecasting.

Datasets

Migration and migrant information is available as a data (highlights). Highlights from the first half of the film WORLD MIGRATION REPORT FOR THE YEAR India was the winner. highest the amount of migrants in the area in other countries Mexico comes in second with 17.5 million people, followed by China and Mexico (11.8 million and 10.7 million, respectively).

The United States is still the most powerful country in the planet. most popular location of travel (50.7 million international migrants).

In nations with a good standard of living, number employees on the move decreased marginally, whereas it increased elsewhere between 2013 and In2017, the number of migrant workers in high-income countries increased. nations decreased slightly (from 112.3 to 111.2 million people) The highest rate of increase was in the upper middle class. income countries (increased from 17.5 to 30.5 million).

In 2017, By 28 million, male migrant employees outweighed female migrant workers. people around the world.

Male migrant workers accounted for 96 million (58%) of all migrant employees.

Table 1. Key facts and figures from the World Migration Reports, 2000 and 2020

	2000 report	2020 report
Estimated number of international migrants	150 million	272 million
Estimated proportion of world population who are migrants	2.8%	3.5%
Estimated proportion of female international migrants	47.5%	47.9%
Estimated proportion of international migrants who are children	16.0%	13.9%
Region with the highest proportion of international migrants	Oceania	Oceania
Country with the highest proportion of international migrants	United Arab Emirates	United Arab Emirates
Number of migrant workers	-	164 million
Global international remittances (USD)	126 billion	689 billion
Number of refugees	14 million	25.9 million
Number of internally displaced persons	21 million	41.3 million
Number of stateless persons	-	3.9 million
Number of IOM Member States*	76	173
Number of IOM field offices*	120	436'

Sources: See IOM, 2000 and the present edition of the report for sources.

Notes: The dates of the data estimates in the table may be different to the report publishing date (refer to the reports for more detail on dates of estimates); refer to chapter 3 of this report for regional breakdowns;* indicates the data was not included in the report but is current for that year; ' as at 28 October 2019.

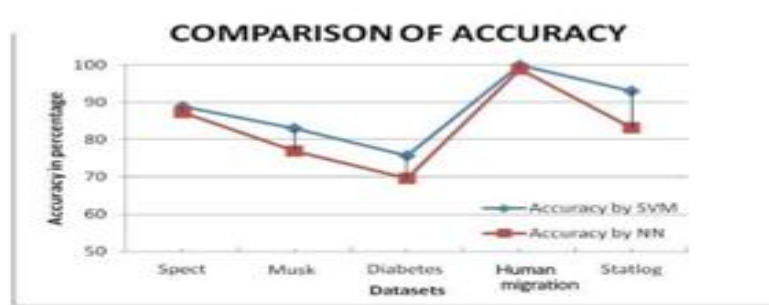Males made up 52% of the oversea migrants, while females made up 48%.

Results

Fig. 3. Comparison of Accuracy.

Number of migrant records	Support Vector Machine (SVM) Accuracy	XGBoost Model Accurac	Artificial Neural Networks (ANN) Accuracy
1200C	0.9473	0.9333	0.8%
1120C	0.96	0.9615	0.862%
6500	0.9736	0.9629	0.909%
12302	0.9718	0.9836	0.9607%
25124	0.9771	0.9866	0.9865%
7800	0.9833	0.9944	0.9925%

Table 5.5: Comparison using Performance Metric - accuracy

The overall accuracy findings are reported for comparison in Table 5.5, based on the trials completed. A visual representation of each algorithm's performance is shown as:
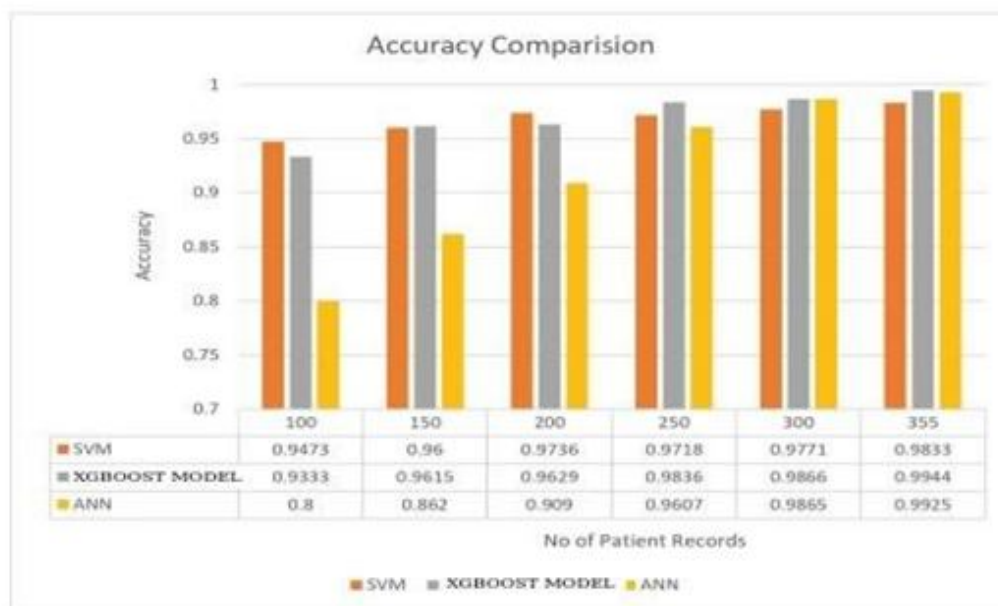

Figure 5.4: Performance Comparison Chart

Different record sets are present in figure 5.

Conclusion

Machine learning models of human migration can now be used instead of traditional gravity or radiation models in nations that track human migrant movements, thanks to the increased highresolution socioeconomic data is available Machine learning models provide more modelling flexibility since they can mix several input data in nonlinear ways that static equations cannot represent. Models based on

machine learning are very simple to create. tailored to the issue or the nation in question. We develop two machine learning models. to forecast Flows of people between counties in the United States United States and between nations all around the globe use two sets of features to in comparison to these models models of traditional human migration, and we find in most cases, our models outperform the previous models assessment measures. This is something we'd want to expand on. study by looking at all of the features in the model and combining various models to better explain human migration[14]. While the SVM model[6,7,8] can rank the value of features, it The processes that promote human migration are not fully described

tweaked to predict migratory patterns in the face of harsh weather Large populations can be displaced by hurricanes and other natural catastrophes, and identifying where these The first step in providing is for folks to relocate. policymakers with a Tool for planning that is unique. On both spatial and temporal dimensions, higher resolution migration data will be necessary. fulfil these objectives. By definition, extreme weather events and their consequences are brief.

Future Work

The introduction of more realistic and accurate data, along with more flexible algorithms, would simulate the everincreasing outcomes with an accuracy of above 94%.

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DETECTION OF LUNG CANCER USING IMAGE ENHANCEMENT AND ANN

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ABSTRACT

Lung cancer is the most frequent disease and has the greatest fatality rate. In this study, artificial neural network (ANN) method have been investigated and image enhancement technique is followed. The image processing, segmentation, and enhancement phases are all applied to CT scan images of lung cancer. The features extracted are used for training the neural network using back propagation algorithm and finally CT images are detected as cancerous and non-cancerous images. The performance shows satisfactory results and gives accuracy 98.67% accuracy.

Keywords: artificial neural network, image enhancement, segmentation, Artificial Neural Network.

Introduction

Cancer is most serious health problem worldwide, with the smallest survival rate. Among people of ages between 45 and 70 the cause of death is more due to lung cancer. The possible treatments are surgery, chemotherapy, and radiotherapy but, it is more costly and time consuming. The approaches utilized were for diagnosing lung cancer in its advanced stages because it is difficult to recognize the symptoms that arise in the advanced stages, which produce a high death rate, in its early stages.Early detection gives the higher the chances of successful treatment and also reduces death rate. To overcome this, a technique called Artificial Neural Network is used to detect the lung cancer along with image enhancement. In this system, image pre-processing technique is used to provide good class tool for cultivating the manual analysis.

The process of converting a 2D image to a grayscale image occurs during pre-processing. Limited adaptive histogram equalisation approaches were utilised for picture improvement, while the Otsu thresholding method was applied for image segmentation. In further analysis feature extraction values are extracted using Grey level co-occurrence matrix. On this basis training and testing is done and for this purpose back propagation algorithm is used. This study gives accuracy in detection cancerous and non-cancerous cells of lungs in early stages.

Literature Survey

Many authors worked on lung cancer detection techniques in the post-current study. Moffly Vas and Amita Dessai [1] proposed a Lung cancer region segmentation using a mathematical morphological operation. The computational cost of the lungs is reduced by segmentation, which entails transforming the pictures to binary. In this study feed forward back propagation algorithm was used by giving overall success rate of 92%. The disadvantage is that the region of interest is split as white regions, and misdiagnosis occurs when cancer nodules are found on the lung's boundary. Md. Badrula lammiah and mohammad abu Yousuf [2] investigated a system for lung cancer detection it includes two stages in premature state. Binarization is a technique for converting binary images into numeric values that can be compared to detect lung cancer. After the process of feature extraction, the extracted features are further passedto trained network for the purpose of classification and detection. This system obtains accuracy of 96.67%. Gawadeprathamesh pratap and R.P. Chauhan[3]. CT scan images are converted to gray scale image then it passes through high-pass filter which makes bright images by sharpening. Further images are analyzed throughimage processing, median filter, watershed algorithm and final processing is done by passing salt and pepper noise through median filter. The proposed strategy can be used to identify malignancy in lungs. Raviprakash s. Shriwas and akshay d. Dikondawar[4]explains the pre-processing

stage includes steps like smoothing, enhancement and segmentation. For the purpose ofimage preprocessing and extracting of required features histogram equalization is used. A neural network classifier is used to identify whether a patient's condition is normal or abnormal in its early stages. The outcomes are based on a classification system that decides if something is correct or incorrect. The limitations of study is that it requires slower operations when implemented as a simulation on a conservation conclusion and it requires extensive amount of training. It gives 96.04% result as compared to other classifier. Loveneet Kaur, Manmohan Sharma, RajanDharwal, Aditya Bakshi[5], The use of Neural Networks and image enhancement techniques to identify lung cancer is being investigated. The Log-Gabor approach is utilised for picture enhancement, and the enhanced image is then sent through image segmentation using the Marker Controlled Watershed Segmentation technique. For additional feature extraction, a grey level co-occurrence matrix is used. Ant colony optimization and back propagation algorithms are utilised for categorization. This algorithm achieves a 93.33 percent accuracy rate.

Metodology

The procedure implemented in this paper includes six steps Shown below in Fig.1.

Lung cancer images
↓
Image preprocessing (Using Median Filter)
↓
Image Enhancement (Using Histogram Equalization)
↓
Image Segmentation (Using Otsu Thresholding)
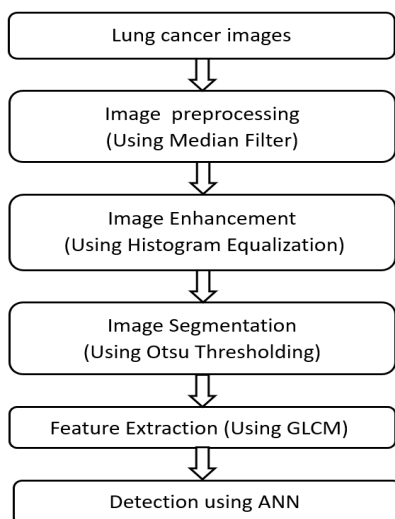↓
Feature Extraction (Using GLCM)
↓
Detection using ANN

Fig.1: Flowchart

a. Data Collection – Computerized Tomography images were collected fromhospital. CT scan images consisting of both cancerous and non-cancerous images of lungshaving size of 512*512 pixels. Further the images are passed through few procedures for detection of lung cancer.
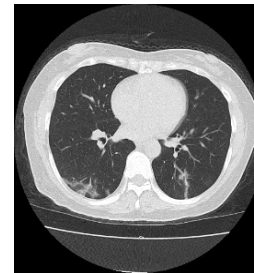
Fig 2a:cancerous

Fig 2b: non-cancerous

b. Conversion Original Image To Gray Scale Image–this process coverts Original image to gray scale image using weighted method according to their wavelengths where it weighs red, green and blue.

Grayscale $= 0.299R + 0.587G + 0.114B$

Input Image (Grey scaled Image)
↓
Select window size
↓
Smax > window size
↓
Sort the values in the current window
↓
Take the median value and replace the center pixel by the median value
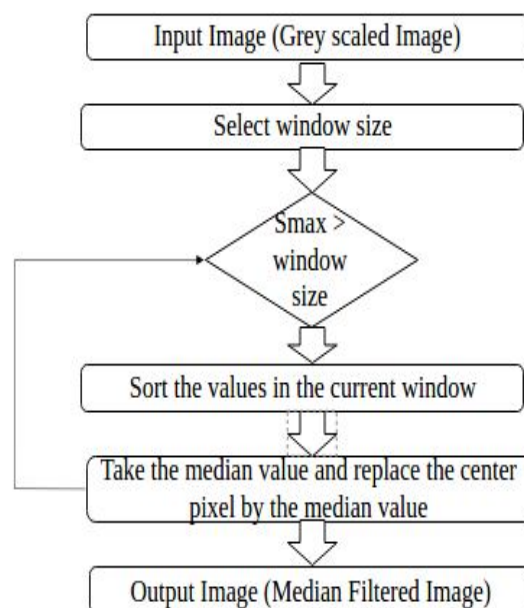↓
Output Image (Median Filtered Image)

Fig.2: Pre-processing

c. Image pre-processing- The noise redundancy and blueness found in the image

are removed during pre-processing. For this purpose median filter is used. The median filter is a non-linear digital filtering technique removes noise present in the image or signal, especially salt and pepper noise. This step of noise reduction improves the results of further processing. Median filter conserves edges while removing noise. The median filter of size 5*5 is used.
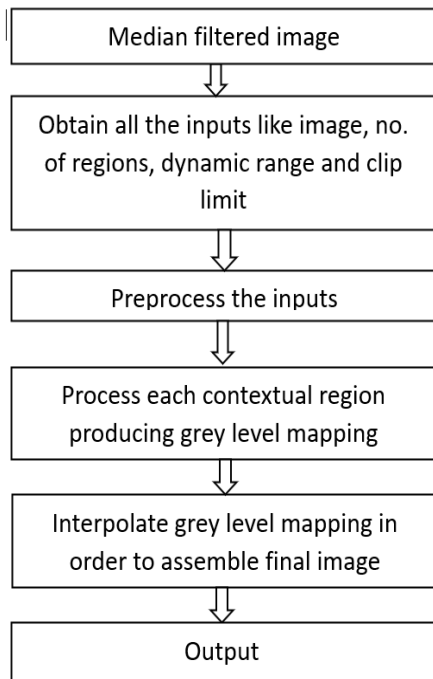
d. Image enhancement –

Fig.3: Image Enhancement

Image enhancement is a technique for increasing image quality so that the final image

is superior to the original. Contrast limited adaptive histogram equalization is used to improve the image. To improve the contrast of the image histogram equalization is used. The image contrast is improved by spreading out the frequent pixel intensity values or stretching out the intensity range of the image. One of the variant of adaptive histogram equalization (AHE), which helps in taking care of over-amplification of the contrast. Clahe works on little areas of an image called tiles rather than the complete image. To remove the false borders, the nearby tiles are then blended using bilinear interpolation. This process can help you boost the contrast in your photographs.

e. Image segmentation– Image segmentation is the division of an image into its basic sections or objects. The output of image segmentation covers the entire image with segments that co-operatively covers the entire image. The Otsu thresholding method is a simplest method of image segmentation.It performs automatic image thresholding in the modest form, which yields a single intensity threshold that separate pixels includes two classes, foreground and background. The image histogram is processed by segmenting the objects by minimization of the variance on each of the classes. The histogram image comprises two visibly different ranges of intensity values that are expressed peaks.
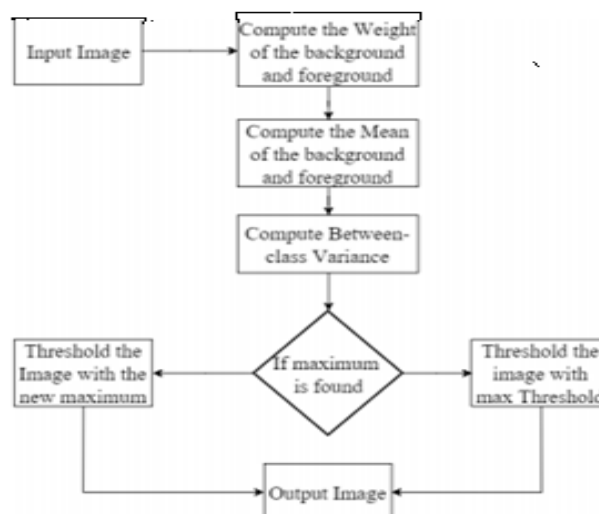

Fig.4: Image Segmentation

f. Feature extraction–

This method where the interesting parts of the images are represented in which large number of pixels of the image are captured. The Grey level Co-occurrence matrix approach is used to extract features. By computing the pairings of pixels in an image that have values and are described in spatial connection, a GLCM is created, and statistical measurements of the image are extracted from this matrix, which illustrate the texture of the image. By GLCM various features have been extracted such as contrast, dissimilarity, homogeneity, energy, correlation.
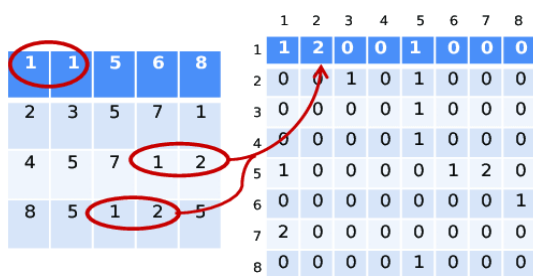

Fig. 5: Gray Co-matrix Calculation

Contrast: Measure local variation in grey-level co-occurrence matrix.

Contrast $= \sum i \sum j(i-j)2 \cdot GLCM(i,j)$

Dissimilarity: It is the measure of distance between pairs ofobject in the region of intersect.

Dissimilarity $= \sum i \sum j|i-j| \cdot GLCM(i,j)$

Homogeneity: It Measures the closeness of spreading of elements in the GLCM to the GLCM diagonal.

Homogeneity $= \sum i \sum jGLCM(i,j)1+|i-j|$

Energy: The sum of the squared elements in the GLCM.

Energy $= \sum i \sum jGLCM(i,j)2$

Correlation: It helps in measuring the joint proability occurrence of the specified pixel pairs.

Correlation$= \sum i \sum j(i-\mu i) \cdot (j-\mu j) \cdot GLCM(i,j)\sigma i \cdot \sigma j$

Lung cancer detection using ANN

For classification purpose Back propagation neural network algorithm is used.This algorithm is used to proficiently train artificial neural networks which follows a gradient descent approach that uses the chain rule.It is iterative, recursive and efficient which are the features of back propagation method for calculating the weights updates.
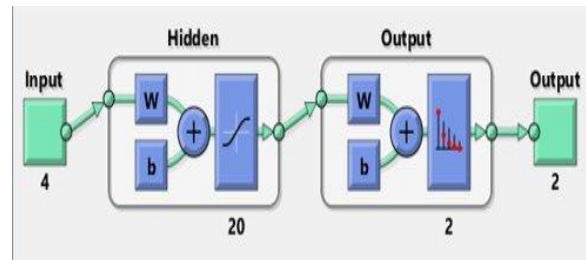

Fig 6: Back propagation algorithm

Classification is categorized into two parts, training and testing. The features which are extracted are used to train the neural network. This will give us a sense of how well the network will do when applied to data from the real world.

Conclusion

Lung cancer disease is the main cause of deaths. The methodology implemented in this study aims to develop an automatic scheme for lung cancer detection. This proposed system uses250 type of lung CT images for testing purposes and obtain the overall result of success rate 98.67%. This system increases the accuracy and speed of system of lung cancer detection.

Future Scope

For better classification purposemore number of features can be extracted. In medical data for correct classification various combinations of earlier features can be used.This helps to detect the stages of the lung cancer.This study can further find place in medical research as well.

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E-SIGHT FOR VISUALLY CHALLENGED PEOPLE

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ABSTRACT

Our project, E-sight for visually impaired individuals utilizing Raspberry Pi, is primarily concerned with the use of technology by blind people. Object recognition and detection, text from image to audio conversion, and current location sharing are all part of our project. In general, blind persons find it difficult to go about their daily lives because to their disability. We interfaced some system with their bodily component to make their lives smarter. We interfaced certain smart functions with their body part in this system. When an obstacle is discovered on the path using an ultrasonic sensor on a body component, the camera is triggered to capture the thing in question. The image is delivered to a CPU to determine the object's type, and then it is sent as a spoken command using earphones linked to the Raspberry Pi. So that blind people can recognize the object in front of them and, if it is determined that the object is a human, they can seek assistance. They may be able to walk based on the thing in front of them if there is a huge impediment, such as a car. We're also working on open-source audiobook software that will allow you to create a reader using only the Raspberry Pi. Here is the Brick Pi Book Reader, which allows you to read an actual book. Also, the blind person can see what obstacles are in front of him or her by using a picture controller to analyse the data and generate genuine coordinates connected to current position, which is then translated into a specific message for the person. We will measure the distance between the blind persons and the obstacle using an ultrasonic sensor, and the distance will be played through earphones.

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Introduction

As a result of use of sound waves, E-sight for visually challenged people allows impaired people to travel with greater confidence and ease. Globally, including a latest study by the World Health Organization (WHO), this seems to be an approximated two hundred and eighty five million disabled individuals. Of those, about 82 percent will be in the older than 50 years age category. Disabled users now make up the largest population in India. There really are 2.5 million blind men in the world, including over 15 million throughout India, so there is requirement to be research. It allows evaluation of indications, the identification of hurdles, the recognition of ecosystem's features, and the ways to obtain the way without opposition on your own. Disabled users, for even the most part, are unable to detect certain specifications leading to a shortage of preconception. Wearing this gadget is all they require to deal with the issues human beings face daily, even if they are indoors or outdoors. Everyday life is much more difficult for them. Even when useful, the standard white cane used by those who are influenced has a lot of drawbacks. A further option is to keep a guard dog, but this can be expensive. Pet dogs, like dogs, are also a option, but they are very affordable. This Suspires the program to create a much more cost accurate list to help disabled persons explore with increased ease, velocity and self-belief First stretchable shutters software that fixes all the identified issues. There are several navigational aids and electronic objects available today for blind human, and several of them became hard to take and improve firm performance to use. It is estimated that visually impaired people can experience so much problems with daily lives as a result of technological advancements. The Raspberry Pi microprocessor, a reduced amount, small sized laptop, can be used to enforce this modern technologies. Everyone can gain new skills in Scratch and Python on this worthy tiny gadget. Computing images is one of the innovations included in this proposal. Performing functions on data in attempt to optimize it or extracting meaningful case is given as object recognition. In this case, the information is a photo, and the outcome is either a photo or qualities present in an photo. Designers use image processing to identify obstacles utilizing machine learning methods.
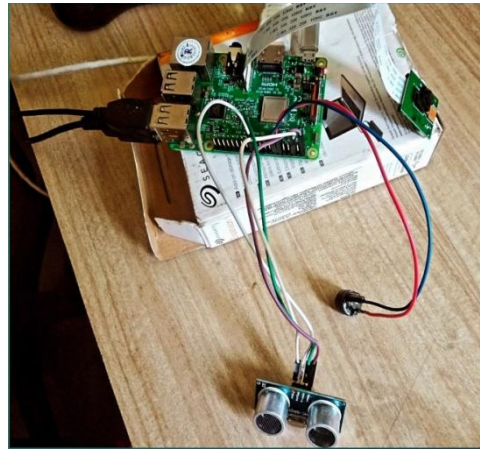
Literature Survey

[1]. IEEE, Ankita Paul, Naiwrita Dey, Ultrasonic sensor based smart sight sticks, Mar 2018, Conference:2018 conference held on recent developments towards convergent technologies (ICCTCT). This study details the design and execution of a visual impaired individual's ultrasonic sensor-based walking cane. A buzzer has been used to notify the visually impaired as well as an ultrasonic sensor module, HC-SR04, can be used to avoid objects in the disabled person's route. This walking stick can be used by blind people to navigate safely. It has a ranging of 5 to 35 cm for detecting obstacles.

[2]. A Wearable Navigating Devices To Visually Impaired Based On Neural Tracking, IEEE Fellow Jinqiang Bai, shiguo Lain, Mar 2018.A new wearable guidance system is proposed in this study to assist blind individuals in walking to their objective effectively and securely in an indoor setting. The detecting, navigating, approach followed, and barrier avoidance module were essential parts of a tracker. To solve this problem, we offer a unique approach that employs a dynamic sub-goal choosing technique to lead clients to their objective while also assisting them in avoiding barriers. That policy is an essential part of a larger plan.

[3]. Smart Whip Navigation Guidance for the Visually Utilizing GPS, Gita Indah Hapsari, Giva Andriana Mutiara, Dicky Tiara Kusumah, 2017 fifth world convention on information and communications technology (IC0IC7). Impaired mobility is among the most significant problems that people with visual impairments face on a daily basis lives. The absence of sight vision severely limits their lives and activities. In this lengthy review, they usually move utilising a visual guidance system and our acquired knowledge. The major goal of this project is to provide a low-cost, dependable, accessible, customer, reduced, and efficient navigation system.

It includes a built-in sensor that sends out ultrasonic waves in the directions the user is travelling by detecting at a maximum altitude of 5-6 m and 30 °.

[4]. Smarter Glasses for Vision, Ankita Bhuniya, Sumanta Laha, Deb Kumar Maity, Abhishek Sarkar, Suvanjan Bhattacharya, AMSE JOURNALS-AMSE IIETA Publication-2017. Visually impaired have a deficiency in their vision which has limitations in terms of mobility. Prototype made using the GPS module, keypad, earphone and raspberry Pi. The results show that the functional testing tools can detect the location area of interest with a deviation of less than 8 m. Also based on the friendly user testing, this prototype categorized good enough to be used by the blind.

[5]. A Vision Challenged Indoor Tracking System Conferences: Proceedings of an eleventh annual conference of computing innovations, as well as a session for PhD students in computer science, Luis A. Guerrero, Francisco Vasquez, and Sergio F. Ochoa, compSys 2010. For such highly vision handicapped, navigating interior surroundings, especially in unfamiliar spaces, is extremely difficult. That approach allows you to find an user's location and compute his velocity and direction of travel. The process utilizes this analysis to find that person's direction, detect any impediments along the way, and provide guidance instructions to the user. Two experimental situations were used to assess the proposal. Even though findings are insufficient to support this statement, they do suggest that perhaps the module is able of guiding disabled persons around an unfamiliar modern world.

Proposed System and Implementation

Our initiative is concerned primarily with technological engagement for visually impaired and uses the Raspberry Pi to provide intelligent support for them. Object identification and detecting are included in our work, as well as text translation from picture to

voice, destination address sharing, and a Translation language converter. In general, blind persons find it difficult to go about their daily lives because to their impairments. We interconnected a system using their walking frame or any other human component to create their sticks smart. Several intelligent capabilities were connected up with the bodily component in this technology. We're currently working on fully accessible audiobooks technology because you can make your own reader using only the Raspberry Pi. The Bricks Pi Book Readers, that could translate an actual book, is presented here. Also, the disabled person can reach his target because the is using GPS to trace original data for location coordinates where disabled people is standing, which is then processed by an image controller to measure actual coordinates relevant to recent position, which is then translated into a particular message for the participant. The distances the individuals and the obstacles will be measured using an ultrasonic sensor, as well as the length will be broadcast over earbuds.

Block diagram

Fig1: block diagram

Hardware Components

1. Raspberry Pi3 model B+
2. Pi camera
3. Ultrasonic sensor
4. Push switch
5. Power supply
6. Audio output
7. SD card

Implementation

Inertial navigation module based on the Raspberry Pi, i.e. camera module, Raspberry Pi, and Audio module. The camera module receives the incoming image and processes it in real time. The Raspberry Pi is an environment that connects all of the essential hardware modules. The pictures are received from the camera module. It performs image analysis and checks for impediments in the route; if an obstacle is detected, the signal is sent to the speech section. (1)This concept is realized via the use of a variety of techniques, the most important of which is image processing, which provides the buyer with vision. Object recognition, facial recognition, and text to speech from the surrounding environment are all part of image processing. It measure the distance between the camera and an object.

Distance $L = 1/2*T*C$

Where: L=The distance

 T=Time between the emission

(2).Whenever a blind person using an E-sight device travels along the road and comes across an obstacle, the picture is recorded with a camera and sent to an object detecting cloud, which issues a notification about the obstacle via an ear pad. (3)Furthermore, the device includes a walking helmet with mode selection buttons. when the button is pressed1. We're also working on open-source audiobook software since you can make your own reader with basic Raspberry Pi controllers for delivering alarm signals.

Fig2: overview of the project
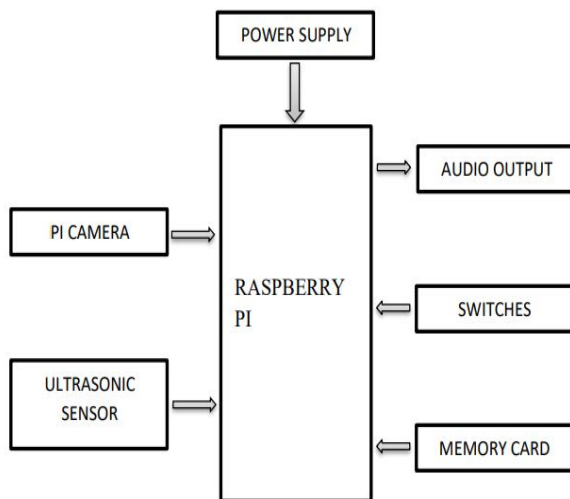
Experimental Result

And primarily, this device is merely a navigational aid that does nothing by itself but instructs the visually impaired on how to navigate. The users are able to walk like a regular person since the system requires time to review sensors data and direct them, therefore they must walk at a reasonable speed to allow the system to analyze and direct them; however, it will not be like a regular person who can see. This prototype was evaluated on ten blind people, and certain limits & usage issues were discovered. The following are the details:

1. The E-Sight for blind people can greatly enhance the person's travel experience in both indoor and outdoor activities. As a result, it can be used as an user gadget to assist visually impaired persons in travelling securely.
2. The device comprises a text decoding and object identification system, as well as distance detecting ultrasonic sensors that can identify things up to 400centimetres (roughly).
3. The detected thing is conveyed over the headphone.

4. An emergency button is offered to assist users in communicating their present location to the authorized people in their registered email Address in the case of an emergency.
5. There is indeed a buzzer that will emit alerting sound
6. Additional switch that is used to capture footage.
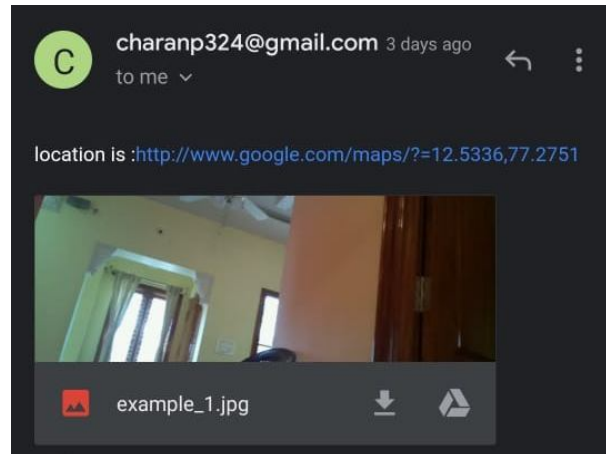

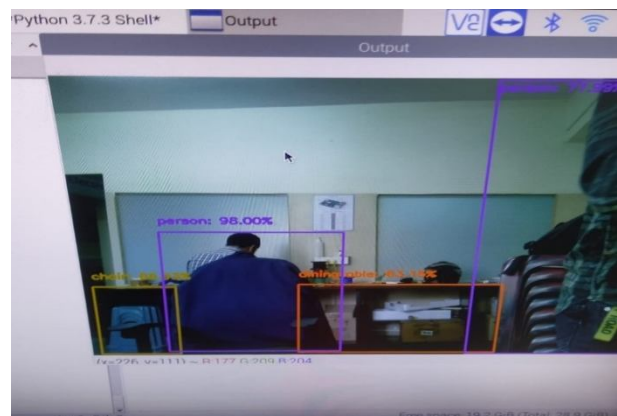Fig3: Output of emergency switch1
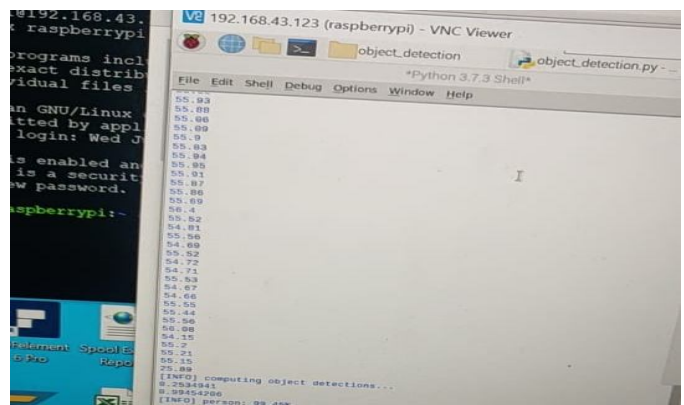

Fig4: Output of object detection and recognition

Fig5: Output of distance calculation between blind person and obstacle

Fig6: Output of emergency switch2

Conclusion

Loss of vision severely limits the aspects of life of visually impaired individuals. One of the main problems that visually impaired individuals face in their daily lives is finding impediments & navigating among crowds. Increasing numbers of blind people around the world motivated the idea E-Sight for visually impaired persons. It is a practical equipment that could be carried by every blind people. In this work, we propose a way for blind persons to determine their locations without using gadgets, taking into account their limits with using gadgets. This device employs a camera and operating technology to monitor nearby items and deliver it to the users in a recognizable format. A dynamic sub-goal selection approach is used to direct users towards their destination while also assisting them in avoiding obstacles. In the event of a threat, this gadget can provide a captured video as evidence. The integrated sensors are low-cost, modest, and easy-to-integrate, allowing the device to be extensively used like a wearable consumer gadget. It does have some restrictions, which we plan to address in future versions. In the improvement of this model in the future. We have to improve the accuracy and interface it to the map system so that the blind can utilize the handheld device assistance with ease.

Future Scope

Because of time limitations, several things which may have been implemented to promote the study's findings were left out, like greater analysis of different object, distance, and input sizes. One thing that might be intriguing is to train unique models on various datasets having lesser resolution and see whether performance of smaller objects may be improved. Another aspect of this experiment that was overlooked had been the effect of lightening on a model's ability to identify objects; this is something that might be investigated further in the future. Additional sensors can be employed in the future for more applications. It is possible to create an Application software. We can link user Aadhar card details also in future, that will enable the administration serve physically disabled people much effectively.

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FAKE INDIAN CURRENCY NOTE RECOGNITION USING PYTHON

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ABSTRACT

Falsifying or faking of money has become a genuine risk to the business of individuals as well as the economy of our nation. In spite of the fact that fake money locators are accessible, they are limited to banks and Corporate workplaces leaving common individuals and small traders helpless. So, in this extent we'll explore the various security features of Indian currency and then set up a software-based framework to identify and contradict fake Indian currency by utilizing image processing techniques and computer vision strategies. The validation system for this currency is completely designed using Python language in PyCharm environment.

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Keywords: Counterfeit currency, counterfeit detection, feature extraction, ORB detector.

Introduction

Currency duplication or manufacturing of fake currency notes illegally by imitating the real production procedure is a large hassle that every nation faces. Counterfeit currency can decrease the esteem of genuine cash and cause expansion due to an unauthorized and unnatural increment with in the cash supply. Manual recognition of notes could be a good way in distinguishing currency notes but it is a very tedious and time- consuming process. Hence, the need of automatic testing procedure for notes comes into the picture which is necessary for handling enormous amount of currency notes in order to get precise output in shorter duration of time. In this paper, we propose a fake currency note detection system using various digital image processing techniques and algorithms.

The proposed framework is outlined to approve Indian currency notes of denomination 500 and 2000 rupees. This system meagerly comprises of three fundamental algorithms and validates the authenticity of different feature present in a currency note. The first algorithm comprises of a few steps which include image acquisition, pre-processing, greyscale conversion, feature extraction, comparisons of images (test image and pre-existing image) and output.to carry out all the process mentioned above we employ different image processing technique such as ORB and SSIM. After this process, in the next step we use 2nd algorithm which is used for the purpose of calculating number of bleed lines

present in the currency notes. Then we use 3rd algorithm for the purpose of validation of the number panel present in the currency notes. Once we apply all the algorithm to the given input image, we get a digitally processed result which is displayed as a out for each currency notes. This framework is smooth way to validate currency notes precisely in shorter time span. This automated system is highly accurate and is easily accessible to everyone when compare to already existing manual method for detecting fake currency note. So, this system is very easy to handle and can easily use by everyone.

Commonly Utilized Security Highlights to Distinguish Fake Notes

1) **Bleed lines:** At the end of each side of a horizontal currency note, there are few lines incorporated with a small angle to the note. These are known as angular bleed lines and it is different for different denominations. There are 5 bleed lines in Rs.500 notes and 7 bleed lines in Rs.2000 notes.

2) **Denominational Numeral:** A vertical band on the right side of the Mahatma Gandhi's portrait contains a latent image showing the respective denominational value in numeral i.e., if we have 2000 then Denomination Numeral will be 2000 and it is same for 500 notes also.

3) **Number panel:** Each banknote provided by Reserve Bank of India (RBI) bears a distinctive serial number along with a

prefix. The prefix consists of the numeral and letter and is followed by a serial number. The number example could be a something like 4CC 456917 and it is generally printed on top left side and bottom right side with numerals growing from small to big size.

4) **Ashoka Column:** The Ashoka Pillar symbolizes the axis on which the world spins and it is placed on the bottom right side.

5) **RBI seal:** the RBI seal is in intaglio printing and it is present just below the Governor's signature.

6) **Denominational value in words:** The denomination of the particular currency note is written in words which is present at the top central region of the note and is in devnagari script.

The above-mentioned features of the currency note are being extracted in our project. Other than the above-mentioned features we also extract some of the other different features in our project which include RBI symbol (i.e., Rs. 500/Rs. 2000 in Devanagari script), Rs.500 rupees written in Hindi and English etc. which are self-explanatory.

Literature Survey

P. Julia Grace, A. Sheema [1] proposed, some of the different methods mentioned here to identifying counterfeit notes includes the use of infrared or ultraviolet techniques radiation optical character recognition (OCR), usage of sobel operator / filter for image processing etc. Radiometric corrections and geometric corrections were utilised as pre-processing procedures to rectify particular mistakes or distortions caused by sensor-earth geometric differences, among other things. Different articles were examined in this study, and the results were based on the accuracy rate gained through various steps. Here image processing is done with the help of MATLAB.

EshitaPilania, Bhavika Arora [2] proposed, an image processing technique for paper currency recognition and conversion. Pattern recognition and neural network matching techniques can be used to extract the region of interest (ROI). Because image processing involves a variety of approaches, digital processing techniques are employed to discover the region of interest,

followed by neural networks and pattern recognition techniques to match the pattern. Template matching is a straightforward technique for classifying bank notes, however for new bill patterns, new templates are necessary.

Shaikh Ajij Amirsab et.al [3] with the help of feature extraction, classification based on SVM, and neural networks, recognition of currency notes is proposed. In note recognition, processing speed and recognition accuracy are the two most critical factors. As a result of the high processing speed and identification accuracy, manual testing of all notes in a transaction is a time-consuming and untidy process, with the risk of shredding notes in the process. This paper is done for old 500 & 1000 rupees notes and MATLAB Tool is used.

Saiyed Mohammed Arshad [4] proposed Water marking, optically changeable ink, security thread, latent image, counterfeit detection pen, and MATLAB version 13 are some of the ways used to detect false banknotes. The automated system's accuracy and resilience depend on extracting enough monetary features from the cash image. The use of machines makes the process of recognising notes easier and more efficient. They used MATLAB to create a fake dollar note identification technique, as well as feature extraction with HSV colour, space between images, thresh, and other image processing applications.

Ankush Singh [5] provide required mobility and compatibility to most people's as well as credible accuracy for the fake currency detection. The features such as security thread, intaglio printing (RBI logo), and identification mark, which have been used as security elements of Indian currency, were extracted using image processing processes..

Problem Statement

To examine the genuineness of Indian currency by preparing a framework, which uses a real-time image obtained from the camera as the test image and performs various operations which includes image processing and computer vision techniques and finally gives us the final output whether the note is genuine or fake.

Objectives

• The main objective of our project is to

distinguish between genuine and fake currency notes with a software-based automatic framework.

- It should be fast and precise.
- It should save time and should be user-friendly.
- This technique should be mainly helpful to common people and also should reduce the problems faced by the people who work in banks, shopping malls etc. while recognizing genuine and fake currencies.

Methodology

Preparation of Dataset

- The basic step includes the preparation of a dataset containing images of various currency notes (i.e., both fake and genuine) and images of various features of each of the currency notes.
- The dataset will generally contain the following. They are:
– Sub- dataset for Rs. 500 currency notes
1) Images of real/genuine notes
2) Images of fake/counterfeit notes
3) Numerous images of each security feature (template)
– Sub- dataset of Rs. 2000 currency notes (Similar structure)
- The different security features which we are considering includes: (for Rs. 500 currency notes- It has a total 10 features)
– Rs. 500 in Devanagari and English script (2 features)
– Ashoka pillar Emblem (1 feature)
– RBI symbols in both Hindi and English (2 features)
– 500 rupees written in Hindi (1 feature)
– RBI logo (1 feature)
– Bleed Lines on Left and right side of the currency notes (2 features)
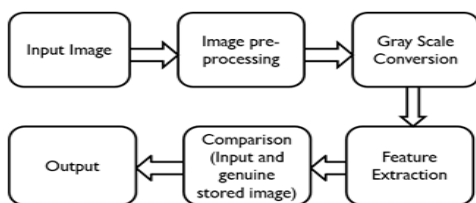– Number Panel (1 feature)

Fig. 1: Architecture diagram of proposed system

Input Image: Here the input image is acquired from digital camera. It will be in the form of test image. This input will test image will be genuine or fake one.

Image Pre-Processing: Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. In this step we read, resize and denoise the image in order to get an enhanced proper image.

Fig. 2: Steps in image pre-processing

Gray Scale Conversion: Grayscale is a range of monochromatic shades from black to white. Many image editing programs allow you to convert a color image to black and white, or grayscale. This process removes all color information, leaving only the luminance of each pixel. The reason for differentiating such images from any other sort of color image is that less information needs to be provided for each pixel in addition, grayscale images are entirely sufficient for many tasks and so there is no need to use more complicated and harder-to-process color images.

Algorithm 1: For feature 1-7
1) Feature detection and matching using ORB: ORB (Oriented Fast and Rotated BRIEF) is one of the algorithms which was developed from OpenCV labs and is mainly used for Feature detection. In our project, once when all the necessary processing steps for the image is done, feature is detected and matched using ORB algorithm. We already have our dataset and ready, which contains

images of different security features present in the currency note with a total of six different templates for each security feature with different shapes and resolutions. After this, the ORB algorithm is used here to detect different security feature present in the query image. To find out the particular security feature in the note, a search area list is defined, which tells the approximate region where the particular feature is likely to be present. Once when the region of the feature is determined, the functions of ORB algorithm is used to detect the feature and then it is marked by using a marker. This operation repeats to all the images present in our data set.

Fig. 3: ORB Feature detection and Matching

2) Feature Extraction: By using ORB algorithm we will now get the exact location of each template within the marked area of the given test image. The marked area is then cropped by using Slicing techniques. After this the operations of gaussian blur is applied to the image in order to remove different noises present in the image. This image is then converted in to gray scale as no operations can be performed on color images and now our feature is ready for the comparison with our trained data set

3) Feature Comparison using SSIM: Once the feature of the teat image is extracted, it is then compared with our existing trained dataset and then a score is provided for the amount of similarity between both the images (i.e. original template and extracted feature) using SSIM

$$\text{SSIM}(\mathbf{x}, \mathbf{y}) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2 + \sigma_y^2 + C_2)}$$

The Structural similarity index measure is method for predicting perceived quality of digital images. It is basically used to measure

similarity between two images. It can obtained from Skimage library and it compare two images based on pixel density. It has a range of -1 to +1. A score of +1 means two images are very similar and a score of -1 means that both images are very different. So, in our project SSIM score for each feature of the test image and already stored template is calculated. Finally mean SSIM for each feature is calculated and Stored.

Fig. 4: Features extracted in Rs.500 currency note

Fig. 5: Features extracted in Rs.2000 currency note

In the above Figures 4 and 5 each feature which is being extracted is marked and numbered. This is as discussed in the below table.

Feature No.	Feature Name
1	Denomination value in Devanagari script
2	Ashoka Column
3	Reserve Bank written in Hindi
4	Reserve Bank written in English
5	Denomination Numeral
6	RBI Seal
7	Denominational value in words
8	Right Bleed lines
9	Left Bleed lines
10	Number Panel

Fig. 6: Table indicating feature marked in fig.4 and fig.5

Algorithm 2: For Feature 8 & 9
Each note contains bleed lines close to one side and right edges. There are 5 lines in the event of Rs.500 note furthermore, 7 lines in the event of

Rs.2000 note close to every one of the two sides. This algorithm is being utilized to check and confirm the number of bleed lines present in the left & right side of a note.

1) Feature Extraction: In initial step, the districts where the available bleed lines are separated by trimming/Cropping the pictures. Thus, a section close to one side and right edges of the note pictures is painstaking extricated.

2) Image Thresholding: within the 2nd step, the image is threshold employing a regional esteem. This guarantee that only the black bleed lines on a white foundation and makes further processing is very simple.

3) Calculation of no of bleed lines: The 3rd step involves calculation of number of bleed lines. In this step first we repeat over each column. At that point, we calculate number of black regions in each column by expanding a counter at whatever point current pixel of column is white and immediately following pixel is dark. Additionally we, tally number of black districts for each column, but in case the number of black regions is as well huge (>=10), at that point that column is erroneous and it is disposed of, at long last the number of dark regions is calculated by considering the non-incorrect columns only and the results is shown as the number of drain lines. This count ought to be roughly 5 for Rs. 500 cash notes and 7 for Rs. 2000 notes.

Algorithm 3: For feature 10

Each Currency note will contain a number panel, where it contains the serial number of the currency note, which is presented at the bottom right part. The Serial number will contain the number of characters which is equal to 9 and neglecting the space between them. This algorithm will perform the operations on the number panel and count the total number of characters presented in the number panel will be displayed.
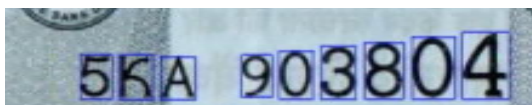

Fig. 7: Number Panel

1) Image Thresholding: This is 1st step, in this calculation is once more thresholding with appropriate esteem so that as it were the dark characters stay within the number panel on a white foundation and gotten to be simple to distinguish. But in this algorithm, thresholding is done utilizing different values,

i.e. first the picture is threshold at the starting esteem (90), at that point all other steps specified underneath are done and number of characters are calculated. After that, the edge esteem is increased by 5 every time and the method of calculation of number of characters is rehashed till either we reach the maximum value (135, in our case) or we discover sufficient confirmation that 9 characters are display within the number panel.

2) Contour Detection: This is 2nd step; Contour detection will detect the threshold image of number panel and localize them easily.

3) Finding Bounding Rectangles: This is 3rd step, the bounding rectangles for each contour detected by contour detection is found. The details of each Bounding Rectangles will be given inside a list

4) Eliminating Erroneous Rectangles: The list of rectangles computed within the past step contain a number of erroneous and superfluous due to present noise in an image. This spurious rectangle should be eliminated. Then bounded by a bigger rectangle are also eliminated. At long last, those rectangles which are situated totally as well tall in the number panel are moreover removed.

5) Calculation of number of Characters: The rectangles which are remained after the above process those rectangles are bounded by each character on the number panel. The rectangles will still be remained until it is calculated and give the number of characters is detected in that threshold image.

The earlier process will be repeated for multiple values of threshold (Starting from 90 and it will be increased by 5 after each iteration). This process will stop if detects 9 characters in four iteration or until it reaches the maximum threshold value (135 in our case).

Feature Extraction: Feature extraction employs the selection and extraction of some of

the Effective and important features, among the largest data set of the features which are extremely important for the recognition of fake currency. Some Features of an image are Latent image and Identification Mark. We first create a database of a number of authentic Indian notes and then extract their features. The extracted features are used for detection of fake currency. Extracted features are stored for the comparison to give the verification result.

Comparison: In our comparison the features extracted from the images of the currency notes plays a very crucial role. In facts, it is the comparison of the features that enables us to differentiate fake notes from the real ones. To compare the performance, we have segmented the image and then we remove from a binary image all connected components (objects) that have fewer than P pixels, producing another binary image. The above step is repeated three times to get the binary image which can be compared. Then we compare the two images and store the difference.

Output: The output of the currency recognition will be given in the format of text. The text output will be given in a text box of GUI.
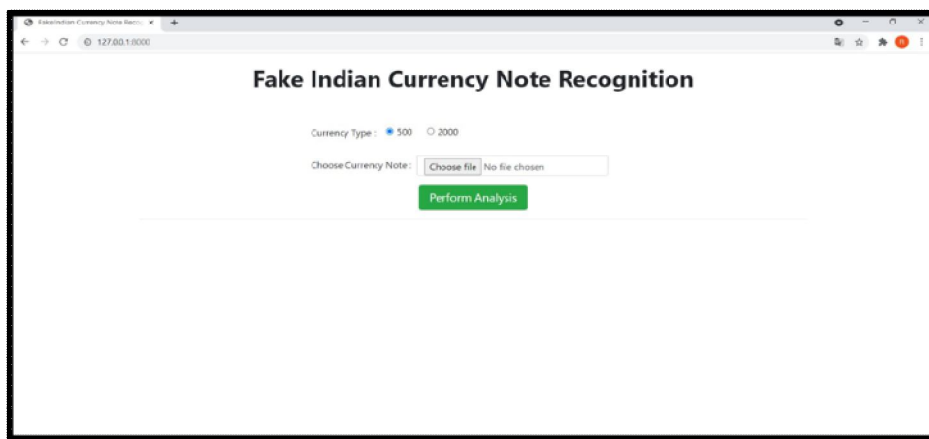
Fig. 8: Initially no image is selected, and user is asked to select the image
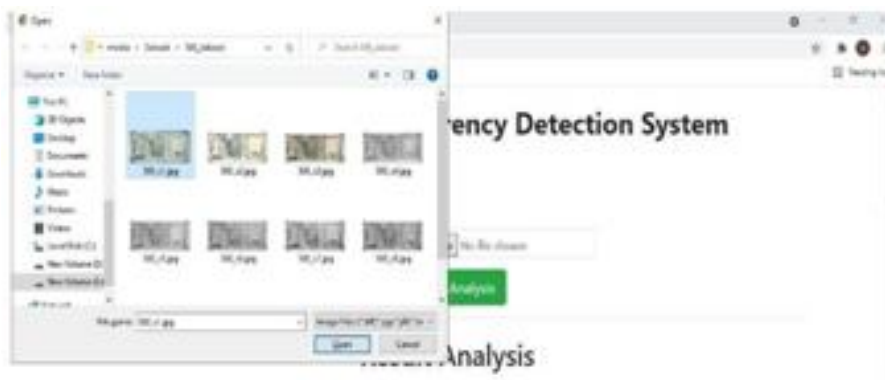
Fig. 9: Browsing image
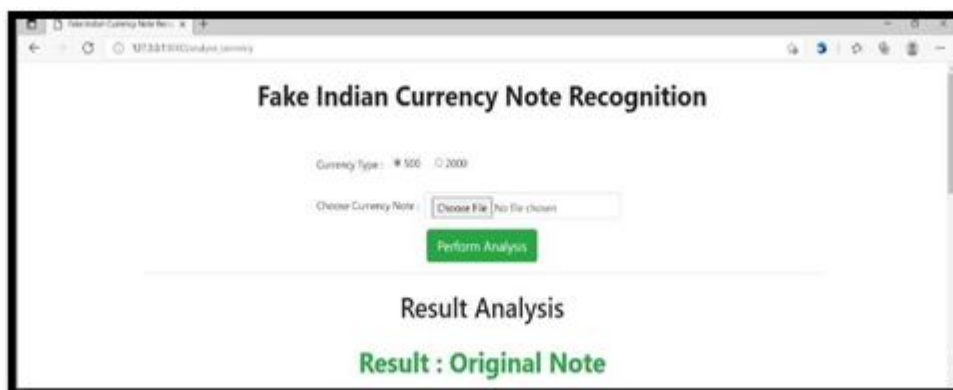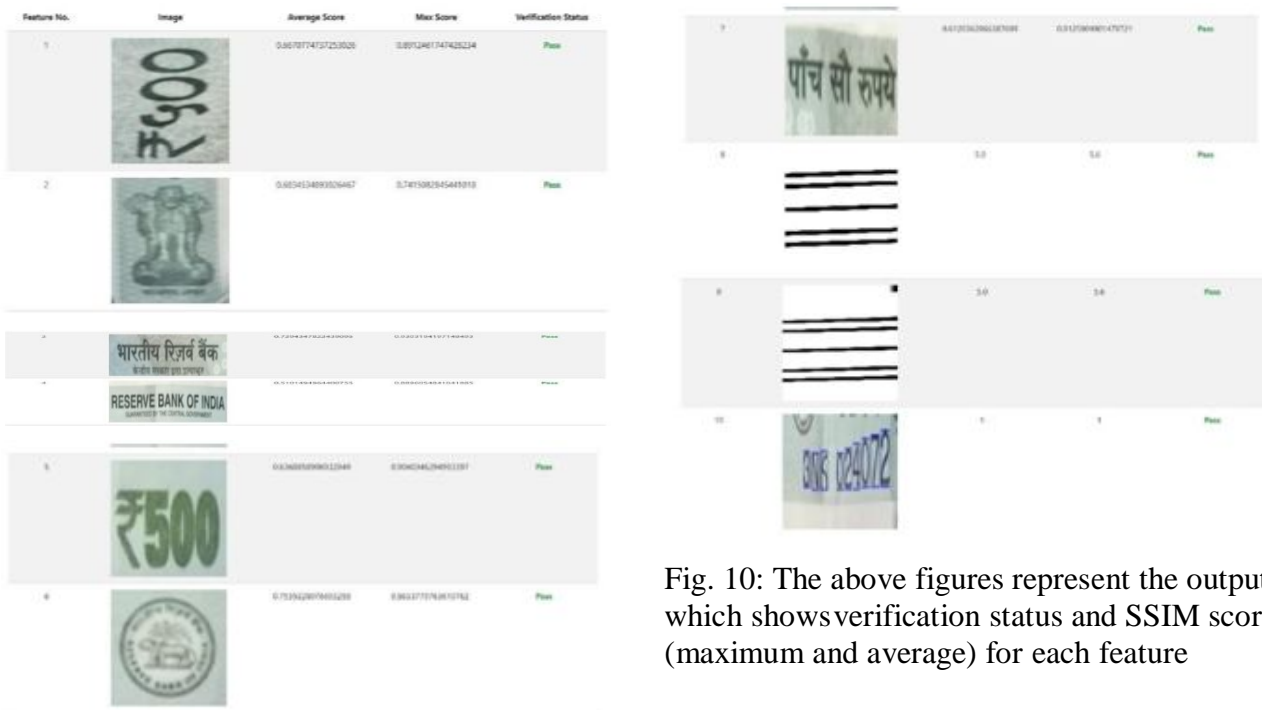
Fig. 10: The above figures represent the output, which shows verification status and SSIM score (maximum and average) for each feature
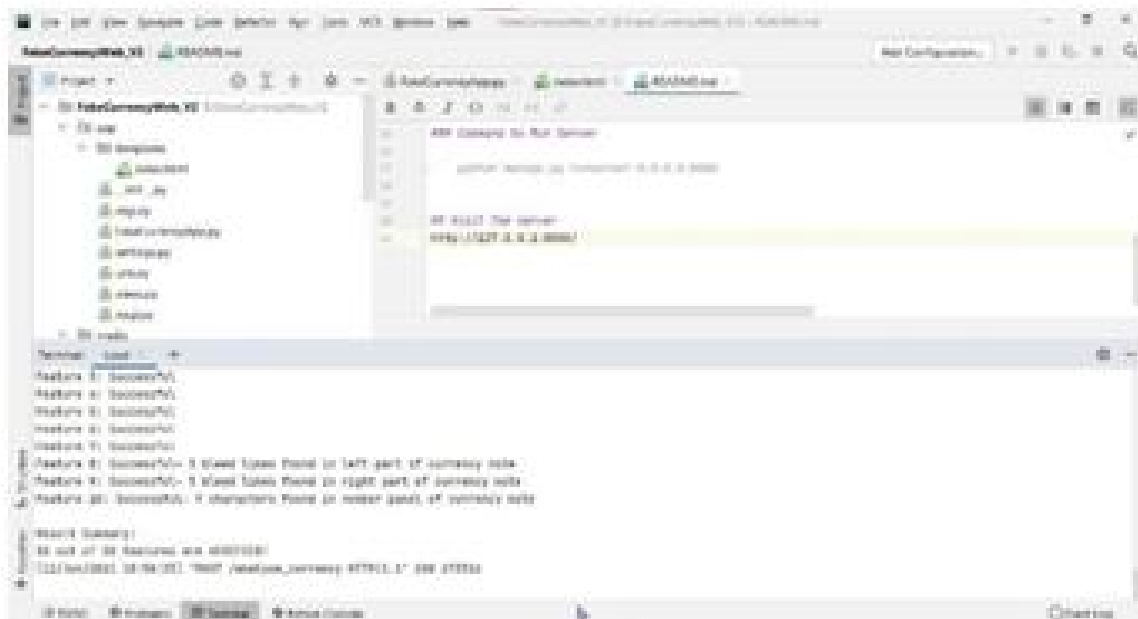
Fig. 11: Output window showing final results (Original Note)

Results and Analysis

The proposed framework authenticates the input image of currency note through image processing. The input image passes through various algorithms in which the image is processed and each extracted feature is thoroughly examined. The results are calculating in the following manner;

Performance Analysis

The performance analysis of the proposed framework is carried out utilizing different pictures of notes. As of now a dataset for both fake and genuine currency notes of 500 and 2000 notes were tested and then accuracy is calculated. For the purpose of calculating accuracy, it was expected that the currency note passed at slightest 9 highlights out of 10 at that point the note is real otherwise it is fake. Testing of both genuine and fake notes is done independently.

• For testing of genuine notes, 9 genuine notes for Rs 2000 and 10 genuine notes for as 500 is considered, out of which 15 of overall 19 notes give the proper craved results.

Accuracy: 80%

• Essentially, for testing fake notes, 6 fake notes are taken into account for each group (12 Notes in total), for which 10 of the 12 notes give the correct required yield.
Exactness :85%

Time Analysis

The proposed framework has been executed utilizing python programming language in PyCharm environment. Along with the end product, a great deal of images and other investigation related information is being printed by our framework. On the off chance that all the information is printed, then at that point the framework requires around 35 seconds to measure, print all the information and give end product.

The final outputs of different features with respect to SSIM score can be tabulated as follows.

Fig. 12: Table for Original Rs.500 currency note

Featur eNo.	FeatureName	AverageScore	Max. Score	Verification Status
1	Rs.500 written in Devanagari script	0.6670	0.8912	Pass
2	AshokaPillar Emblem	0.6834	0.7415	Pass
3	RBI symbol written inHindi	0.7294	0.9303	Pass
4	RBI symbol written inEnglish	0.5101	0.8896	Pass
5	Denominational Numeral	0.6368	0.9040	Pass
6	RBI logo	0.7559	0.8633	Pass
7	Denominational value inwords	0.6120	0.9123	Pass
8	Left Bleed lines	5.0	5.6	Pass
9	Right Bleed lines	5.0	5.6	Pass
10	Number Panel	1	1	Pass

Fig. 13: Table for Fake Rs.500 currency note

Feature No.	FeatureName	Average Score	Max. Score	Verification Status
1	Rs.500 written inDevanag ari script	0.2397	0.2892	Fail
2	Ashoka Pillar Emblem	0.5900	0.7072	Pass
3	RBI symbol written inHindi	0.586	0.8663	Pass
4	RBI symbol written inEnglish	0.6061	0.9249	Pass
5	Denominational Numeral	0.6812	0.7836	Pass
6	RBI logo	0.5642	0.7801	Pass
7	Denominational value in words	0.6092	0.7568	Pass
8	Left Bleedlines	3.0	5.6	Fail
9	Right Bleedlines	3.4666	5.6	Fail
10	Number Panel	1	1	Pass

Fig. 14: Table for Original Rs.2000 currency note

Feature No.	FeatureName	Average Score	Max.Score	Verification Status
1	Rs.500 written inDevanag ari script	0.5916	0.9612	Pass
2	AshokaPillar Emblem	0.5197	0.7715	Pass
3	RBI symbol written inHindi	0.5347	0.8964	Pass
4	RBI symbol written in English	04692	0.9017	Pass
5	Denomin ational Numeral	0.7800	0.9448	Pass
6	RBI logo	0.5077	0.8229	Pass
7	Denomin ational value in words	0.6837	0.8640	Pass
8	Left Bleed lines	7.3	7.6	Pass

| 9 | Right Bleed lines | 7,0 | 7.6 | Pass |
| 10 | Number Panel | 1 | 1 | Pass |

Fig. 15: Table for Fake Rs.2000 currency note

Feature No.	FeatureName	AverageScore	Max.Score	Verification Status
1	Rs.500 written inDevanag ari script	0.2071	0.2071	Fail
2	AshokaPillar Emblem	0.2902	0.4813	Fail
3	RBI symbol written inHindi	0.4604	0.5333	Fail
4	RBI symbol written inEnglish	0.5788	0.6674	Pass
5	Denominational Numeral	0.3411	0.3862	Fail
6	RBI logo	0.4368	0.6233	Fail
7	Denominational value inwords	0.3609	0.3804	Fail
8	Left Bleed lines	6.0	5.6	Fail
9	RightBleed lines	6.1764	5.6	Fail
10	Number Panel	1	1	Pass

Conclusion

In this paper, an automatic model for validating 500 and 2000 rupees notes are been developed using Python 3 software in PyCharm environment, here around 10 features of the currency note are extracted and different templates relating to this are collected and finally both input image and already existing templates are compared using various algorithms and computer vision techniques present in OpenCV function of Python software. After comparison based on the similarity the output is displayed whether the input image is fake or genuine one. This model is almost around 80% accurate in identifying the genuine currency and 85% accurate in detecting the fake currency.

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STRATEGIES TO DETECT COVID-19 AND MEASURES TO PREVENT IT

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ABSTRACT

Severe acute respiratory syndrome (SARS) is an abbreviation for acute respiratory syndrome (sars Syndrome. SARS-CoV-2 is a kind of coronavirus (also known as Novel Coronavirus or COVID-19) is a contagious viral bacterial respiratory illness that will be studied to determine the scope of the epidemic in India as well as future forecasts. The fundamental reproduction number, R0, in China, where the outbreak began, is determined to be between 2-2.5, depending by location. As the Asthma virus spreads rapidly, medical testing kits are in limited supply all around the world. Since the corona epidemic, determining whether or not someone was infected has been extremely difficult. Temperature gadgets are frequently used to tackle this problem by measuring body temperature. These gadgets are equipped with contact - free infrared temperature sensors that can detect body temperature without requiring physical contact. Furthermore, the traditional contact within heat level evaluation has the drawback of wasting commodities and generating problems. We offer a contact free, tailored CBTM construction with an isolated heat sensor to determine the aforesaid problems. In this project, we connected an IR temperature sensor and used a picture of the person to send email warnings when the temperature of a certain person crosses the defined values.

Keywords: COVID-19, IR temperature sensors, Thermal cameras;

Introduction

Body temperature is among the most viral things in the human body. By taking the body's core temperature, it is possible to determine whether the patient has fever or not. It can also make educated guesses about the treatment's impact on the patient. It is particularly critical for those who require extensive monitoring (e.g., infants and the elderly). As a result, body temperature is currently the most widely utilized indication by physicians in hospitals to assess a patient's physiological state. As a result, an Automated CBTM technology seems to have become a worldwide research topic, with the primary objective of precisely and long-term body temperature measurement.

The two major types of continuous body temperature monitoring methods utilized today are real interaction and non-interaction. The touch measuring device has the possibility of measuring a high thermal resistance (about 90°C to 300°C) without remaining unaffected by the environment. Many touch techniques for measuring core temperature (e.g., clinical temperatures and thermocouple) are currently used, however this approach not only active industry, space, and commodities, but it also adds to caregivers' workload and wastes resources.

Furthermore, in order to achieve precision in the measuring technique, the participant's activities will be denied, and the approach might cause damage. On comparing the encounter procedures, the non-contact core temperature measurement will use infrared techniques which do not require significant contact with skin cells during the procedure. The most common IR systems are temperature sensors and infrared imaging. In this work, we utilized the Thermo sensor to see the metabolic rate as an image.

Image processing, which specializes with the collection of necessary data connected to digital images and performs a distinctive role in technological progress, is also included in this project. Our main focus will be on acquiring digital photos and then processing them with programmes and techniques to extract relevant data. As the visual data is delivered into the image processing system, it is processed to make it valuable without the need for human observation. Image processing information will play a significant role and assist in a variety of fields where it may be used. Image processing has a wide range of applications and may be used in almost any situation where imaging data can be linked to pre-determined algorithms. It was a sophisticated image analysis tool that also served as the foundation for our research.

Literature Survey

[1] The researchers with the emergence of the COVID-19 worldwide pandemic, thermal sensors have become one of the instruments utilized for screening. On the market, there are a variety of sensors prices ranging from low to extremely high. This study shows how smaller, less expensive sensors may be integrated into a bigger array of sensors to provide greater healthcare and be utilized for form identification and object recognition. The AMG8833 Feather Wing sensors were utilized, and the Raspberry Pi framework was used.

In this case, [2] The extraordinary 2019 new coronavirus epidemic, dubbed COVID-19 by the World Health Organization (WHO), has put a number of countries throughout the world in jeopardy. The impact of the COVID-19 epidemic, which was previously limited to Chinese nationals, has now become a source of great concern for almost every country on the planet. Due to a lack of facilities to cope with the COVID-19 outbreak and concerns about overburdened healthcare organizations, the majority of these countries have gone under partial or total lockdown.

Despite being a basic physiological indication of thermal heat-strain, core body temperature (TC) is harder to identify semi throughout the field, according to the study [3]. This study used a Kalman Filter to estimate TC using a combination of skin temperature (TS), heat flux (HF), and heart rate (HR) data (KF).

In this case, the [4] We are attempting to create a method for identifying the new coronavirus using radiography, i.e., X-rays, in this study. We also provide an information for the scientific community for more improvement, which was taken from several scientific research hospital facilities that treat COVID-19 patients, along with the study.

This research [5] proposes the development of a system that can accurately classify the viral disease from a thermal image with fewer human encounters using a high

- resistivity with an attached thermal imaging device. Furthermore, the suggested device is connected with facial-recognition technologies and can show the pedestrian's confidential info as well as take their temperatures autonomously. The medical approach improves expectations for this suggested design, and it may be able to help prevent the coronavirus from spreading further.

Methodology

In our project we used two modules, they are firstly the Shield and sound module and next for image processing and touch sensor. The data of the individual soldier should be stored in a data base, then if any intruders try to enter the border or military training centre, the surveillance camera will scan the activities of the person who trying to cross the border during night time, if it does not match with any of the soldier, then it sends the information to the control room through programmed arduino. The controller can control the device from control room itself, he can shoot the person who are trying to cross the border. The devices that we are installed can be damaged by the external intruders, to overcome from this we are using a capacitive touch sensor to sense the multiple touches, which is connected to the buzzer through arduino gives the alarm whenever the devices are tried to damage, then we can get alert.

The soldiers working in the remote areas cannot get to the connection during war, to overcome this we are came up with a shield and sound module. When the soldiers are injured then the location of the injured soldier can be obtained by the shield module that is whenever the soldier hit by the terrorist, then he had a life jacket along with it there will be a shield made up with a copper winding. Once the bullet penetrates the shield the copper windings brake up and the location of the injured soldier will be sent to the data centre through GSM module. If the any intruders are tried to enter the border of the nation during night time then the sound sensor senses the sound and the information will be sent to data centre.

System Design

Our system represents the complete architecture of detection and identifying the infected person. It includes components such as, Raspberry Pi 3B+, Pulse oximeter, Servo motor, Ultrasonic sensor, IR temperature sensor, PI camera.
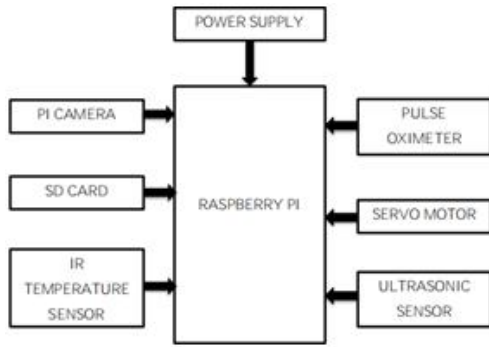
Fig4.1: Block diagram of covid-19 screening device.

Fig.4.1 shows the block diagram of the covid-19 thermal screening device. A Raspberry pi is used as a microcontroller to control all the devices. Hardware used in this proposed project is Raspberry pi 3b+- serve as microcontroller, IR temperature sensor- to measure the body temperature, Pulse oximeter- to measure the pulse and respiration level, Servo motor- to control the door locking system, Ultrasonic sensor- to maintain the particular distance between the device and the person, Pi camera- to record or to take snapshot of the person.

Initially, once the power supply given to the microcontroller, all the devices which are connected switches on and starts working according to the program written. Power supply is the basic requirement for any of the microcontroller. Without the power supply no microcontroller can be used. Each microcontroller has its own power ranges. Basically, it may be from 3.3V to 12V it may differ in these ranges.

The raspberry pi lens is linked to the equipment, and the pi lens must be activated on the raspberry pi in order for it to operate. Pi lens is mainly used to take snap shots or recording a video or live streaming a video it depends on the programmer how he wants the pi camera to be worked as. Raspberry pi is basically a mini-CPU wherein normal CPU, we have the storage devices to store data. The Raspberry pi also needs a storage device to store data so SD card is inserted to Raspberry pi. IR temperature sensor is mainly used to check the body temperature of any human without the contact of the body. This is the initial stages of checking a person is infected with covid-19 or not. Pulse oximeter is used to check the human pulse rate, High or Low. And even the respiration level of the human can be measured in this device. Servo motor is used for door locking or unlocking system. The spacing between the gadget and the individual being checked is maintained using an ultrasonic sensor.
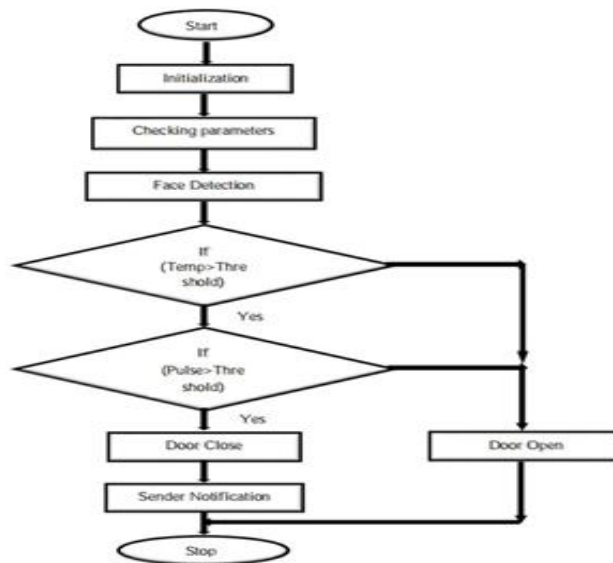

Fig4.2: Flowchart

a) Proposed System

Nowadays covid-19 is a major pandemic. Different measures and medicines regarding to that major research is going on, one of it is temperature screening project and its details are as follows,

Level 1: Testing i.e., temperatures will be measured. If temperature range is higher than fixed threshold value then the second level of test will be conducted.

Level 2: Pulse oximeter test, if in case the pulse rate is "HIGH" than threshold value, then mail will be sent to specific person.

If at both levels temperature is lower, a door lock system is made for locking and unlocking according to the initial test of pandemic. Before door unlocking, attendance is monitored when temperature is low. Our methods which are constructed here is with Raspberry Pi. And the code written with the help of Python language and Open CV library.

b) Experimental Results

Output of IR Sensor and Pulse Oximeter:

The item temperature is detected by the IR sensor in the first image. The beat and oxygen level are sensed when the item temperature exceeds the threshold value.

In the second image, the heartbeat and oxygen concentration of the item are monitored following the identification of thing and ambient temperatures.

Fig: Output Image Displayed

Fig: Digital Output of both Object and ambient Temperature

Output of Ultrasound sensor:

If individuals or groups are nearby to one another, the alarm of social distancing appears in the diagram below.

Fig: Output image along with the alert

Conclusion

A novel real-time early tracking and protection system for coronavirus has been created utilising a smart gadget that is coupled with a temperature system. The smart gadget can also detect an individual's elevated body temperature. The emergence of coronavirus is the most recent major issue that has occurred throughout the world, and it has sparked a lot of interest and consciousness among individuals. E3arly identification of coronavirus symptoms will be one of the most effective strategies to stop the diseases from spreading.

Because elevated body temperature is one of the most prevalent symptoms, a real-time monitoring and controlling system for the application process that displays people's temperatures automatically is required. As a result, the screening procedure' diagnosis will take less time, and there will be less human encounters that might hasten the transmission of the coronavirus. It may be determined that remotely sensed data approaches, which will provide a variety of methods for identifying, detecting, and detecting coronavirus, hold excellent potential and capability for meeting the demands of the medical system.

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MANASVITA- PRE DETECTION OF SUICIDAL TENDENCIES

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ABSTRACT

Suicide is a complex public health problem of a global dimension. Every suicide is a tragedy. Accounting for these, it is essential for developing an effective technology for pre-detection. In this model, the neurobiological sensor output data are run on the python program to obtain the level of suicidal risk factor in a suspect as the output. The current conventional method of diagnosis relies on filling questionnaires or survey from the patient or relatives, doing a physical examination by the doctor, just lays the groundwork but is not accurate enough. In this paper, we discuss the interconnection between the psychological, physiological and Socratic maieutic factors and their impact on suicidal tendencies in prime suspects. Thereby, the proposed project is an attempt to provide an electronic solution for the precautionary prevention of suicidal attempts in a suspect. A technical approach to the prevailing drawback by monitoring psychological, physiological and behavioral changes is designed.
_____

Introduction

The research has shown, Suicide can be defined in such a way that 'A fatal self-injurious act with evidence of intent to die is Suicide'.

KEY FACTS (World Health Organization Extract):

- Globally, approximately 800,000 people die due to suicide every year.
- Number of people attempting suicide are increasing every year.
- Considering teenagers, the third cause of death is Suicide.

We can use many terms to describe suicidal and self-harming behaviours in the scientific literature. To allow meaningful comparisons, consensus definitions of international terminology is important. Number people committing suicide every year is approximately 800,000 people, ie one person every 40 seconds. From many researches we can say that there may be 20 people attempting suicide while one person died by suicide. Suicide is a global phenomenon and occurs throughout the lifespan. What does the current evidence tell us about suicide? Every suicide is a tragedy. Accounting for these, it is essential to developing effective suicide prevention strategies. Suicide prevention starts with recognizing the warning signs. Thereby, the proposed project is an attempt to provide an electronic solution for the precautionary prevention of suicidal attempts in a suspect.

A. Project Objective

The objective of our project is to design a software that helps to detect suicidal tendencies much prior to committing the act. Our project also determines other underlying medical problems the suspect might have. Motivation of our project is to reduce the number of deaths caused in the world due to suicide.

The presented study has evaluated the possibility of distinct physiological and psychological changes in a suspect prior to the attempt of suicide. The proposed software system draws digital outputs of the picked up signals by the sensors to send an alert signal to get help.

In this model, the neurobiological sensor outputs are given to a program on Google Colaborator to get the level of suicidal risk factors. The current conventional method of diagnosis relies on filling questionnaires and surveys by the patient or relatives, doing a physical examination by doctor, just lays the groundwork but is not accurate enough. A technical approach to the prevailing drawback by monitoring psychological, physiological and behavioural changes is designed.

Lastly, the put forward idea marks its application in medical sectors dealing with neural disorders leading to suicidal tendencies, or by people who have access to interact with suicide suspects.

B. Literature Views

In the paper [1], the author speaks about passively monitoring physiological, behavioural, and psychological changes in a

neuropsychiatric patient by making use of actigraphy, location sensing, monitoring social activity, heart rate monitor, and responses to standardized questionnaires. This monitoring is done with the help of sensors that can be attached to smartphones or smart devices like wearable accelerometers, Holter monitors, and multimodal sensing approaches that fuse multiple data types.

The paper [2], is a developmental research of Uncertain threat having a direct impact on the variation of neurobehavioural signals providing data of increased suicidal ideation. Experimentation is done in individuals with elevated sensitivity to uncertain threat (U-threat) and found that they experience very high levels of chronic distress compared to normal individuals. The authors concluded the paper saying that the individual having high reactiveness to U-threat are more prone to suicidal tendencies. These people opts suicide as a mean to escape from uncertainties.

The paper [3] emphasises the Neuroscience of Loneliness. Individuals who love loneliness will be in the state of social isolation. This is having a direct relation to depression, anxiety, and Post-Traumatic Stress Disorder. These individuals need to be monitored often because they are more vulnerable to depression and their mental health to be overlooked oftenly. The authors found that social isolation affects the activation of dopaminergic and serotonergic neurons, which are key to our emotional well-being.

In [4] reference, the author discusses how neural signals and programmed mathematical logic can be combined together. A combination of neural signal processing and embedded system is developed which gives more accurate solution to psychological problems.

This paper [5] discusses how EEG (electroencephalography) can be used to detect suicidal tendency in psychiatric patients. EEG is a non-invasive equipment to record the intrinsic electrical activity of the brain. This paper focuses on Biological Aspects of Suicidal Behavior, by making use of biomarkers and signal sensing. EEG is a valuable diagnostic tool in many clinical applications including psychiatry. The author emphasizes that by measuring the biological aspects the suicide risk can be assessed.

A literature survey has been performed to view the trends in suicide attempts within the past years and see how various mental disorders have an impact on the physiology and behaviour of a human. It is clear from the study that mental disorders have a direct relation to the suicidal tendencies. Many researches showed a light towards predicting these suicidal tendencies through monitoring physical and biological changes. It is clear from the research reviewed that incorporating Neurotechnology with Neural Networks can give a new way to the research and it need to be examined thoroughly. The types of mental disorders need to be enlisted and studied, along with its dependency to suicidal activities. A novel design needs to be designed which can be most beneficial to the society in order to reduce the number of suicides committing. Relativity of psychological, physiological and behavioural impact on suicide is still being researched and continues to be problematic in the development of a neural algorithm. This field of inquiry is very important as the main outcome of it is a precautionary prevention of suicide in prime suspects.

Existing Systems

The current conventional method of diagnosis relies on filling the questionnaires/surveys by patient or relatives, performing a physical examination by the doctor. In recent years, researchers have published theories on electroencephalographic risk markers of suicidal behaviour and also have studied the sensing technologies for monitoring serious mental illnesses and identifying unique electroencephalographic signals to detect a potential depression and anxiety biomarker and a pervasive approach to EEG-based depression detection. In the presented study we inquire about the possibility of combining psychological, physiological and behavioural factors to identify suicidal behaviour.

Problem Statement

The research has shown that suicide can be defined in many ways. One can say that it is a self-injurious act. The current pandemic has also increased the feeling of loneliness in many teenagers which is resulting in a higher rate of depression and anxiety disorders. The taboo

towards mental disorders in most countries is increasing the level of undiagnosed mental health issues which makes detection and prevention of suicide much harder than ever.

With the help of Global dataset collected as a part of literature survey, we can say that Suicide is a common cause of death throughout the lifespan of an individual and it is found from the survey that globally number of young people committing suicide is a large number than any other cause of death.
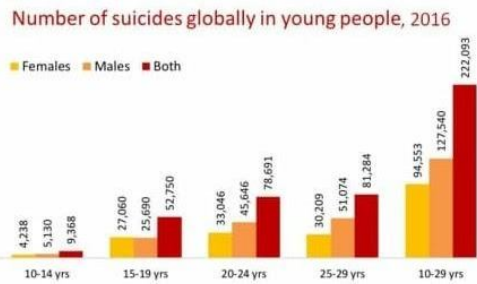

FIG 1: Number of suicides globally in young people, 2016

This shows that suicides should be considered a primary health concern and demands immediate attention for their prevention. The conventional therapeutic and socratic maieutic approach of detection and diagnosis requires the integration of technology to improve accuracy, precision and save time to prevent loss of lives to suicide.

Proposed System

Brain signals matters a lot. Brain can be defined as a perpetual machinery located in skull which can compute, navigate, making decisions, creating imaginations forged via a neural network. For this to happen, the Brain unleashes a hurricane of chemical activities on a psychological level which in-turn triggers different physiological behaviors. These patterns of changes are distinct from one another when the brain has to make choices or decisions, in this case, with respect to an attempt to commit suicide. Reason for a Suicide attempt can be mental disorders, especially depression and alcoholic individuals. If an individual attempted suicide before, the risk factor of committing suicide is very high. Risk and protective factors and warning signs in case of suicide are clearly defined and demonstrated by The Suicide Prevention

Resource Center. Risk factors are defined as how more likely an individual thinks or attempts suicide. Immediate risk of suicide is indicated by Warning signs. Individuals who are less likely to attempt suicide are enlisted or characterized in Protective factors.

The fore-front project idea aims to propose a solution to neuro-electronically detect the adverse neural behaviour in the suspect exhibiting suicidal behaviour by collecting the data of the overall chemical and electrical activities that arise from the interaction in the neural network.

Block Diagram
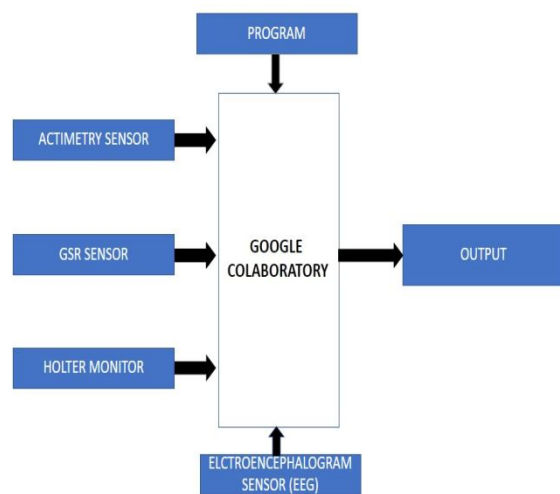
A. Experimentation

In our project, we are using an environment called Google Colaboratory that allows us to code and run programs in Python. The data of the individuals should be stored in a database, then this data is taken as inputs to the program to process them to obtain one of the six levels of suicide risk as an output. We have collected outputs from electroencephalogram sensor which gives analog electro-chemical brain signals, actimetry sensor which gives the analog sleep-awake cycle signals, holter monitor which gives the heart rate and the heart rate variation data and galvanic skin response sensor which essentially is a lie detector, is used to monitor the answers to the set of questionnaires to analyze the behavioural changes and stored these data sets in digital form. This data is given as inputs to our program which then runs through two different if-else loops to produce the relevant outputs of

six levels for the given inputs. The six output levels being No Suicide Risk, Low Suicide Risk, Moderate Suicide Risk, Elevated Suicide Risk, Severe Suicide Risk and Extreme Suicide Risk.

1.1. Google Colaboratory

Google Colaboratory, or "Colab" is used in the project to code the neural algorithm. It is a product from Google Research. It helps young researchers to write and execute Python code. This platform is well suited to domains like artificial neural networks, machine learning, data analytics.

Researchers need to sign in to their Google account, then click the colab or https://colab.research.google.com.

EXAMPLES: many example or sample programs will be available in their Jupyter notebooks. GOOGLE DRIVE: Jupyter notebook in your google drive.

Google Colab ML Libraries

- Keras: It is written in Python, runs on top of TensorFlow, CNTK, or Theano.
- PyTorch: It is ideal for developing deep learning applications.
- MxNet: This also ideal for developing deep learning applications.
- OpenCV.
- XGBoost.
- GraphViz.

As per the information provided by Google's Colab documentation, A GPU provides 1.8T Flops and has 12GB RAM while TPU delivers 180T Flops and provides 64GB RAM.

1.2. Python

Python is a high-level, general-purpose programming language. It is developed by Guido van Rossum and first released in 1991. The main features of Python are code readability and making use of whitespace for coding. It is an object-oriented programming language. The language constructs used in Python makes the programmers to write clear and logical code for any type of projects. The special features which are available in new programming languages like dynamic typing and automatic memory management is incorporated in Python. It has the garbage

collecting capability. Multiple programming paradigms like procedural, object-oriented, functional programming are supported in Python. Python has a comprehensive library in it, hence it is also known as "batteries included" language. Python was first developed late 1980s just after the invention of ABC language. The second version of Python is released in 2000, Python 2.0, which have features like list comprehensions and a garbage collection. The third version of Python is released in 2008, Python 3.0. The second version Python ie Python 2.7 is extended to 2020.

System Requirements

- Google Colaboratory
- Python

B. Mathematical Modelling

The input combinations of the data set consisting of the psychological and behavioural factors based on their priorities along with Emotional Intelligence (EI) and Active Suicidal Ideation (Active SI) for the corresponding output of the six levels are taken separately and a mathematical equation for each output state is drawn using the Karnaugh Map integrating the AND and OR gate combinations.

Let us look at the input combinations for one level or state of the output and deduce the mathematical logic. We will simultaneously look at all the other equations for the rest of the input combinations.

Output State 1: Low Suicide Risk

BP1	BP2	SI	EI	PP1	PP2	PP3
0	0	0	0	0	0	1
0	0	0	1	0	1	0
0	1	0	0	0	0	1
0	1	0	1	0	0	1

Table: Low suicide state combinations

Using Karnaugh Map, we get

Eq_2 = (~B_P1 & ~SI & ~P_P1) & ((~B_P2 & ~EI & ~P_P2 & P_P3) | (~B_P2 & EI & P_P2 & ~P_P3) | (B_P2 & ~P_P2 & P_P3))

This equation combines all the input combinations for low suicide risk to give the output as 'Low Suicide Risk'.

The same method is followed for all the other input combinations.

$Eq\_1 = (\sim B\_P1$ & $\sim SI$ & $\sim P\_P1$ & $\sim P\_P2)$ & $(\sim P\_P3 \mid \sim B\_P1$ & EI & $P\_P3)$

$Eq\_2 = (\sim B\_P1$ & $\sim SI$ & $\sim P\_P1)$ & $((\sim B\_P2$ & $\sim EI$ & $\sim P\_P2$ & $P\_P3) \mid (\sim B\_P2$ & EI & P_P2 & $\sim P\_P3) \mid (B\_P2$ & $\sim P\_P2$ & $P\_P3))$

$Eq\_3 = ((\sim B\_P1$ & $\sim B\_P2$ & $\sim SI$ & $\sim P\_P1$ & $P\_P2) \mid (\sim B\_P1$ & $\sim B\_P2$ & SI & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $\sim P\_P3) \mid (\sim B\_P1$ & B_P2 & $\sim SI$ & $\sim P\_P1$ & P_P2 & $\sim P\_P3) \mid (B\_P1$ & $\sim B\_P2$ & $\sim SI$ & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $\sim P\_P3))$

$Eq\_4 = (\sim B\_P1$ & $\sim SI$ & $\sim EI$ & $\sim P\_P1$ & P_P2 & $P\_P3) \mid (\sim B\_P1$ & $\sim B\_P2$ & $\sim SI$ & EI & P_P1 & $\sim P\_P2$ & $\sim P\_P3) \mid (\sim B\_P1$ & $\sim B\_P2$ & SI & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $P\_P3) \mid (\sim B\_P1$ & B_P2 & $\sim SI$ & EI & $\sim P\_P1$ & P_P2 & $P\_P3) \mid (\sim B\_P1$ & B_P2 & SI & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $\sim P\_P3)$ & $(B\_P1$ & $\sim B\_P2$ & $\sim SI$ & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $P\_P3)$

$Eq\_5 = (\sim B\_P1$ & $\sim B\_P2$ & $\sim SI$ & P_P1 & $\sim P\_P2) \mid (\sim B\_P1$ & $\sim B\_P2$ & $\sim SI$ & EI & P_P1 & $P\_P2) \mid (\sim B\_P1$ & B_P2 & $\sim SI$ & P_P1 & $\sim P\_P2$ & $\sim P\_P3) \mid (\sim B\_P1$ & $\sim B\_P2$ & SI & $\sim EI$ & $\sim P\_P1$ & P_P2 & $\sim P\_P3) \mid (\sim B\_P1$ & B_P2 & SI & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $P\_P3) \mid (\sim B\_P1$ & B_P2 & SI & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $P\_P3) \mid (B\_P1$ & $\sim B\_P2$ & $\sim SI$ & $\sim EI$ & $\sim P\_P1$ & P_P2 & $\sim P\_P3) \mid (B\_P1$ & $\sim B\_P2$ & SI & $\sim EI$ & $\sim P\_P1$ & $\sim P\_P2$ & $\sim P\_P3)$

Future Scope

Configuring and rigging up a hardware system integrating ASIC with all the sensors from which the data is collected so that the entire procedure can function on a single device thus saving significant time on losing lives to suicide. Since a hundred per cent accuracy is not attained with the prevalent system and results can vary depending on the patient, we look forward to increasing the precision of the system. Some psychiatrists may be reluctant to use the tool, their major concern is about risk stratification, they may think it is too inaccurate to be useful. The classification of suicidal risk has taken into account limited instances, the dataset need to be maximized.

Result

If the subject whose combination of psychological, physiological and behavioural characteristics from the data set proves that the subject is suicidal, then running the same set of inputs on the code will give the exact result about the subject's suicidal tendencies as per the data set.

Here we are using the data from the Electroencephalogram sensor, Actimetry sensor, Holter monitor and Galvanic skin response sensor to analyse according to the priority table of the psychological and behavioural factors and also the physiological changes to arrive at the appropriate output, that is one of the six levels of suicide risk from 'No Suicide Risk' to 'Extreme Suicide Risk' through 'Low Suicide Risk', 'Moderate Suicide Risk', 'Elevated Suicide Risk' and 'Severe Suicide Risk'.

Advantages

- Suicidal behaviour is a primary health concern and it lacks a technological approach to its prevention. The presented project strives to achieve the same by giving a brisk warning about this behaviour, making its prevention more achievable.

- By adopting this idea into the current healthcare system, targeting patients in mental recovery hospitals or therapeutic centres can prove constructive in their speedy recovery.

- The study provides a great knowledge about psychological, behavioural and biological factors that can predict suicidal tendency and many cognitive mechanisms related to prediction of suicidal behaviour. With the assistance of this, the advancements can be considerably larger in the healthcare industry through technological means.

Applications

- Mental Healthcare Centers
- Rehabilitation Units
- Counseling Clinics
- Therapeutic Centers

VII. Conclusion

Suicidal behavior is a primary health concern

and it lacks a technological approach to its prevention. The presented project strives to achieve the same by giving a brisk warning about this behavior, making its prevention more achievable. By adopting this idea into the current healthcare system, targeting patients in mental recovery hospitals or therapeutic centers can prove constructive in their speedy recovery. The novel design provides a great knowledge about psychological, behavioural and biological factors and several cognitive mechanisms related to suicidal behavior. We have so far done extensive research in the field and also identified all the required hardware and software components. Hence with the assistance of this proposed project, we hereby conclude this report looking forward to considerably larger advancements in the healthcare industry through technological means.

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CHILDREN SECURITY AND TRACKING WITH AN ALERTSYSTEM USING GSM AND GPS TECHNOLOGY

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ABSTRACT

Child safety and tracking is a major concern as the more crimes on children are reported nowadays. We see such a huge number of occurrences of abduction and missing of child. To address these issues, a smart security system for children must be built. So, this model describes a secured system for children consisting of Raspberry Pi microcontroller, the Pi camera which is used to capture a real-time image of the surrounding place and various sensors such as Heartbeat Sensor, Temperature Sensor, Vibration Sensor, Sound Sensor and Sweat Sensor. This device results the parameters like heart rate, temperature changes, sweat content, excess vibration, and extreme sound. When these factors exceed a certain threshold, the device activates and tracks the child's location and will send the message via Twilio or a mobile application called Telegram.

Keywords: Raspberry Pi microcontroller, Pi camera, GPS and GSM module, Twilio, Telegram.

Introduction

The development of Children is key to the succeeding of any society. Children are the ones who play a vital role for deciding how the world will appear after some years. In present time there is a huge number of kidnapping cases. As reported by the National Crime Records Bureau (NCRB) thousands of children are reported to be missing in India every year. Where few of the Children are traced by the police within a short period of time and some of the cases were left unsolved with no hint.

In several circumstances we make use of Global Positioning System (GPS). GPS is a navigation and positioning system which delivers location and timing information around the world without depending on time and weather. GPS is used to track the location of people. The location and other information can also be tracked through computer applications or mobile phone. The both services of GPS and GSM is provided through Twilio in this project.

The designed model results the location and situation of the missing child. This instrument is arranged with various sensors like Heartbeat sensor, Temperature Sensor, Vibration Sensor, Moisture Sensor, and Sound Sensor. The sensors result the current state of the child when the threshold level mentioned is crossed. The Raspberry Pi is used as a microcontroller in this electronic device. The sensors connected to the Raspberry Pi results the geographical location of the children which is sent through SMS to the phone using Twilio. The placed camera results the live capturing of the surrounding picture of the child which is sent through mail to the concerned person.

It is difficult for the Parents to monitor their children when they are at public places. This might lead the child to be lost or kidnapped. In order to overcome such instances, the children tracking system is developed to assist parents to take care of their children's safety. The main aim of this child tracking system is to ensure that the missing child is safe and healthy even in the crowded places.

Literature Review

[1] This proposed method make use of two sensor nodes which are the 'staff node' and the 'student node' which is connected by Bluetooth communication for the security center for tracking the location of the student as well as the teacher. The location will be traced and sent to the supervisor if the two nodes have been relocated away from the classroom. This model is useful to the children and the staff only when it is in the school campus. This device makes use of powerful computer system to react immediately

and update the information to message processing system.

[2] In this mentioned paper, it is mainly focused on the safety of the child in public occasions. The prototype is comprised of sensors, GPS Technology and an Android device. The concept of cloud computing is used where the data is collected from sensors and it is analyzed for extracting the required information which has been sent to the device. After the collection of obtained information, it needs to be stored, processed and shared via integrated cloud and mobile application. This device holds the disadvantage that the obtained location will not be very accurate.

[3] In this proposed paper, a tracking device is accessed through the online website with authorized parties for secure child monitoring. The model contributes Raspberry pi microcontroller and Pi camera which is used to capture the real time videos. The author makes use of Bluetooth Technology.

[4] In the last paper, they have mainly focused on getting the location of the child when they are out with their parents at the time of shopping or heavily crowded place. GPS and GSM based tracking system is developed. The location of the child is shown on maps which help them to spot.

Children Tracking System

A. Block Diagram
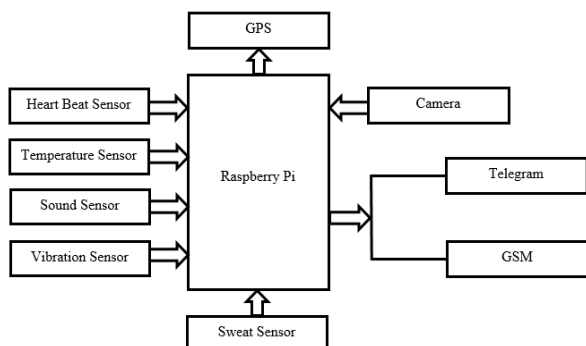
Figure 1: Block Diagram

The fig 1 represents a block diagram for Children security and Tracking with an Alert system.

This system proposes a secure child monitoring and alert system. Addresses the concern and provides a child safety and tracking architectural design. A Raspberry Pi microcontroller, GPS, Pi camera, and several sensors are included in the proposed system. The important factor is the health monitoring of the child. Here the child health is monitored using various sensors which are interfaced with the Raspberry Pi. So that if any condition gets worsen the message is delivered to the concerned person using Twilio. Whenever the sensors are triggered, a location is shared, the Pi camera which is used in the device will automatically send the surrounding image to the specified mail. The Bluetooth device that is used for voice modulation, which will convert the voice to text, has been connected to the system and indicate to the parent through the message. It also consists of a button where it could be manually activated and send the location with the surrounding images to the parent.

B. Flowchart
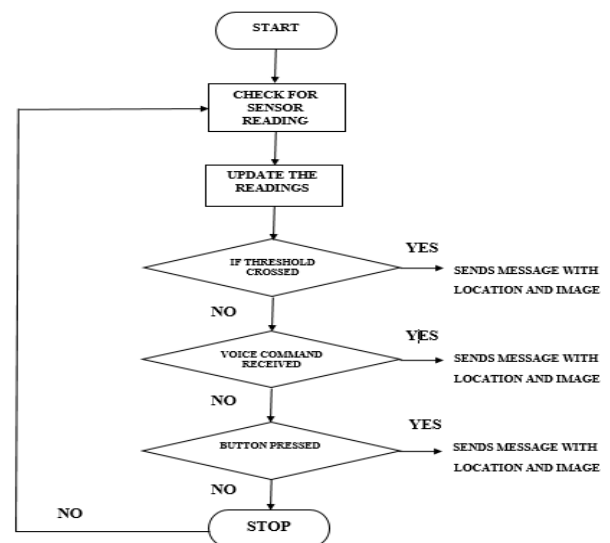
Figure 2: Flowchart.

The figure 2 clearly explains the flow of the program.

Each sensor that has used in the system will be having some threshold values which would be pre-defined. Firstly, it will check for the sensor readings, and if any variations detected it would update the readings. When it has crossed the threshold values it will

instantly send a message to the parents informing them of the changes that have occurred, along with a live location and picture. If the readings have not exceeded the threshold value, then it will check for any voice modulation that has detected. If any variations have found it will be notified, if not it will check whether the button is pressed, if any changes have noticed it will update it to the parents. So, that the parents will get to know about their child condition.

C. Hardware Requirments

- Raspberry Pi 4 Model B: The Raspberry Pi is known as the 3rd generation single-board computer. It is a mini- Computer and it has an in-built microprocessor. Here we can run multiple programs, which has their own operating system.
- Heart Beat Sensor: The Heartbeat sensor which will easily incorporate the live heart rate data and if any variations are detected in the heartbeat it will update it to the parents.
- Vibration Sensor: The Vibration sensor will measure the changes due to pressure, acceleration, force etc. Whenever extreme vibrations is detected it will automatically sends the message. Here we make use of SW-420 vibration sensor.
- Temperature Sensor: The Temperature sensor will measures temperature, whose output voltage will varies based on the temperature of the surroundings. The LM35 temperature sensor is used.
- Sweat Sensor: The Sweat sensor placed in the system will measure the sweat content if any high sweat content is measured it will notify the same.
- Sound sensor: The Sound sensor is a sort of module that detects the sound of the environment.
- Pi-Camera: The Pi camera is made out of a small circuit board that uses a flexible ribbon cable to connect to the Pi's camera serial bus interface connector. Where this Pi-Camera will capture the image of the surrounding and send the image to the concerned person through the mail.
- Bluetooth Device: The Bluetooth device is used for voice modulation which will

convert the voice to text, that has been connected to the system and indicate it to the parents by sending a message.
- External Power Supply: An external power supply of the 5V is provided to the system.
- Analog to Digital Converter (ADC) module: Since all the sensors in this system are of analog, here the Pi board will accept only the digital input. So, to achieve this we had make use of external ADC.
- Voice Bot: Voice Bot is mainly used for communication which will works by converting the audio to text format of the natural language with the help of Artificial Intelligent.

D. Software Requirement

- Twilio: The Twilio SMS service will help you to send and mange messages programmatically. It uses the message resources to fetch message and list message associated with the account.
- Telegram: Telegram is a cross-platform, cloud-based instant messaging software that is free and open source. This means that while connected to Wi-Fi or mobile data, we can use it to send messages to anyone.
- Python: Python is a High-level programming language. And also it is an interpreted programming language which has its own advantages. The python is easy and simple to write the code, which is an open source, freely downloadable and a platform independent.
- Open CV: Open CV is a library that is used to handle computer vision issues. Numpy, is a highly efficient library used for numerical operations with MAT Lab. It is open source and fully downloadable and focuses on real-time image processing.

I. Experiment and Results
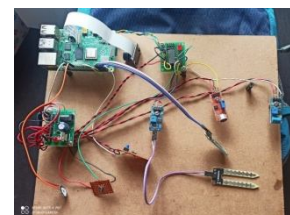
Figure 3: Children tracking with an Alert system Design.

The figure 3 shows the complete system design of the Children tracking and alert system.

Where in this experiment, the system will trigger and sends the Coordinate whenever there is any changes in the threshold value and sends the SMS along with a predefined message and location of the children using Twilio service and Telegram.

```
------------------------------------------
Temp : 28.71 deg C
setHeartRate
Hold The finger On sensor
99.70149253731344
sound level: 55 db
vibration level: 1023ppm
child fell down..
True
sweat level: 608ppm
------------------------------------------
```

Figure 4: Result Window

Sensor Names	Reading 1	Reading 2	Reading 3
Heartbeat Sensor	99.70 bpm	108.54 bpm	118.60 bpm
Vibration Sensor	1023 ppm	568ppm	405 ppm
Temperature Sensor	28.71°C	29.03°C	30.97°C
Sweat Sensor	608 ppm	979 ppm	1022 ppm
Sound Sensor	55 dB	61 dB	69 dB

Table 1: Experimental Trials of each Sensor.
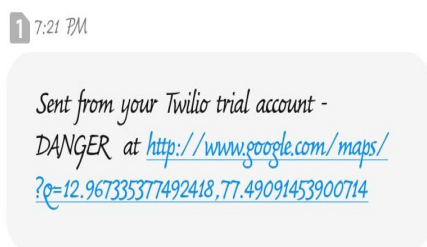
Figure 5(a): An SMS sent using the Twilio.
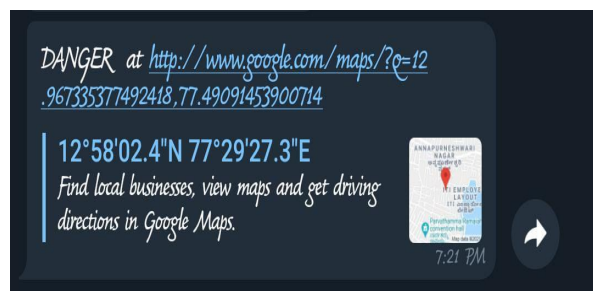
Figure 5(b): An SMS sent through Telegram.
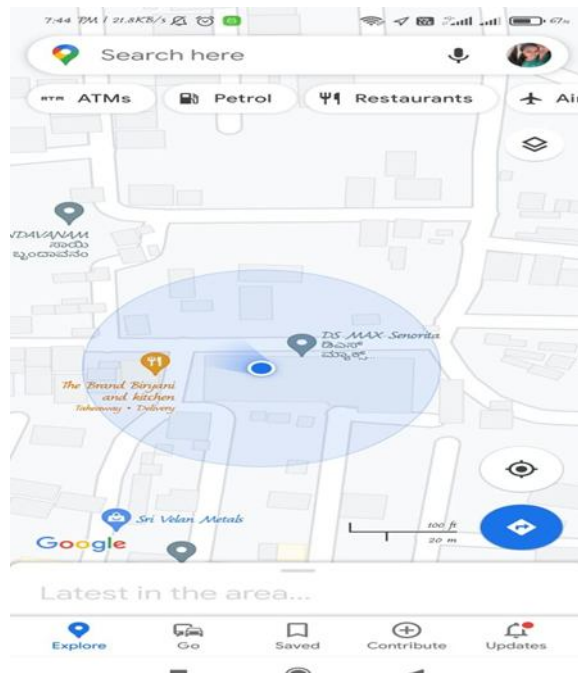
Figure 6: Geographical location of the

Children Tracking.

Figure 5 (a) & (b) shows an SMS received by concerned person through Twilio and telegram which consist of a pre- defined message along with the geographical location of the system as shown in Figure 6.

Figure 7: A surrounding image captured by the Pi-camera.

Conclusion

This project produced a Child Monitoring and

Alerting System in real-time using a Raspberry Pi with a camera. This system will assist Parents in monitoring their children and will ensure protection of the child all around the world. The device results in the geographical location of the child, capture and send the images around the child with the help of sensors induced in the device, the health of the child can also be determined.

Future Scope

In our system, we track the child's location and use the Pi camera to capture the image around it. Hence in the future, this system can be enhanced by the adding the Live Video streaming so that parents can visually look over the surrounding place where the child is located.

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CLOUD BASED AUTOMATED WASTE SEGREGATOR USING ML

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ABSTRACT

As we all know, cleanliness is the major factor for human health. One important feature of cleanness is the efficient waste disposal. Waste disposal has become a huge cause for concern in today's world. And improper disposal of waste which affects the environment and leads to spread of diseases. Since people are not following the guidelines issued by government and are not segregating the wastes into different categories leading to improper waste disposal. So, we have proposed a system which segregates various kind of trash based on their nature and dumped into different compartment at the disposal level itself .it uses appropriate sensors and image processing techniques to classify the plastics from other waste. This idea helps in proper waste management and thus able to distinguish the recyclable and non-recyclable waste. This provides efficient and hygienic waste disposal system helps in waste Optimization.

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Introduction

Waste management is an important requirement for ecological sustainable development. Approximately 1 lakh tons of waste is generated every day in our country . Among which only small amount of waste is recycled.So possible solution for this problem could be segregating the waste at the disposal level itself. Using Embedded technology and image processing technique waste can be sort into metallic waste, wet waste ,dry waste , and plastic waste present in dry waste , thereby making waste management more effective.

The quantity of waste that are being dumped world wide increasing day by day due to the increase in urbanization and advancements in technology which increased migration of people to cities which results in increased waste generation. The segregation of the waste following that transportation and discarding of the waste needs to be very specific and controlled so as to avoid the risk to the health and safety of the public. Different types of wastes need to be sorted and treated effectively for reasons like hygiene, control the spread of diseases and toxicity. Waste segregation is an important and inevitable stage in waste management. However, in today's busy life schedule wastes are thrown in every hook and corner of the city roads making it difficult for the waste segregators to segregate them manually with

bare handed which leads to health issues. Most of the waste are dumped directly to the landfills without proper sorting and this has caused a huge impact on us. Where the landfills are reaching its maximum capacity.

Most of the waste have some reuse or recycle content that need not to be thrown away and unproductive method of waste disposal do not allow these materials to be fed back to the system for recycling and reuse, this leads to an unnecessary pressure of utilization of resources resulting in resource depletion.

In accordance with the swatch Bharath initiative launched by the government of India which focuses to provide clean nation, so a smart bin which segregates the waste more effectively and recycling much easier may possibly be the solution for simple and convenient waste management

The proposed design which works on a simple and efficient approach .it can be customized for household or public use depending on the applications . it uses some sensors to detect the type of waste and a camera is used for image acquisition and classification of plastic from other waste

The Properly sorting up of moist, dry and plastic waste lets us recycle it more productively and saves us a lot of money and resources

Related Work

In 2018, "Manisha Jayson, Sanket Hiremath [1]" have developed a system which makes

use of a Infrared proximity sensor to sense the waste. It makes use of dual motor and tray system. Once the presence of waste is detected is it is made to fall on the tray which in turn triggers the moisture sensor placed on tray. There is a predefined value for classification of wet and dry waste. If the moisture sensor reading is beyond the predefined value it is categorized as wet waste if not it is classified as dry waste. Servomotor mechanism disposes the waste into the right sub bins that is wet and dry.

In [2] "Priyanka, Hemavathi" : Had introduced a system for waste classification which is proposed for segregating the wastes as metal and other wastes. This paper proposes such a system which is cheap and easy to use. The whole process is done in two steps. Firstly, the waste is detected by IR sensor and pickedup by the robot arm.

Secondly, the waste picked is sensed on the waste segregation system to segregate the wastes as metal and other wastes by means of induction proximity sensor. The waste is then dumped into the bin.

In [3] "Souptik Paul"Proposed a system in which the existence of waste is sensed with the help of a IR sensor. Further with the help of metallic sensor the waste is sensed and classified as metallic and non-metallic. It uses ultrasonic sensor to check the status of the bin and with the help of Wi-Fi module it intimates the required personnel regarding the status of the bin.

In [4] "Ajay V P", "Bradeep Kumar M" and Team had designed a model in which the waste is put on a conveyor belt, which moves on wheels driven by DC motor. Proximity sensor is used to classify as metallic and nonmetallic waste. Depending on inputs by the sensor, the waste is thrown into suitable compartment. this system concentrates mainly on industrial waste.

The main drawback of all the previous systems was it failed to segregate the plastic present in the dry waste which was successfully classified in the proposed model.

Proposed Framework

Our project design involves the use of Machine Learning techniques to classify the plastic waste present in the dumped dry waste.

Further the metal , wet, dry waste are classified based on the output of the sensor values .

Hardware used in this proposed project is Arduino Uno & as microcontroller, IR sensor – to detect the presence of the trash, Metal detector- which helps to classify the dumped trash as metal , Rain sensor – which is used to classify wet waste .

Ultra-Sonic sensor which is used to check the status of the bin. A buzzer is used to alert the required personnel aboutthe status of bin. Two Motor drivers are used to rotate thebin and the tray during the entire process.
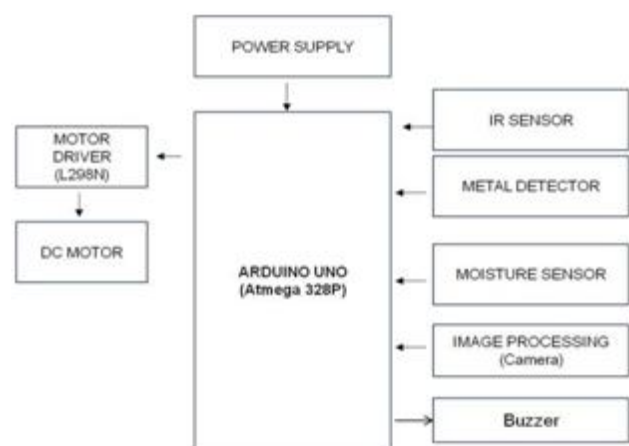
Fig. 1: Block Diagram of Proposed Framework

Methodology

Initially, once the power supply given to the microcontroller, all the devices which are connected switches ON and starts working according to the program dumped into the microcontroller. Power supply is the basic requirement for any of the microcontroller. Without the power supply, no microcontroller can be used. Each microcontroller has its own power ranges, basically it may vary from 3.3V to 12V it may differ in these ranges. The power system consists of four main circuits that are a step-down transformer, a rectifier, a filter and a regulator. The IR sensor is placed at the top of the model(collector unit) to sense the waste while dumping on the rotatable tray. This sensor initially detects the presence of waste and switching the other sensors indirectly.

After the garbage is loaded on the tray, the waste is detected and identified into various

wastes by using metal sensor, rain sensor and a camera for sensing reusable and non-reusable waste present in dry waste. Here we are using L298N motor driver for driving two DC motors simultaneously. One DC motor is placed with rotatable tray and the another motor is fixed below the square shaped Bin. By using this motor driver we are driving two motors at different directions at a time. The ultrasonic sensor is faced opposite to the bin to check the amount of trash present in the bin. The Square Bin is divided into four sub bins such as metal bin, wet bin, reusable and a non-reusable bin.

Initially the garbage is loaded on the rotatable tray through funnel. This waste is first detected by metal sensor, if the waste dumped is identified as a metal then this sensed data is send to the Arduino uno micro controller. This Arduino uno will process the data and which in turns guides the DC motor to rotate the bin at certain angle and then the waste is discarded into the metal bin by rotating the tray at clockwise direction.

If the waste is not detected as a metal, then this waste is sense by the Moisture or Rain sensor and if the waste contain moisture in it. Then this sensor output is send to the microcontroller and in turn guides the motor to rotate at certain angle to dump the waste respectively. Future if the waste is not detected either as a wet or metal, then this waste will undergoes with image acquisition technique.

When the metal and rain sensor fails to detect as a wet or metal waste then the camera is turned ON and then an image of the dumped waste is captured. This image will undergo in image acquisition model and this data(image) is send to the microcontroller. The algorithm which is trained is used to identify and classify it into plastic or dry waste and sends the data back to the microcontroller. Using the data obtained from the algorithm the microcontroller operates the DC motor then the waste is dumped in the respective bins. The major wastes segregated at this stage is plastic, paper and other dry wastes.

Fig. 1: Aerial View of the Project Model

At last by using an ultrasonic sensor, if the bins reaches its maximum level it will send the data to microcontroller. Then this data is processed and it is notifies the processed data to pre-assigned person's and thus buzzer is also turned ON to make alert of the bin status.

Results

Fig. 2 Shows the Arduino Mega and the Power Supply circuit on the kit.
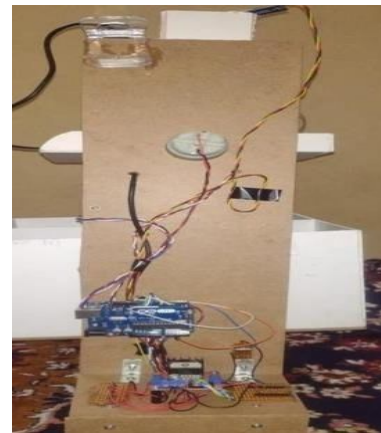
Fig. 2: Arduino Uno & Power supply

Fig. 3 shows the overall setup of the system.

Fig. 3: Side view

Fig. 4 shows the Image Acquisition and Ultrasonic module

Fig. 4: Camera and Ultra Sonic Sensor

Fig. 5 Shows the capturing of the dumped waste by the image classification model
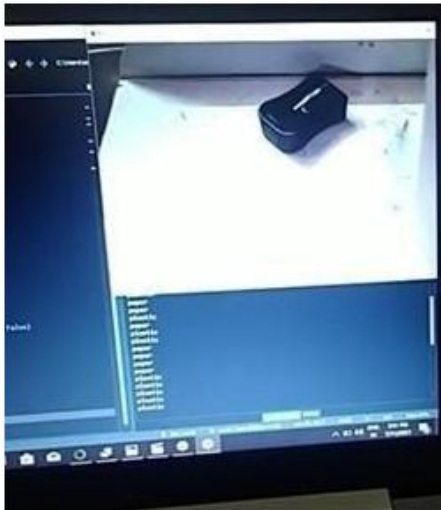
Fig. 5 Working of Image classification Model

Fig.6 shows Processed data to the ML Algorithm from the Image acquisition model and classified as plastic or paper.

Fig. 6: Classification of waste as plastic or paper

I.   Conclusion

In recent years, improper dumping up of waste has become a huge problem in the existing world. Usually the wastes are discarded without planning and treating them and also increased dumping of wastes at the land fill sites. In our model, i.e., Automated waste segregator system which segregates metal, dry, wet, and plastic present in the waste. It reduces manual effort on segregating larger amount of waste collected. Dustbins monitoring at time intervals is not needed because automatically status of bin is notified when the bin is filled. This model provides a better option for the waste management and it is of low cost.it can be implemented for household, college and offices. Which is an user- friendly system

Future Scope

Future enhancement can be done by segregating all waste by using image processing which gives higher accuracy, without the use of sensors and allowing large amount of waste segregation in less time and by increasing the size of the funnel large amount of waste can be dumped. Further recycling of waste can also be done in this stage.

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AUTOMATIC COW MILK EXTRACTOR

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ABSTRACT

Automatic milk extractor designed in such a way that all farmers can easily affordable and can get high income here in this paper Teats are detected under experimental situations using an analytical method based on the Haar- cascade classifier. the Milking System's vision development, Haar- Cascade Classifiers are being used for real-time teat detection. The suggested vision system is intended to swiftly and precisely detect teats so that a manipulator can be directed to connect milking cups to teats with the minimal mistake. The system has gone through multiple rounds of development as the result of various image kinds being tested.

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Keywords: Teats, Haar-Cascade Classifiers, Automatic Milking System.

Introduction (Automatic cow Milk Extractor)

Because of population growth and resource depletion, food and shelter are becoming increasingly difficult to meet in today's global economic environment. As part of every human being's diet since childhood, milk and dairy products are nutrient-dense foods that provide energy and significant amounts of protein as well as vitamins B5 and B12 that are essential for reducing hunger and malnutrition in the most vulnerable populations. As the world's population grows, milk production is still needed in cold and difficult-to-reach areas. Cow milking is a labor-intensive process. Milk harvesting by hand A significant element in extended working hours which takes occurs twice a day for up to 300 days per year. Globally, the solution to this issue is to automate the process of milking. Without adding additional labor costs, automatic milking systems reduce heavy workload and allow for individual cow milking frequency monitoring based on production level or lactation stage. Worldwide, the use of automatic milking systems (AMS) is increasing, and some design and facility recommendations have been made to achieve optimally.

The next 10 years are expected to be dominated by Intelligence artificial (IA) comprising deep neural networks and machine education. Consumers gain now from these technologies, but their uses must yet be examined by the dairy sector. Patents submitted by the top Automatic milking system brands demonstrate that their technology is still left behind on a lack of cow-related data and that their systems rely on the MIS to control future milking procedures.

On the Automatic Milking System, this paper discusses current research on the creation of a visual system for detecting cow teats, which guides the machine for victorious connection of the suction cups. It seeks to develop a Haar Cascade Classifier from open source available data on the internet and test it in a laboratory as well as on small data from local farms.

Ease of Use

Teat Detection Algorithm

Laser/CCD systems are the most common vision systems used in commercial AMS today. Lasers and CCDs are used to detect teats using edge detection methods. This can be done by combining information about laser and camera distances as well as incidence angles to determine the teat position in a three-dimensional space.

In the most recent research on hybrid vision systems, the following conditions were found to be necessary for optimal functionality:

In the teat region, the teats and the background should be contrasted. The teats should also be visible without obstruction.

Dairy cows aren't used to being milked by robots, but these conditions make it more difficult for them to adjust. Machine learning

algorithms are used in this research to resolve the camera's vision in a more open environment. Since the Haar- Cascade Classifier is invariant to brightness, color, length, position, due to the availability of free data. The supervised machine learning algorithm is easy to follow.
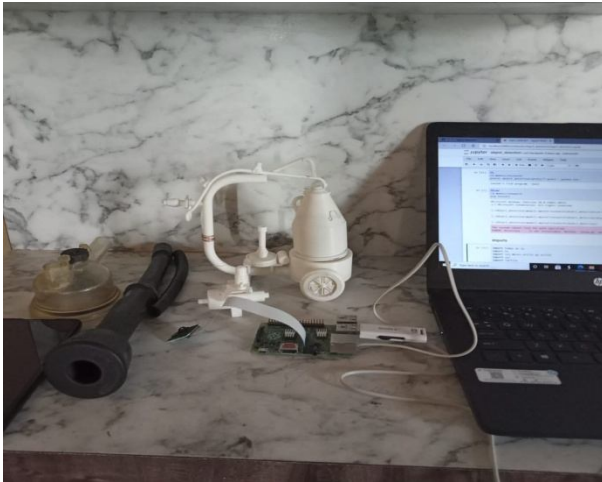
Fig. 1: Experiment setup

Methodology

A Generic Milking Procedure (AMS), as illustrated in the diagram below.

The visual system of the AMS is crucial for its operation throughout this procedure. AMS can recognize and identify cows for milking by using the location of the cow. The manipulator approaches the cow from a distance and detects it using the vision system for the detection of teats.
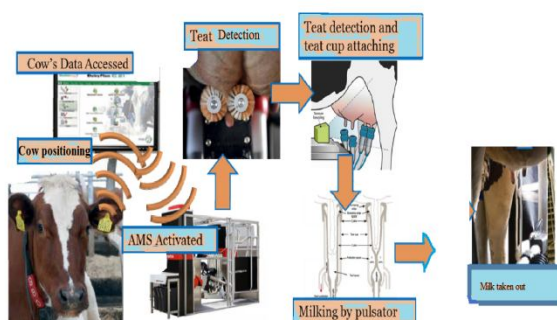
Fig. 2: Automatic Milking System

Active guiding is available via the vision system positioned just behind the handler as the cow teats are located and contacted to connect the milking cups. To connect the teat

properly, teats must be recognized and the cup must be positioned center-to-center with the teat tip. The Haar- Cascade Classifier was used to effectively identify the teat profile and pinpoint its tip in a captured image because to its efficacy in object classification and face detection.

Object recognition in the Haar-Classifier is based on Haar-like properties. For these calculations, the contrast values between adjacent rectangular groupings of pixels are employed instead of the pixel's intensity values. To detect objects in an image, features comparable to those found in Haar- are employed. Even though the Haar-classifier recognizes a large number of characteristics in a short period, undertraining and overtraining can result in false-positive detection in the one case and The second set of an empty result.

Once the system has detected and identified the teat and teat tip, The distance between the teat tip and the manipulator is calculated, allowing it to plan the manipulator's path to attach the teat cup to it. For this paper, we will not discuss how to calculate the teat's distance from the teats.

Algorithm Development

Using python script, images from Image-Net are used to train the Haar- algorithm. on the other hand, are extracted from Google image search.

It was applied to a grayscale image that had been converted from a color picture captured by the camera. We discovered that when we ran There was a lot of noise, which makes the detection unreliable, with the haar cascade method, so that we had to delete it. The algorithm has improved by six steps for the detection was finalized after incorporating different techniques for noise removal and getting better classification accurately

Results and Discussion

Various stages of development were completed before the teat detection system was ready for testing outside of the laboratory.

1. Cascade Harr Training Classifier

To analyze the findings and identify the optimal choices, 3 alternative Haar-Cascade

Classification settings were trained. The Ubuntu 16.04 is of (64Bit) system with 8 Gb RAM, and also Intel Core i5-4440 CPU and Gallus 0.4 on NVC1 were used throughout the training. During the course, the system was used. To marks the affirmative samples, Objectmarker.exe was utilized, and the document info.txt was developed. The files were added and repetition was deleted using Microsoft Excel tools after division into two sections. the marking task to handle the large sample size. The following are the three types of training performed

1st type

For this type, a vector file with a pixel size of was developed. To avoid overtraining with this vector file, Real AdaBoost and Ratio BreakValue have taken the training and 10e-5 acceptance.

To end the training after the acceptance ratio has been attained, the number of training, stages were set at 50.

In this cascade, our interest item, cow teat, is hardly recognized by the system. The cascade is somewhat undertrained, despite the training up to stage 14. The camera was moved nearer to the picture (about 5 cm) to determine whether the sensing has Changed.

Type 2

In this type a similar type 1 vector file has been utilized; however, from 3000 to 4000 positives and negatives, the sample number used per training has risen, while all other characteristics stayed very much like Category 1. After training up to stage 16, this type of acceptance ratio of training has been attained. Results were collected at the same distance from the camera for the identical test pictures

This casceded system properly notices the teats with some false positives. The most learned cascade of the three is employed for the improvement of the detection outcomes.

Image Detection Processing

The system Cascade Type 2 was chosen as the best suited throughout training and selection. The Interest Region (ROI), defined by the cyan rectangle, was processed using image processing techniques.

Before being placed in order, these strategies had been tried and tested to produce the intended result. The openCV2 Python library, as well as NumPy, and the libfreenect Python wrapper, were used to implement these techniques.

Both testing data, as shown in Fig., detect the teat tip for In the scenario, every teat. It offers us optimism that we may test the system in the future under real-life conditions.

After the Cascade was trained and the Type 2 Cascade was selected as above, the Python script was examined on a group of 20 cows on a cow farm.

Occlusion and shadow caused a low number of detections during the test, even though there were no false positives.
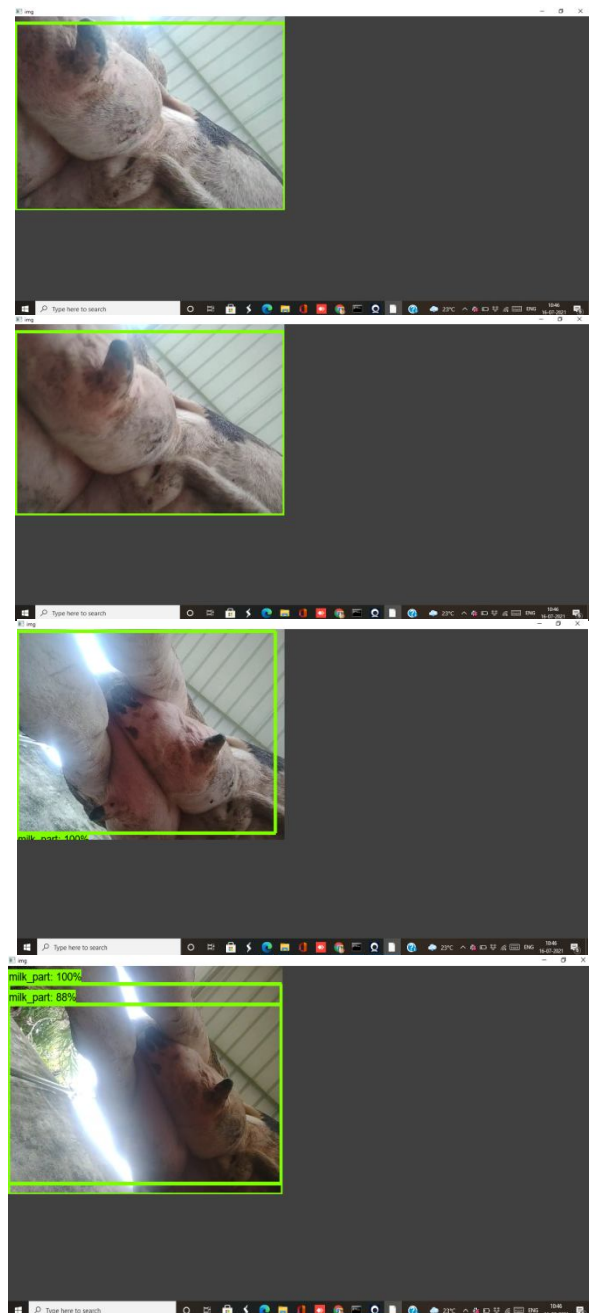
Conclusion

In a live scenario on a cow farm, the teat identification system created in the lab produces precise findings, however, it cannot detect teats in the darkness. The system uses Haar cascade to narrow from the scene to the teat and the method of imaging to restrict the position of interest from the teat to the tip of the teat, resulting in less memory consumption and more quickly than the systems of existing industries. The study is still in the early phases of development and the manipulator will be advanced to another level of real-time coordination to approach the suction cup attachment.

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MILITARY BORDER SECURITY ROBOT USING IOT TECHNOLOGY

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ABSTRACT

The most troublesome and important responsibility for national defense and security is border police work. It's vital to secure the borders with good and advanced technology in specific instances, like when terrorist infiltration, invasions, and illicit activities occur between the borders. Several expenses are borne within the space of defense as a result of the employment of old security techniques to guard the border from intruders. Some military teams use the employment of robots in unsound regions, but that doesn't seem to be as effective as the victimization of army men. The main objective of the paper is to elucidate the technologies used in this technique and also the manner in which this could facilitate the troopers to secure the border of the country. With the help of IoT technology and various sensors It detects landmines associated with unknown people victimization an IR detector to trace the intruders. Once any obstacle is detected, the signal is shipped to Arduino and the rover is turned in the appropriate direction in step with the program. Once the rover is in autonomous motion, the image is captured for each second and it's updated. The image is shipped and the image is being monitored by the protection folks within the host space. This paperwork enhances the security on the border with the help of IoT and image processing technology. This work ensures the military people safety on the border helping them to safe their life's with the effective usage of technology.

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Keywords: Landmine, Robot, IR Sensor, Artificial Intelligence, IoT, Image Processing.

1. Introduction

Considering border security into consideration is a crucial element of any country's security strategy. It ensures the country's security. At an equivalent time, it prices the country an enormous quantity of cash. In recent years, the Indian border military forces have two-faced destruction attributable to attacks on close countries. In many cases, our troops got the prospect to enter the enemy's base that may well be a dangerous job. Such dangerous jobs area unit avoided by the pattern of robots. A mechanism that operates mechanically associated generally resembles somebody's or an animal. The various risky areas of todays is converted in to robot's area unit and radio-controlled by a laptop or electrical hardware. Robots have confiscated dreary and dangerous tasks, displacing humans. The employment of robots in military conflicts creates moral concerns. In fiction, the employment of mechanism autonomy and its potential repercussions area unit mentioned, and it's going to be a wise concern within the future. Basically, the military mechanism is capable of quality, detection of dangerous gases, identification of people below the surface, and metal detection. The military mechanism can be a self-contained spy mechanism equipped with a wireless camera. Compared to troopers, this Army mechanism is a lot of economical. This robot's superiority is that it are often controlled wirelessly from a distance, motility no risk to the soldiers' lives. Lustiness and strength area unit another to robots, making certain their performance during a speculative setting.

Automatic Gun Targeting System's earlier construct was to use automation to spot and target living objects or any movement in extremely secure regions, like the border. A sensor-based automatic gun targeting system that targets a living object at intervals the sensors vary is termed as automation. The system consists of PIR sensors, a microcontroller, associated an RF transmittal and receiving unit with a targeting gun area unit the foremost vital parts in automatic gun targeting. Until then, the border is guarded by Iron Spike wires and a tower from that individual flashes lightweight over the border space the least bit hours of the day and night. These folks area unit entirely to blame of border security. Automatic gun targeting systems won't entirely relieve troopers of their

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responsibilities, however they'll share the bulk of them and eliminate human mistake on the border. Any living object at intervals the vary of the sensors are detected. The raspberry receives the signal from the sensing element. The raspberry receives the signal from the sensing element. It creates the code associated sends it to the guard tower through an RF transmitter, wherever the code is received by associate RF receiver. The microcontroller on the receiver facet controls the targeting gun, buzzer, and motor driver circuit, and also the targeting gun within the receiver can target the object, in keeping with the received code. A sensing element has detected the target, as indicated by the buzzer. As a result, the person on the watch tower could quickly confirm the object's location. The automatic gun targeting system can use automation to enhance border security, doubtless reducing human effort to an excellent extent. Face recognition and Bluetooth technologies are often another to the system within the future, permitting it to run a lot of expeditiously. The aim is to place the system (model) in situ for a defined during this article. And set it with the exception of an enormous variety of antecedently saved faces with sure period variations. It permits USA to find a lower-dimensional area during a fast and economical manner. This formula can even be accustomed confirm somebody's gender or to grasp somebody's facial features. This technique includes of associate Internet-controlled autonomous mechanism equipped with a camera and a PIR sensing element for detection living bodies. Users are ready to operate the mechanism remotely over the web, creating it potential to regulate it wirelessly.

2. Problem Identification

We noticed through the surveys that all of the strategies adopted in the previous work not address all the military related issues at a single approach. The Proposed system, merging two different systems for camouflage and target gun shooting into a whole system. Previously, the communication was based on Bluetooth technology which was limited in range on the other hand our system employ Wi-Fi to boost connectivity. After the review of various work in this direction we identified the problem as to"Design and Implementation of Smart Surveillance System and Camouflage using Classifier and Blob Detection Model**"** for the safety of military peoples using recent technologies.

3. Our Approach

These days, with the advance of innovation, numerous robots with deeply express incorporated frameworks area unit presently expressly occupied with such risky obligations to end the work reliably and accurately. This can be meant to relinquish connected knowledge with reference to military robots, even as their skills and effectiveness within the field. The venture's primary objective is to create a golem with more developed reach and disguising capacities. It helps with getting the shade of the environmental factors and improves strength and making ready speed. This golem will enter hostile space undetectably and provides info to United States by suggests that of a camera. A laptop controls the event of this golem remotely. This endeavor is totally battery-fueled. An air soft (or nerf firearm) turret strained by Arduino has independent movable ness and releases the weapon once movement is known. There is likewise AN intelligent mode wherever you'll handle it together with your console. Movement Detection utilizes open CV and laptop vision to screen moving focuses before the camera. As a part of the disguising utility and for observation reasons, the framework incorporates a solitary shading device camera. This quality makes it laborious for assailants to acknowledge this golem. We have a tendency to utilized remote handsets to impart between the transmitter and collector. Intelligent and Motion Detection area unit the 2 modes utilized. In intelligent mode, you'll handle the turret distant and stream live film. Movement Detection utilizes open CV and laptop vision to screen moving focuses before the camera. The projected framework incorporates one shading device camera for disguising functions and additional cameras for observation. The shading device camera identifies the shade of the surface and changes the robot's tone befittingly.

4. Related Works

The most troublesome and imperative obligation regarding public guard and security is line reconnaissance. The significant reason for this investigation is to clarify how the innovations in this framework work and how they will help troopers secure the nation's boundary. The exceptionally least we can do to forestall such occasions is to continually screen and distinguish interruptions across the boundary. Despite the fact that it takes a great deal of work to stretch out across the line and watch out for things, the critical need is to foster a computerized line reconnaissance framework that dispenses with the requirement for human mediation. Besides, if the framework identifies something dubious, it should have the option to react properly by conveying a caution ready and enacting a weapon actuation framework. It is dependent upon the human regulator to choose what to do next once an attack has been recognized. Our essential concern today is the security of our nation's lines. Waterways, valleys, sloping spots, gaps, and different landmasses. Because of IoT-based innovation, which is significantly harder to shield and where our heroes are bound to chance their lives and meet suffering, would now be able to be stopped. They're worked to work in a threatening climate, continually checking, identifying, and following aggressors [13].

To manage responsibilities quicker than people, robots are acclimated with sharing errands and working self-sufficiently. A robot framework is made in the gave framework configuration to screen and perceive movement to work on the security and observation of inside spaces. This automated framework contains five separate parts, including mechanical arms for picking and situating merchandise from transport lines, a ultrasonic sensor for distance estimation, and a visionary framework for recording intruder developments and sending the pictures across an organization. At the point when a fire is recognized, a fire sensor cautions the encompassing region. The area of the mechanical framework is characterized by the GPS longitude and scope esteems. One is the self-ruling mode, and the other is the manual mode utilizing a distant administrative framework. To accomplish continuous

movement and obstruction aversion, an automated framework should likewise do way arranging. Right now, in the task, the outcomes are evaluated finally, and the absolute exertion is characterized, including coding points of interest. An automated framework is an incorporation of equipment and programming intended to achieve a specific undertaking, which can likewise be named an installed system. Autonomous robots are utilized in an assortment of uses, like air terminals and exhibition halls, to distinguish and recognize objects utilizing a multimodal platform [1, 2, 3, 4, 5].The amazingly nimble elements of a quad-copter permit it to begin and fly in any indoor or outside situation. The thought is to get back with an organization of automated elevated vehicles (UAVs) to help troops police the nation's line productively and cost-viably. Following the way and staying away from obstacles is conceivable by using GPS to figure the path mileage and speed. The air and ground groups worked together to foster a framework that gives a full picture of the boundary while being financially savvy and guaranteeing line security. To effectively recognize and follow focuses on, the UAV or quad-copter can keep up with steady correspondence with the lower base. Besides, the framework incorporates the capacity to convey constant notices of a gate crasher recognized at a particular spot to a close by watching group utilizing an Android application and a continuous data set like Firebase. This outlines the utilization of GPS to make independent vehicles, just as picture handling advances and man-made consciousness for airborne survey and target detection [11, 12].The framework is fuelled by radio frequencies. A Bluetooth module for correspondence between the administrator and the robot, just as a module for gadget control. It affects the nation's economy and serenity. The issue of the structure's freedom requires a huge monetary cost. The freedom of the land requires a huge amount of gross public pay and human work all together for this goal to be cultivated. Nonetheless, the customary methodology has the drawbacks of being tedious and exorbitant. This examination assembled a landmine discovery meandered robot to aid the field, which is a quicker, safer,

and more definite procedure than the past way. The distance between the sensor head and the ground surface is as per the following. The avalanche essentially affected the result. The presentation of the metal locator's landmine recognizing capacity can be expanded by adjusting the dividing and height between ground mines and the sensor head [3,9,10].

It is cultivated by coordinating different sensors, cameras, and actuators into a web application for an IoT-based remote multifunctional robot for military purposes, using MQTT and the HTTP convention on a Raspberry Pi 3. This gadget permits clients to watch and work military robots from any area in the world. It additionally includes various sensors, including movement sensors to distinguish human presence, an inductive nearness sensor to recognize landmines, a temperature sensor to identify temperature, and various gas sensors to distinguish risky gases in the climate. Observation in distant line regions is a significant piece of the tactical's main goal. The recommended arrangement is a self-governing automated gadget with a camera and a website page for distant reconnaissance through the web. Most military gatherings have as of late enrolled the assistance of military robots to play out an assortment of perilous assignments. A component, by and large, is a blend of mechanical and physical science models made by people to satisfy a specific reason. The Indian boundary military have been destroyed as of late because of assaults on adjoining nations. We've fostered a marginal military method that forestalls enormous scope human losses. This technique can likewise be utilized to keep an eye on hostile area through significant things along the boundary, just as track adversary developments into our country. Since the component is so little, it will be shipped to the foe's camp to watch out for their exercises [6].FLIR is given an IP address and associates with the control place through a nearby organization. An engine-controlled spotlight with an infrared and laser firearm is used to enlighten the scene in shifted conditions. Various sensors and a night camera are utilized in this framework, and information from the sensors is remotely moved to the control station. To help with target

acknowledgment, a robot man is furnished with a laser automatic rifle and a camera, just as Bluetooth-empowered correspondence between the control community and the robot. The robot and the rifle are both constrained by the control community. A PIR sensor-based framework with a camera and GSM-based correspondence with the control community was additionally answered to be utilized. The control station sends orders to a robot, which goes towards the objective and utilizations a laser to control the interruption. The observing focus controls an admonition framework to alarm the interruption. A checking focus-controlled laser gun is intended to keep programmers under control and try not to coordinate dock with infiltrators [7, 8].

5. Methodology

The robot handles both information and yield, while the PC handles all image preparing. These information gadgets are utilized to catch the entirety of the fundamental information for preparing, for example, a shading distinguishing camera, a video taking care of camera, and a deterrent sensor. Utilizing a WIFI trans-recipient, the information is then remotely moved to the PC. The information is therefore handled by the PC utilizing an assortment of picture preparing methods. It decides the shade of the setting and conveys that data to the robot. The client can likewise control the robot's movements by means of a PC. One of the PC's most significant capacities is to show the robot's live video transfer. The whole sign is serialized utilizing a WIFI trans-collector.

To yield the got shading, the shade of the LEDs that cover the screen can be changed. One of the robot's three transfers is locked in to achieve this. The robot's versatility will be constrained by the PC we use.
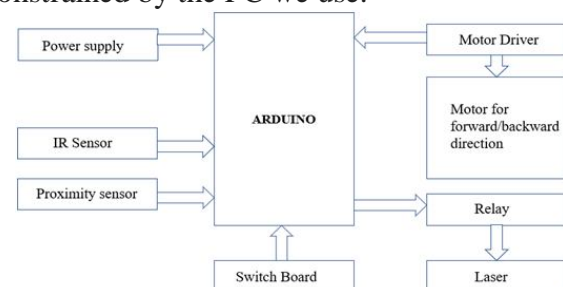

Figure1: Architecture of the Proposed Military Robo System

5.1 Missile Detection

As opposed to the important work gave in the first segment, this investigation proposes a visual strategy that doesn't need any AI strategies. Accordingly, dissimilar to a HAAR course classifier, the framework won't need any earlier preparing (Viola and Jones, 2001). A subset of the information test photographs was kept to change the different constants needed by the different kinds of calculations utilized, like the canny edge.

A camera was put on the robot's front windscreen to gather the photos required. This is on the grounds that it all the more genuinely portrays the situation of building a gadget that might be introduced on a vehicle for business purposes. Driving about and developing a picture library utilizing pictures brought about the making of a picture library. A web camera was used to keep away from any intricacies that could emerge while shooting a moving robot, for example, picture obscuring.

This additionally opens up piece of the handling power expected to run the product that has been constructed. To recognize a rocket, the proposed strategy starts by changing the recovered picture into a grayscale picture. A Gaussian channel was applied to the grayscale picture to tidy it up and eliminate commotion. The gathered street surface is then exposed to a fundamental separation-based edge discovery strategy (Canny edge location). A high contrast picture is created by the canny edge indicator.

5.2 Gun Targeting

We'll utilize an Arduino to make a movement following air soft (or nerf weapon) turret. Since the weapon turret is independent, it moves and shoots the firearm when movement is recognized. There's additionally an intelligent choice where you can utilize your console to control it. This task was made with an air soft weapon; however you could without much of a stretch adjust it to utilize a Nerf firearm all things being equal. This venture is little, light, and runs completely on batteries. Intuitive and Motion Detection are the two diverse activity modes we made.

You can utilize the intelligent framework to control the turret from a remote place and stream live film. To follow moving focuses before the camera, Motion Detection utilizes open CV and PC vision. Since this device shoot shots, play it safe when utilizing the turret. In case you will fire someone, utilize a nerf weapon rather than an air soft firearm!

5.3 Landmine Detection

Landmine freedom is a major issue in numerous nations all through the world, and catastrophic events and land advancement can intensify the issue. Subsequently, finding and securely eliminating landmines is a main concern. The initial phase in the demining technique is to find landmines on the ground. For safe identification, strategies that don't depend on touch are fundamental. For safe discovery, non-contact location innovations are fundamental. Landmines are identified in the signs delivered by non-contact-based sensors like metal indicators and radars. Ground infiltrating radars, or GPRs, are an intriguing instrument for landmine discovery in view of their benefits over different sensors. The GPR can be utilized as a solitary sensor or as a strengthening sensor related to a metal identifier.

They can recognize both metal and nonmetal landmines. It can likewise be made light sufficient that it tends to be used as a variety of various radio wire components in a hand-held or vehicle-mounted gadget. Landmine recognition might be trailed via landmine distinguishing proof, which is the way toward recognizing the kinds of landmines and their internment profundities. Landmine location and expulsion will be supported by this extra information. Since recognizable proof makes a greater number of strides than location, it has stood out enough to be noticed in the connected fields.
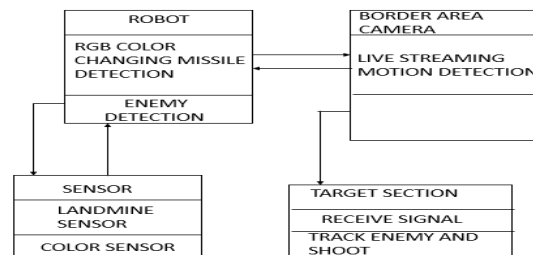
Figure 2: Workflow Diagram of Military Border Security Robot

6. Implementation and Results

Hardware Requirements

- Arduino
- laptop
- IR Sensor
- PIR sensor
- Proximity Sensor
- Laser Gun
- Relay
- LED
- WI-FI module
- Power supply system

Software Requirements

- Python
- Open CV
- Embedded C

Functional Requirements

- The color of the Robot should change automatically in response to the camera input. Robot should capture the face and Recognize.
- The face should be captured and recognized by a robot should Enemies Be Targeted by Robots (Unknown Faces)
- Robot should not target the Known Face
- Using a proximity sensor, a robot should be able to detect landmines automatically.

Non–Functional Requirements

- **Usability**

Easy Interface for capture of image and target enemies.

- **Reliability:**

Easy Handling
Secured and Theft Proof

- **Performance**

Should not take excessive time in Targeting the Enemy.
Should Take Minimum Time in Landmine Detection.

- **Supportability**

Contain easy to understand code with provisions for future enhancement

Outcomes

- Face recognition
- Soldier health monitoring
- Landmine detection
- Gun targeting

7. Conclusion and Future work

The proposed framework is planned to fill in for human life. This proposed robot may work as a security framework just as a lifeline, given the expanded accentuation put on human existence. It screens battling zones and catches the encompassing regions and assumes a critical part in this. The robot changes tone as per its environmental elements and is stowed away from the adversary's vision since it depends on the Chameleon's shading evolving impact. Robot-to-robot correspondence empowers activity in regions where human-to-human correspondence is unimaginable. Moreover, the robot's disguise makes it inconceivable for the exposed natural eye to recognize it. The proposed innovation further develops our security specialists' capacity to spot interlopers overall. The robot can likewise be utilized in conditions where people would die, like high elevations.

The undertaking's fundamental objective is to utilize a PC to control a robot. The microcontroller is modified to such an extent that the robot moves relying upon which key is squeezed. It stops if a human presence is distinguished, and the bells actuate a caution framework, alarming the police. We can utilize this robot in an assortment of fields and in an assortment of situations. We can utilize our PC to send the robot anyplace by interfacing a bomb finder to it (war zones, backwoods, coal mineshafts, anyplace, anyplace). We can get the temperature of hurtful zones on the actual PC by connecting a temperature sensor to the robot. We can fire at the objective from a PC by interfacing a terminating instrument and a remote camera to the robot. Without losing any lives, we can basically adapt to conditions like the Mumbai fear monger assault.

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SOLAR ENERGY FOR RPI IN REMOTE AREAS

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ABSTRACT

In this era IoT devices are ruling the world. IoT devices which can be operated using internet, Bluetooth and wireless remote are increasing rapidly. Therefore, now a days power management of IoT devices is very important and is of more concern as it results in efficient way of power consumption, where power or energy management is a process of analyzing and minimizing our system's power management. So , managing the energy efficiently i s the answer for country's increasing desire for power or energy. For outdoor and remote IoT applications usually we can use energy conserving system to avoid interrupted operation. Therefore, we use conventional source of energy which is solar energy through the collection of photovoltaic cells. The light & heat generated from the sun is harnessed using different evolving technologies. But, the use of solar energy for outdoor applications avoids issues concerning with the utility of the energy. In this paper, firstly we have showed how to install Raspbian OS as our paper mainly concerns on Raspberry Pi's power management. Here, we introduce a new system which uses solar energy in IoT devices such as Raspberry Pi that uses energy by means of a photovoltaic cell. Since, the availability of energy systems are comparatively less in remote places, this system helps us in this crisis. Many IoT devices which needs to be installed in remote places faces this issue but adopting this system overcomes the energy related problems. We performed various operation on wireless sensors such as ultrasonic sensor and PIR sensor by connecting it to Raspberry Pi and gathered the results of power consumption in each case. Based on the results obtained by measuring power consumption of different wireless sensors , we have shown how to choose the solar panel by using different kind of sensor's power management. We have also showed how the data collected by the sensors are uploaded to cloud though Think Speak(as we can not go and get the data physically every day in remote places)where we can visually see the output in the form of graph and numerical data. Lastly, this system can also be called as solar energy for RPi in remote places.

Introduction

Our paper mainly focuses on low power consumption of RPi 3b+. As RPi is nothing but a small credit card sized computer which enables us to explore computing & also allows to program through various programming languages like python etc. Efficient method of energy conserving in RPi is very important to build a software app which gives us the details about the amount of energy acquired by the devices [1]

As mentioned above that RPi is capable of computing, IoT comes into picture here. All the electronic devices connected to internet comes under internet of things (IoT). Internet of things – insimple words, any internet connected devices which is capable of data transfer and storage over wireless networks is referred as IoT devices. These devices are capable of transferring and storing data in cloud, where we can easily access and collect the data whenever required.

When we look into our project RPi 3b+ is also an IoT device which transfers data and is capable of connecting to internet through its Ethernet cable &IP address of available network where data can be stored in cloud. There are some more other devices we have used in our project such as ultrasonic sensors & PIR sensors for calculating the power consumption by RPi. A power meter for measuring the respective voltage& current. Next when we clearly aim on our project, the next factor is low power consumption.

There is a minimum number of detailed performances regarding methods to reduce the power consumed by the RPi minicomputer which is used[2]. Now a day's power or energy consumption has become an important thing if we take any electronic device because lower the power consumption, higher will be the efficiency. So, for a device to work efficient we have made a device compatible to low power consumption. Here in our project also we will

mainly aim on that so that the efficiency will be high along with ease to implement.

As a result, our project focuses on solar panel for reducing the power consumption & making our project more reliable & efficient. Solar technology introduces the energy for many users, which includes generation of electricity, comfortable interior environment. It can be built in a distributed area or a base station.

The conventional energy system always requires the exact arrangement of solar panels array as well as batteries in order satisfies the energy requirement and to reach a particular time without encountering an input from the solar panel.

As solar energy is one of the conventional sources, it can be used in an optimized way for our project. In a quick calculation, if the RPi 3b+ uses 3watts an hour then 12v battery at 1.3Ah gives 15.6Wh. So, the battery should last about 5hours. When we use 12V and 5W solar panel then this gives an output current (I) of 2.4A or 2400mAh for this solar panel.

Our solar panel has the specifications of 12v & 5w which is affordable. But we know that RPi has a specification of only 5v. So, in order to connect the solar panel with RPi the first thing we have to do is toreduceoursolarvoltagefrom12vto5v.Hence,we have used buck converter for reduction of voltage. But in order to run our RPi through solar energy we required a device to store the energy, sowe have used battery for storage.

We have chosen this project because nowadays using renewable energy is very useful to reduce pollution, dependence on non-renewable energy and cost. By using renewable energy source such as solar energy reduces the power used, wastage of energy and also cost. Along with that implementation of this project is also easy in forest areas so that it's easy to access the information from cloud without any physical presence and because of restricted energy limitations If the system is powered by the photovoltaic grid, it is very important to decrease the energy use to exploit its life span.

The managing of energy is accepted out powerfully by gathering the information from the power meters, used by means of RPi from various benchmarks such as sensors, solar panel and data collected from cloud. As now we are clear about the introduction, let's discuss the methodology, result and analyze the project.

Related Work

Laxmi Khichadi, Siva Ganesh Kumar, Dr. NagamaniK.[1]demonstrated in their paper, is a open source which permits user to create, run and test the applications. The data can be accessed later by the user. The information exist in the cloud can be examined by various techniques like Load monitoring, Load profiling and load forecasting. The load forecasting can be used to detect voltage, power, current changes that occur in building and home applications. It calculates quantity of energy consumed at a given amount of time. The variations in the electrical load for an amount of time are verified through load profiling. The load forecasting supports the companies in maintaining electric supply to their clients. Efficiency and overall cost of company may be raised using this technique.

Qihao He, Dr. Bruce Segee, Dr. Vincent Weaver [3] in their paper they explained, RPI is very famous for n-number of different embedded applications in areas to both its lesser cost and lesser energy consumption in contrast to its proficiency. Their aim is to identify the energy interpretation of hardware and software execution for an embedded structure. Rapid performance and impotent power are always reasonable. It is observed that at high power, the performance is fast and lead to lower total energy for a computation task.

FabiánAstudillo-Salinas, Daniela Barrera-Salamea, Andrés Vázquez-Rodas, Lizandro Solano- Quinde[2] , They have used Raspbian Lite OS distribution which consumes less energy compared to other OS's, it displays better performance in each test cases. The operating system used be Raspbian Lite operating system is used and HDMI controller must be immobilized to control wifi router.

Girish Bekaroo, Aditya Santokhee [4] has detailed information about how to reduce power consumption of, and using of personal computers is cost efficient, long node lifetime and reduced adverse environmental impacts. The study has given the in-depth information about power overheads of different structure in

addition to how usage impacts power consumed by computer systems.

F. Kaup, P. Gottschling, and D. Hausheer This paper[5] mainly concentrates on introducing a PowerPi mathematical model. In this publisher calculate the power cases of RPi based on different CPU & circuit loads. It will permit to approximate the power consumed value with precision of 3.3% and publishers declare that it will produce an optimal energy expenditure by fluctuating the RPi software load.

M. Maksimović, V. Vujović, N. Davidović, V. Milošević,andB.Perišić,In[6] is offered a complete comparison among RPi and additional existing Internet of Things (IoT) devices. The RPi has a good performance with respect to calculating workload, dimension and price.

R. Fisher, L. Ledwaba, G. Hancke, and C. Kruger [7] A same method is explained additionally in [7]. It reveals a comparison between current consumption and various IoT platforms, where RPi is one among the costliest device.

Carlo N. Cabaccan1, FebusReidj, G. Cruz2 [8] detailed that power consumption of nodes are necessary to explain the performance of the complete wireless sensor network. Numerous approach and design are used to develop the performance of nodes in the method used after power expenditure evaluation. Representation of hardware mechanisms is done at all level to pretend power feeding of nodes as near as possible.

Calugay, Ace Anacleto P. III,Santos, Gilan Daniel R, Santos, Josemaria Israel S., Tolentino, RolandoT.II,Zhuo,EugeniaR.in[9],the author has said The main aim of web-controlled power board is used as a tool for saving electricity and to increase mobility in a power board remotely.

AqeelMahesri and VibhoreVardhan, in [10], To extend the battery life, we used to reduce system power without compromising performance. This has motivated portable computers to feature components that support various power modes.

KamarKesrouani, HoussamKanso, Adel Noureddine,[11] depicted a software-founded and multiformulas power approximation method. The technique is used to approximate the power consumption bestowing to the CPU utilization. Our model is authenticated with an average error rate of 1.25 % and maximum unique of 3% in stress exams, and an average of 2.5% for software test cases. Aferwards differentiated the energy impact algorithms, programming languages and compilers are used for double groups of programs.

R Agarwalk, R Martinez, S Harte, CSegard ,and B Flynn, in [12], A microcontroller–based humidity sensing node was developed and power feeding was studied for six different working methods. This method consists of sensing, data broadcast and asleep.

Oscilloscope was used to evaluate the voltage fall over resistor and current flowing where the power characteristics of sensor node were also evaluated .

Methodology

This project mainly works on Raspbian OS which requires an SD card for storage. Initially SD card is inserted in laptop through a SDcard holder, later card is formatted and flashed using software balena Etcher. Now SD card is inserted to RPi and suitable connections are made in which RPi is turned on through micro-USB cable.

As RPi requires SSH (secure shell) connection for serial communication, again SD card is inserted to laptop where text document is created and named as SSH. For booting RPi without GUI, the created SSH document is deleted and RPi-pc connection is established

For setting up Wi-Fi, ethernet cable is connected between RPi-pc. Available network is shared to RPi through advance IP scanner and putty configuration. Later required RPi IP address is found and connection is established using putty configuration and remote desktop connection (inbuilt).

When we give user name and password to remote desktop connection the Raspbian OS desktop is opened. The desktop looks like this. As mentioned earlier, on various benchmarks the power consumption of RPi is measured through power gauge. Respective voltage and current values are noted.

Raspberrypi specification: Investigate the different methods of RPi power consumption

namely, RPi- desktop as idle, different sensors, solar panels.

Several test cases were performed to analyze the achievability of the RPi's treatment as an inaccessible station. The RPi can be measured by the Secure shell link and current drawn after the above test cases is rejected. The succeeding technique is comparative investigation of power acquired after the RPi and components specification is depicted in table 1.

Table 1: Components Specifications

Components	specifications
CPU	Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64- bit SoC @1.4GHz
RAM	1GB LPDDR2 SDRAM
Wi-Fi	Gigabit Ethernet over USB 2.0
3D graphics	4-pole stereo output and composite video port
Other interfaces	CSI camera port for connecting a Raspberry Pi camera DSI display port for connecting a Raspberry Pi touchscreen display

Raspberry Pi as IDLE

On case 1, the current drawn from the device is calculated on default state and also on switching off. The disconnecting peripherals are used to decrease the power feasting. However after disabling the HDMI port, the measurements were achieved.

Raspberry pi connected to two different sensors.

On case 2, the device power consumption is measured through 2 different sensors which gives the results based on its usage of power. Then the power consumed is compared between usage of sensors along with RPi. This is specified in table2.

Table 2: Sensor Specifications

COMPONENT POWER(W) S	VOLTAGE (V)	CURRENT (A)
ULTRASONIC SENSOR	5.1	0.43	2.19
PIR SENSOR	5.1	0.43	2.19
MANY ENSORS	4.88	0.45	2.2

Raspberry PI Powered up Through Solar Panel

The power module needed an precise size of the solar panels arrays and batteries. On case 3 RPi is powered up through solar panel, where solar panel is connected to battery, controller and buck converter. Buck converter converts 12V solar voltage to 5V raspberry pi input voltage. Later based on these benchmarks the set-up is made and power is measured & specifications is given in table 3.

Table 3: Solarpanel Specifications

COMPO-NENTS	VOLTAGE (V)	CURRENT (A)	POWER (W)
SOLAR PANEL	5	0.36	1.81

Uploading data to cloud using Think Speak.
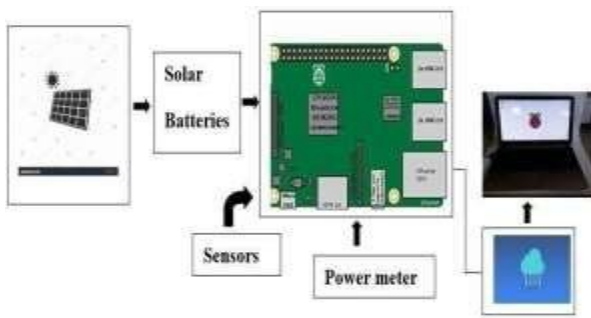
Fig. 1: Solar Energy For IOT Device

Raspberry Pi 3B+:

RPi 3B+ as shown in fig 2 is the most modern embedded device in the RaspberryPi3range,a64-bit quadcore processor operated at frequency of 1.4GHz,dual-band at 2.4GHz and 5GHz wireless LAN, Bluetooth version 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT.

The connection setup is made as before using solar panel and the power consumption values are uploaded through cloud using ThinkSpeak. Firstly, ultrasonic sensor is connected to RPi and the following results are obtained.

We can observe that by varying the distance of ultrasonic sensor, there will be a change in graphical representation data accordingly with respect to time in ThinkSpeak. So, this data can be accessed through cloud.

Later using power meter, we have measured how much power is consumed by ultrasonic sensor when it is sending data to ThinkSpeak.

Proposed Model

Initially RPi is connected to monitor or desktop where it requires ethernet connection. This connection is made from USB cable such that serial port communication occurs through SSH connection as mentioned earlier. Power gauge or power meter is used to determine voltage and current in turn giving us the output power consumed by these devices. Sensors are used to collect the information through RPi and by performing various performance counter of the sensors, we are going to evaluate the results. Solar panels are connected to power up the RPi such that the benchmarks performed earlier are compared with solar powered RPi. Later, at the end all the collected data are uploaded to Think Speak which can be accessed through cloud. It's given in fig1.

Fig. 2 Raspberry pi 3 B+

Solar Panel

A solar panel as shown in fig 3, or photovoltaic unit is the collection of photo-voltaic cells layered in a outline for setting up. Solar panels used as a conventional energy and produce direct electricity. A group of PV cells is called a PV panel, and a scheme of panels is an array. Arrays of a photovoltaic method supplies solar electricity to electrical apparatus.

Fig.3. Solar panel

Power Meter

This USB Power Meter as shown in fig 4 is a unique device that can provide voltage reading of 0.01Vandcurrentreading of 0.001A, displayed on the LCD display, while the device is connected to a power resource.

Fig.4 Power meter

SD Card

Micro SD as shown in fig 5 is a removable flash memory card used as a storage space. The cards are used in mobile phones for storage. Trans Flash cards are of 16MB and 32MB sizes. Micro SD cards are sold in many sizes, it varies from 64 MB to 32 GB,

whilemicroSDHCcardsvariesfrom4GBto64GB. Bigger ones are micro SDXC memory cards, varies between 8 GB and 1 TB. Most are in the range of 0- 100mA at the supply voltage of 3.3V.

Fig.7 Ultrasonic sensor

PIRsensor

A passive infrared sensor (PIR sensor) as shown in fig 8 is electronic sensor used to calculate infrared (IR) light reflecting from objects in the area of vision. These are used in PIR founded signal detectors. They are generally used in security alarms and automatic lighting appliances.
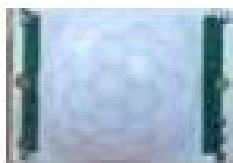
Fig.8 PIR sensor

Fig .5 SD card

Buckconverter

A Buck converter (step-down converter) as shown in fig 6 is a DC - DC power converter which reduces the voltage from its supply to its load. It is a switched-mode power supply (SMPS) consists of as a minimum two semiconductors (a diode, transistor, capacitor, inductor). To decrease voltage ripple, filters with combination of capacitors and inductors are added to converter's output (load-side filter) and input(supply-side filter).

Fig.6 Buck converter:

Ultrasonicsensor

An Ultrasonic sensor as shown in fig 7 is an electronic equipment that calculates the distance between the target object and sensor. Ultrasonic waves move quicker than speed of sound. Ultrasonic sensors consists of dual modules namely the transmitter (It transmits the sound by piezoelectric crystals) and receiver (It receives the sound later it has passed to and from the target). When transmitted wave hits the target and reflects back to the receiver, the distance is calculated by the sensor.

Battery

An electrical battery as shown in fig 9 is a combination of one or more electrochemical cells, used to store energy. There are movable batteries that is used to control any power that is coming in and power out. They can be charged up using a USB cable when power is available and a user of other devices that would generally use a USB cable.

Fig.9 Battery

I. Flowchart
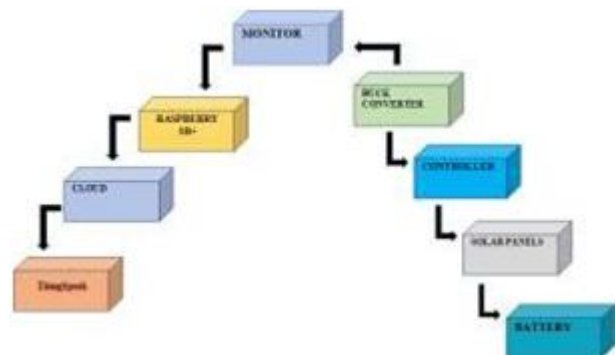
Fig.10 Flow Diagram

Result

We ran different test cases and used the methods to assess the performance of RPi. For the different test cases the power readings are obtained using power gauge or power meter and it is analyzed in the graphical form as line chart which is shown fig. 11. Then creating a cloud space using a ThinkSpeak software, ultrasonic sensor was connected to RPi and the data obtained from ultrasonic sensor module was analyzed and monitored using the software mentioned. The output data obtained is visualized in graphical form as shown below.
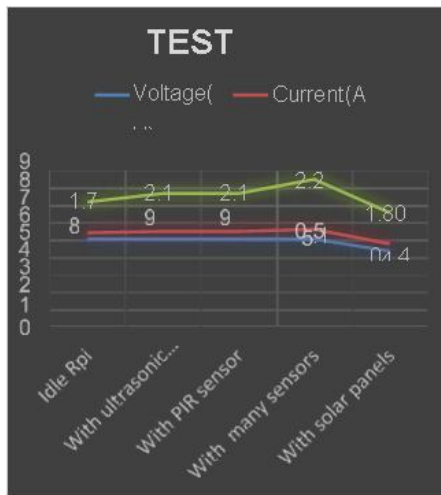
Fig 11. Test Result

Fig 12. Think Speak Result

Conclusion

Analyzing all these results, we could say that the maximum power consumption is through software rendering when compared to hardware rendering as it takes more time & more power consumption. Hence this paper depicts the following conclusions such as

The proposed system is power efficient. Renewable energy is effectively utilized. Energy generated from solar cells is stored in the battery and is used to power up RPI for the control of all the components. Sensed value is uploaded to cloud and data is monitored in Think Speak.

Futurework

Our project mainly helps in future projects which can be implemented in forest regions (remote areas). We have designed our system such that if there is any motion captured, it can detect the motion through PIR sensor. The total counts of data can access through cloud. In order to perform all these functions, low power consumption of RPi is a much-required criteria. This project has other various applications such as, industry, homes or any other firms. RPi can as well be associated to many sensors to analyze information rather than connecting RPi to the network.

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MODELING AND GEOMETRIC OPTIMIZATION OF HIGH DEFLECTION MICROCANTILEVER

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ABSTRACT

Microcantilevers are one of the most simple, flexible and sensible structures of MEMs design. Microcantilever based devices can be used to sense different physical, chemical, biological stimuli and can also be used to detect small mass. Microcantilever design is a complex multivariate issue which constitutes mechanical, electrical and thermal design aspects of its physical and process parameters. The stimulus applied results changes in deflection and resonant frequency of the microcantilever which can be measured using different electronic, physical, piezoresistive or optical means. Even though, many literary works include various designs of microcantilever involving stress concentrated regions (SCR), there is exiguous focus on its optimal dimensions. In this work, SCR based microcantilever design with various geometrical dimensions has been investigated and the optimal solution for improved sensitivity has been ascertained by using Finite Element Analysis.

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Introduction

Microcantilever structures typically consist of thin beams with micron dimensions. In recent years, extensive research on microcantilever based sensors has demonstrated diverse applications in Healthcare, Environmental monitoring, Industrial analysis. Microcantilevers have been designed as piezoelectric, piezoresistive, calorimetric, interferometric, capacitive and mass spectroscopic sensors used for Medical diagnosis, sensing of explosives, force , displacement measurement and detection of biological molecules, gases, temperature, pressure, chemicals, DNA, proteins, Volatile Organic Compounds [1]. The use of cantilever as a sensing element in atomic force microscopy has pioneered the extensive research on using microcantilever as a sensing element. Numerous advantages like Portability, design simplicity, high sensitivity, inexpensiveness, device flexibility, Label free detection and robustness have motivated microcantilever based sensor design compared to the conventional sensing techniques. More over label free detection eliminate the need for reagents, radioactive/fluorescent labels or calorimetric enzymatic assays as opposed to label-based detection for biological/chemical sensing.

Conventionally, Most of the materials used for developing cantilever sensors belong to the silicon family viz. Silicon bulk, polycrystalline silicon, silicon dioxide, silicon carbide, silicon nitride. However cantilevers using polymers like Su-8, Polyvinylidene Fluoride and chemical compounds like zinc oxide, zeolite are being developed and explored for various applications [2]. The microcantilever structures can be fabricated using either surface micro machining or bulk micro machining. Moreover, Micro machining can shrink the size of sensors effectively by allowing their integration on the same chip without extra fabrication costs.The recent and rapid growth of the integrated circuit design and fabrication technologies has enabled the on chip fabrication of the microcantilever arrays.

The read-out techniques are important for analysing the mechanical changes of the cantilever. Optical method has been a popular means for cantilever read-out, but it needs sophisticated equipment, large space and is also expensive. In piezoresistive method, the

electrical resistivity of such material changes with applied stress. The deformation of the microcantilever caused by the generated surface stress as a function of applied load is reflected as the change of resistance of the piezoresistive material. It is the less complex and most economical read out method but suffers the lack of practicality due to its low resolution. Higher mechanical sensitivity results in bending due to large surface stress which helps in improving the overall sensor sensitivity and reduces the cost. By improving the sensitivity of the microcantilever, the detection capability can be improved and the costs can be reduced.

In Static mode, Deflection of the cantilever and in dynamic mode, the resonant frequency of the microcantilever is the two key parameters which are used to determine the sensitivity of the microcantilever. Different ways to improve sensitivity include changing the geometry, incorporating Stress Concentrated Regions, material properties of the microcantilever [3-8]. The cantilever beam dimensions have to be chosen carefully based on the resolution and sensitivity needed. The design sensitivity and the calibration sensitivity determine the overall sensitivity and accuracy of the device. Optimizing cantilever geometry has been a popular approach for improving the sensitivity. Many research works prove that low aspect ratio of the Cantilever results in improved sensitivity. Microcantilever was designed and tested for point load and surface stress load conditions in [9]. From the results, it was concluded that narrow and long cantilevers are suited for point load applications whereas low aspect ratio cantilevers are befitted for surface stress load applications like chemical/biological sensing. Rectangular, triangular, and half-ellipse shape microcantilevers with inner cut were designed and simulated in [10] which proved that rectangular cantilevers with low aspect ratio and with high aspect ratio inner cut delivered high sensitivity and effective fabrication of the cantilever beam.

Various microcantilevers with rectangular and trapezoidal profiles clamped as single legged and double legged structures were designed in [11], It has been found that trapezoidal profile cantilever offered better displacement characteristics than its rectangular counterpart. Sensitivity was investigated in terms of its resonant frequency for a non-uniform profile microcantilever with trapezoidal shape at the fixed end and rectangular shape in the free end in [12] whose results exhibited three times better sensitivity compared to a rectangular prismatic cantilever. In [13], authors suggested a rectangular paddle cantilever for wind speed sensing which offered high sensitivity. Authors proposed and validated the structural integrity of a highly sensitive Microcantilever in [14] which incorporated many stress concentrated regions. Even though many works use U-shape for microcantilever design, there is no proper emphasis on the inner cut which gives the U-shape for the rectangular cantilever [15-17]. In this work, a more clear approach is followed to detect the length of the inner cut for varied physical dimensions. The microcantilever design is optimized for enhancing its performance characteristics. In this paper, Finite Element analysis for various cantilever geometries was carried out by varying the physical dimensions and we demonstrate the choice of physical dimensions for enhancing the overall sensitivity in terms of microcantilever deflection characteristics.

Materials and Methods

Due to the minute dimensions, process limitations and design costs of the microcantilever systems, direct experimentation is not feasible. Computerized Finite Element Analysis tools are found to be reliable means to model the Microcantilevers. The device performance can be estimated through numerical modeling to check whether the design goal is satisfied or not and optimize the design accordingly before fabrication. In numerical modelling, the device model is represented as finite number of components which are well defined and the behaviour of every component is analysed using mathematical solutions. The most commonly used numerical method for microcantilever systems is the finite element approach. Finite Difference Time Domain (FDTD) method and Finite Element Analysis (FEA) are the two most commonly used techniques for MEMs simulations. However, FEA offer few advantages over FDTD method like the exact

consideration of sloping boundaries, evaluation at any point, using less number of nodes to model the system yet yielding accurate results and the ability to handle complex multiphysics simulations. Due to these advantages, Finite Element Analysis has been the widely applied numerical technique for MEMs applications which involve electromagnetic, thermal and electromechanical simulations or the combination of all in by the use of a Multiphysics environment.

Finite Element Analysis

In finite element approach, the problem model is modelled in terms of partial differential equations and integral equations through discretization method and the approximations of the real solution are ascertained. The mathematical model is subdivided into several disjoint components known as Finite Elements. The response of every element is modelled as function of the set of node points. The overall response of the mathematical model is then evaluated as the solution of a discretized model attained by the collective response of all the elements. The first step is to divide the microcantilever structure as node elements through a process known as discretization or meshing. Then these elements are approximated as matrices whose equations can be solved to obtain unknown quantities. There are few commercially available Multiphysics software tools which are used to develop Finite Element models of the MEMs structures. Utilization of these software tools greatly helps on focusing on the design problem and physics involved and eliminates the need for learning the FEA approach

Modeling

Intellisuite is a commercially available industry standard integrated design environment, specifically designed for MEMs structures. The Numerical computation is performed using the FEA of Intellisuite by considering the physical dimensions and the process parameters. Models can be built either by using layout and fabrication structure in IntelliFab or the 3D builder. A 3D geometry of the rectangular microcantilever is modeled and simulated using 3D builder and thermal, electrostatic and mechanical (TEM) analysis module using

Intellisuite software. This module facilitates the incorporation of different material properties, boundary conditions and loads to completely analyze the device in static or dynamic domains. By using the 3D builder feature, a meshed 3D model can be generated without the need for device backend processing information like fabrication processes. The numerical modeling depicts the mathematical representation of microcantilever device which can be represented as a static or dynamic model. Due to its abundance and inexpensiveness, Silicon is the most popular choice for microcantilever based sensing structures. Silicon microcantilevers offer good thermal and moisture stability. The use of silicon beam also facilitates ease of fabrication and On-chip integration. All the models are of silicon material with a young's modulus of 170 Gpa and Poisson's ratio of 0.26. The geometry of the cantilever beam is approximated by using meshing of 1 μm.
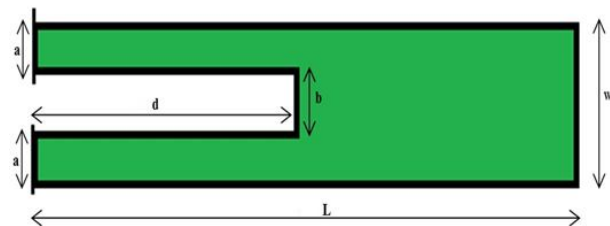
Figure 1 Schematic of microcantilever with rectangular SCR

The microcantilever beam is clamped at one end and suspended at the other end. In such cantilever structure, the entire stress is concentrated at the clamped end. The microcantilever beam is subjected to a pressure load of 10 Mpa at the free end. The mechanical analysis is carried out by considering the microcantilever deflection as the sensitivity parameter. The deflection of the cantilever is a mechanical parameter which is dependent on the physical dimensions of the cantilever beam such as the length L, width W, thickness t and also the material properties. The design goal is to find the optimal SCR length with respect to microcantilever physical dimensions that results in larger deflection using static mode of operation.

The applied load induces a stress, resulting in deflection of the microcantilever. The deflection of the cantilever is investigated by changing the length, width and thickness. The

external mass applied induces stress in the microcantilever structure which further lads to its deformation. One way to improve the sensitivity of the microcantilever is to optimize the device by including stress concentrated regions (SCR) on the cantilever surface such that the deflection characteristics were improved. The SCR is a geometric discontinuity which causes the cantilever to experience a local increase in stress intensity. Microcantilever with rectangular SCR of length d and width b is considered for the analysis as shown in Fig. 1, the cantilever width a is same on the both sides of the SCR at the clamped end. In this work, the optimal dimensions of the SCR are investigated along the longitudinal distance of the microcantilever for different physical dimensions of length L, width W and thickness t of the microcantilever. The methodology adopted for optimized analysis is carried out by longitudinally varying the length of the SCR for different dimensions of the length, width and thickness of the cantilever.

Results and Discussion

In this section, the effect of SCR length on the deflection sensitivity for different geometric conditions of microcantilever is examined independently and the results are demonstrated. Influence of the microcantilever length Effect of SCR length on the deflection of the cantilever was analysed by varying it longitudinally along the length of the cantilever. For this analysis, Microcantilevers of different lengths L = 100 μm, 150 μm, and 200 μm are considered with a constant values of beam thickness t = 1 μm, beam width W = 20 μm and SCR width b = 10 μm. The length of the SCR is varied incrementally and the corresponding deflection results are obtained for an applied pressure of 10Mpa for all the simulations. These deflections results are presented in table 1and plotted as a function of SCR longitudinal distance in Fig. 2. The increase in the length of the rectangular SCR has depicted an increment in the deflection up to an optimal point. From the results obtained, it is clear that this optimal point where the maximum deflection is obtained is at an SCR length of 44 μm, 66 μm, 88 μm for 100μm, 150μm, and 200μm length cantilevers respectively. These values ascertain that the optimal dimension for SCR length is 44% of the microcantilever length.

Table 1 Deflection Results

L=100 μm		L=150 μm		L=200 μm	
Longitudinal Distance (μm)	Deflection(μm)	Longitudinal Distance (μm)	Deflection(μm)	Longitudinal Distance (μm)	Deflection(μm)
40	0.498	50	2.469	80	7.938
42	0.499	60	2.515	84	7.956
43	0.499	62	2.519	87	7.962
44	0.499	64	2.521	88	7.963
46	0.498	66	2.522	89	7.963
48	0.497	68	2.521	90	7.962
50	0.495	70	2.519	100	7.916
60	0.477	80	2.485	110	7.804
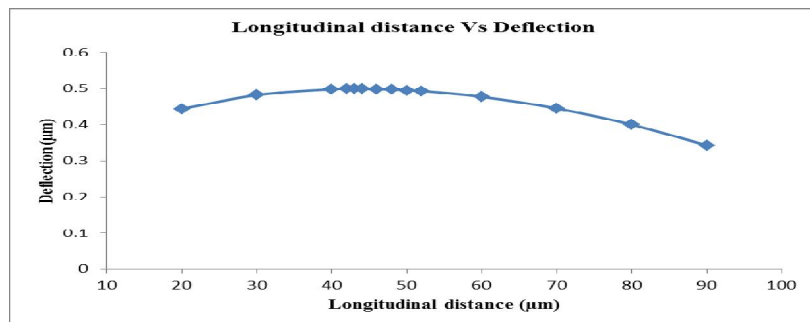
(a)
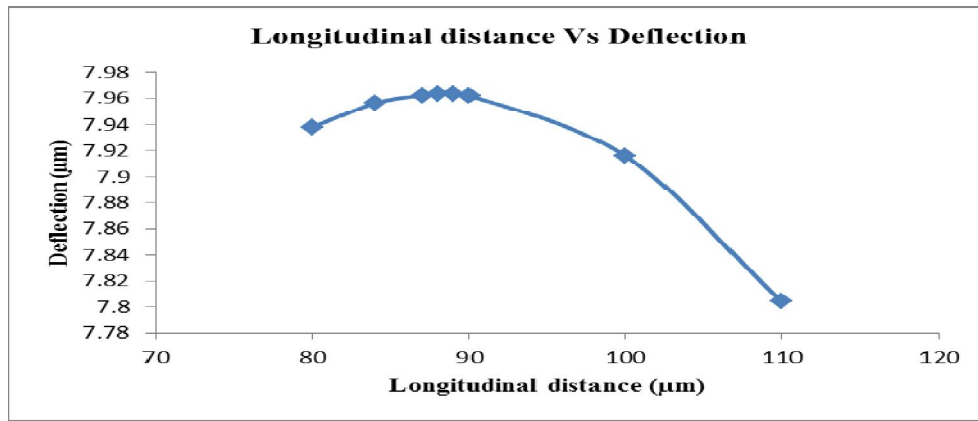
(b)
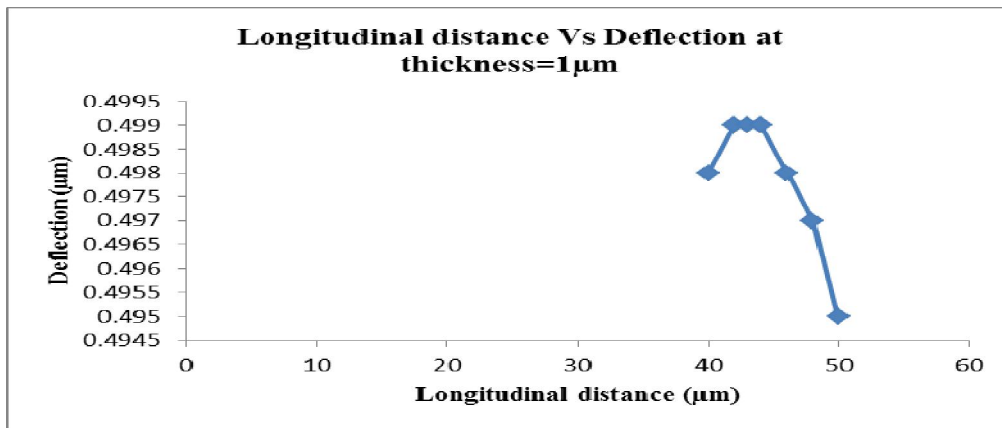
(c)
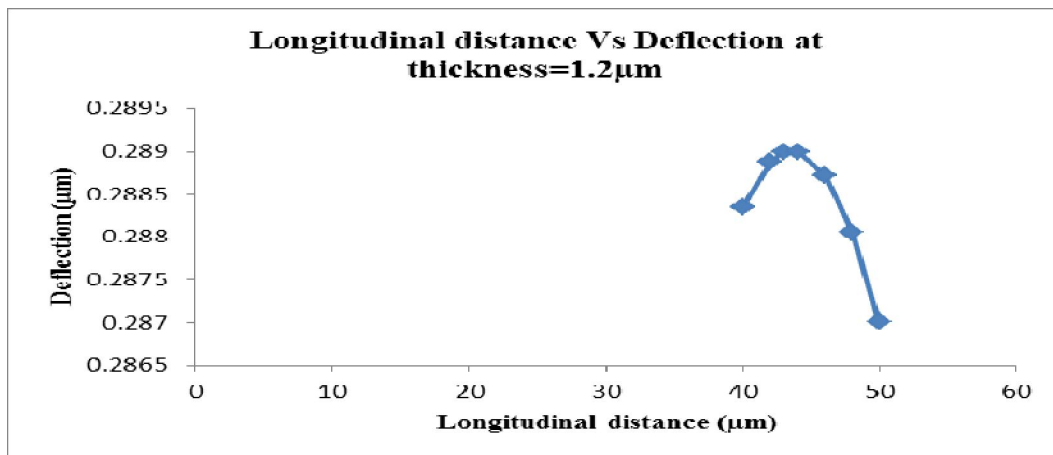
(d)

Figure 4 Deflection sensitivity as a function of SCR longitudinal distance for various thickness for constant values of L=100µm, W=20 µm

Conclusion

Even though rigorous research is available on the SCR based micro cantilever designs, there is less focus on the SCR size aspects. In this paper, Rectangular micro cantilever designs with varied geometrical dimensions were investigated for the optimal SCR length using Intellisuite software. In each case, the objective was to identify the SCR geometric configuration that maximized the performance contingent on design constraints. The analysis was based on the static mode considering deflection as the sensitivity parameter. Based on the deflection sensitivity, from FEA results, the optimal length of the rectangular SCR is found to be constant at 44% of the total

cantilever length in U- Shaped cantilever irrespective of its physical dimensions. This inference is validated for different values of length, width, and thickness of the micro cantilever. This design optimization can be readily fabricated using the conventional equipment without the need of any additional processing. Hence, the SCR geometry along with the beam dimensions is critical for enhancing the overall sensor performance by improving its deflection sensitivity.

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AUTOMATIC SPEED CONTROL AND ACCIDENT AVOIDANCE OF VEHICLE

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ABSTRACT

Now a day-to-day collision on a motor vehicle has developed a major security issue. Cases of injury and decease from car crashes are reported regularly. The number of pedestrians hit by cars is also increasing in cities and highways. Additionally, in zoos, wild animals are often killed by cars. The cost of living is immeasurable, the cost of damage to vehicles also has a negative impact on asset. In many cases drivers fail to recognize the presence of hindrances in advance and the brakes require the driver's response to run thus increasing comeback time, which in turn reduces their reliability. When any obstacle (such as a human body, car, etc.) comes in visible of a automobile, controlling the rapidity of the vehicle is an effective key to circumvent accidents. We recommend a solution to our project to dodge road coincidences and control vehicle swiftness. Ultra-sonic sensors for cars detect complications, details and transfer them to the car to stop the car with the aid of Arduino Uno. In addition, if there is an hindrance approaching the car, soon the buzzer and LED will notify the motorist.

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Keywords: safety, automobile, coincidence, reflex system, ultrasonic sensor, hindrance, road coincidence, Arduino uno, LED, Buzzer, etc.

Introduction

From progression to humanity, we rush to modernization and sculpture in the road and automotive system to duck an unique act which sets a good instance in the work of improving our lives. The availability of new technologies in automobiles is growing day by day. Some famous countries have already exposed their strength in the development of non-motorized vehicles. Some of these can be determined by precise timing. Therefore, on the basis of this it is very important for the driver to participate in the program as soon as possible in a critical situation where the vehicle is very close to another vehicle. A car accident problem is portion of an boundless slope of accidents that can happen wherever at any time. Around 1.2 million individuals perish on the roads every year, making the foremost source of demise worldwide. Short-income and mid-income republics are where greatest of these deaths happen. Speedy economic growth has augmented traffic congestion and road damage. There are very limited roads protection actions in developing nations, leading many accidents. This causes a chief encounter as developing nations misplace about 3 percent of their uncultivated domestic product as a result of road accidents. A road coincidence is the important cause of death for many years, most accidents are safe and expectable. There is ample evidence of ways to help accomplish road safety. Some nations have effectively executed these results to significantly reduce road accidents. Implementing this global intervention suggests great potential to prevent future injuries and save people lives around the world. This scheme is suggested to eliminate common driver errors, as many smart cars only monitor programs, for example speed bumps, anti-bolt brakes, and additional automated systems, particularly luxury automobiles, but these automobiles are not of a lesser amount of expensive for everyone and as a result, an expensive system is required. well but it works carefully for all automobile users.

A accident prevention program is a scheme designed with devices or sensors mounted in the vehicle to alert its car user to any potential traffic congestion. Other dangers associated with these sensations include the proximity of vehicles to nearby vehicles, and the exact distance from the vehicles. The ultrasonic distance sensor is adjusted to measure closeness to the front and rear motor. Many of the ultrasonic sensors available for vehicles are allowed to approach vehicles at very low speeds. While complex analysis of proximity information can't be used directly, a clever

approach is considered to process the distance learned without the devices/sensors to extract the suitable cautionary signals and security-procedures.

Traffic crash prevention systems are based on system control systems and vehicle warning systems that prevent motorists from decelerating schemes. Numerous programs are there which is expensive and makes it too expensive for mid-income employees to personal those cars. These methods don't take into account the level of safety in the suspension of vehicle. It always gives the room a human error. Therefore, this outlines the progress of an programmed accident prevention system which uses detection barriers and distance measurements using ultrasonic distance sensors to sense their obstructions and brakes automatically without the car user permission.

Literature Survey

A collision prevention program is a vehicle safety program designed to minimize potential imminent danger. These structures have changed over period from dumb structures to present smart structures that are in action and below investigate. They practice electrical circuits connected to sensors and occasionally sensors for camera to sense improper hazards.

As soon as exposure is made, these structures give the driver a cautionary in the event of an impending collision or to operate independently without the driver's installation by automatic brakes [9]. In [10], this method practices 2 unlike sensors, the one which forward's and the other backwards. It sees hindrances when it reaches a distance. The system however, is limited to detecting hindrances and providing cautioning indications, no actions are automatically involved to prevent a collision.

In, [9] introduced a crash evasion method by means of optical maser rays. First, the structure measures their location in 1 second and then proves it on the road with optical maser rays. Optical maser is luxurious and nonstop action requires sufficient electricity, which may not at all possible for use in standard low-cost vehicles and used vehicles.

Similarly, [11] introduced an anti-congestion system by removing the driver's speed control

and braking thus reducing the impact of the rear end and improving the driver's ease of operation. However, the system is limited to use only in difficult traffic situations.

The method [12] uses devices that guide and obtain indications as of vehicles; barriers to stream of traffic robots and the fundamental storage repository is located inside vehicle to express if circulation safety should be engaged. But the structure is inadequate to power outages that might disturb system performance. In [8], the system avoids collisions where the speed is less than 20 kilometer / hour and retains the car user in attentive manner, to avoid collisions. The structure used has no countermeasure to prevent collisions.

In, [13] the raspberry pi and ultrasonic distance devices to portion distance in relation to motionless substances. Devices are installed to notice the hindrance in visible of the automobile in addition to the obstruction located in the unsighted commercial in the automobile.

The structure has no countermeasure to prevent collisions. Function in [14] practices a locator sensor that guides high-occurrence sensor waves.

These will strike nearby substances, then reoccurrence to the device, then they calculate distance, rapidity, and comparative speed proximately. The structure is limited to usage of watch-only caution to aware the car user. The next one [15], in this it uses low-robotic automation to carry out the subject tasks, such as course-plotting, swiftness controller circuits and crash exposure structures.

The structure will be only presented with gears under two wheels and following method comprises drawing 2 white strings laterally the measurement of road wherever it travels. In [12], introduced a method used by the Optical maser device, which recognizes automobile using Optical maser radiation, by transmission and getting.

Structure [16] provides a sensory system to display vehicle environments, measure distances from other vehicles, and to detect potential obstacles. Important subjects which decelerated the development of these ground include software complication, the charge of the car modelling system.

Structure [17], it spots matters or hindrances by means of sonar devices that produce wide-ranging rays and accepts the rays indicated from the hindrance, the evading procedures as the straightforward structure for avoiding conflicting collisions. System limitations as shown in the use of sensory integrity.

Problem Statement and Motivation

Problem statement

One of the weather-related problems is, when the   driven path is covered by fog the vehicle in our front can't be seen from a distance and by the moment, we see the vehicle we won't be able to control the driven vehicle if at a greater speed. Hence in this project of ours we use an ultrasonic distance sensor which detects the vehicle at a distance and alerts the driver of the vehicle.

According to the WHO (World Health Organization), approximately 13,448 people die, and 795 fatal crashes occur every year in India due to the presence of fog.
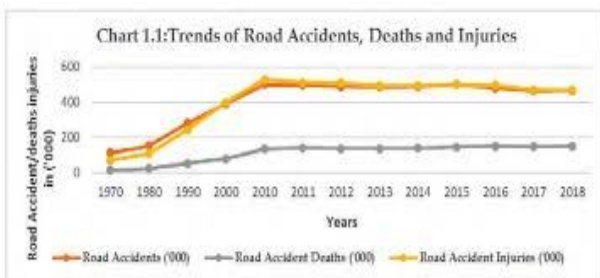
Motivation

The main motivation of these project is to prevent accidents due to errors caused by humans or due to weather related problems hence we are using sensors to prevent them from happening.

Proposed System and Implementation
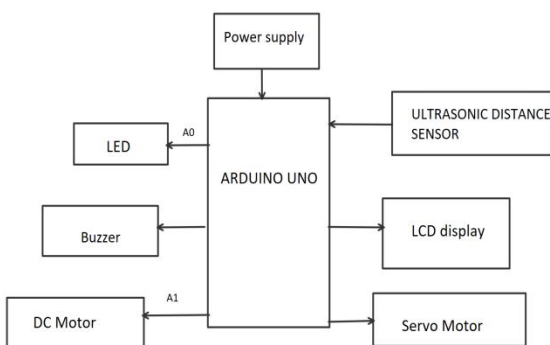
Fig1: Block diagram of proposed system

Proposed system

The way we work is based on a "warning system" that allows cars to send geo messages indicating a "loss of visibility" warning the car driver so that they can adjust their speed before it is too late. This method also applies to other dangerous driving situations such as due to a car parked on the road or where there is an obstacle on the road. The purpose of these warnings in the end is to reduce the speed limit of vehicles by asking speeding vehicles to descend in order to maintain a safe distance.

Hardware components

1. 16x2 LCD display
2. Arduino uno R3
3. Motor engine (DC Motor)
4. Ultrasonic distance sensor
5. Power supply
6. Smoke sensor
7. LED
8. Alarm buzzer
9. Servo motor

Fig 2: hardware connection

Methodology

The first step towards making of the project is to gather all the required components such as power supply(230v,5A), Alarm, 16x2 LCD display, Arduino uno R3, DC motor engine, LED Lights, ultrasonic distance sensor. The Arduino uno R3 is a 28-pin microcontroller, and it relates to other components through the pins. The LCD display consisting of 16 rows and 2 columns is connected to pin 8,9,10,11,12,13 of microcontroller. The alarm buzzer is connected to pin 7 of microcontroller and the motor engine connected to pin 6. The LED lights is connected to the Arduino circuit through a3and a2.A power supply is used to run the circuit which runs at 5v is connected to the Arduino board. Pin 4 and 5 is connected to the ultrasonic distance sensor used to sense the vehicle incoming. Thus, when all the components are placed at the designed locations the power supply is switched ON and the DC motor starts running. Now when a obstacle is placed in front of the UDS, it senses the obstacle placed in front of it by a distance of 15m and alerts the driver by sending a message to alarm to buzz and the

LED light turns red. This slows down the vehicle motor and stops running thus preventing it from accident. When the obstacle is removed from the path, the motor starts running thus making the vehicle to move forward.

The ultra-sonic sensor calculates the distance using the formula

D = ½ T x C

D is the distance

T is the time

C is the speed of sound (343 meters/second).

Experimental Result

We have implemented our project suing software platform (proteus software) where we have connected the components according to the circuit design made. In software as we cannot place the actual obstacle, we have connected a potentiometer to the test pin of ultra-sonic sensor in which the power is connected to one end of the potentiometer and ground to the other end of the potentiometer. Thus, when we make the potentiometer high and low the ultra-sonic sensor senses the obstacle when it's made high and low when the obstacle is removed.
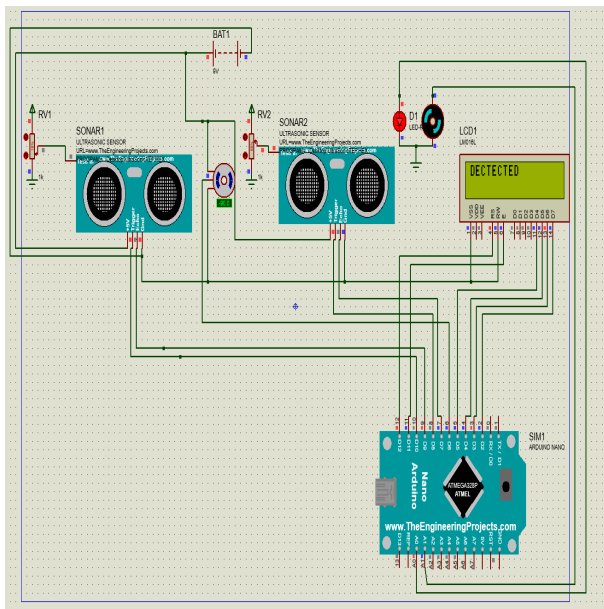
Fig 3: Experiment Output

We were able to implement our project in hardware, but we were not able to connect every component mentioned above due to some misconnection in our end, but we were able to alert the driver and avoid the accident to occur
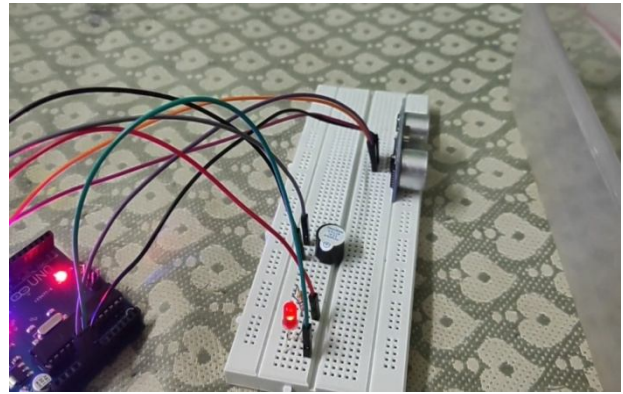
Fig 4: Experiment output

Conclusion

Introduction to car crash prevention, using an ultrasonic distance sensor-generated anti-collision structure is introduced. Intention was to decrease accidents to lessen fatalities, wildlife deaths, motor vehicle injuries and property damage during collisions and thus eradicate associated charges. For the structure to do the job you love, it is made as an automated scheme, based on the Atmeg 328 microcontroller. The system used was to regulate the space among vehicles also obstacles correctly, provides caution using cautioning structures, and performs brakes with a least range given an typical reply time of 0.86 seconds and a proportion fault of 12.8 percent during action.

Future Scope

Setting up the ultrasonic sensor will alert the driver when the driven path is not visible by means of weather problems such as fog and slow down the motor. so that in future the number of accidents will slowly decrease due the advancement of this type of technologies.

The succeeding guidelines will be well thought-out in the forthcoming:

- The structure can be started by car in a different way.
- Possible integration of ultrasonic distance sensors with radar detection sensors will deliver a safe security system that can be used in vehicles.

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POWER OPTIMIZATION IN SHIFT REGISTERS USING MODIFIED D FLIP FLOP

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ABSTRACT

With the increase of data storage in electronic gadgets, the power consumption towards storing and retrieving data is also high. With the portable electronic gadgets, optimizing the power can increase continuance of device usage. Shift registers are widely used in temporary data storage and data transfer. In this paper, SISO and SIPO type of shift registers are implemented using D-flip-flop and Modified D-flip-flop. The Modified D-flip-flop is implemented using C-MOS technology which can be implemented using 5 transistors. The power utilization for SISO and SIPO designs is compared.
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Keywords: SISO, SIPO, D FLIP-FLOP, MODIFIED D FLIP-FLOP, CADENCE

1. Introduction

In VLSI technology forgoing years silicon CMOS technology has become an important fabrication technique for relatively better performance and cost-effective VLSI circuits. In VLSI technology the first transistor was developed by William B. Hackey in 1947. The integrated circuits are developed by the year 1960 and mainly there are four generations and they are small scale integration, medium scale integration, large scale integration and very large scale integrations. The technology has been developed in such a way that the number of transistors in an integrated circuit on a single chip has been developed. In this process the risk chips is possible to process 35 million instructions per second. So the technology is increased in terms of scaling, processing and enhancing by CMOS[6].

Shift registers are also considered as sequential circuit which stores the data. The main objective of any VLSI circuit is to reduce the delay and power consumption. Researchers are trying to introduce new techniques to fulfill these aims. SISO and SIPO shift registers are designed using CMOS technique and implemented via cadence EDA tool. This paper compares the power consumption of Modified D-flip-flop with gated D FF circuit. In this paper Modified D-flip-flop has been implemented using CMOS technology. Here SISO and SIPO shift registers have been designed implementing both D-flip-flop and Modified D-flip-flop .The power consumption in both the shift registers has been compared.

D flip-flop is bi-stable circuits which give the output in response to a input pulse. The data at rising and falling edge of the clock is given as input to the sequential circuit .These flip-flops store the data's on both the rising and falling edge of the clock signal and this is termed as double edge triggered flip flops and those flip flops that store data's only on the rising or falling edge are known single edge-triggered flip flops. So the latches and flip flops are the sequential circuits that store high and low state of data called as logic states.

The power consumption is perilously the most important factor in the modern VLSI circuits especially for those circuits which work on low-power applications. Flipflop is one of the most power consuming digital electronic circuits used in many devices such as register file and many more. It consists of clock distribution networks and storage network which consumes more power almost 50% of total power consumed. So we discuss D-Flipflop and modified design of D-Flipflop which consumes less power.

1.1 Objective

The objective of this project is to :
- D-Flip flop and Modified D-Flip-flop are implemented at transistor level and power consumption in individual is compared.
- Design and compare SISO and SIPO shift registers using the D-Flip-Flop and Modified D-Flip-flop.
- All the above designs will be analyzed and the output is simulated using

Cadence Virtuoso Tool in 180nm technology.

2.1 D Flip-Flop

The gated D-FF is as shown in the figure 2.2 The D Flip Flop is the building block of shift registers. It captures the value of the D-input at the rising or falling edge of the clock. That captured value becomes the Q output. Propagation delay is reduced in D Flip Flop. Since there is only one input (D), it uses lesser number of pins and more can be packed into a single package [8].
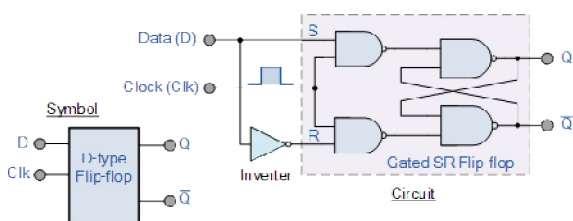
Figure-2.1 Symbol of D-Flipflop

Figure-2.2 Circuit diagram of D-Flipflop

2.1.1 Construction

D Flip-Flop is constructed using 4 NAND gates and an inverter, each NAND gates is implemented using 4 transistors 2 NMOS and 2 PMOS and an inverter is designed using 2 transistors i.e., 1 NMOS and 1 PMOS

Working

D flip flop working can be understood with following cases:

When data is set to high the output of the flip flop is set and when data is low, the output would be reset.

When the data to the clock is set to 1 both the "set" and "reset" states of the flip-flop are in high state.

When the clock input is in high state, the data input is copied to the output Q.

2.2 Modified D–Flip Flop
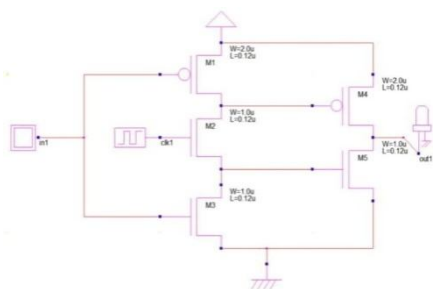
Figure-2.3Modified D-flipflop

The modified D-FF has been constructed using C-MOS technology[7]. CMOS is a complimentary MOS where two enhancement MOSFETS, one N-type (NMOS) and the other P-type (PMOS) are connected as a complimentary pair. Enhancement-type MOSFETS are normally off.

The CMOS circuit offers two benefits. The channel current is exceptionally low and a stream just during progress from one state to the next (ON/OFF).The power consumed is very low in steady state. Modified D Flip Flop is implemented using CMOS technology which utilises three NMOS and two PMOS transistors and thus the Modified D Flip acts as an inverter. When Gated D Flip Flop is implemented, it needs 20 transistors. Thus Modified D Flip flop reduces the transistor count significantly.

The circuit becomes dynamic in nature if less number of transistors is used and these Modified D-FF results in the reduced power consumption.

It gives good driving factor with good output signal and better performance.

2.2.2. Working of Modified D Flip-Flop

The Modified D Flip Flop is shown in the Figure-1.3. Its working can be understood with three cases as[8] :

i. Clock is high and input is low: transistors M1, M2 and M5 are ON, M3 and M4 are off and the output is low.

ii. Clock is high and input is high: transistorsM1 and M5 are off, M2, M3 and M4 are on and the output is high.

iii. Clock is low and input is low: transistors M1 is on and the remaining transistors are in off state and the output is low.

3. Construction of Siso and Sipo Shift Register Using D-FF
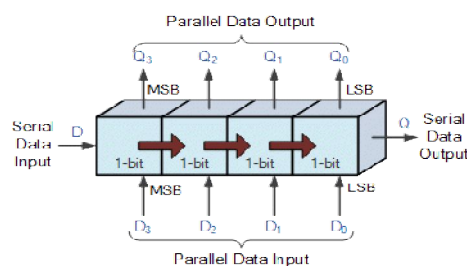
Figure-3 Block diagram of shift register

3.1 Design OF 4-BIT SISO Using D-FF

In Serial In Serial Out (SISO) shift registers data loading and data retrieval to or from the shift register occurs in the serial-mode[1].
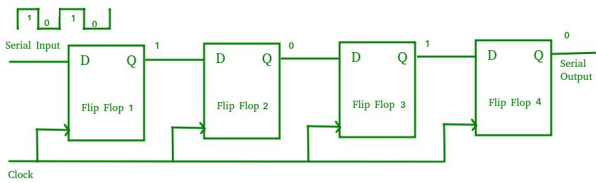
Figure -3.1 Block diagram of 4-bit SISO

SISO is constructed using 4 D Flip-Flop and a clock using 80 transistors.

The operation is as follows.

The number of individual data latches required to make up one register device is usually determined by the quantity of bits to be stored with the foremost common being 4-bit wide constructed from eight individual data latches.

It consists of four registers, each register is a D type latch, with one input. This data input can be logical '0' or '1'.

The four registers are arranged serially, where one register feeds its result to the next.

3.2 Design OF 4-BIT SIPO Using D-FF

In Serial In Parallel Out (SIPO) shift registers data loading takes place serially and data retrieval occurs parallel.
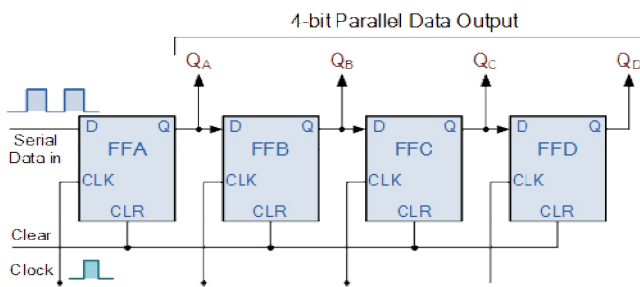
Figure-3.2 Block diagram of 4-bit SIPO

3.3 Design OF 4-BIT SISO Using Modified D-FF

SISO is a unidirectional shift register constructed from positive edge triggered modified D-FF's. The output(Q) of each FF is connected to D input of FF to it's right. Flip flops are synchronized with each other. The content of the left most FF after the clock signal depends upon the signal value on the serial data in line. Here we can send the bits serially from the input of the left most modified D-FF and output at the right most modified D-FF[4].

3.4 Design OF 4-BIT SIPO Using Modified D-FF

The serial in parallel out unidirectional shift register is constructed using positive edge triggered modified D-FF. Initially all the flip flops are cleared. All bits are entered into flip flops in similar manner as SISO but all bits at the output are taken out simultaneously.

4. Simulation and Results

Cadence Virtuoso tool in 180nm technology is used to simulate the shift registers. Power consumption ofD-FF and the modified D-FFare compared and observed. Itis observed that the power in modified D FF is reduced. The performances of the shift registered are evaluated by comparing the average power and delay. Table1illustrates that the number of transistor usage is greatly reduced in modified D FF. Reduced number of transistor is providing power optimization.

Table -1 : Comparison of Power and No of Transistors for shift register design using D FF and Modified D FF

	D-FF	D-FF SISO	D-FF SIPO	MD-FF	MD-FF SISO	MD-FF SIPO
NO OF TRANSISTORS	20	80	80	5	20	20
POWER (µW)	14.18	53.86	53.86	2.331	12.42	11.09

In SISO and SIPO the numbers of transistors used in D-FF are same i.e., in D-FF the number of transistors used is 20 whereas in modified D-FF five transistors are used. The best result in each compared category is emphasized. The output is same as the input and it is changed at the rising edge of the clock signal. The same principle applied in the modified D-FF. In D-FF of SISO the transistor used are more compare to D-FF, i.e., 80. Similarly, D-FF of SIPO are constructed using 80 transistors.

The power consumption of both the shift registers is 53.86x10-6 watt[3]. In modified D-ff of SISO and SIPO the transistor used to construct the design is 20.

Here we are moving from D-ff to modified d-ff we have advantages, in this design we have reduced the number of transistor and the power consumption is reduced drastically.
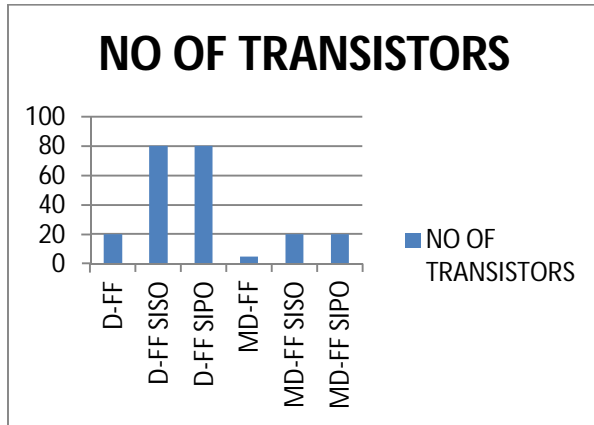
Figure-4.1 Block diagram of 4-bit SIPO
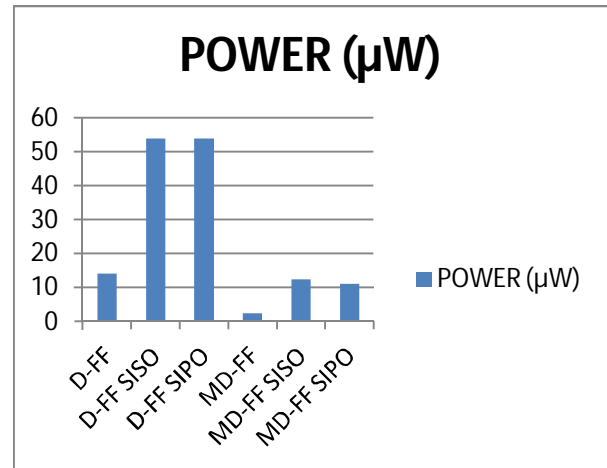
Figure-4.2 Block diagram of 4-bit SIPO

Simulation Graph of D Flip-Flop
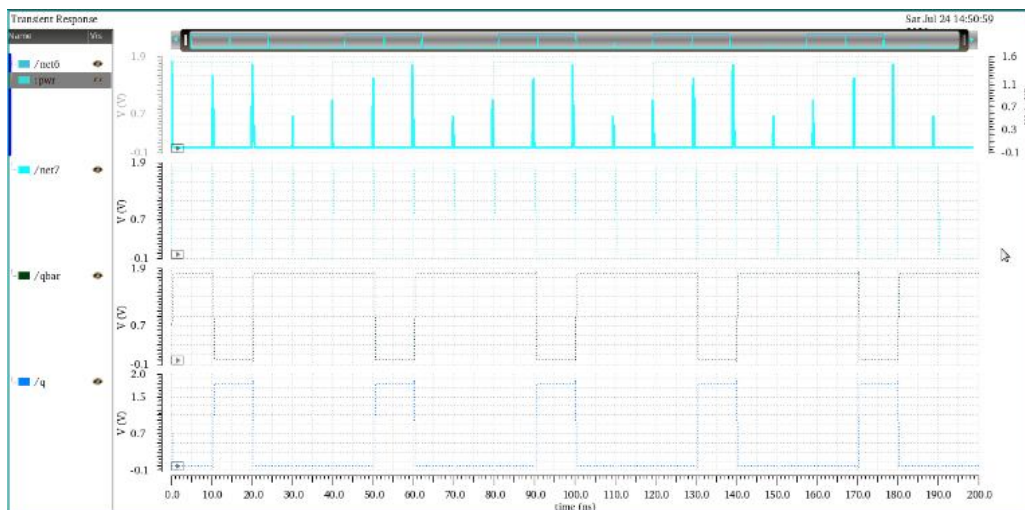
Simulation Graph of Modified D Flip-Flop
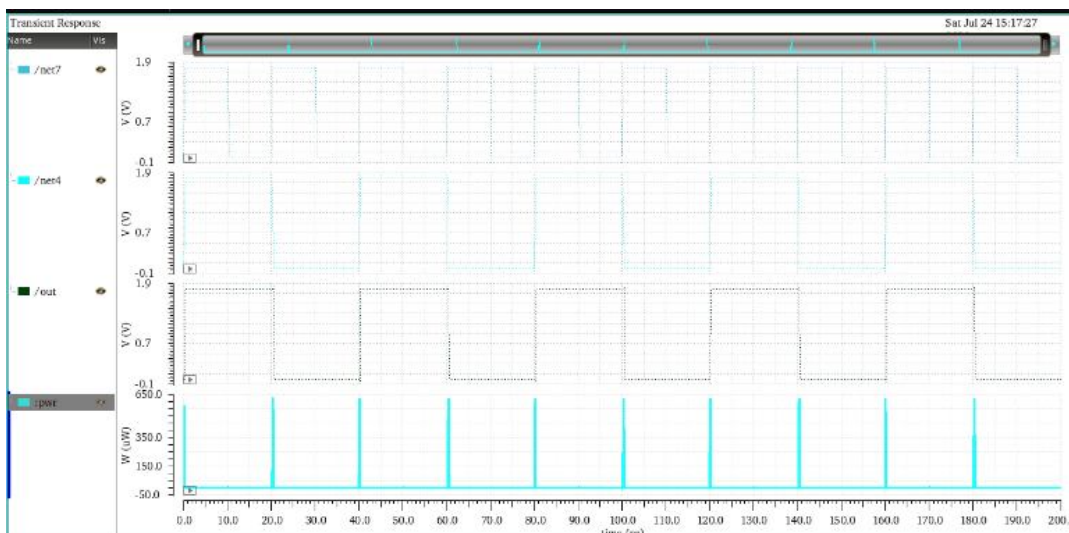
Simulation Graph of SISO Using D-Flip Flop
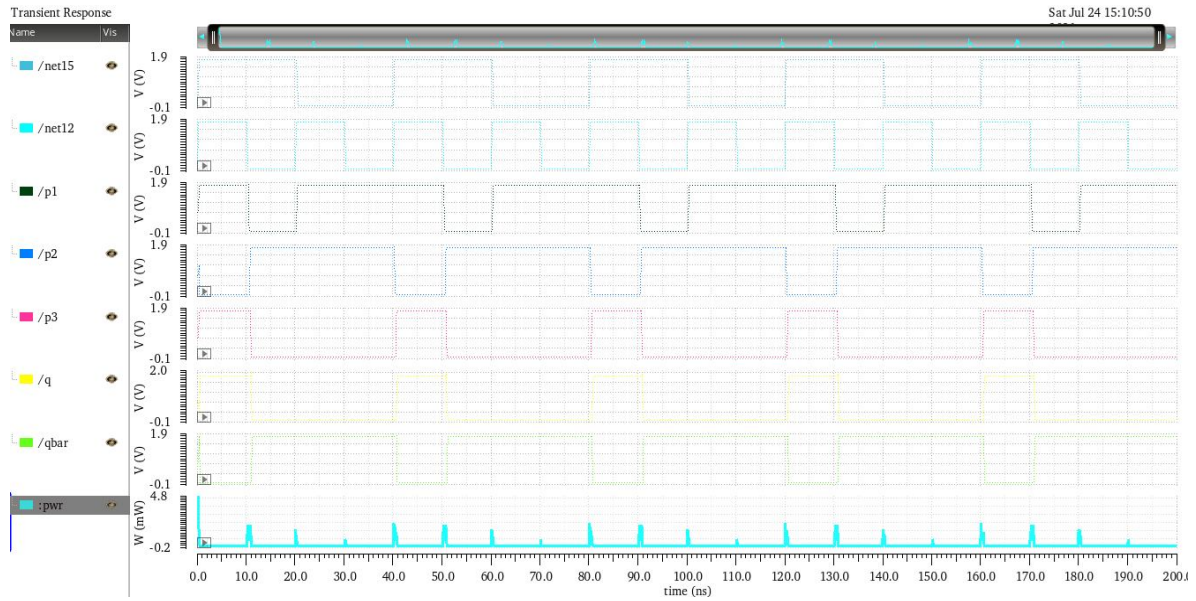
Simulation Graph of SIPO Using D-Flip Flop
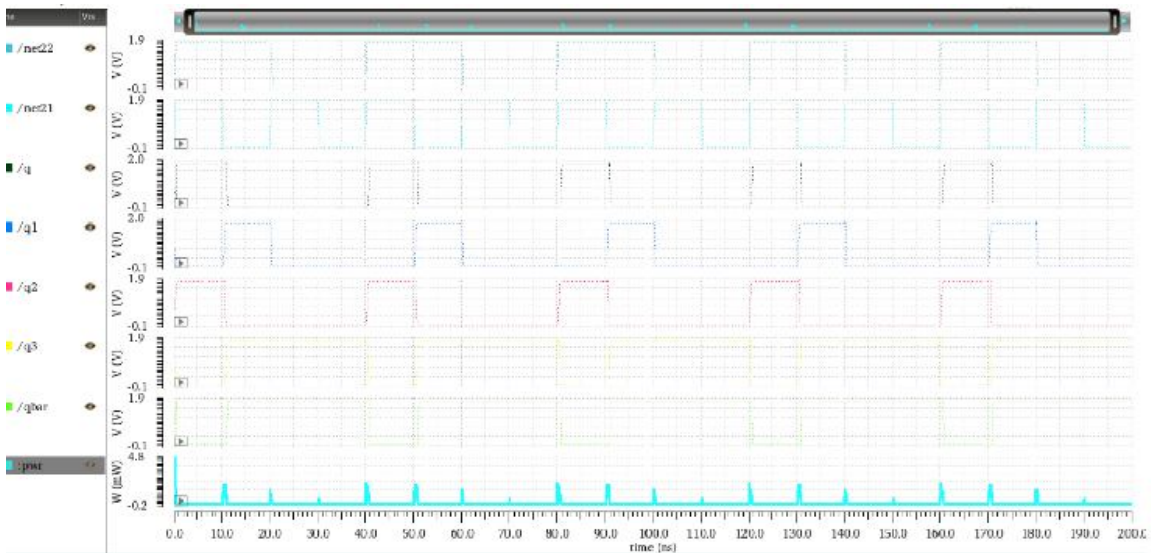
Simulation Graph of SISO Using Modified D-Flip Flop
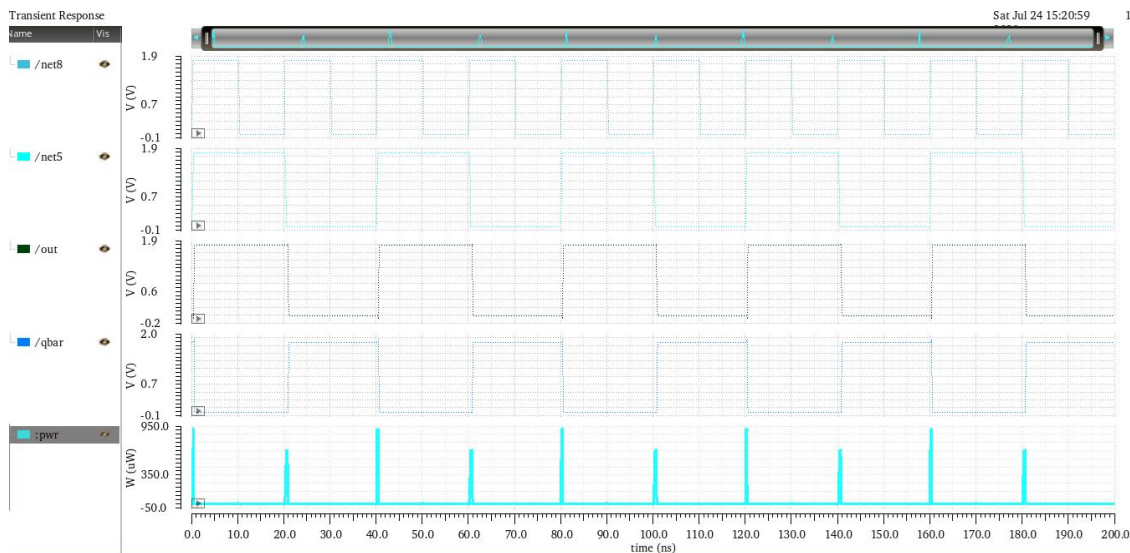
Simulation Graph of SIPO Using Modified D-Flip Flop
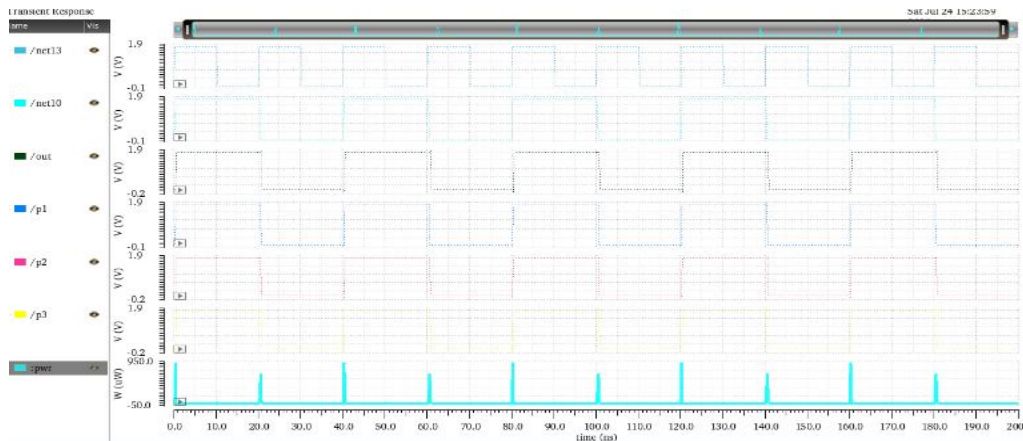
4. Conclusion

Replacement of D-FF with Modified D-FF can save appreciable amount of power consumption. Modified D flipflop is implemented using CMOS technology and d flipflop is implemented using gates .In this paper SISO,SIPO shift register are built using Modified D-FF.The number of transistors used in Modified D-FF is less than the gated D-flip flop. Hence Modified D-FF saves 83.56% power consumption compared to the gated D-FF.when shift registers were implemented using modified d flip flop the power consumption reduced by 76.94% compared to gated d-flipflop. These designs have been analyzed and implemented using Cadence Virtuoso tool with 180 nm technology.

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THE START UP SCENARIO: A COMPARATIVE STUDY BETWEEN UNITED STATES OF AMERICA & INDIA

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ABSTRACT

The paper has explored the Startup scenario in two countries leading in terms of number of startups cropping up in their territory. It has evaluated the sectors in which the two countries have maximum startups and explored a series of variables which have had an impact on growth and development of startups in respective countries. The study has evaluated and compared the ecosystem of starting a venture in US and India using historical data on formation of start – up companies and movements related to them after their formation. It is observed that there are many similarities of startup economy in India and USA. USA leads the entire world in terms of number of startups originating from the country and India stands at third position. However Indian entrepreneurs are fast catching up with it. The study has used random effects regression to analyse and compare the growth of certain sectors in a particular country. The study also compared the performance of startups in particular cities of these countries so as to analyse the impact of ecosystem of a particular geographical area on initiating a startup.

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Introduction

Entrepreneurship has been the buzzword for quite some time, and has attracted many young professionals to take the leap towards starting their own venture. Even though, initiating a startup is a high risk, high return affair where on one hand 9 out of 10 start-up companies fail within one year of their operations still many qualified youngsters are taking plunge. Companies like Flipkart, Snapdeal, Paytm, Freecharge, Ola, OYO Rooms, etc. have enjoyed massive funding from International investors and are making a good name for themselves.

The growth of Indian entrepreneurship industry has been very steady over the past few years. With the number of startups in India touching the 55,000 mark by December 2020, the Indian startup ecosystem recorded a total funding amount of $70 Bn across 5,985 funding deals from 2014 to 2020. The good funding and improved ecosystem has had an impact on the number of startups originating from the country. In terms of the number of funding deals and startups funded, fintech, enterprise tech and edtech were the top three sectors in the Indian startup ecosystem in 2020. The year 2020 was remarkable in another sense since it witnessed emerging of 11 unicorns in a year, highest for Indian startup industry. The pandemic has maximum positive impact on adoption of online learning products and services which helped edtech industry overtake ecommerce from the third spot. It is clearly observed that the year 2020 belonged to the edtech industry. However, it is essential that this momentum is maintained so that India reaches the second position in the next few years. The main factors fuelling India's startup ecosystem are vast consumer market, rising middle class income, changing job preferences, evolving mindset and the steps taken by the Indian Government to promote the entrepreneurial culture. Government has launched numerous schemes to attract entrepreneurs by providing them required skills as well as funding under different schemes.

The astounding success of Apple, Google, Facebook, Airbnb, Uber , Microsoft etc has further motivated Indian entrepreneurs giving them hope that companies once making a humble beginning can go on to have multi-billion dollar valuations. One common point about these companies is that all of them incorporated in the US. Is it mere coincidence that USA has been one of the leading economies in the field of Innovative businesses

and startups? The startup revolution in USA started decades ago and today we witness its spillovers with innovations in almost all sectors of the economy. Being a capitalist country in advanced stages of development, the entrepreneurs in USA have ease when it comes to pursuing their entrepreneurial pursuits.

The study aims at comparing the startup ecosystem in India and the US, using a series of variables. The study seeks to evaluate the factors, policies, cultures which motivate entrepreneurs leading to higher growth rate of companies in one country vis-à-vis other.

Literature Review

Education and infrastructure have played a key role in presence of large number of startups in the U.S. as compared to India. However, there are many other differentiating factors responsible for the same which are discussed here.

Katz and Wagner (2014) challenge the regional concentration of startups and focus on the emerging concept of innovation districts where existing companies have set up their headquarters and interacted with a number of startups too support and nourish them. Innovation districts are the results of mega trends changing the geographical preferences of startup companies, in the process, re conceiving the link between shaping the country, place making and networking

Toomey (2014) uses 10-K SEC filings of US biotechnology companies and their expenditure in research and development to study the increased interest in this sector over time.

Iyer, Khanna and Varshney (2002) performed a study to observe the impact of caste on entrepreneurship in India. They observed SCs, STs and especially the OBCs have progressed significantly in independent India. They further observed that OBCs have progressed more in entrepreneurship as compared to SCs and STs. As a result of economic progress, Dalits have progressed to become millionaires but similar scenario is not observed for SCs and STs. This discrimination exists even in progressive states and pockets where OBCs have made significant progress.

Audretsch et al. (2012) analysed local nature of entrepreneurship determinants to investigate these questions for manufacturing and services in India. They compared organized and unorganized sectors within these two industry groups. They observed that education levels and local infrastructure access are the most prominent local traits linked to entrepreneurship across all sectors. They concluded that in comparison to the U.S., we find that India's economic geography is still in the emerging stage and that the government must adopt appropriate policies to ensure substantial impact on entrepreneurship.

Raghupathi and Raghupathi (2019) explored country level innovation and observed that with development of a nation, government's expenditure on R&D experienced a decline. However, this motivated local innovation and even filing of patents. The researchers urged countries to recognize factors influencing high-technology exports for innovation. They believed that designing of national innovation ecosystems could boost economic growth through innovation.

Krishna (2018) investigated 45 high-tech startups and analysed that entrepreneur's prior startup experience, explorative mode of learning transformation, causal decision making of the entrepreneur and availability of funding for the startup as the key factors that reduce the time to survival of Indian high-tech startups.

Rizwana and Singh (2019) attempted to identify the various impediments faced by startups in scaling up their business. In a sample study of 357 startps based in the state of Karnataka, India the authors concluded That success of a startup was influenced by the age of the founders, age of the startups, and prior experience of the founders.

It is essential to identify and enhance localized ecosystem that encourages entrepreneurship and acting upon them is essential to foster economic growth. Fernandes and Pakes (2010) believe that in the future, entrepreneurship is expected to play a key role in India in terms of job growth and development of a strong manufacturing base and transition of people out of subsistence living and the informal sector. Kuckertz (2020) analysed that Policy measures to boost startups would deliver desired outcome only if accompanied by other attributes of an entire entrepreneurial ecosystem which includes ease of doing business.

Glinka and Thatchenkery (2013) compared perception towards entrepreneurship in India, USA and Poland. They observed the most negative images from Poland while India was closer to the USA. It was a surprising finding since Asian cultures are generally perceived as more distant from the USA than European. The reason for this may lie in high uncertainty avoidance of Poles and their risk aversion (Hensel and Glinka, 2012). While people in the three cultures seem to want to succeed and achieve, the ambivalence towards wealth creation is very clear among them. For the USA, entrepreneurship is the foundation of its economic engine and there is no ambiguity about the desirability of possessing wealth.

Suresh Babu and Sridevi (2019) observed that current economic scenario in India is on expansion mode. They appreciated schemes 'Make in India', 'Startup India', MUDRA etc. 'Make in India' being great opportunity for the Indian start-ups and restrict brain drain. They believed that with ample opportunities available for startups offering a range of products and services at affordable prices. They expected some of these startups to become unicorns by expanding their ventures to unchartered territories.

Mahalakshmi, Bhowmick and Sarkar (2020) analyzed Indian start - up scenario so as to provide predictive suggestions on fund raising based on factors like start - up's location, domain vertical , type of investment funding it is expecting, etc. The authors used real world data from 2016 to 2019 an built predictive model using ANN. They considered startups belonging to diverse domains such as consumer internet, ecommerce, finance, healthcare, food & beverages, education, technology and logistics. They developed a model to help predict the startups expected funding from investors and also analyse market competition and their chances of survival.

Objectives

The study intends to explore the dynamics of startups in India and USA over the time period 2000-2020 and observe the following:

1. Discover similarities & dissimilarities between start-up companies in USA & India.
2. Sectoral attractiveness / sectoral composition of start-up companies across time in the two countries.

Research Methodology

In order to achieve the objectives, the study uses the following methodology which is a mix of descriptive and predictive data analysis:

1. Measures of Central tendency and Standard Variation
2. Cross tabulations and Chi square test of independence
3. Random Effects GLS Regression

Data Sources

The study uses data from Crunch database maintained by Tech Crunch, Inc 42 and worldbank database for all the macroeconomic variables. The study uses data from 2000-2020 of startup companies incorporated in India and USA.

World Bank Database: A series of macroeconomic variables have been sourced from the World Bank Database to study inter-relationships with start-up company variables.

Data Analysis & Observations

Startup companies have displayed tremendous growth in the past 20 years (post 2000 period), particularly in the US. The main attribute for this growth is definitely the availability of capital for starting an entity. Historically also USA has been the launch pad of numerous entities which had a humble beginning but went on to become billion dollar companies. World over, promoters of these startups are idolized by budding entrepreneurs as their role model. The well-developed infrastructure in USA has served as a big enabler to the startups in terms of providing the right atmosphere, support system in the form of extensive distribution channels access for professionals required for smooth functioning of any new entity.

Moreover, the thought process of consumers in USA has evolved a lot over a period enabling them to grab, adapt and use latest technology to the most. The adoption and feedback rates of early adopters in US are very high.

Table 1 : Comparison of India and USA on range of variables affecting Startups

Variable (December 2020)	India	USA
Total No. of Start ups (-)	41,061	99,671
Tech based Start ups	9,300	48,500
Set up a new business (days in 2019)	18	4
Corporate Tax rate	25.17%	21%
No. of Tax payments by business (p.a.)	33	11
Bank Lending Rate	10.3%	3.3%
R&D spending % of GDP	0.65%	3.1%

Source: Compiled from https://www.startupranking.com/countries, Worldbank database

Over the past 15 years, there has been an increased level of enthusiasm and excitement amongst professionals trying their hands at entrepreneurship. Even the students at top tier business schools are giving up plush campus placements and opting to pursue their passion via entrepreneurship. A structural change in government's policies due to opening up of the economy has played a major role in boosting the setting up of startups in India.

As a result of New Economic policy 1991, India opened its gates for the foreign players in multiple fields and also permitted them to set up their base in India. This has lead to a major acceleration in access to the latest technology and knowledge of successful business practices being followed by the developed countries.

Relatively cheap availability of labour provided an opportunity for offshore activities to foreign companies who set up their base in India so as to take advantage of cheap human resources. The major beneficiary of this relatively cheap human capital was software companies handling accounts of US companies. The young educated Indian entrepreneurs seized the opportunity and learned all the relevant lessons from their foreign counterparts on techniques of setting up a business of their own. This led to the emergence of a new working class in India-the young turks, in other words – entrepreneurs keen on starting a venture of their own

It is further observed that even though USA stands at the top most position in terms of number of startups originating from the country, its relative growth rates has been relatively less than that of India.

It can be observed that USA's growth rates over the years have been relatively lower than that of India. The growth of Indian start up industry has been volatile but has grown at a much better pace as compared to its western counterparts. Here are many reasons which have contributed to this growth rate viz., better access to raising capital, a huge big consumer base due to large population, rising middle class leading to higher disposable income, large proportion of young population, and access to technology.

An analysis of deeper analysis shows that over the 25 year time period from 1991 to 2015 reveals that till 2002, there was a clear uptrend in USA implying that the number of startups being incorporated in USA was relatively higher as compared to India. However, post-2002, the scale has tilted in favour of Indian entities. The scenario is similar in terms of number of funding rounds and number of acquisition deals with a clear downtrend being observed in case of USA. The major reasons attributing to the higher growth rate in USA pre 2002 were the technological advancement in the software industry during that time period and integration of that technology in other core sectors of the economy.

Liberalisation of the Indian economy post 1991 has played a major role in the growth of entrepreneurial culture in India Liberalisation helped in integrating of the Indian economy with its global counterparts and as a result provided a exposure to the latest worldwide trends to the Indian entrepreneurs. A slow and steady trickle down effect was observed with less number of startups incorporating in the first post liberalization decade followed by a steep surge in the latter part. Opening up of the Indian economy provided an impetus to

cross border interaction and filled huge gaps in the existing market systems. The young visionary professionals in India took advantage of this scenario leading to higher growth rate of startups being established on the Indian soil post 2002.

Another dimension of the evolving of startups in any country is their present status. The study analysed the current status of these entities by classifying them in 4 categories viz., (i) Acquired implying all those companies which were acquired by another (ii) Closed – this category included all those startups which could not run the show and had to close down (iii) IPO – this category includes all those startups which performed well and went on to float their Initial Public Offer (IPO) and (iv) Operating – this category lists all those companies which have been to pull out of all the hurdles and are still operating.

Table 3 : Present Status of Start Ups under four categories

	India	USA	Total
Acquired	37	3,153	3,190
	132	3058	3190
Closed	57	2026	2083
	86	1997	2083
IPO	8	675	683
Closed	28	655	683
Operating	1172	23659	24831
	1028	23804	24831
TOTAL	1274	29513	30787
	1274	29513	30787
Pearson $\chi^2(3) = 117.9874$			p=0.0000

The study performed cross tabulation of status of company and conducted chi squared test of independence. It is observed that the p value is 0.00 implying that null of no independence can be rejected at a 1% level of significance. Hence, it can be concluded that a significant relationship exists between country in which a company is started up and its present status. So, the origin of startup plays a significant role in its success or failure.

After establishing that there is a significant relationship between the country in which a startup operates and its success and failure, further data analysis was done to assess the geographic concentration of formation of startup companies within the two nations

Table 4 : Geographical concentration of Startup companies in USA

City	Acquired	Closed	IPO	Operating	Grand Total
San Francisco	8.3%	4.7%	1.3%	43%	58%
New York	1.8%	1.3%	0.3%	15%	18%
Lenox	1.5%	0.6%	0.4%	7.7%	10%
Amarillo	0.8%	0.6%	0.2%	6.8%	8.3%
Seattle	0.8%	0.4%	0.1%	4.3%	5.6%
TOP 5 Total	13.1	7.6	2.3	77	100.0%
C5 (Concentration)	76%	68%	63%	59%	62%

It is observed that in USA, maximum number of startup companies originated in the city of San Francisco. This was followed by New York, Lenox, Amarillo and Seattle respectively making these cities claim the status of top 5 cities promoting startups. It is further observed that San Francisco lead from the front by promoting 58% of all the startups in the Top 5 category. The city of New York was a distant second with mere 18% of the

startups being incorporated in its territory. The data clearly indicates that when it comes to formation and promotion of startup companies in USA, the clear winner is San Francisco for the prospective entrepreneurs. The C5 concentration tells the share that top 5 cities have in relation to all the other cities. It is clearly observed that C5 concentration for acquired, closed, IPO and operating companies for USA are 76%, 68%, 63% and 59% respectively. The C5 concentration for all companies in the USA stands at 62%.

A similar analysis was performed for the Indian states as well and it was observed that Bangaluru was the city of choice for entrepreneurs followed by Mumbai, Delhi, Gurgaon and Hyderabad. It was further observed that Bengaluru was the base for 35% of all startups in India closely followed by Mumbai's whose share stood at 29% followed by 17% in New Delhi , 13% in Gurgaon and 6.7% in Hyderabad. Unlike USA, the startup companies in India are evenly spread out around the top three regions. The C5 concentration for acquired, closed, IPO and operating companies for India are 86%, 74%, 88% and 83% respectively. The C5 concentration for all companies in India stands at 82%.

The data clearly points out the fact that India is more concentrated than USA as far a startup ecosystem is concerned. Further, it is also observed that San Francisco has 58% of startups in the top category whereas Bangaluru has only 35% of startups in the top 5 category. New York, which stands second in terms of startups operating from the city has mere 18% as compared to Mumbai (2nd in India) which attracts 29% of start up in India.

A Cross tabulation of the status of companies and the regions of companies was performed for USA and a Chi squared test of independence was done to observe whether a significant relationship exists between regions in which companies are founded and their current status. Cross tabulation data reveals that p value of the test is less than 0.01, and thus we can reject the null hypothesis that two variables are independent. A similar test could not be performed for Indian cities as expected

values were less than 5 which make the results unreliable.

A ranking of various sectors on the basis of number of start ups in it from 2001-2020 reveals that the sectoral composition of startups in India and USA is similar such that Enterprise Tech is the most popular sector both in India and USA. In India, The Enterprise Tech sector is followed by E Commerce, Ed Tech, Fin Tech, Health Tech and Biotech respectively whereas in case of US, Biotechnology, Healthcare, Consumer goods and services and Fintech occupy the top slots respectively after Enterprise Tech.

It is further observed that in US, there are more than 47,000 startups in the topmost sector viz., Enterprise Tech and the Biotech sector with 7125 enterprises is a distant second. However, in India the top 5 sectors are very closely spread near each other. While Indian entrepreneurs showed relatively more interest in E Commerce, Education and Financial Technology startups, their US counterparts were more focused towards Biotechnology and Healthcare start-ups.

 The study performs a detailed analysis of two sectors viz., E Commerce and Biotech to understand the macro factors which have an impact on formation of startups in a particular sector. It is observed that E-Commerce has attracted a lot of attention in India from both entrepreneurs as well as investors. The sector has received millions of dollars in funding, especially since 2010, and seen a huge rise in usage of these services by Indian consumers. This has been majorly propelled by rising disposable incomes of the young population who wish for convenience in daily activities. The usage of E-Commerce services has made the life of users easy and comfortable by providing numerous services at doorstep. E commerce services help individuals reduce their transaction cost of searching desired products at different stores. Most of these sites were inspired by their US counterparts and their performance in US was a psychological cushion for investors. Hence, investors generously supported the Indian ecommerce startups leading to their high growth rate. In addition, focus of the Indian government on

improving the infrastructure, internet connectivity and penetration, high growth in usage of smartphones further fuelled the growth of ecommerce startups in India.

In a detailed analysis of funding of ecommerce startups, it is observed that the funding has been mainly towards specific niche segments such as fashion and beauty private labels and there has been a recovery of investor confidence even in the sub-sectors such as social commerce.

Between 2017 and 2018, a steep decline of funding of 36% was observed in the ecommerce sector. However, confidence in the newer commerce models and verticals has turned around the scenario and in 2020; there was an increase of 10% in the capital inflow. Over the past few years, we have witnessed that both Indian entrepreneurs and investors have expressed an increase in interest towards formation of a startup. However, US is far ahead of the car

Over the past few years, there has been a tremendous increase in startups by both entrepreneurs and investors alike. However, US is ahead of the curve as can be seen in the graph which depicts the number of startups in India and US in shopping and commerce space.

Data Analysis

Basic regression analysis using panel data models was performed to analyse whether there exists a significant difference between the two countries in terms of the factors affecting this sector. The number of companies is the dependent variable and various macroeconomics variables were taken as independent variables. The panel data models were used since the data resembled a long panel with 2 cross sections and 20 time periods. The Hausman's specification test was performed to identify the models to be used between the fixed affects and random effects model. The test showed us that there was no significant difference between the estimates of the random effects model and the fixed effects model. Thus, as per convention, a random effects model was chosen to identify relationships.

Table 5 : Random Effects GLS Model for E Commerce industry

Random-effects GLS Regression		Number of obs = 40	
Group Variable : Country		Number of groups = 2	
R-sq: within = 0.6072		Wald χ^2 (4) = 88.54	
Between = 1.000		Prob > χ^2 = 0	
Overall = 0.6783			
Number of Companies	Coefficients	Z	P> z|
Internet users per 100 people	1.51	2.73	0.006
GDP per Capita Constant 2005	-0.00459	-2.81	0.005
Length of Total Road Network (km)	0.00130	2.74	0.006
Number of Acquisitions	6.26	2.15	0.031
Constant	-77.37	-2.5	0.012

The results of the random effects model are given in Table 5. It is observed that internet users per 100 people, GDP per capita income, road length in kilometers (as a proxy for infrastructure & logistics network development) and number of acquisitions in the e-Commerce space significantly affect the number of companies founded in this space. All the coefficients are significant at a 5% level of significance and the model is overall also significant as depicted by the p-value of the chi-squared test of overall significance.

GDP per capita shows an unexpected negative sign implying that for every 100 rupees decrease in per capita GDP, a new start-up in this space is born. This may be due to a recent shift in interest away from e commerce start-ups since the competition has increased exponentially over the last few years and others sectors have come up. All other variables show expected signs depicting that for every 2 person increase in internet users per 100 people, there are 3 commerce start-ups being born. For every 1 acquisition that

takes place, there are 6 new start-ups in this sector.

It is further noted that there wasn't any significant difference between numbers of startups in the two economies. The drivers in the two economies of e commerce startups are statistically the same as none of the interactive dummies turned out to be significant and hence were dropped from the model.

Biotechnology Sector: Biotechnology sector was also analysed as it received much more interest from the entrepreneurs and investors in USA vis-a-vis India. There was a surge in biotechnology sector in US but not so much in India. The recent flows in the biotech firms has been due to the human genome project which studies and simulates the genes of humans to identify the likelihood of the happening of a particular ailment or disease and can be mitigated in advance. Biotech also has huge implications for increasing food productivity and agriculture studying cross-

breeds and using advanced ways to look at biology from various dimensions. Such kind of projects like time, effort and money, all of which India is currently very short of. The life cycle of such biotech firms are indefinite, since achieving a milestone may take years of research and because of this nature, India hasn't seen a lot of attention in this sector.

To identify the drivers of such interest and disinterest, a fundamental regression analysis involving panel data models has been performed. For identifying which of the models to be used between the fixed affects and random effects model, the Hausman's specification test was performed which showed us that there wasn't any significant difference between the estimates of random effects model and the fixed effects model. Thus, as convention says, a random effects model was chosen as the model to identify relationships.

Table 6 : Random Effects GLS Model for Biotech Industry

Random-effects GLS Regression		Number of obs = 40	
Group Variable : Country		Number of groups = 2	
R-sq: within = 0.8609		Wald χ^2 (4) = 57.39	
Between = 1.000		Prob > χ^2 = 0	
Overall = 0.9639			
Companies	Coefficients	Z	P>IzI
Urban Population (% of Total)	-4.325	-3.33	0.001
GDP per Capita Constant 2005	0.009	2.85	0.005
Adj Savings Education Exper	3.48E-10	7.99	0
Expenditure on R&D (per million)	0.06	1.94	0.069
Constant	105.099	2.85	0.003

The results of the random effects model are given in Table 6. It is observed that urban population (% of total) , GDP per capita income, adjusted savings education expenditure and expenditure on R&D per million people in the biotechnology space significantly affect the number of companies founded in this space. All the coefficients are highly significant at 5% level of significance and the overall model is also significant as depicted by the p value of the chi square test of overall significance.

It is observed that urban population shows a negative sign implying that for every

percentage point decrease in percentage of urban population, approximately 4 new startups come up in the biotech space. Other variables show expected signs. For every increase in GDP ('000) per capita, eight new start us are born. There is an expected relationship between expenditure on education and formation of startups in the biotech space. The expenditure on R&D per million drives the growth of biotech firms in US as depicted by the significance of interactive dummy variable. This shows that there is a significant difference between factors affecting formation of biotechnology firms in USA.

Conclusion

It is concluded that the New Economic Policy in 1991 with its three pillars of liberalization, privatization and globalization was the harbinger of startup companies in India. With MNCs setting up their offices in India, there was an inflow of technology and India's abundant human capital was put to use in sectors where their relative productivity was higher leading to improvement in and increase in the income levels. The startup culture had a positive impact on availability of jobs and income levels. All these factors combined together opened up new opportunities for aspiring entrepreneurs in India. The data conclusively points out that the increase has been phenomenal since 2000 as economy was liberalized in a phased manner and the effects and spillovers started trickling on by then.

It is further concluded that the city / region in which a startup operates plays a pivotal role in success and failure of the entity in both the countries.

Both India and USA have observed a downtrend in the average time between two rounds of funding.

From a top 5 cities perspective, the geographical concentration of startup activity across two nations is different. India is geographically more concentrated. If we consider C1, then USA is more concentrated. From sector composition viewpoint, enterprise tech was the top ranked start up category in both India as well as USA to start a new venture.

Further analysis was done for two particular sectors viz., e commerce and biotechnology. It was identified that there is no significant difference between the driving factors of e commerce in both countries and that the sector is largely driven by internet penetration and usage, real incomes of consumers, infrastructural development and the number of acquisitions in e commerce space. It was interesting to note that the pace of growth of biotechnology sector in India is behind that of USA and that it was a sought after sector for entrepreneurs in USA. A significant difference was observed between the drivers of biotechnology sectors in the two countries, with number of researchers in R&D per million being a significant factor for US but not for India. It was further noted that difference in surge of biotechnology sector is due to expenditure on research and development and education coupled with the fact USA is way ahead of India on the development curve than India due to its focus on advanced technology and research.

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ASSESSMENT OF OPTICAL PROPERTIES OF ZnO THIN FILMS DEPOSITED ON DISSIMILAR SUBSTRATES

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ABSTRACT

A wurtzite structure with tetrahedral bonding configuration is found in ZnO which is a compound semiconductor. In a thin film device, it is a promising material for various optical and optoelectronic device applications. Also, among other potential applications are, for example, piezo-electric transducers, spin functional devices, gas sensors, straightforward hardware in solar cell, UV light producers, surface acoustic waves and savvy windows and so forth In this work, optical properties of ZnO thin film saved on three diverse substractes have been investigated. All together to research the optical properties of ZnO thin film simulation program "MATLAB" was created for its high proficiency to deliver precise chart. The optical properties of ZnO thin films were concentrated as an element of frequency in the reach from 300 nm to 1200 nm. The refractive index, absorption coefficient, extinction coefficient decline with the expansion in frequency and their qualities are consistent in the higher frequency area. By looking at among the refractive index of three substrates it was tracked down that extraordinary KDP displays most reduced refractive index. The transmission spectra of ZnO thin films were researched for various thicknesses (100nm, 450nm, 750nm). It was additionally seen that every one of the substrates show a high conveyance of (80-95)% in the obvious area. In addition, in transmission spectra non-interference and interfernce impacts were dissected. No peaks in the transmission spectra uncovers the proof of non-interference impact. Interference fringes are addressed by the maxima and minima in the interference tenure. Because of the interference effect the quantity of pinnacles increments with the expansion in thickness. Subsequently, from the outcomes it tends to be closed that extraordinary KDP is the better substrate among different substrates for the affidavit of ZnO thin film and give better foundations for optoelectronic device applications.

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Keywords: Optoelectronics, Thin Film, ZnO, Dissimilar Substrates, Simulation, MATLAB

Introduction

Zinc oxide is an II-VI compound semiconductor material with incredible potential for an assortment of functional applications, like piezoelectric transducers, optical waveguides, surface acoustic wave gadgets, varistors, phosphors, straightforward conductive oxides, synthetic and gas sensors, turn utilitarian gadgets, and UV-light emitters.[[1]] Its wide bandgap 3.37 eV at room temperature makes ZnO a promising material for photonic applications in the UV or blue ghastly reach, while the high exciton-restricting energy 60 meV [[2],[3],[4]] permits productive excitonic outflow even at room temperature. It additionally has relevantcharacteristics of a straightforward conductive oxide (TCO)[[5]],which makes it valuable material for various mechanical applications like optical, optoelectronic gadgets, level board shows, fluid gem shows and meager film

photovoltaic gadgets, straightforward gadgets and so forth [[3]-[7]]. After the improvement of nanotechnology, there is a ton of ache to consider the different significant properties of this material in its nano dimensional structure for example either as nano dimensional slender film ornano structure/nano molecule [[6],[7],[8],[9]]. The nano dimensional meager films pull in much interest for their applications in future optical and optoelectronic applications due to their normal properties, for example, high optical conveyance in noticeable and close to IR-locale, high electrical conductivity and high compound and actual solidness [[8]]. Alongside the test considers viz. union and portrayal of the physical and compound properties, it is profoundly unnecessary and imperative to examine these properties hypothetically to foresee the enhanced properties of the equivalent prior to executing the materials for previously

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mentioned applications [[9]]. In particular, for the applications in optical and optoelectronic gadgets, it is critical to examine the diverse optical properties like refractive file, eradication coefficient, conveyance and reflectance with shifting the frequency or energy of the occurrence light. For planning the current optical and optoelectronic gadgets, it is likewise essential to know the thickness, refractive index and annihilation coefficient as a component of optical frequency to foresee the optical conduct of a device[[10],[11]]. In the current work, we start our reproduction utilizing two distinctive model known as

Sellimeier model and Cauchy's scattering model for optical properties in the obvious and close IR district frequency (300nm to 1200nm).Where the optical properties of ZnO thin film kept on germania silica, remarkable quartz and uncommon KDP substrates for various thicknesses (100nm, 450nm, 750nm) were investigated. The demonstrating is done by utilizing Matlab code. This examination is essential to set up a connection between's hypothetically determined what's more, tentatively noticed properties before the execution of this material in gadget creation.

II. Materials and Methodology
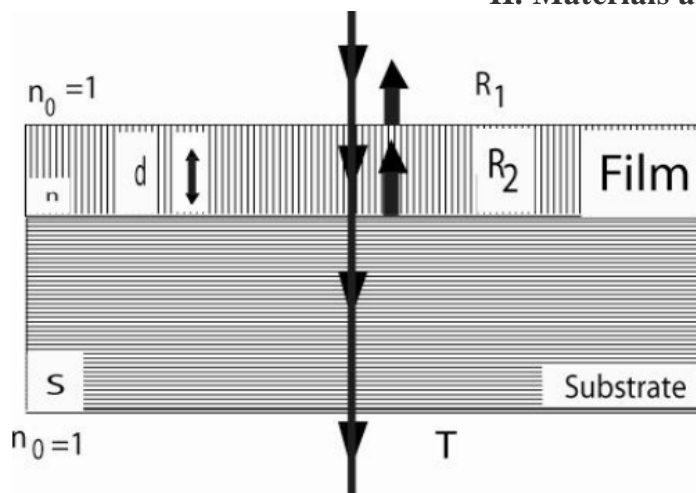
Figure 1: Model of the thin absorbant films on a transparent thick substrate.

The concise model of the thin permeable films on a straightforward thick substrate is appeared in figure 4.14, where d and n is the thickness and refractive index of the thin films individually. The substrate has a thickness of the few significant degrees bigger than d and the refractive index is s. The index of encompassing air is characterized as no=1. R1 is the force of the mirrored light on the interface among air and film, and R2 is the reflection on the interface between the film and substrate in center [12-

15]. While the reflection at the interface between the substrate and air under substrate isn't considered here [12].

The sellmeier equation for the refractive index,n, of ZnO thin film as a function of wavelength is given by,

$$n^2(\lambda) = A + \frac{B\lambda^2}{\lambda^2 - C^2} + \frac{D\lambda^2}{\lambda^2 - E^2} \quad (1)$$

A,B,C,D and E are fitting Parameters, λ is the wavelength of light (nm). Fitting parameters are calculated for different thickness, as deposit varies significantly [13]. The sellmeir coefficients of ZnO is given in table 2.1

Table-1 : Fitting parameter by the method VASE of sellmeier model for Zinc Oxide [14] .

A	B	C (nm)	D	E (nm)
2.0065	1.5748×10^6	1×10^7	1.5868	260.63

From this fitting parameters by the Matlab programme the refractive index of ZnO has been studied. The refractive index of the substrate.

$$S^2(\lambda) = 1 + \frac{A_1\lambda^2}{\lambda^2 - \lambda_1^2} + \frac{A_2\lambda^2}{\lambda^2 - \lambda_2^2} + \frac{A_3\lambda^2}{\lambda^2 - \lambda_3^2} \quad (2)$$

Table-2:The Sellmeier Coefficients of various substrates where $\lambda1,\lambda2,\lambda3$ are in nm were given below [11]

Material	A_1	A_2	A_3	λ_1 (nm)	λ_2 (nm)	λ_3 (nm)
Germrnia Silica	0.711040	0.451885	0.704048	64.27	124.408	9425.478
Extraordinary Quartz, n_e	1.38100	0.0100	0.9992	93.505	11310	9528
Extraordinary KDP, n_e	1.13000	0.0001	0.9999	93.51	7671	12170

From, these coefficient with the Matlab the refractive indices of the substrates have been calculated. The extinction coefficient of ZnO is given by the following relation.

$$k(\lambda) = F_k e^{-G_k\left(\frac{1}{H_k}-\frac{1}{\lambda}\right)} \qquad (3)$$

Table- 3: Cauchy parameter for Zinc oxide [13]

Fk (nm-1)	Gk (nm)	Hk (nm)
0.0178	7327.1	337.87

with the help of equation (2.3) and cauchy parameter the extinction co-efficient of ZnO thin film has been determined. After that the value of R1 and R2 has been calculated by the following equation.

$$R_1 = \frac{(n-1)^2+k^2}{(n+1)^2+k^2} \qquad (4)$$

$$R_2 = \frac{(s-n)^2}{(s+n)^2} \qquad (5)$$

The absorption co-efficient of ZnO thin film is given by the following equation

$$\alpha = \frac{4\pi k}{\lambda}. \qquad (6)$$

The expression of the transmission of ZnO thin films deposited on different substrates is given by [12],

$$T(\lambda) = T_0(\lambda) - 2\sqrt{R_1R_2}\,\text{Cos}[\delta(\lambda)] \qquad (7)$$

$$\delta(\lambda) = 2\pi \times \frac{2nd}{\lambda} + \pi. \qquad (8)$$

In equation (2.8), T0(λ) is considered to be the term of transmission with no interference effect. The thickness of the films were 100nm, 450nm, 750nm which are used in this project. For different thickness of ZnO thin films deposited on different substrates,the transmittance have been determined by Matlab programme [16-20]. On the other hand,the transmission spectrum can be divided into two terms. They are (1) non-interference term (2) interference effect term.

III. Methodology Outcomes and Discussion

The optical properties of ZnO thin films were investigated as a function of wavelength in the region of 330-1200nm.

3.1. Refractive index

The disparity of refractive indices with wavelength for ZnO and diverse substrates remained shown in Fig 2(a) to 2(d) displays a declining bent of refractive index with the aggregate wavelength ranged from 300 nm to 1200 nm [21-22]. Altogether the curves are strategized using sellmeier equation.At 300 nm ZnO and all substrates designates the maximum refractive index which is 2.92 for ZnO,1.5165 for Ge-Si,1.5902 for unexpected Quartz and for unusual KDP it is 1.5003.By associating all substrates it was detected that unexpected Quartz shows maximum refractive index while unexpected KDP demonstrates lowermost refractive index [23-24].
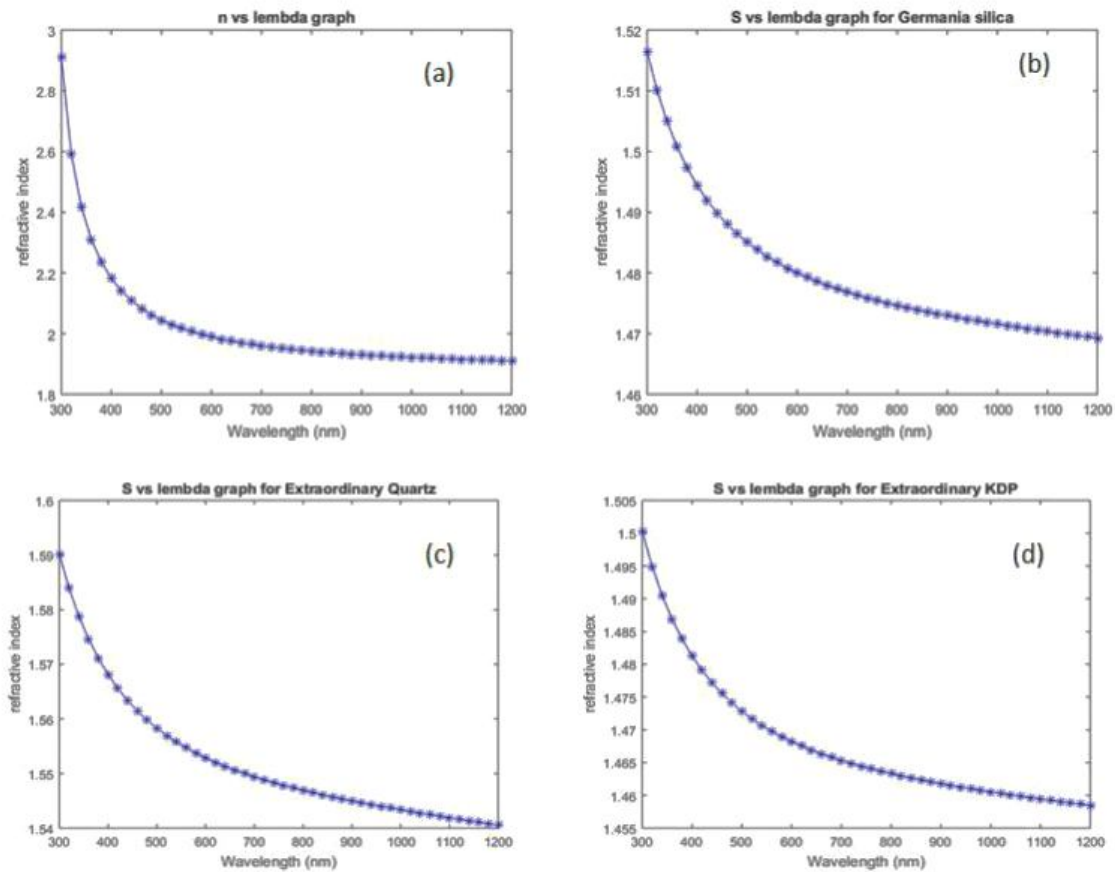
Figure2: Variation of refractive index as a function of wavelength for (a)ZnO, (b)Ge-Si, (c)Extraordinary Quartz, (d)Extraordinary KDP.
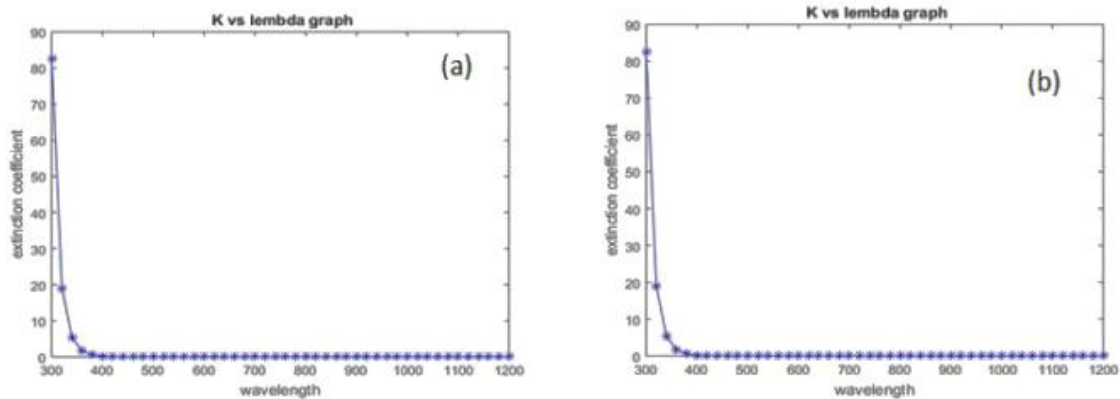
Figure 3: Variation of (a) coefficient co-efficient and (b) extinction coefficient as a function of wavelength for ZnO thin film.

Fig 3(a) and 3(b) characterizes the dissimilarity of absorption coefficient and extinction coefficient with the wavelength for ZnO thin film. The curve of Fig 3(a) displays that the absorption coefficient declines abruptly with the rise in wavelength which shows that the ZnO film is the supreme absorbent in the UV region but stumpy absorbant near the observable region [25-27]. The rate of absorption coefficient is originated to be virtually zero for observable assortment while can be recognized as the high conduction value of the films for observable region. From Fig 3(b), it can be evidently detected that ZnO thin film displays the maximum absorbance for lesser value of wavelengths [28]. Note also can be done from the curve that at everywhere 370 nm, the value of extinction coefficient inclines to zero which happens due to trivial absorption by ZnO in the adjacent to UV and observable region.

3.2 .Transmittance Analysis
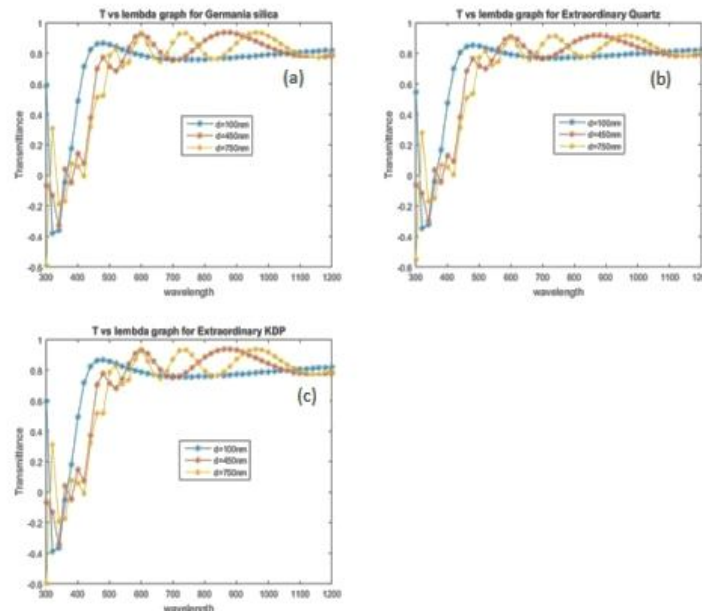
Figure 4: Transmission spectrum of ZnO thin film for different thicknesses deposited on (a) Germania Silica,(b) extraordinary quartz, and (c)extraordinary KDP.

Figure 4(a) to 4(c) expressed the optical transmittance spectra of thin film substrates Germania Silica, extraordinary quartz and extraordinary KDP for dissimilar thickness (100nm, 450nm and 750nm). It is evidently perceived that all the substrates revelation about a high transmittance of 80-90% in the observable region with a strident absorption edge near ~380 nm. For all the substrates extreme peak is initiate for the thickness of 750nm [29]. It is pragmatic from Fig 4(a)to 4(c) that the maximum transparent region ranges from 420nm to 1200nm. Meanwhile, the strong absorption varies between 300-380nm which is in U-V region. In

this, transmittance is little due to enormous photon energy. At the wavelength 700nm, Germania Silica depicts

transmittance (87.17%), extraordinary quartz (86.38%) & extraordinary KDP (87.28%). Moreover, transmission spectra were evaluated for non-interference

and interference results.

3.3. Transmittance with and without Interference Effect
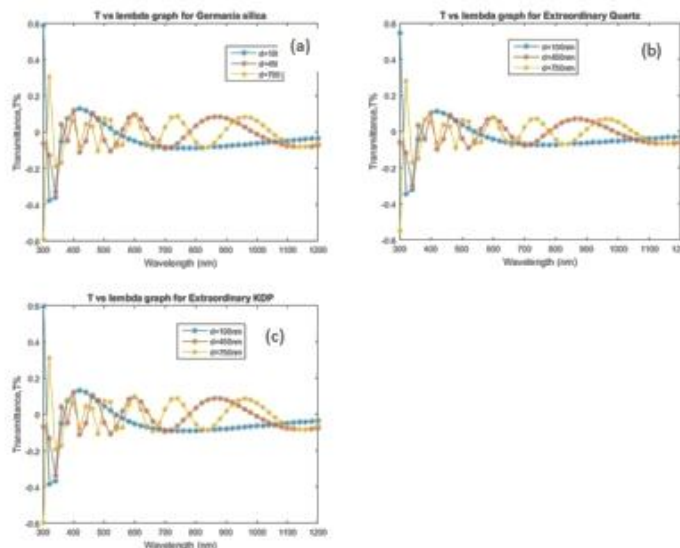
Figure 5 : Transmission spectrum(with interference effect) of ZnO thin film for different thicknesses deposited on (a) Germania Silica,(b) extraordinary quartz, and (c)extraordinary KDP
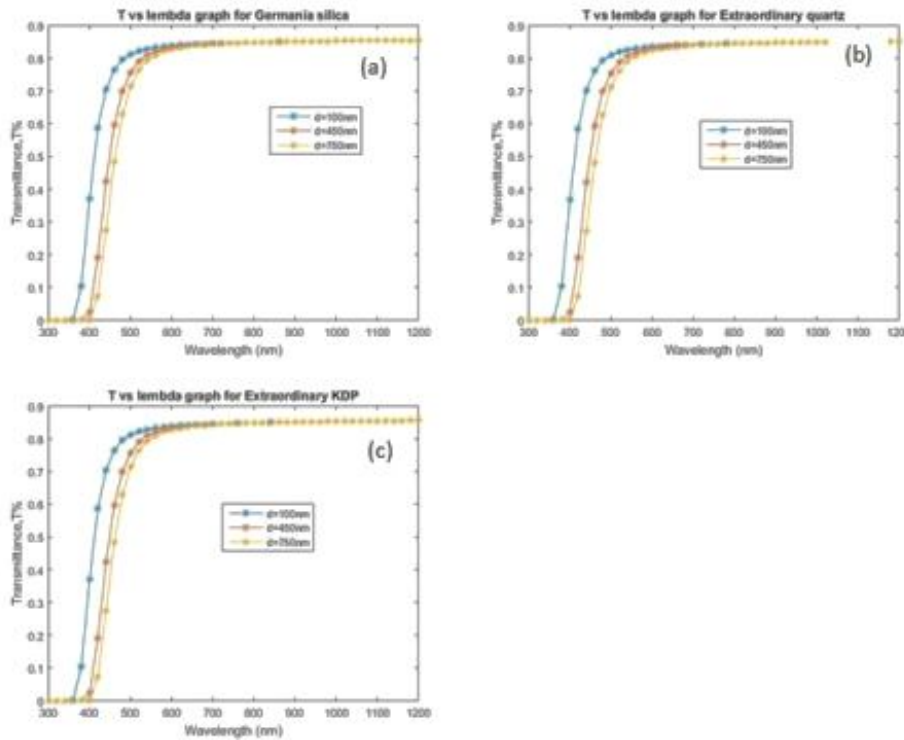
Figure 6: Transmission spectrum without interference effect of ZnO thin film for different thicknesses deposited on (a) Germania Silica,(b) extraordinary quartz, and (c)extraordinary KDP.

The charts shown in figure 5(a) to 5(c) are the transmittance spectra for substrate of Germania Silica, extraordinary quartz and extraordinary KDP at dissimilar thicknesses at ambient temperature. In that, the transmittance of the samples fluctuates with rises in wavelength [30]. At 340nm it relics virtually void for all films, after growth is noted at around 365nm. Like all cases, there are interference fringes with peaks and deeps which depicts the flatness and exceedingly reflectance of the film surface. These fringes happen due to the numerous reflection of light happening amongst top and bottom surface of the film which in contact with the substrate.

The diagrams shown in figure 6(a) to 6(c) are the transmittance spectra for substrate of Germania Silica, extraordinary quartz and extraordinary KDP at different thicknesses at ambient temperature. Inthose pictures, the transmittance of the samples fluctuates in the same manner with increase in wavelength. In these cases, the transmittance in the U-V region remains insignificant and then jerks to surge near the observable portion.

After the wavelength 500nm, all the spectra of unalike thickness remains constant upto 1200nm. At wavelength more than 500nm, the transmittance is about 82.18% for Germania Silica, 81.92% for extraordinary quartz and 82.20% for extraordinary KDP is observed. Associating among numerous substrates, it can be concluded that extraordinary KDP exhibited highest transmittance and extraordinary quartz exhibited lowest transmittance in the visible region. After this, it shows no peaks and drops which is the evidence of non-interference effect. A reliable rise in transmittance is detected during the wavelength range for all films.

Conclusion

- ZnO thin films have been utilized for quite a while in making electronic devices, optical coatings, instrument hard coatings, and decorative parts. This experimental study reveals the optical properties of the ZnO thin films which is to be examined through the refractive indices, absorption coefficient, extinction coefficient and transmission spectra with multiple thicknesses (100nm, 450nm, 750nm) deposited on three dissimilar substrates.

- The refractive indices, extinction coefficient and absorption coefficient droop with the sudden hike in wavelength which causes constant path in particular wavelength region.

- Three substrates: the following observance are made
- ✓ 300nm extraordinary quartz demonstrates maximum refractive index of 1.5902
- ✓ extraordinary KDP shows lowermost refractive index of 1.5003 which indicates that light travels faster through extraordinary KDP than other substrates.

- All the substrates displays peak transmittance 80to 90% in the visible region with a shrill absorption edge near 380nm.

- Furthermore, the non-interference and interference consequence were observed in transmission spectra.

- Beyond, 520nm of wavelength, there are no spikes in the transmission spectra because here the consequence of reflectance and interference is thoroughly nullified.

- In the interference outcome, there exist maxima and minima which are the suggestion of interference effect. Due to this, numerous reflections at the interface of films as wells as substrate are at the

interfaces of film. Also, spikes increases with its thickness due to interference effect.

- Atlast, the conclusion is made, extraordinary KDP is the best substrates for the deposition of ZnO thin

film with highest transmittance and low refractive indices.

- A substrate with high transmittance and low absorbance certifies its usage in different optoelectronic devices.

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TIME DOMAIN RESPONSE ENHANCEMENT OF PV BASED CLCIS FED INDUCTION MOTOR DRIVES USING PRC

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ABSTRACT

Time-domain Response improvement using Photo Voltaic (PV) based Landsman Converter (LC) in cascading assembly is a soft procedure in the current scenario. The PV cluster output is optimized using cascaded LC. This effort uncovers demonstrating and simulation of Cascaded Landsman Converter Inverter System (CLCIS) with a photovoltaic source. LC has the competence to overcome the Conservative converter drawbacks like high ripples and low output voltage. MATLAB Simulink models were made using MATLAB for CLCIS and closed-loop assessments were performed with Fractional Order Proportional Integral Derivative (FOPID) and Proportionate Resonant Controllers (PRCs). The current work manages the examination of transitory and consistent state time reactions of CLCIS with FOPID and PR controllers. The results exhibit that transient response was upgraded by using a PR controller.

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Keywords: PV array, PI, FOPID, PRC, CLCIS and PWM.

1. Introduction

Solar based PV array station is a generating system that connects and sends power to the LC. Along with the achievement of important PV power stations, the study on the control approach of a three phase induction motor load connected inverter has been elucidated in [1]. To upgrade the quality of power generation from the PV framework, an adequate force converter choice turns out to be fundamental. DC to DC converters accessible was immense in the power transformation framework. Nevertheless, they were diverse in circuit arrangement and undulation decrease. As indicated by the presentation and its proficiency for PV framework, the converters were chosen.Advanced converters (LC, ZETA, SEPIC) were addressed by Manikandan.et.al;[2], to decide its presentation and proficiency. Radha Kushwaha et.al; proposed an Electric Vehicle (EV) battery charger with Interleaved LC trailed through a flyback converter. Planning and assessment were done for up gradation of quality battery charging [3]. Investigation and examination of advanced converters for PV that were responsible for induction engine drive applications was suggested by Ch.Hussaian Basha.et.al; these converters act as Buck-Lift converters depending on load necessity. The Maximum Power Point Tracking (MPPT) strategy was utilized to follow the quick difference in sunlight based irradiances by the iterative interaction. Moreover, it is employed for the delicate beginning of the induction drives [4].

Power Factor (PF) improvement at the source end of the Brush Less Direct Current Motor (BLDCM) utilizing bridgeless LC was suggested in [5]. An improved exhibition of the suggested course of action was achieved because of the decreased number of force transformation stages alongside torque ripple minimization [5]. The plan and execution of another battery charger for EV with PF development at the source end was suggested by Radha Kushwaha. In the recommended arrangement, the conventional uncontrolled converter at the front end of the present EV battery charger was wiped out by the changed LC which corrects the PF [6]. Aman Jha introduced a changed bridgeless LC took care of the Power factor amendment for light producing diode driver. The Pulse Width Modulation (PWM) strategy was utilized for the ebb and flow control to accomplish convincing illumination control of the LED without trading off the proficiency [7]. The LC reliant on a PF Correction in bridgeless setup that took care of a BLDCM drive was planned for low power household devices. The conduction misfortunes associated with diodes were reduced by the bridgeless system and

exchanging misfortunes of semiconductor switches of VSI were diminished by the use of low recurrence exchanging signals in electronic compensation [8]. The customary LC was improved to accomplish the high transforming voltage transformation proportion for sustainable power applications. Another Switched Reactive Circuitry (SRC) built by LC and double diodes were consolidated to boost the voltage change proportion [9]. Sanjay S granted the guideline of PF for low voltage uses with the assistance of an LC that drives the BLDCM. The motor speed was achieved by managing the direct current link voltage of the inverter which takes care of the BLDC motor. The converter was worked in DICM to control DC voltage and the Voltage Source Inverter (VSI) in low switching recurrence lessens the exchanging losses [10]. Aman Jha introduced an altered Landsman converter that took care of PFC based LED. This system was focused on High Brilliance (HB) projection use with illumination management of High Brilliance basic colour LED. PWM strategy was utilized for momentum control to accomplish illumination management of LED drivers without bargaining the proficiency [11]. Anjanee Kumar Mishra introduced the Sun-oriented Photo Voltaic (SPV) cluster that took care of four-stage; 8/6 Switched Reluctance Motor (SRM) drive using altered LC as a DC-DC converter for an aqua siphoning framework. The changed LC is utilized here to augment the yield force of the PV system utilizing an Incremental Conductance (IC) most extreme force point by MPPT algorithm and to facilitate the delicate beginning of mentioned drive [12].

Single Phase (1-Ph) drives were usually coupled to a 1-Ph electrical structure for household appliances like water pump, domestic fan, hair driers, mixie, etc; while the Three Phase (3-Ph) IMs were naturally coupled to a 3-Ph power structure for heavy industrial applications because of the noble characteristics like self-starting, highly reliable, good PF and high power density [13-14]. Induction motor drives can be employed for constant speed application with the aid of a constant frequency supply. Variable speed application is also possible with the headway

of solid state switches which results in variable frequency supply [15].

As of late, fractional order exhibiting has drawn attention of scientists and engineers in the arena of control scheme design [16-17]. A Fractional Order PID (FOPID) controller has been planned for a DC motor and realized on an embedded scheme. It was established that fractional-order derivatives can portray the behavior of certain genuine dynamical frameworks better than their integer order equivalents [18]. FOPID Controlled solar based Buck-Lift Converter with modified inductor topology was applied for resistive load [19]. Time response of PI and FOPID controller based LC plan, working scheme and implementation were realized and compared in [20].

Maximum and consistent power transfer to the grid by individual converter using PRC was evaluated in [21]. LC in BL configuration compare and implement PI and PR controllers in time and rate of recurrence domains for a multiphase converter associated to the feeble grid via filters. [22]. The efficacy of the controller tuning techniques was explained by their implementation and respective performance evaluation among the four processes. The controller performance was investigated in all aspects for a specific sample, exposing the merits and drawbacks of the control type and the tuning scheme [23]. PR controllers present imaginary endless gain in a slim bandwidth that was focused at a predefined resonance frequency, hence removing the stable state error (Ess) at that rate of recurrence and permitting effective tracking behavior with voltage reference signals [24].

The evaluation of literature in this sphere revealed the absence of CLCIS controlled by PI, FOPID and Proportional Resonant Controller (PRC) and found none comparing the relative merits of time-domain response powered by these control models. There is a necessity to improve the dynamic response of CLCIS. The examined papers do not address the enhancement of the Time domain response of CLCIS. The cited works do not expose the comparison of PI, FOPID and PR controlled CLCIS. The present effort put forward PRC to elevate the time domain parameters of PV based CLCIS.

2. Design and Principle of Landsman Converter

The LC is one more way of directing an uncontrolled power supply, such as minimal effort wall-wart. PV based LC as shown in Fig-1is anticipated to function in discontinuous conduction mode to control the time domain parameters of LC output. Canonical Switching Cell (CSC) has excellent performance as a PF pre-regulator. The combination of switch sw_1, capacitor C_2 and diode D_3 is known as CSC. This cell combined with an L_2 and capacitor C_4 is named as CSC converter.
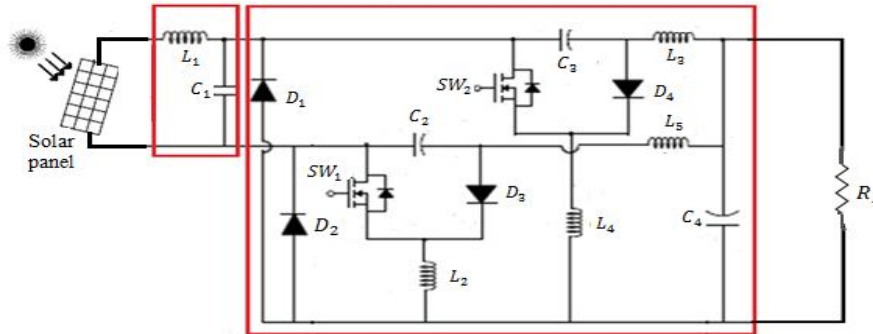
Fig.1 Circuit Diagram of LC with Solar Panel

The uninterrupted conduction mode of operation was achieved in LC with proper component design. Contingent on the irradiance factors, the action of LC is in Lift or Reduction mode. A circuit diagram of PV linked to LC is displayed in Fig.1. Various components like inductor L_1, L_2, capacitor C_1, C2 of the LC were designed. The values found in Table-1were considered for the proposed scheme.

$$L_1 = \frac{M*I_0}{8*f^2*C_1*\Delta I_{L_1}} \quad (1)$$

$$L_2 = \frac{M*V_{PV}}{f*\Delta I_{L_1}} \quad (2)$$

$$C_1 = \frac{M*I_0}{f*\Delta V_{C_1}} \quad (3)$$

Table-1. Design Parameters of LC

V_{in}	200v
C_1	2500µF
L_1	0.5mH
C_2, C_3	0.3µF
C_4	0.1µF
L_2	1mH
MOSFET(IRF840)	500V/8A
DIODE	230V/1A
V_0	420V

The LC feeds the VSI which is further energies the IM and the centrifugal pump. The LC fed propelling scheme is provided in Fig.2. The yield of the solar panel is boosted using a Landsman Converter. The output of LC is given to a PWM inverter.
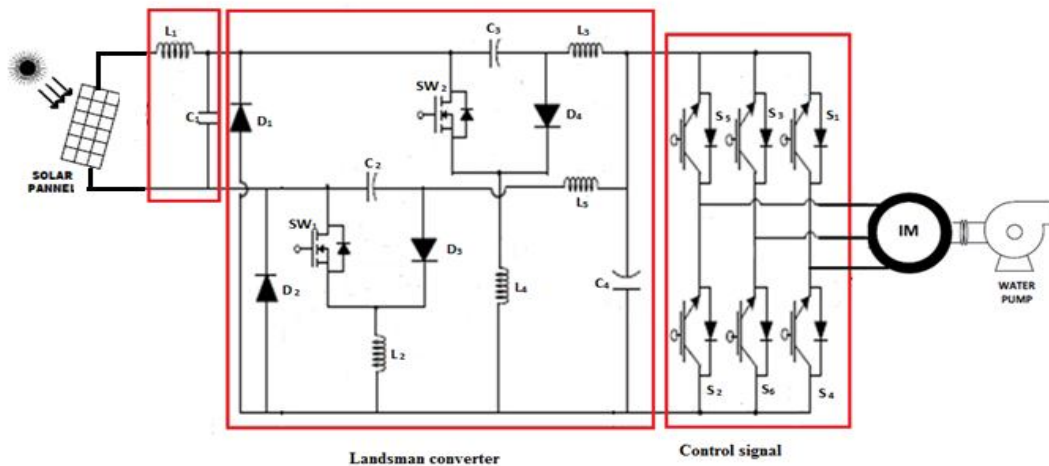
Fig.2 Circuit Diagram of PV based CLCIS fed IM pumping system

3. FOPID Based LCVSI fed IM

The PV yield is boosted by the LC and then LC output is connected to VSI. The simplified block diagram of FOPID based LCVSI fed IM Drive is delineated in Fig.3. The DC output from the PV system is applied to a three phase inverter through a LC network. The yield of three phase inverter is applied to three phase IM.
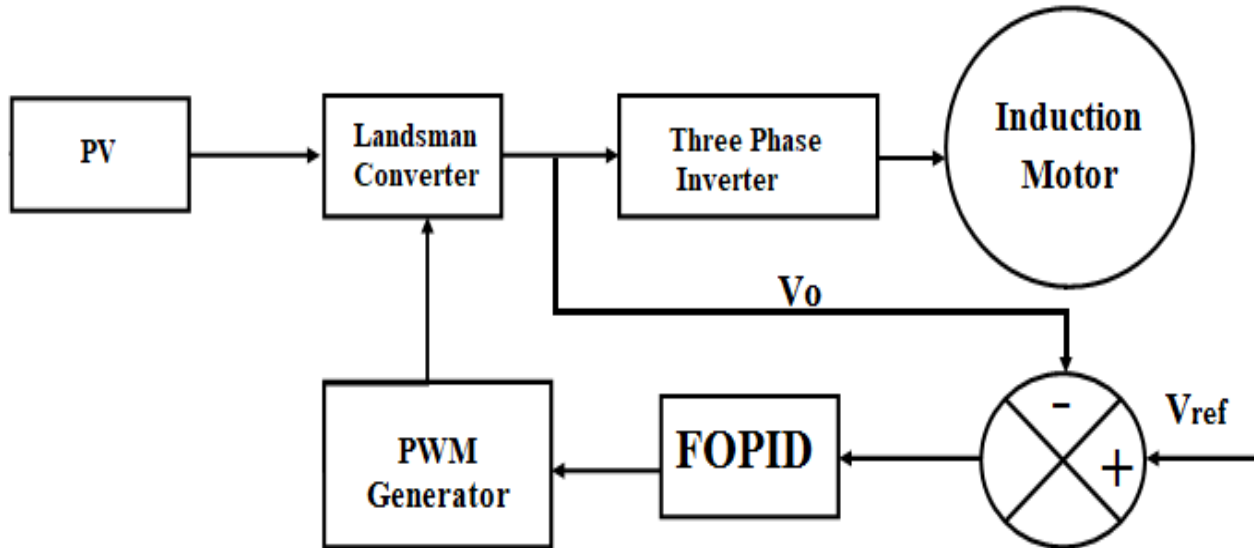
Fig.3 A simplified Block Diagram of FOPID controlled PV based LCVSI fed IM drive

Fractional order approach allows us to depict and demonstrate an honest query more accurately than the old-fashioned "whole number" strategies. Flexibility and upgraded performances are the hallmarks of FOPID controllers. Owing to the existence of five constraints to be tuned, the tuning of the FOPID controller becomes difficult. Apart from conventional parameters such as proportional – Integral - derivative error constants, additional two terms namely, 'order of differentiation' (μ) and 'order of integral' (λ) were introduced. The fuse of (μ) and (λ) gives more flexibility and improves the implementation of conservative PID controllers.

The expression for L and C is given below

$$L = V_i D \quad /f\Delta I \quad (4)$$

$$C = D/2f_s R \quad (5)$$

where,

f_s – Switching-frequency

D – Duty-ratio

ΔI – Ripple-current

V_i –Input-voltage

R – Load Resistance

Output equation of PID is given as shown below

$$V_o = K_1 e + K_2 \int e \, dt + K_3 de/dt \quad (6)$$

K_1- 'Proportional-error-constant'

K_2- 'Integral-error-constant'

K_3- 'Derivative-error-constant'

In a partial order controller, the order of two additional tuning parameters (μ) and (λ) varies from zero to one. The fundamental FOPID controller equation is

$$G_s(S) = K_p + K_i/S^\lambda + K_d S^\mu \quad (7)$$

where

μ - 'order of differentiation'

λ – 'order of integral'

A system simulated Simulink block diagram is shown in Fig.4.
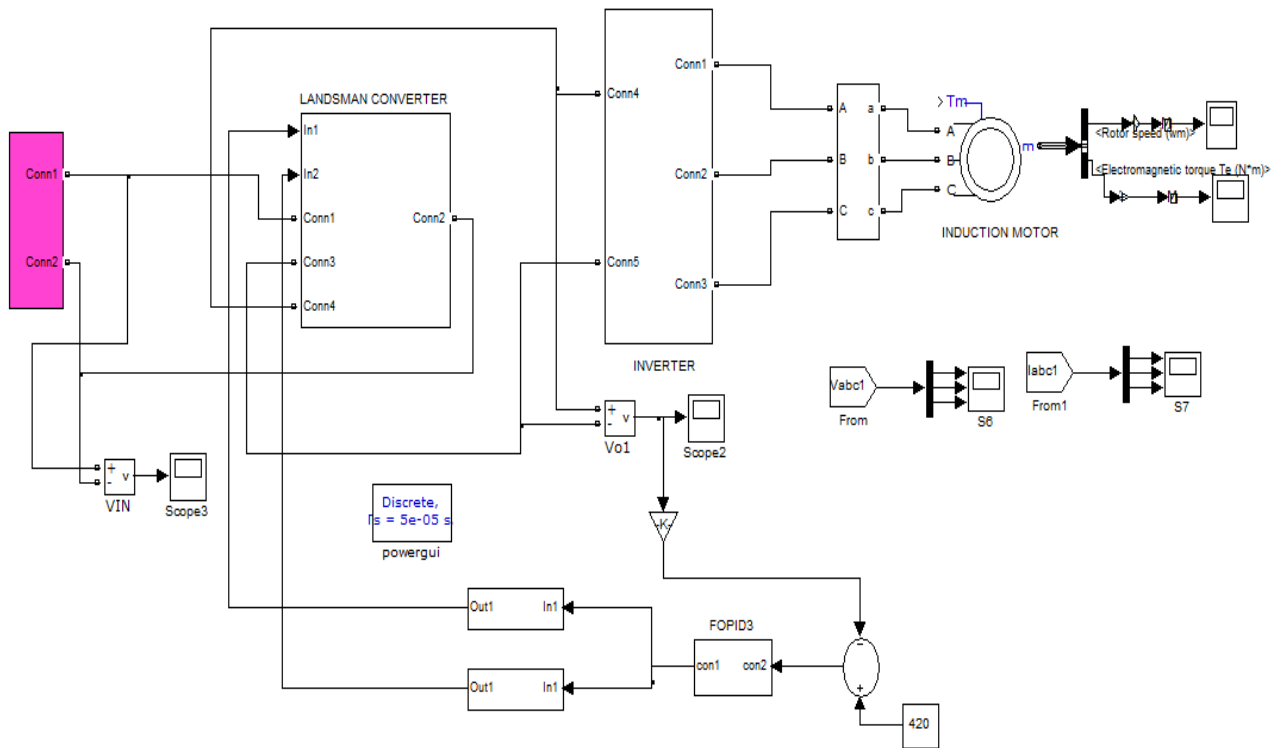
Fig.4 A Simulink block diagram of Solar based LC with IM controlled by FOPID
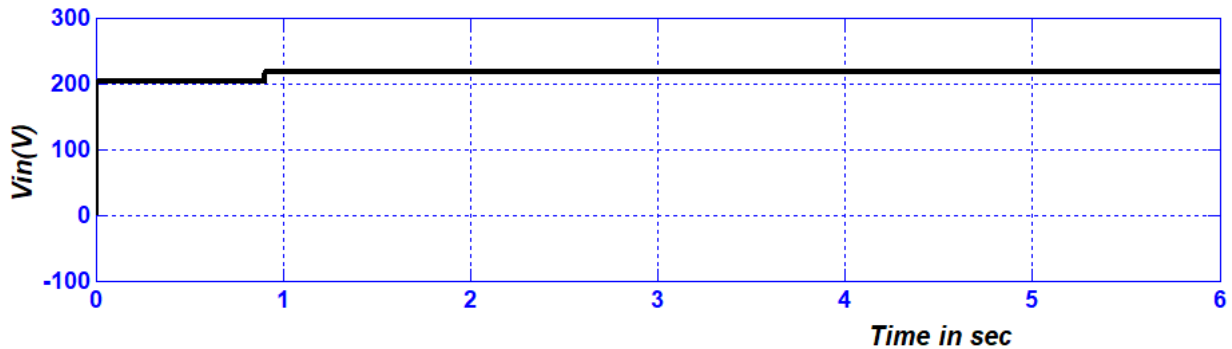
Fig.5 Simulated Voltage across PV Panel

A system simulated output Voltage of PV panel is given in Fig-5. The value is 220V. The System simulated output Voltage of LC is shown in Fig.6. The desired value of is 420V is simulated.
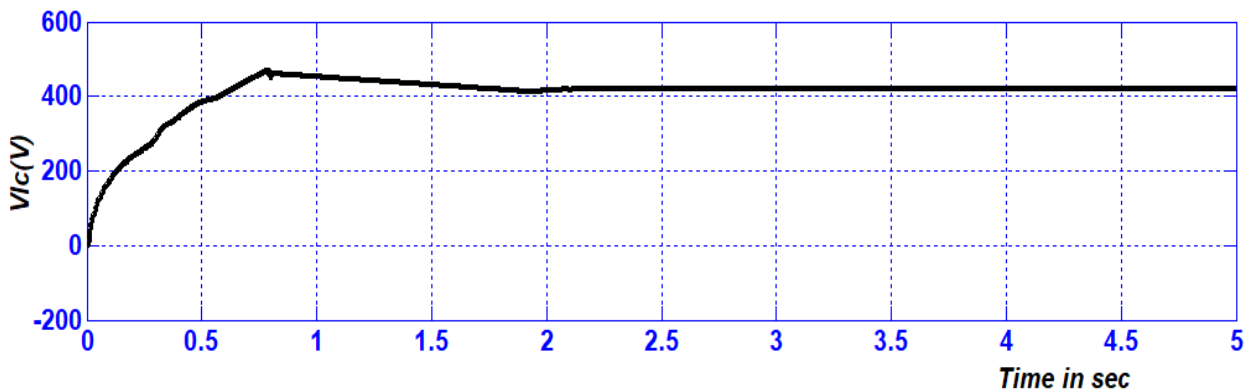
Fig.6 A system simulated Voltage across LC

The inverter output voltage is revealed in Fig.7.
It reaches its designed value after settling time.
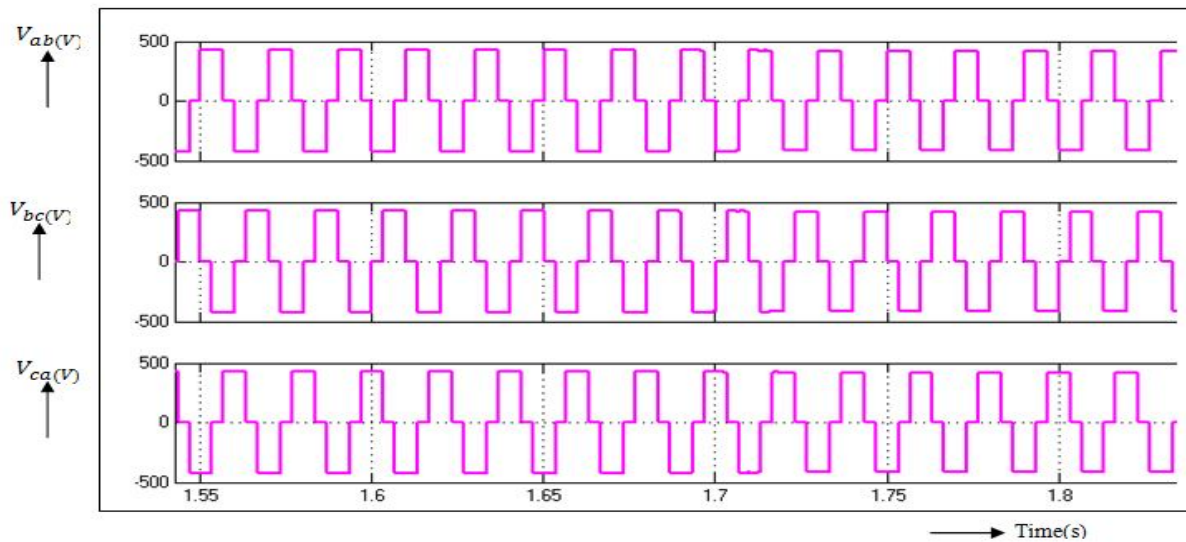
Fig.7 A system simulated output Voltage across Inverter
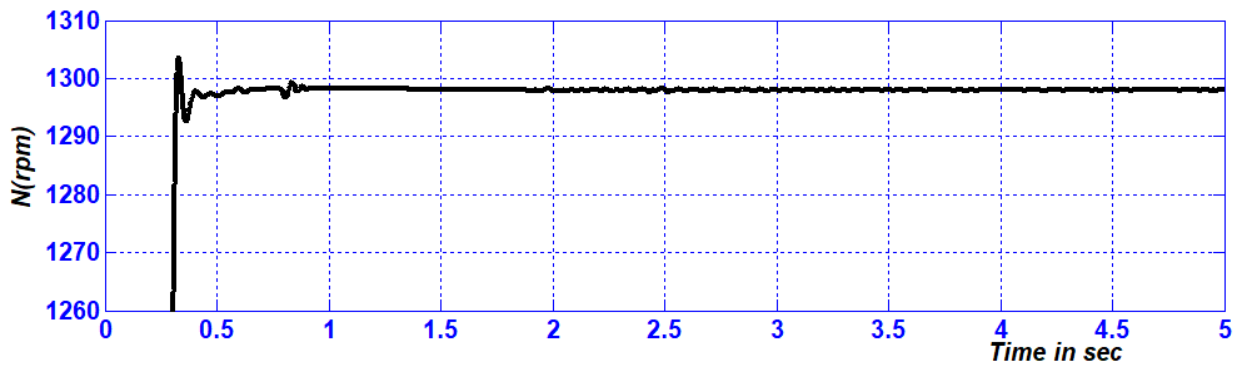
Fig-8. Motor speed

The IM speed response pattern is revealed in Fig.8. It is settled after 2.00sec. The speed of the motor is 1299 rpm. Torque of 2.6Nm is outlined in Fig.9
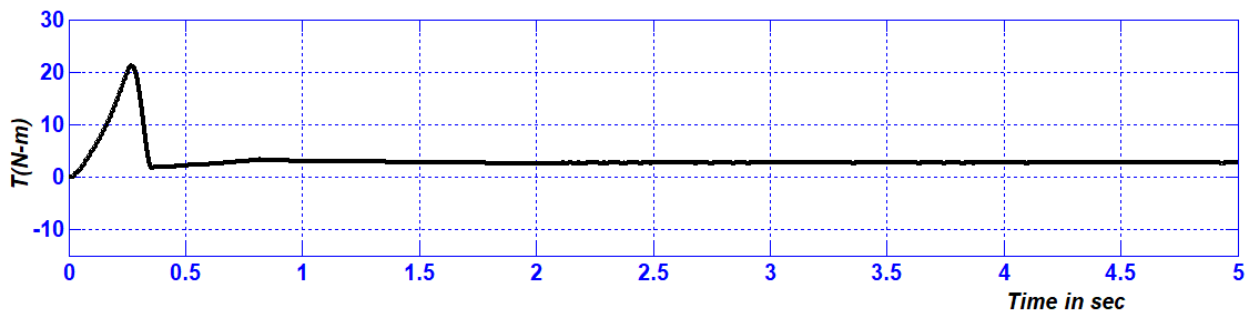
Fig-9. Motor torque

4. Proportional Resonant Controller (PRC)

The fusion of Proportional and resonant terms establishes PRC. The undesirable features of the FOPID controller were suppressed using PRC. Higher gain is guaranteed by of PRC. The proportional term determines bandwidth, phase margin and gain margin. Either voltage or current is controlled by using PRC. This controller is more efficient than the FOPID controller with nearly zero steady-state error.

The yield of PV is boosted by the Landsman Converter and then LC output is connected to VSI.Fig.10 shows a simplified block diagram for the suggested system with PV based LCVSI fed IM drive.The DC output from PV system is applied to three phase inverter through a LC

network. The yield of three phase inverter is   given to three phase IM.
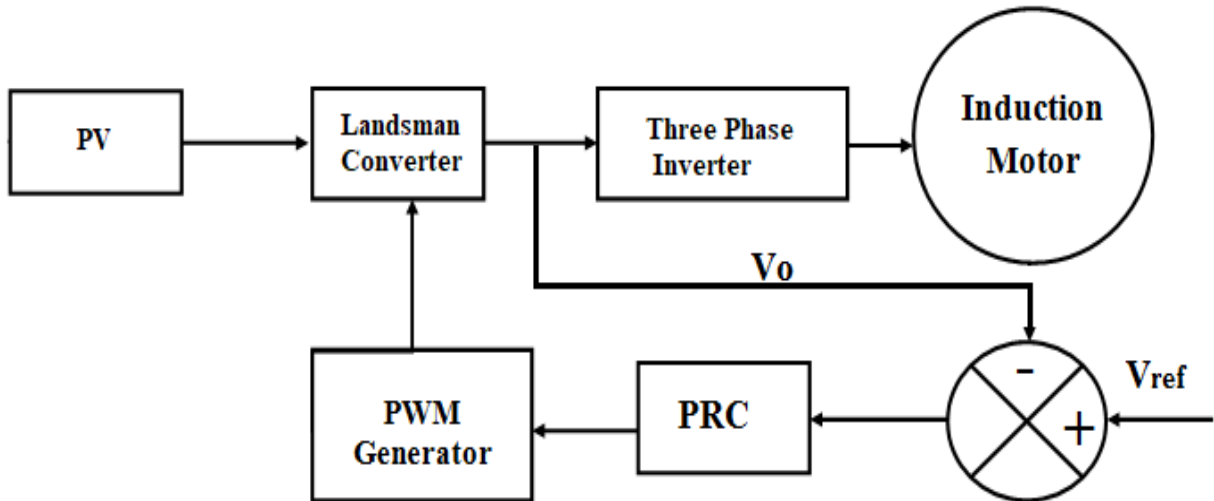
Fig.10 A simplified Block Diagram for proposed system of PV based LCVSI fed IM drive

4.1. Analysis

The theoretical Transfer Function (TF) of PRC is as follows,

$G(s) = K_p + K_r\ S/S^2\omega^2$ (8)

'K'$_p$ – 'proportional-constant'

'K'$_r$ – 'resonant constant'

'ω' – 'resonant frequency', rad/sec

In a non-ideal system, a new term Quality factor (Q) is introduced and its value is

$Q = f_c / (f_h - f_l)$

where f_c – central frequency

f_h – upper level frequency

f_l – lower level frequency.

Normally higher value of Q is preferred to get more gain. This is achieved by choosing tiny band pass. The value of Q is traded to attain high gain and stability of the scheme. The non-ideal TF of the scheme is

$G(S) = K_p + K_r\omega_oS/S^2 + \omega_oS/Q + \omega^2$ (9)

First harmonic equation is found above. For each harmonic separate block can be added.

A Simulink block diagram of the system is charted in Fig.11.
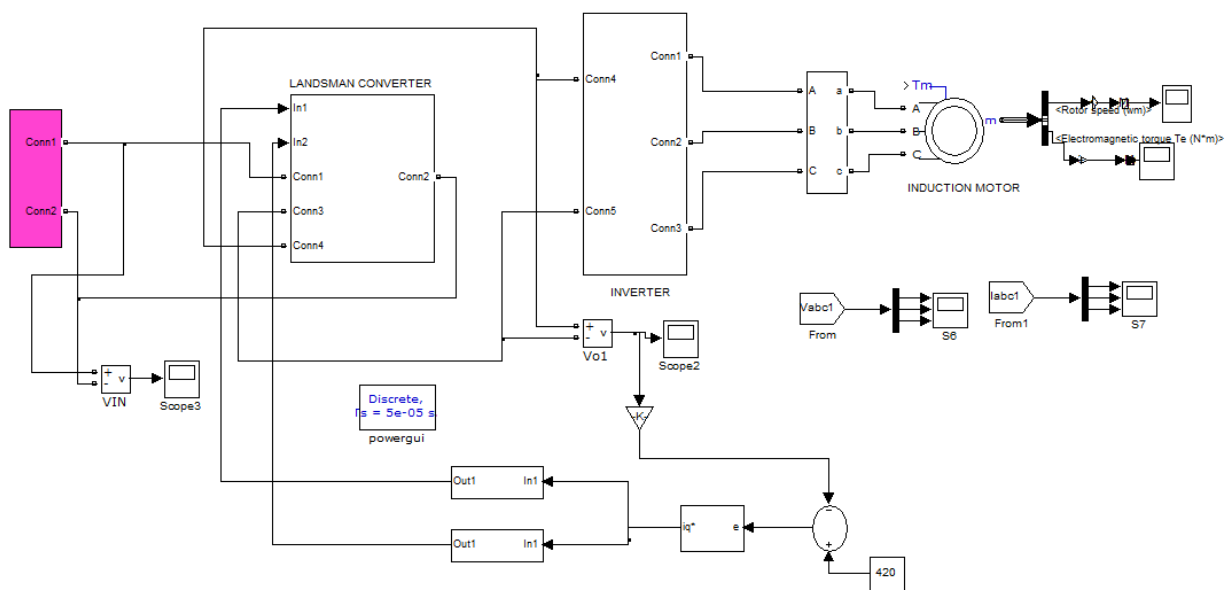
Fig.11 A Simulink block diagram of Solar based LC with IM controlled by PRC
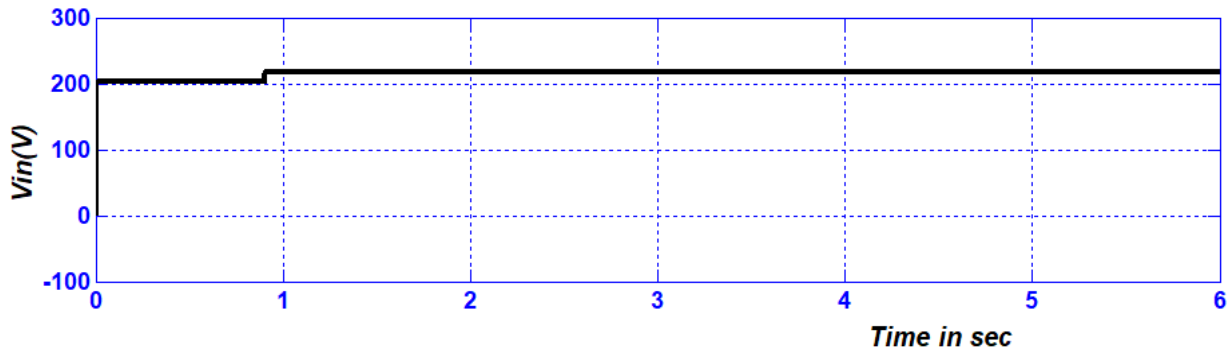
Fig-12. System simulated Voltage across PV Panel

System simulated Voltage from PV panel is delineated in Fig-12 and the value is 220V.

System simulated output Voltage across the LC is delineated in Fig.13 and the value is 420V.
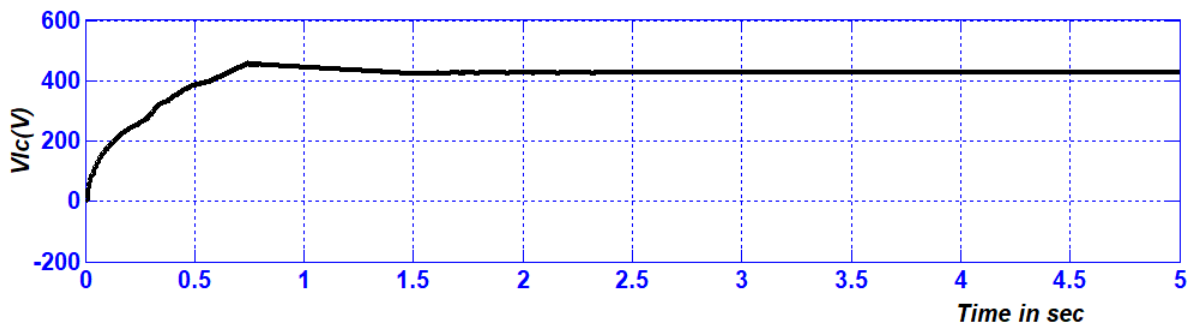
Fig.13 System Simulated LC output

Inverter output is projected in Fig-14.
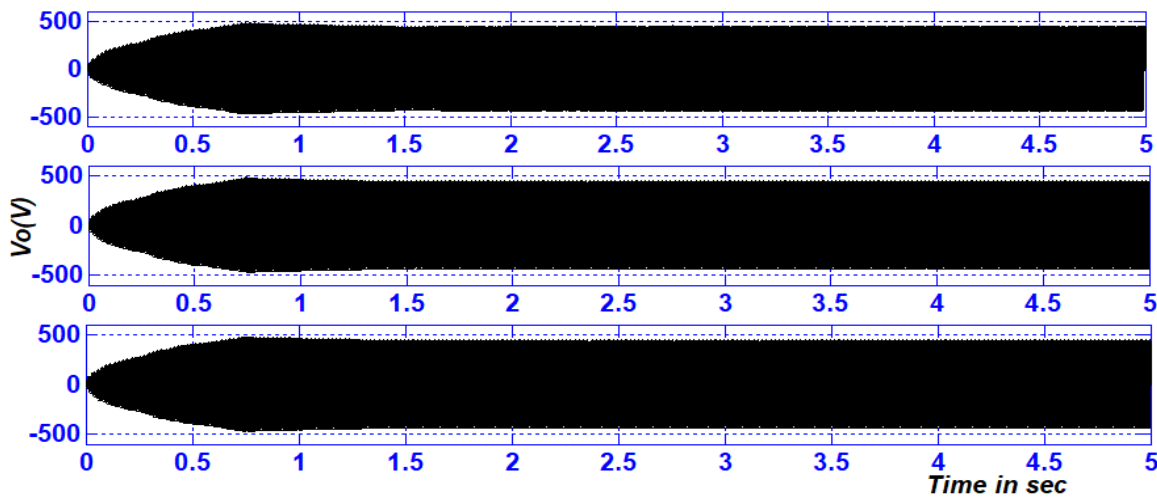
Fig.14 Simulated output Voltage across Inverter
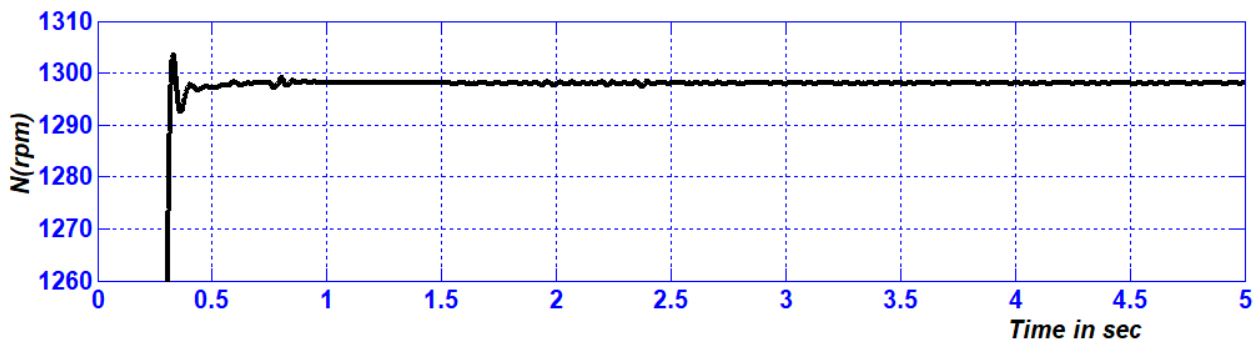
Fig-15. Motor speed

The IM speed curve is shown in Fig.15. It reaches steady after 1.7 sec and the speed is 1299rpm.Torque is exposed in Fig.16. The value is 2.7Nm.
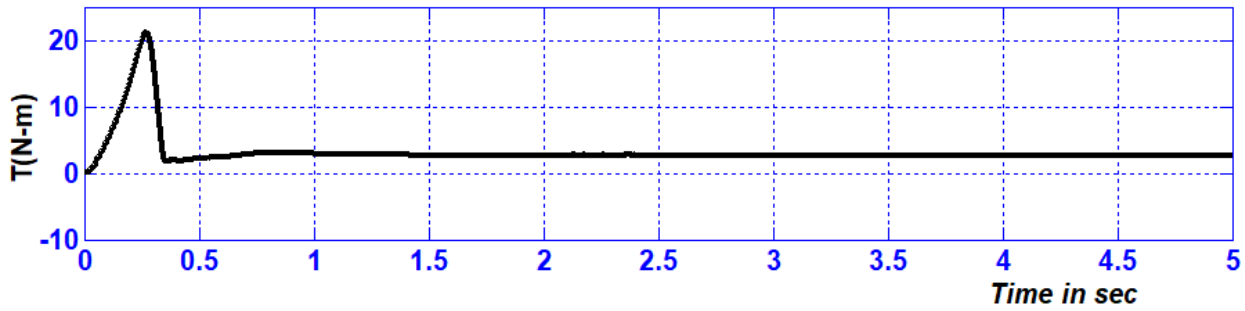
Fig.16 Motor torque

Table-2 Dynamic performance Parameters of LC with PI, FOPID and PRC

Controller	$T_{r(sec)}$	$T_{s(sec)}$	$T_{p(sec)}$	$E_{ss(V)}$
PI	0.99	2.65	1.1	1.9
FOPID	0.97	2.00	1.00	1.5
PR	0.70	1.60	0.75	1.2
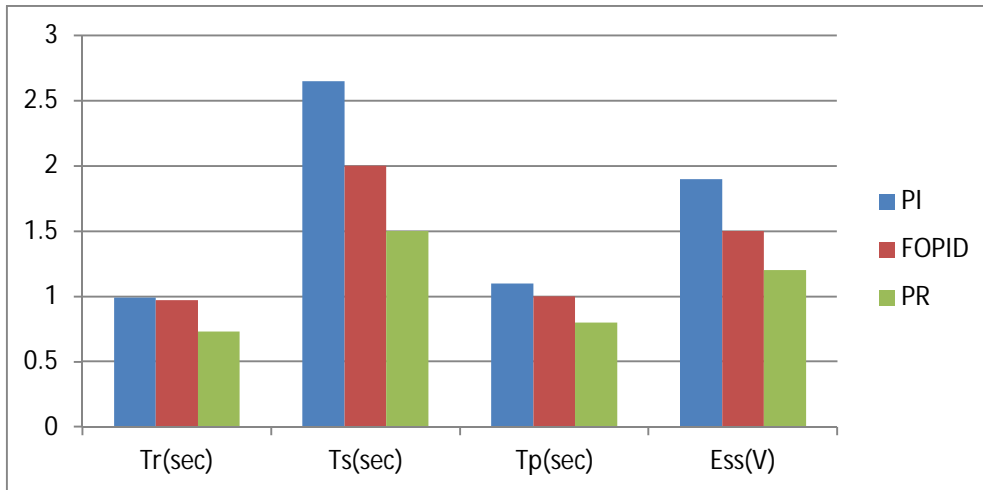
Parameters related to PI controller were found in [20]. Comparison of transient and steady state parameters with FOPID and PR controllers is presented in Table-2. By using PRC, the rise-time is diminished from 0.97sec to 0.7sec; settling time is diminished from 2.00sec to 1.60sec; peak-time is diminished from 1sec to 0.75sec; steady-state-error is diminished from 1.5 V to 1.2 V.

5. Conclusion

Closed loop evaluation of LC with FOPID controller and PRC was done. The use of LC has removed additional filtering requirement. Hence smooth DC output was obtained with minimal losses. The output voltage is boosted using a cascaded structure in LC. PR controller regulates the voltage at the earliest. The investigation and MATLAB simulation show constant voltage and speed can be retained by using PRC. The conclusion signifies that the PR controlled system settles fast with reduced steady state error. The benefits of the suggested system are high voltage gain and better speed response. PRC powered model exhibits superior steady state and transient response than PI and FOPID counterparts.

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FACTORS INFLUENCING SELECTION OF MOBILE SERVICE PROVIDER AND CUSTOMER SATISFACTION IN TELECOM INDUSTRY IN INDIA

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ABSTRACT

Purpose - The purpose of this study is to find out the factors which influence a customer in selecting a network service provider and the factors which provide satisfaction to the customers from their respective service providers. Research Methodology – A structured questionnaire was designed based on the objectives of the study and purposive sampling was used for data collection from respondents in Delhi/NCR. For the purpose of data analysis, Cronbach Alpha Test, Factor Analysis and Multiple Regression Analysis were used. Findings – The factor analysis result in five factors among which Quality of Services is found to be the most important factor. All the five factors together explain 60.779 of total variance. Regression results indicate that five variables are significantly related to dependent variable (satisfaction of customers) except one variable i.e. customer care services. Among all variables quality of services is the most important variable followed by service offered, network coverage, fairness in price and promotional channels. Research Limitation – The research is based on Cross-section primary baseline survey data and thus only represent the situation in particular location in current year and does not have longitudinal dimensions.The socio-economic conditions of the customers are different such as their age, gender, income etc. that might lead to biasness in their decision.Value/Originality – The present study contribute in the exiting research by identifying the factors which lead to selection of network operator and satisfaction of customers from their respective service providers specifically in Telecommunication Industry.

Keywords: Quality of Services, Factor Analysis, Multiple Regression
Paper Type – Research Paper

I Introduction

Background of the Study

The telecommunication services started flourished with the expansion of land-line (also known as fixed line or wire-line) telephone networks. However, till early 1990s, the sector was monopolised by the government in India. There was huge demand for telephone connections but the supply was highly constrained. At that time, the telephone spread in India was 0.8 per hundred persons as against the world average of 10 per hundred persons. The post liberalization period was favourable for the development of telecommunication services sector in India. The opening up of the telecom sector attracted domestic and foreign private investments. The entry of private sector telecom service providers led the way for enhanced competition in the market. The initial growth rate was very less in mobile segment due to varied reasons such as premium pricing of services, lower network coverage and relatively high cost of mobile instruments. The continuous innovations in technology and marketing along with liberalization make the

Indian telecom sector conducive for rapid developments. This facilitated telecom services to the Indian consumers at affordable prices. The mobile telecom service providers shifted their pricing strategies from premium pricing to penetration pricing. The convenience of mobiles phones and the low pricing of services attracted more and more customers to the mobile telecommunication services.

Mobile phone which was considered as a luxury in early periods of 2000s has became a necessity now. Infact, the market of mobile telecom services in India is rapidly approaching the stage of saturation. At present there are 7 service providers in India. Each of these competes to attract customer of other service provider by providing different plans. Few customers also use multiple SIM to avail different benefits. However, majority which has single SIM, select the service provider based on factors such as service quality, brand image, service charges and plan and network quality (shah, 2012). Thus customer selection decision for service provider and customer satisfaction is very crucial for growth of any service provider. With this backdrop, this study

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addresses two questions: First, what are the factors which influence customers in selection of network operator and second how satisfied are consumers with their current service providers and what influences their satisfaction? A primary survey is carried out to address the research question by getting feedback from Airtel and MTNL service provider. This study helps in identifying the most important factors while go for a network service provider and checking the subscriber's satisfaction for the same. Therefore, the present study helps the service providers in understanding users need and work according to them.

Indian Telecom Scenario

The numbers of mobile users have grown exponentially in the last decade. In India, total wireless subscribers in December 2016 stood at 1,127.87 million. The wireless tele-density is around 88 per 100 people in India, but this number camouflages significant variation across states and region (i.e. rural and urban area). Some cities have gone beyond 100 tele-density raising questions about what this measure represents.

Figure 1: Tele-density penetration in India (1998-2015)
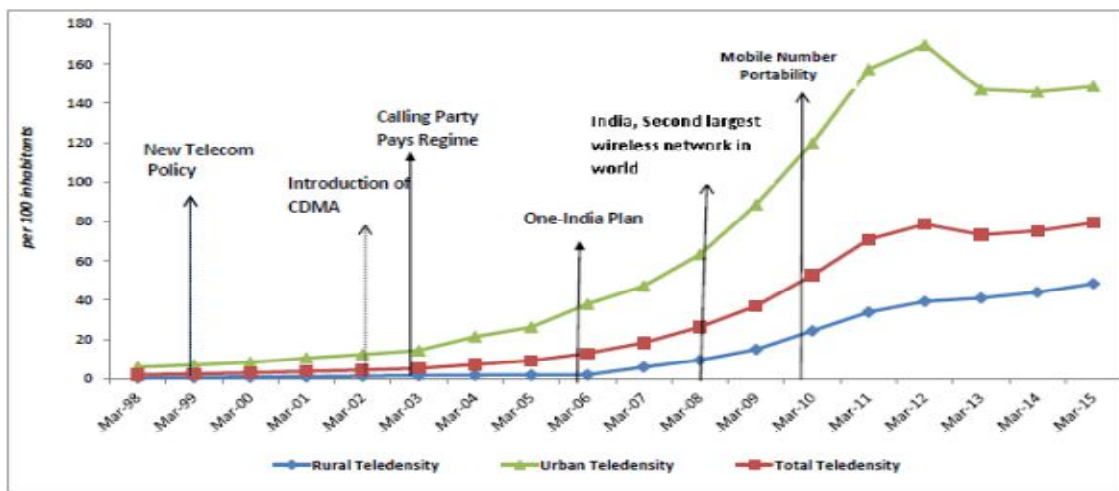
Source: Telecom Regulatory Authority of India

Wireless subscriptions are outnumbering wire line or fixed telephone lines, highlighting significant leapfrogging and the importance of mobile phones. The growth of wireless services has been substantial, with wireless subscribers growing at a compounded annual growth rate (CAGR) of 57.1 per cent since 2004. The tele-density of wireless phones has increased from 63.22 per cent in 2010 to 88 per cent in December, 2016.

With new telecom policy in 1999, the private sectors were allowed to provide cellular services. Since then they are playing an important role in the expansion of telecom services. The share of private sector in total telephone connections is now 91.09 per cent as per the latest statistics available for December, 2016 as against a mere 5 per cent in 1999 (Table 1).

Table 1: Market Share of Public and Private Operator (in percentage)

Particulars	Public Operator	Private Operator
Total Subscribers	10.21	89.79
Wireless Subscribers	8.91	91.09
Wire line Subscribers	70.54	29.46

Source: TRAI, Performance Indicator Report, Oct-Dec, 2016

Among the private service provider, Bharti Airtel is the leading service provider in access segment in terms of number of subscribers with 269.68 million subscribers and 23.58 percent

of total market share (Figure 2). MTNL holds a very low .32 per cent.

Figure2: Percentage Market Share of Service Providers in Total Wireless Subscribers at All-India level
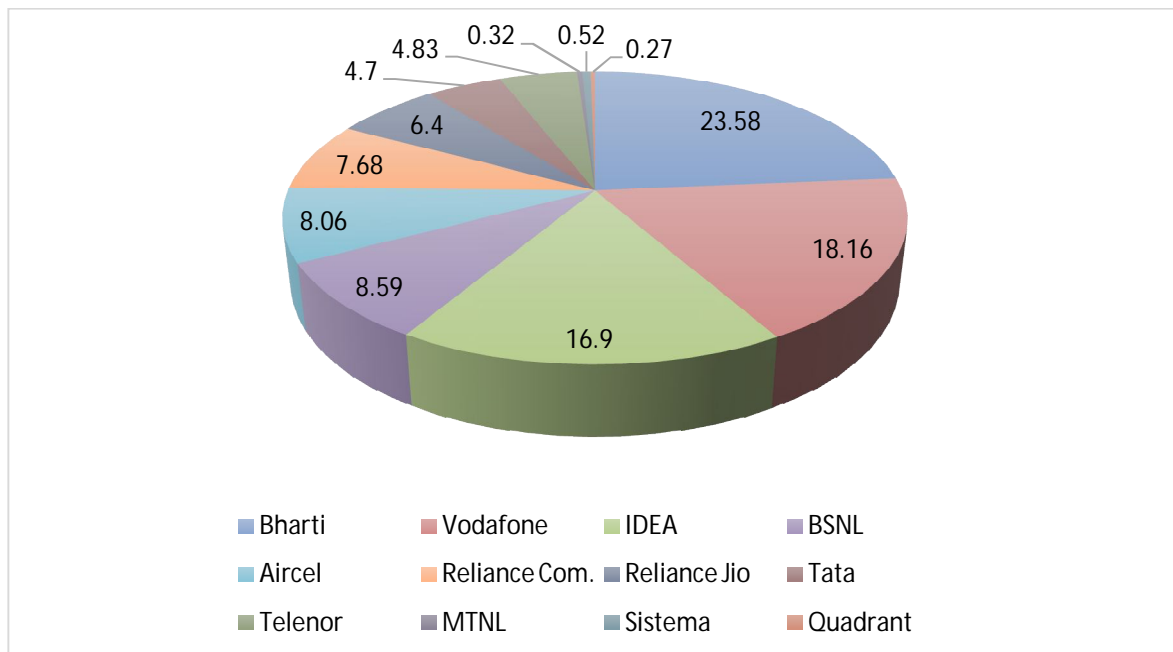
Source – TRAI, Performance Indicator Report, Oct-Dec, 2016

Figure 3 shows the growth in wireless subscriber base of MTNL and Airtel. It shows that the subscriber base of MTNL is increasing, but with a very low rate whereas in case of Airtel it is continuously increasing.

Figure 3: Growth in Wireless Subscriber Base: Airtel and MTNL
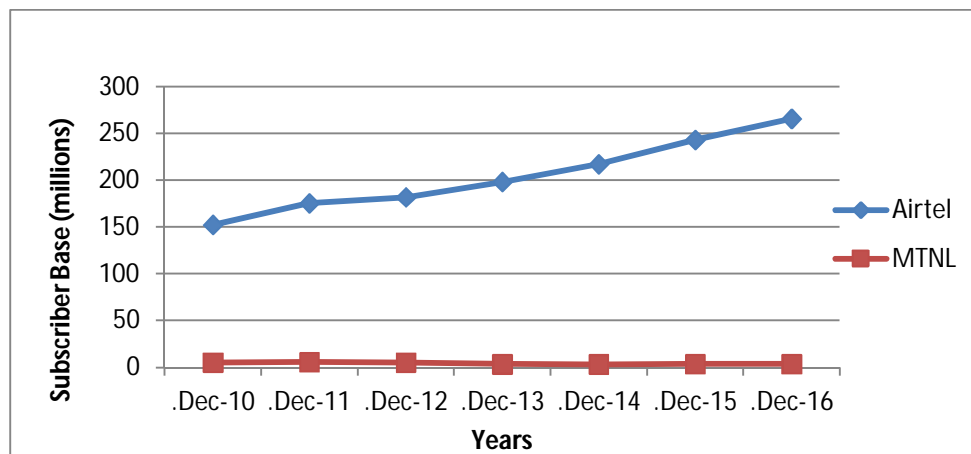
Source: TRAI, Performance Indicator Report, 2010-2016

II Literature Review

The review of literature was done specifically to identify factors which lead to selection of network service providers and satisfaction of customer's from their respective service providers. The literature review was divided in two sections. First section present International studies related to Consumer Behaviour and Mobile Service Provider (MSP). And the second section include various studies specific to India which are related to customer satisfaction, customer loyalty, MNP (Mobile Number Portability) and factors/consumer preference for MSP (Mobile Service Provider).

International Studies

Studies Related to Consumer Behaviour

Iqbal et al. (2008) affirm that satisfied customers of telecom sector have high extent

of usage and intentions to repurchase in future. Greater the level of satisfaction of customers greater will be repurchase chances of customers i.e. satisfaction leads to loyalty. The satisfied customers also recommend others to use the same.

Ling and Run (2009) in their study examine the factors that influence customer satisfaction and customer loyalty in telecommunication services. The findings of the study indicate that factors with significant impact on customer satisfaction are promotion, cost efficient plans, free services, technology factors, line quality, convenience and handiness, while factors affecting customer loyalty are service quality, subscription status, promotion and inconvenience in switching phone number.

Study by Silva, K.A (2009) in Sri Lanka found that the most important factor in continuing an existing service provider is the ability of the service provider to give value to the customer, followed by assurance and responsiveness. The least important factors were legal undertaking tangibility and payment terms.

Zhang (2009) investigated the impact of relationship marketing tactics on customer satisfaction and trust, which in turn increase customer loyalty, by focusing on Swedish mobile telecommunication sector. An analytical model is developed as a guideline to test the relationships between relationship marketing tactics, relationship quality (trust and satisfaction) and customer loyalty.

Muzammil, Sehrish and Adnan (2010) targeted various subscribers of telecom sector in Pakistan to identify the factors affecting customer satisfaction. The results showed that both the factors have significantly contributed towards customer satisfaction but comparatively price fairness had the larger impact on customer satisfaction than customer services.

Ilias and Panagiotis (2010) observed that customer service, pricing structure and billing systems are the service quality dimensions that have more significant positive influence on customer satisfaction which in turn has a significant positive impact on loyalty.

Afzal et al. (2010) study was carried out to find the determinants of customer satisfaction and customer retention in the cellular industry of Pakistan. The study result that fairness in price is the major determinant of customer satisfaction and the second most important factor is voice clarity. And lastly the study concludes that there is significant relationship between customer satisfaction and customer retention.

Leelakulthanit and Hongcharn (2011) investigated the determinants of customer satisfaction by interviewing 400 mobile phone users in Thailand. This study found that promotional value, quality of customer service at shops and corporate image play the most important role in determining customer satisfaction.

Almossawi (2012) in the study sheds some light on the importance and consequences of satisfaction in the competitive telecom industry in Bahrain. The key objective was to find the determinants of customer satisfaction, customer switching and customer retention. The factors related to payments and savings (such as offers, rents, and charges) are the most significant in determining satisfaction, retention, and likelihood of switching from one mobile provider to another. Conversely, intercommunication factors (such as customer service, friendly employees, and user-friendly websites) were found to be the least significant. A significant positive relationship was found between satisfaction and retention while a poor association was noticed between satisfaction/retention and loyalty.

Studies Related to Choice of MSP (Mobile Service Provider)

Study by Christian et al. (2007) interviewing 700 consumers around the world reveals that 80% of consumers would prefer a service provider that gave them more choice in the applications and services available on their mobile device and around 69% of consumers wanted devices that are compatible to personalization and configuration of applications.

Alom, Khan, and Uddinl (2010) in their study interviewed 60 university students in Bangladesh who were also mobile users, to identify the determinant factors in selecting mobile service providers. Results of that study revealed two factors, brand image and perceived call rate, to have the most influence

on the consumers' selection decision of a mobile service provider in Bangladesh.

Haquea, Rahmanb, Rahmanc (2010) study aims to find out the factors that may have played significant role to select the telecommunication service provider. Non-probability convenience sampling method was used for selection of consumers. This study identifies that network quality is one of the most important factor and other factors which influence the consumers in Bangladesh's vast mobile phone market are product quality, availability, and promotion.

Rahman, Haque and Ahmad (2010) in their study aim to assess the factors that have played significant role to select telecommunication service providers. A survey instruments were employed on Malaysian mobile phone operator's consumers' included by demographic background, price, service quality, service availability and promotion. The findings of the study help the service provider to invest their resources more efficiently and to make more appropriate strategies.

Hasan , Yeasmin and Dey (2013) in their paper explored that call charge, network coverage, faster internet service and promotional package such as bonus on recharge, cash back on use are the main features that influence consumers' mobile phone operators' choice and switching behaviour. The study also found that there are no significant differences between stayers and switchers with respect to influencing factors except factor 1, supplementary services and factor 2, value added services. Both groups gave more importance on service price and connectivity and mobility factors. So, marketing strategies should be designed and executed by the companies to attract and retain their customers by lowest possible price, strong network coverage and faster internet service. Both primary and secondary data was collected and survey method used for the study.

Studies Specific to India

Studies Related to Customer Satisfaction and Loyalty

Eshghi, Kumar, and Gangui (2008) in their research paper try to identify the impact of service-related factors on customer satisfaction, repurchase intention and the recommendation of a service to others. For this they recruited 238 mobile phone users in four major cities of India. They found that the most significant predictors of customer satisfaction are competitiveness, relational quality, reliability, reputation, support features, and transmission quality.

Thaiyalnayaki and Varshney (2012) in their research identifies the factors which influence customer loyalty and determine the level of customer satisfaction. The study was carried out in Chennai. This study facilitates the marketers to design the essential operational parameters for designing the retention strategies and to enhance customer experience management.

Chakraborty and Sengupta (2014) in their paper developed a model related to customer satisfaction of mobile network provider in Kolkata. The study help in identifying the determinant of customer satisfaction to mobile service provider and it finds out that generic requirements, flexibility, and price were the major determinant .It also concludes that the determinant of customer satisfaction may be different for different service providers.

Studies Related to MNP (Mobile Number Portability)

Kumaravel and Kandasamy, (2011) their research paper describes that impact of mobile number portability on mobile users switch over behavior-Indian mobile market. Mobile number portability is now a crucial issue for mobile service providers. The most challenging job for the present day is that retain existing mobile customers. The mobile operator's ability to retain its customer has a direct impact on its profitability and effectiveness. Losing a customer will affect the mobile operators in terms of cost. The study concluded that idea cellular, Bharti Airtel and Vodafone emerged as most preferred mobile service operators in terms of Mobile Number Portability in Indian telecom market.

Parmar and Chaudhari (2012) in their research paper surveyed 100 customers from Surat City to find out the comparative analysis of customer satisfaction before and after the adoption of Mobile Number Portability. Poor network facility of the previous service provider, better SMS pack from new service

provider and full talk time on recharge are some of the reasons for switching from one operator to another.

Venkatachalam and Harikaran (2015) in their research study aims to investigate the consumer behaviour towards Mobile Number Portability service. The study is done on the mobile users of Coimbatore city. The study concluded that there is a visible effect of the MNP on cellular service providers. They are giving more attention to retain the customer. Mobile number portability is also constrained by the fact that only operator portability is supported and people migrating out of a circle would have to surrender their number. This reduces the scope of implementation and benefits to the users. Every mobile company will try to maximize their subscribers by giving better services than other mobile companies. MNP is services that enable mobile subscriber to switch operators will retain their mobile number.

Studies Related to Factors/Consumer Preference for MSP

Shah (2012) in his research paper studied the prominent factors which influence the choice of mobile service provider and to know the influence of motivators on the choice of mobile service provider This study reveal the consumers preferences for MSP's in Bardoli region(Gujarat). The present study clearly points to the fact that the three factors, viz.., service quality, brand image, service charges and plan and network quality play a vital role in the choice of an MSP. The second part of the study reveals the role of word-of-mouth in the marketing of a service provider.

The gap identified after literature review was the expectation- satisfaction gaps in the telephone services provided in Indian Telecommunication industry.

III Research Methodology

The present study helps to examine the factor influencing the selection of network operator and to ascertain the level of customer satisfaction. Out of 9 telecom service providers (MTNL and Airtel), two telecom service providers have been chosen for the study purpose. The reason of selecting these service providers are to select one from public service provider (i.e. MTNL) that has highest share among public providers and the other from private service provider (i.e. Airtel) has highest share among private service providers.

Sample Design

MTNL and Airtel service providers have been purposively chosen as the sample units for the purpose of the study. It was decided to conduct the study in NCR region by considering four regions (east, west, north and south) for the purpose of collecting primary data. In reliability literature, Kline (1986) suggested a minimum sample size of 300, as did Nunnally and Bernstein (1994). A good general rule of thumb for factor analysis is 300 cases (Tabachnickand Fidell, 1996). Guadagnoli and Velicer (1988) claimed that a sample size of 150 observations was adequate for accurate EFA. Also, Hair, Black, Babin, and Anderson (2010) recommended a minimum sample size for EFA of "at least five times as many observations as the number of variables to be analysed" (p. 102). As per the above literature, the sample size was decided to be 400 subscribers. The samples of subscribers were chosen as 65 from MTNL and 335 from Airtel.

Data Collection Method

The purposed of the present study is basically empirical in nature as most of the study based on the primary data. However, the study also gives the scope for analysing the secondary data of the sample unit.

Primary Data Collection

Primary data have been collected through a structured questionnaire to the subscribers, informal interview with the subscribers and telephonic interview with the official of MTNL and Airtel. The questionnaire was constructed based on the objectives of the study, literature review, discussions with academicians and telecom experts. The questionnaire was pre-tested by interviewing 50 subscribers. The questionnaire was finalised by incorporating necessary changes based on the feedback and gap identified during pre-testing of questionnaires. The information was collected by using Likert scale (5- point scale). In order to get the required information from the

respondents, some open ended questions were also used in the questionnaire.

The filled in questionnaires were received from 405 respondents. Out of which 369 questionnaire were considered to be used for analysis after verification and consistency. The questionnaires which have not been considered are either partially filled or some questions were not answered by the respondent. Out of 369 questionnaires which were considered for analysis, MTNL subscribers were 35 and Airtel subscribers were 334. The researcher faced hardship in locating the MTNL subscribers as the users are very less.

Secondary Data Collection

For any kind of research, it is inevitable to prepare a strong base with the help of secondary data in general and business research in particular. In order to analyse various aspects relating to the logistics of churn management, the secondary data was collected from different telecommunication authorities such as TRAI (Telecommunication Regulatory Authority of India), COAI (Cellular Operators Association of India), DoT (Department of Telecommunication), MTNL (Mahanagar Telephone Nigam Limited), Bharti Airtel etc. The data was also collected from various reports, newspapers, magazines, e-journals and various websites.

Data Analysis

For description of the secondary data graphic and diagrammatic methods, percentages were used. For analysis of the primary data, the statistical techniques used in the study are Frequency descriptive analysis, Cronbach's alpha test, Factor Analysis and Multiple Regression. The analysis is done using SPSS 23.0 software.

IV Result and Discussion

After analysing the data collected through structured questionnaire, the results were divided in three groups and discussed in detail. The first group is about the descriptive statistics, second group factor analysis results and in the last group multiple regression results are discussed.

A) Descriptive Statistics

Irrespective of the service provider, majority of the respondents are from 19-30 age group. The results suggest that MTNL users are spread across almost all age categories, whereas majority of Airtel customers are from young generation. Gender-wise results show that majority are male among MTNL user and female among Airtel respondents. In Airtel users, 78 percent respondents are single, whereas 50 percent MTNL surveyed users are single and rest 50 percent are married. Income distribution results show that among Airtel respondents, majority (56 per cent) have no income followed by high income category (24 per cent). This contrast for MTNL surveyed user where majority (31 per cent) belongs to high income category followed by no-income (26 per cent).

Education result suggests that both service provider respondents are under-graduate degree holder followed by master degrees. It is crucial to mention that since the sampling procedure was purposive and Whataspp, Facebook, and Google doc application are also used to collect information from respondents for which respondents are likely to be educated.

Occupation descriptive results suggest that respondents from both MTNL and Airtel are students followed by government and corporate employees.

The results clearly show that majority of the customers below 24 years of age using pre-paid connection and as the age increases customers shift from pre-paid to post-paid connection. Same results are given by income statistics that customers with no income uses pre-paid connection and customers with higher income uses post-paid connection.

Gender is not affected the choice of customers for pre-paid and post-paid connection. But their Marital Status affects it. Singles are using pre-paid connections more as compare to married and vice-versa.

The education background of the customers clearly indicates that more under graduate customers are using pre-paid connection whereas more bachelor degree holders followed by post-graduation use post-paid connection more.

The results also show that job-position is significantly related to preference for pre-paid or post-paid customers. Customers with no job

category uses pre-paid connection whereas, government and corporate employees uses post-paid connection.

Other than socio-economic characteristics, the data captured the mobile-usage specific information from the respondents as presented in Table below.

Table 2: Statement showing mobile consumer behavioural preferences of sample respondents (in percentage)

Measures	Item	Airtel	MTNL
Duration of connectivity	< 1 Year	17	14
	2 Years	24	6
	3 Years	18	17
	> 4 Years	41	63
Reliability	Yes	86	48
	No	14	52
Recommended	Yes	86	59
	No	14	41

Source: Computation from primary data

The results suggest that majority of both MTNL and Airtel users are using the services since more than 4 years. It means customers are satisfied with their current service provider. Therefore, customer satisfaction leads to loyalty towards mobile service provider as also evident in other studies [Bugel, Buunk and Verhoef (2010), Johnson and Sirikit (2002), Kim et al. (2004)].However, they may be using more than one SIM of different service providers. When asked would you think that your mobile service provider can be relied upon in keeping to its promises, we found majority 86 per cent from Airtel said "yes". However we receive a 48 per cent positive response from MTNL user regarding this. This direct us to think that there may be need to increase the reliability for MTNL as compare to Airtel services. This thinking is further strengthening with results of respondents on whether they would like to recommend their specific service provider to others. Majority of Airtel customers have responded that they will recommend there service providers to others, whereas in case on MTNL, only 59 per cent customers said that they recommend there service provider to others.

B) Factor Analysis

In this component of the study, important factors related to choice of network operator were studied. Factor analysis helps in deducting the important attribute among the listed attribute.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.927
Bartlett's Test of Sphericity	Approx. Chi-Square	3738.370
	Df	276
	Sig.	.000

Source: Computation from primary data

The above table depicts measure of sample adequacy, the value varies between 0 and 1, whereas the value closer to 1 is considered better. The KMO value comes out to be .927. It implies that the data is distinct, reliable and possess sample adequacy. Bartlett's Test of Sphericity measures whether there is enough correlation between variables or not. In this analysis, it is highly significant because p-value is less than .01.

Table 4: Rotated Component Matrix

	Component				
	1	2	3	4	5
Call Connectivity	0.817				
Network Coverage	0.792				
Data Connectivity(Internet)	0.765				
Voice Clarity	0.75				
3G/4G Technology	0.696				
Quality of Customer Care Service	0.695				
Time Taken for Complaint Resolution	0.61				
Ease Access of Information	0.505				
Video Calling	0.476				
Economic Tariff Plans		0.76			
Concession Call Rates		0.65			
Lucrative Offers		0.621			
Initial Subscription Cost		0.556			
Price/perceived call rate		0.492			
International Access Service Facility			0.77		
Less documents required while taking connection			0.64		
Easy SMS,MMS			0.58		
Roaming Rates			0.538		
Availability of different options related to Payment Channel				0.703	
Availability of different options related to Recharge Vouchers				0.642	
Promotional offers/Additional Package				0.627	
Procedure of handling Bill Dispute				0.614	
Appealing Advertisements					0.786
Brand Image of the Company					0.632
Eigenvalue	6.106	3.079	2.528	2.586	1.418
Variance explained (%)	38.108	8.147	5.551	4.531	4.441
Cumulative variance	38.108	46.255	51.806	56.338	60.779
Reliability coefficient alpha	.903	.800	.687	.752	.451
Number of items	9	5	4	4	2

Source: Computation from primary data

The total variance is explained by the Principle Component Analysis (PCA). After checking the Eigen Values of variable, Varimax Rotation is applied to the selected variables. The factor loading of 24 variables is observed and then all variables are categorized into 5 factors. The five factors together explain 60.779 of the total variance.

After studying the features of the attributes/ variables under each factor, the researcher proposed suitable titles to the 5 factors (constructs).They are as follows:

Factor-1, titled as "Quality of Services", Factor-2 as "Various Schemes of Products", Factor-3 as "Roaming Facilities/Services", Factor-4 as "Facilities/Support Services" and Factor-5 as "Advertisement & Brand Image".

This research paper findings is quite similar to (Rahman, Haque and Ahmad, 2010) where service quality, price, service availability and promotion are results of factor analysis. And also with the study of (Haquea, Rahmanb,Rahmanc, 2010) that identifies network quality is one of the most important factor and other factors which influence the consumers in Bangladesh's vast mobile phone market are product quality, availability, and promotion. Chintan Shah (2012) study clearly points to the fact that the three factors, viz.., service quality and brand image, service charges and plan and network quality, play a vital role in the choice of an MSP. This study shows different results to the present research paper where service quality is most important.

C) Multiple Regression

Multiple regression analysis is applied to find out the extent of relationships between dependent and independent variables. The dependent variable is satisfaction of customers.

And six independent variables are fairness in price, quality of services, promotional channel, customer care services, services offered and network coverage.

Table 5: Regression Results Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.673a	.453	.444	.580
a. Predictors: (Constant), Network Coverage, Fairness in Price, Promotion Channel, Customer Care Services, Services Offered, Quality of Services				
b. Dependent Variable: Satisfaction of Customers				

Source: Computation from primary data

The above table show that the dependent variable (satisfaction of customers) is 44.4 per cent depend on independent variables(fairness in price, quality of services, promotion channel, customer care services, services offered and network coverage). It is being observed that the independent variables least impact satisfaction of customers in telecommunication industry. The value of R square and Adjusted R Square conclude that if any independent variable is deleted there is only a minimal impact on the solution.

Table 6: ANOVA Results

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	98.862	6	16.477	49.059	.000b
Residual	119.229	355	.336		
Total	218.091	361			
a. Dependent Variable: Satisfaction of Customers					
b. Predictors: (Constant), Network Coverage, Fairness in Price, Promotion Channel, Customer Care Services, Services Offered, Quality of Services					

Source: Computation from primary data

In above table, ANOVA explained the overall model was significant. Since the significant value is less than 0.05 so it indicates that, the model is statistically significant. It is clear that all the independent variables i.e. fairness in price, quality of services, promotion channel, customer care services, services offered and network coverage are connected to the dependent variable i.e. satisfaction of customers.

Table7:Regression Coefficients Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
1 (Constant)	.926	.175		5.303	.000
Fairness in Price	.102	.034	.123	2.970	.003
Quality of Services	.248	.048	.286	5.147	.000
Promotion Channel	.074	.040	.090	1.852	.065
Customer Care Services	.056	.039	.074	1.437	.151
Services Offered	.175	.047	.199	3.736	.000
Network Coverage	.097	.036	.139	2.664	.008

Dependent Variable: Satisfaction of Customers
Source: Computation from primary data

After the analysis it is being observed that only five variables are significantly related to dependent variable except customer care services. It means satisfaction of customers do not dependent on customer care services. Their satisfaction is only dependent on fairness in price, quality of service, services offered, network coverage and promotion channel.

Among all the variables, quality of service is a major variable with a standardized coefficient b=.286 that can satisfy the customers towards their respective service provider. The second variable which satisfy the customers is services offered with a standardized coefficient b= .199. The third, fourth and fifth more significant variable are network coverage, fairness in price with a standardized coefficient of b =.139, b = .123 and b =.090 respectively. The least significant variable as per the analysis is customer care services with a standardized coefficient of b=.074.

The regression analysis clearly indicates that quality of services is the most important factor

of customer satisfaction. Therefore, the service providers should focus on the quality of services irrespective of the price. Now days, earnings of the people has increased and they usually do not want to compromise for the quality of service. Their focus is on excellent data connectivity. The results of Manish Madan (2016) study clearly states that all the independent variables i.e. customer service, price fairness, sales promotion, coverage and promotion are connected to the dependent variable i.e. customer satisfaction. In the present study quite similar results are shown such as independent variable fairness in price, quality of services, promotional channel, services offered and network coverage are connected to independent variable.

V Conclusions

To conclude, our results confirmed that various factors influence customer's decision for selecting a particular service provider. The results of factor analysis revealed that quality of service is the most important factor followed by various schemes of products, roaming facilities, support services and advertising/brand image respectively in choosing a service provider by customers.

The network coverage of Airtel is found to be better than the MTNL. Airtel customer care centre are easily available at customer convenient locations. Even some customers are using Airtel connection because it is recommended by the retailer. The distribution strategy of Airtel is very effective as compare to MTNL. It was also found that the private service providers such as Airtel are found to be very effective in providing tailor made plan to their customers. The public service providers such as MTNL should focus on designing of customized products as per customer's needs.

The authors found few areas of improvement which can help attracting more customers by MTNL and Airtel service providers. One area could be incorporating advancement in technology such as online options for recharge and payments. Airtel Payments Bank is the first entity to get the final licence from Reserve Bank of India for launching a Payments Bank. Airtel has launched India's first live payments bank. It is recommended that MTNL can also launch payment banks for the benefits of customers. Thus, considerations of quality of network coverage and internet services are essential by service providers. The other areas are to establish customer care centres near to buyer's locations so that the buyer can easily approach to them. Then mobile operators need to maintain customer care centres with updated technologies. The customer care centres should design quickly complains resolution programs. Expertise staff should be hired to timely and efficiently to handle customer's query.

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ANALYSIS OF VIRTUAL INTERACTION PLATFORMS

Prashant Jadhav

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ABSTRACT

*Purpose: Purpose of the study is to help users choose the best virtual interaction platform amongst variety of available players in the market i.e., Google Meet, Cisco WebEx, Microsoft Teams, Zoom etc. so it can suit as per the user's requirements.The report is also expected to help many researchers and Corporate users /decisión makers to take this as an input in their respective areas.With too many Virtual interactions software`s in the market (free and paid) users find it difficult to decide and get a factual report on selection of the right platform. **Research Methodology/Design:** The proposed research framework is planned with one dependent variable and two independent variables. The dependent variable (H0) is selection of the virtual interaction platform and hypotheses is around two independent variables i.e., H1 and H2. H1 is the Relative Advantage and H2 is the Security of the interaction platforms. As the dependent variable identified is the selection of the virtual interaction's platform, the factors which influences are been considered while selecting the virtual interactions platform. Focus area is only B2C (Business to Consumer),B2B is not in the scope of study. **Source of Data/Collection/Analysis:** The data collection method used is a Primary Method collection in which the research instruments would be a combination of personal Interviews, Online Surveys /Questionnaire through Google Forms and a format in MS Word document with pre filled details. The collection and collation of data from different sources would be directly done with the trial version of the IBM SPSS platform. Microsoft Excel may be used if required. SPSS would be used for the data Analysis and Intepretations,**Sample Size/Target Respondents:** Sampling method selected would be convenience sampling as the population would be close and handy to be interviewed. The questionnaire includes the qualification, occupation and level of computer literacy. The sample size selected is **37.**The target audience of the respondents are largely based out of Mumbai and Pune with respondants demographics across Age, Gender, Occupation and active users in the space of using virtual interaction platforms and computer literate. **Major Findings:** Zoom is the most favourite platform amongst the consideration set. It is also the most preferred one for hosting/participating in the meeting .Zoom is also the preferred choice of platform across all the ages groups. Intention for the Selection of Platform is been influenced by Relative advantage and Security. **Research Implications:** The findings of this research can be referred by IT Head and Managers from the industry to take the right decisións in the selection of the platform, They can also customise /upgrade the existing platform to match the requirements of the users in the Enterprise. At an academic level, the inputs can be used for further proper empirical and cross-sectional studies . They can use the research to pick up the best features suting theie requirements.*

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Outcome

- Quick selection of the platform based on the high priority and most useful features

The Problem

Many a times, the host of the meetings conducted do not have any structured approach of choosing a platform and relies on the hearsay which leads to selection of undesired platform leading to waste of time, resources and money.

Approach

- Gartner report`s input helped in narrowing down the industry leaders (Zoom, Meet and MS Teams).

Theoretical Perspective

- Unified Communications global market has huge growth potential with current value pegged at ~80 b$.
- Zoom, Meet, Teams, WebEx, Go to Meeting are dominant players across Unified Communications space
- Post Pandemic, the engagement across all the industries have increased manifold.
- 60 mins is the average time allotted to the class sessions. Lack of Bandwidth, Webcams, Headsets are some of the top hindrances observed in conducting the session.
- Proposed research framework has one dependent variable (Intent to Select the Platform amongst Zoom, Meet and Teams) and two independent variables namely i) Relative Advantage & ii) Security.

Research Methodology

Primary data was collected using the MS Word questionnaire with a convenience sampling method and a sample size of 37 respondents. The scope is for B2C and covers only India geography.

Analysis and Data Interpretation

- **Reliability** factor (Interval scale selection) for all three platform shows a strong reliability of **96%**.
- Descriptive **Statistics** includes basic statistics with **bar, pie, stack charts** between nominal scale.
- Chi -squared test analysis shows **no relationship** amongst **Computer literacy & Selection of hosting platform.**
- **Factor Analysis** reduced **31** statements to **14**& 17 ones were with factor loadings less than 0.50.
- One Way ANOVA shows **no relationship** between **Computer Literacy** &**Intent to selection** either of 3 platforms (Zoom, Meet or Teams)
- Correlation Analysis shows **Security** and **Intention to selection** either of 3 platforms, **moderately and positively corelated**
- Linear Regression Analysis shows
a) Relative Advantage is a key factor in shaping the user's decision to use Zoom

and Teams as their virtual collaboration platform.
b) Security is an important variable in influencing the intent of the user while selection of Meet as the Virtual Interaction Platform

Introduction

Research Question and Hypotheses

Many users at the individual level and Organizations (Institutes) level had challenges in selection of the right type of platform for having virtual interactions for meetings, lectures, social relations and other casual conversations.There was no clear analytical method or a ready reckoner to choose and guide the users to get started without any time loss and hassles. The access of the system in a timely manner and delivery was critical given the time constraints of deliveries and target defined earlier. It was imperative to know which was the best platform to choose and get started. Virtual interactions mean online, synchronous communication established between the users/consumers. This includes the videotelephony, online chat and telephone services online sessions, webinars, web conferencing.

Its application usage is in teleconferencing, telecommuting, distance education and social relations.

U.S. unified communications market size, by product, 2014 - 2025 (USD Billion)

Source: www.grandviewresearch.com
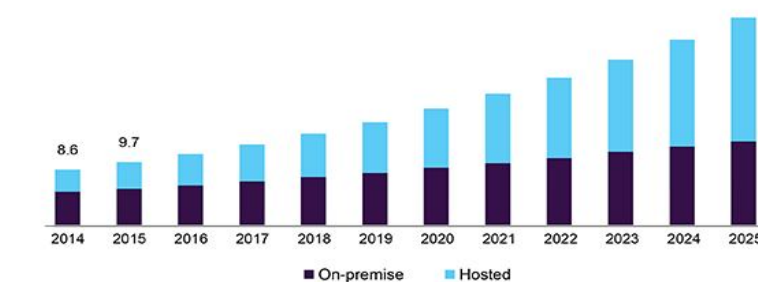
Company Profile

There are 4 to 5 players in the UCS segment in India namely,Zoom, Google Meet, MS Teams, Cisco Webex and Go To Meeting

Three Major Players as per Gartner Report Magic Quadrant 2020

As per the Gartner`s Magic Quadrant Report 2020, there are 3 major leaders in Unified Communications Space. Microsoft, Zoom and Cisco

VIDEO CONFERENCING APPS
Number of Responses: 278
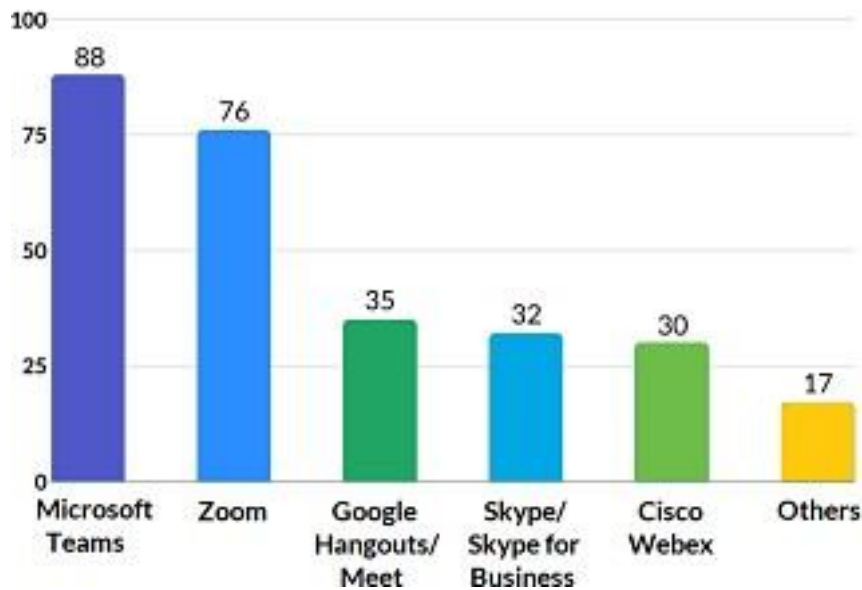
Primary Research

Dependent Variable: Selection of Virtual Interactions Platform

The research model proposes the selection of the platform for virtual interactions as a dependent variable. This means as a user who joins the meetings/sessions/lectures and as a host (Teacher, Individual) a transactional decision has to be taken on the best platform to be chosen

Independent Variable

The above hypotheses show that there are two categories of Independent variables from the technological context. i.e., a) Relative advantage b) Security.

Hypotheses 1: Relative Advantages of Virtual interaction

It is based on the comparison of the ease of use, rich set of features, UI, storage space usage, time to access /get started etc offered by the three platforms the independent variables i.e., the features of the application will influence the intent and adoption rate of the users.

Hypotheses 2: Security Concerns of Virtual interaction

A strong and robust Security enabled platform is the most sought after and the adoption is driven by the measures taken by the providers to ensure no data loss or breach or fraud related security incidents.

Research Methodology /Instrument

Unit of Analysis and Research Instrument

The Research instrument used was a simple MS Word document for the data collection.

Source of Data Collection

The audience type was largely known, the criterion for the selection of the audience was basis on the person`s computer literacy, occupational details and regular usage of the virtual platforms.

Sample Size

Sampling method selected is a convenience sampling as the population would be close and handy to be interviewed. The sample size selected is **37**.

Limitations to Research Methodology

i) As the sampling method chosen is a convenience sampling, there is a possibility of errors happening due to the lack of representation of the population and this could be a source of bias.
ii) The survey has been done with a limited and insufficient sample size (37 respondents)
iii) Due to the Pandemic situation, face to face data capturing with the respondents was limited to only o two people, this may lead to some bias in the reports generated.

Data Analysis and Interpretation

<u>a)</u> **Tools and Process for Data Analysis**
SPSS tool (30-day trial) from IBM is used for the preliminary and advanced analysis.

<u>b)</u> **Analysis and Interpretation**
Data Cleaning Steps followed below
Missing values: First the missing values were identified and filled appropriately. Values especially in the interval scale was kept at neutral value as 3. This was done directly in the SPSS dashboard
Consistency Check: The check was done by exporting the SPSS data to an excel sheet and then applying a filter to cross check and validate the options. The values which were entered due to human error were corrected to nearest value. For example, in one of the respondents, the value 3 and 4 were nearby and 4 was entered incorrectly instead of 3.

Reliability

Reliability is used to check the reliability of the Likert interval scale. When a questionnaire has many Likert scales and one wants to determine the reliability of the scale, Cronbach alpha`s value is checked. All three platforms have a acceptable reliability (C $\alpha > 0.95$)

A) Descriptive Statistics
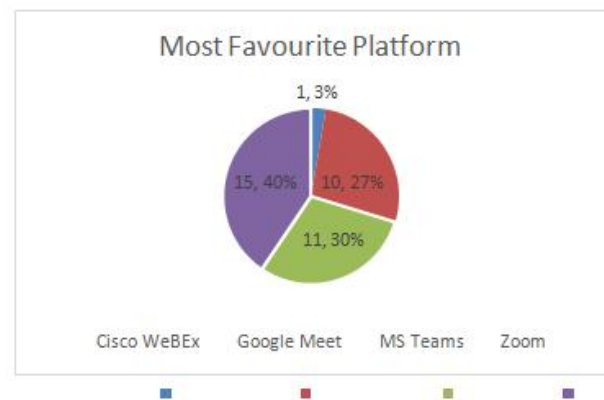
Analysis: Respondent's v/s Most Favourite Platform
Interpretation: From the above analysis, the Most Preferred platform amongst the three players is Zoom with 40 % saying Zoom as the preferred platform of choice

Respondents v/s Prefered Hosting Platform

11, 30%

16, 43%

10, 27%

■ Zoom ■ MS Teams ■ Meet

Analysis: Respondent's v/s Most Preferred Hosting Platform
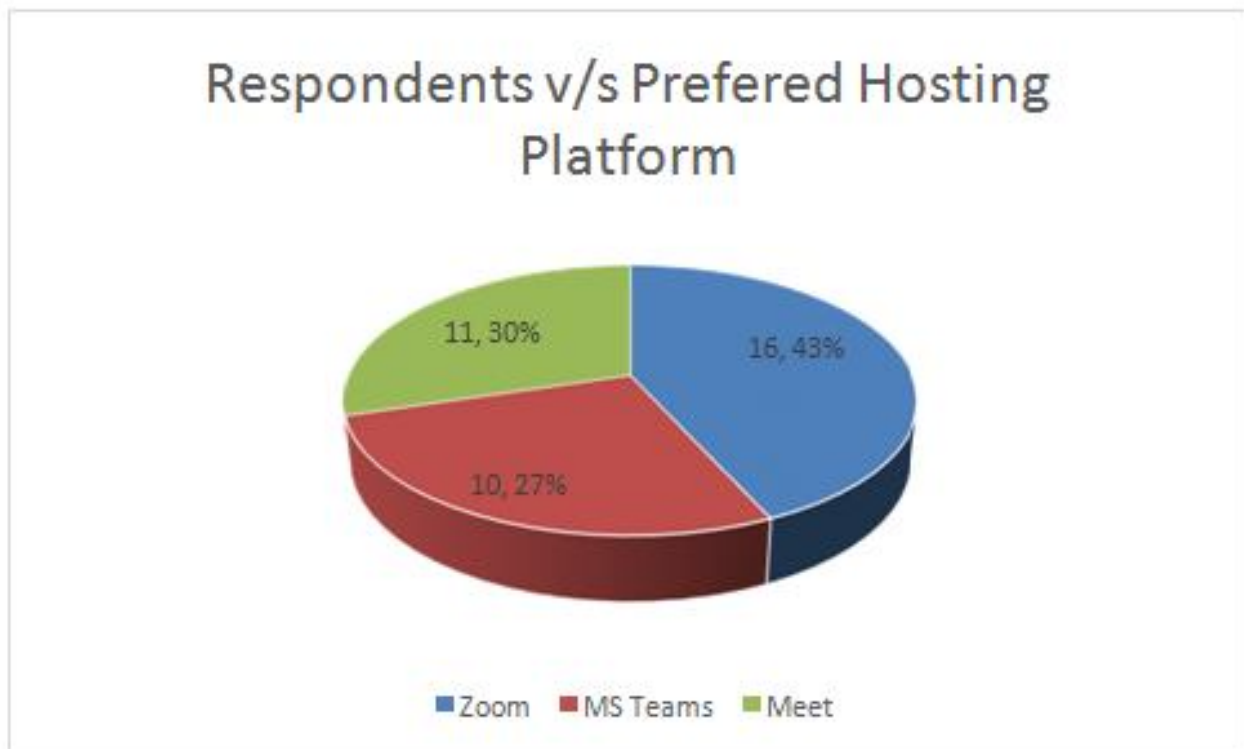
Interpretation: From the Above Analysis, the Most Preferred Hosting platform amongst the three players is Zoom with 43 % .

Respondents v/s Prefered Participation Platform

12, 33%

16, 43%

9, 24%

■ Zoom ■ MS Teams ■ Meet
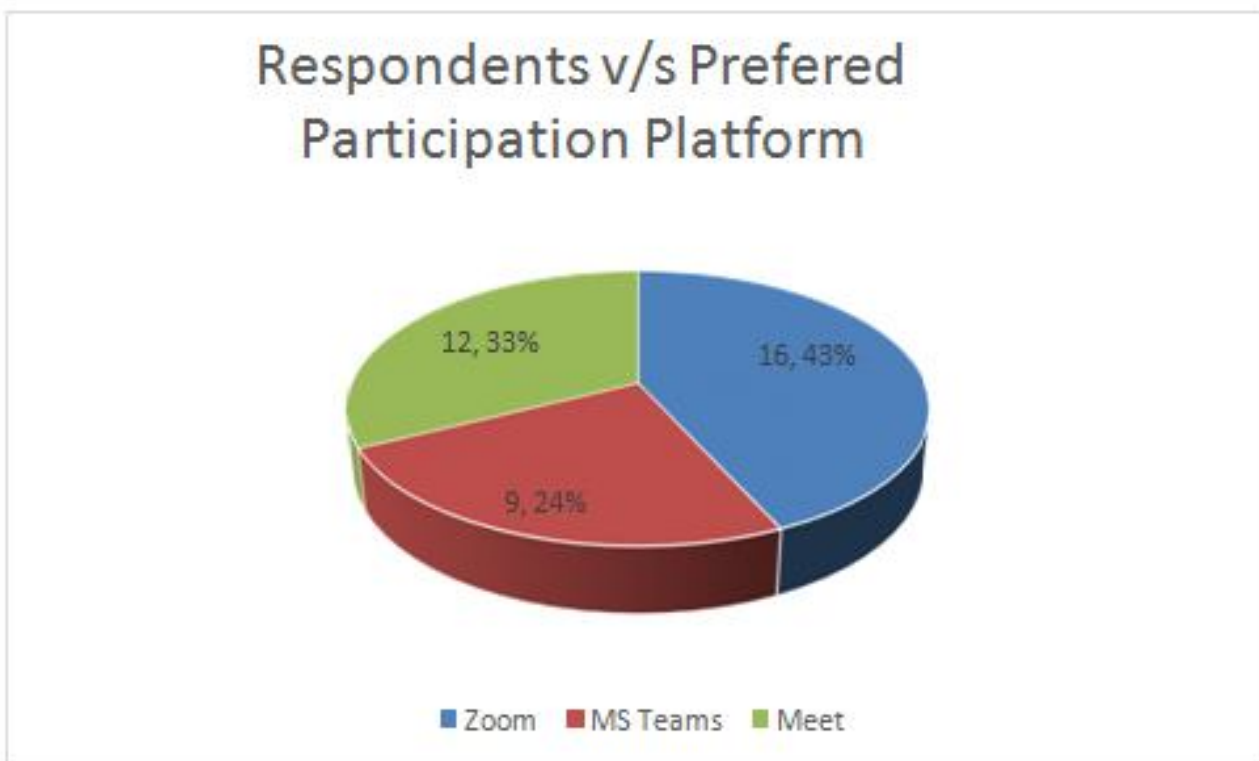
Analysis : Respondent's v/s Most Preferred Participation Platform

Interpretation: From the Above Analysis, the Most Preferred Participation platform amongst the three players is Zoom with 43 %
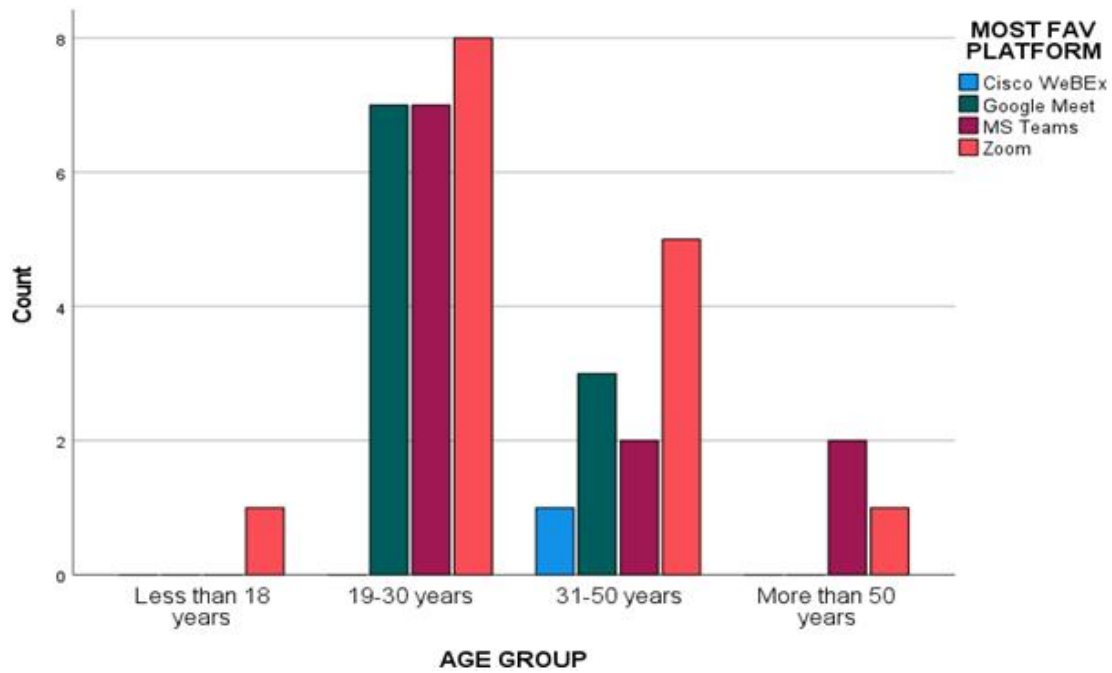
Analysis : Bar Chart of Respondent`s across three platforms v/s Age Group

Interpretation: Age wise categorisation of Most Favoured Platform

Analysis :CHI SQUARE (Computer Literacy and Preference for Hosting)**.**We are using the

Phi and Cramer `s V nominal scale as the rows and columns are equal (i.e., 3 rows and 3 columns)

Objective: To identify the relationship between the two variables

H0: It is clear that, no relationship exists between categories of Computer Literacy and Preference for Hosting the meeting

H1: It is clear that, a relationship exists between the categories of Computer Literacy and Preference for Hosting the meeting

Justification: Both questions are on nominal scale hence we can use Chi-Square

Symmetric Measures				COMPUTER LITERACY			Total
				Low	Medium	High	
Nominal by Nominal							
N of Valid Cases Symmetric MeasuresNominal by NominalN of Valid Cases Symmetric MeasuresNominal by Nominal	Zoom	Count		1	9	5	15
		% of Total		2.8%	25.0%	13.9%	41.7%
	MS Teams	Count		0	4	6	10
		% of Total		0.0%	11.1%	16.7%	27.8%
	Meet	Count		0	3	7	10
		% of Total		0.0%	8.3%	19.4%	27.8%
	Cisco WebEx	Count		0	1	0	1
		% of Total		0.0%	2.8%	0.0%	2.8%
N of Valid Cases Symmetric Measures		Count		1	17	18	36
		% of Total		2.8%	47.2%	50.0%	100.0%

Chi-SQTests			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.580[a]	6	.472
Likelihood Ratio	6.356	6	.385
Linear-by-Linear Association	2.164	1	.141
N of Valid Cases	36		

Interpretation

Pearson Chi Square = 0.472
Alpha = 0.05 (alpha will not be divided by two as it is not following normal distribution)
As 0.472> 0.05 hence Accept H0.
Interpretation: As a result, there is no correlation between computer literacy and meeting hosting preference.
CHI SQUARE (Gender and Computer Literacy)**. We are using the Contingency nominal scale as the rows and columns are unequal (i.e., 2 rows and 3 columns)

Objective: To identify the relationship between the two variables.
H0: It is clear that ,no relationship existsbetween the categories of Computer Literacy and Gender
H1: It is clear that ,a relationship exists between the categories of Computer Literacy and Gender

Justification: Both questions are on nominal scale hence we can use Chi-Square.

GENDER * COMPUTER LITERACY Crosstabulation

			COMPUTER LITERACY			Total
			Low	Medium	High	
GENDER	MALE	Count	1	5	13	19
		% of Total	2.8%	13.9%	36.1%	52.8%
	FEMALE	Count	0	12	5	17
		% of Full Total	0.0%	33.3%	13.9%	47.2%
Total		Count	1	17	18	36
		% of Full Total	2.8%	47.2%	50.0%	100.0%

Chi^2 Tests

	Value	df	AsymptoticSignificance (2-sided)
Pearson Chi-Square	7.349[a]	2	.025
Likelihood Ratio	7.928	2	.019
Linear-by-Linear Association	3.259	1	.071
N of Valid Cases	36		

Interpretation

Pearson Chi Square = 0.025
Alpha = 0.05 (alpha will not be divided by two as it is not following normal distribution) As 0.025< 0.05 hence Reject H0

Interpretation: Therefore, there is a relationship between the Computer Literacy and Gender

"Symmetric Measures"			
		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.412	.025
N of Valid Cases		36	

Now in this case, to check the strength of the relationship we further refer to the table with symmetric measures as calculated above. As the contingency coefficient value is 0.412 Hence the strength of association is 41.2% which is not very strong.

Factor Analysis

After the first run of Factor Analysis, 31 statements were reduced to 14 statements. 17 statements were dropped from further analysis as their factor loadings were lower than 0.50. While dropping these 17 statements from further analysis, the entire

scale of brand recall i.e the third independent variable considered earlier, which consisted of 5 statements were completely dropped.

The 14 statements consisted of one dependent variable namely "intent to select virtual interaction platform consisting of 4 statements, and two independent variables namely relative advantage and security with 6 and 4 statements respectively

Now we proceed with the final factor analysis with 2 Independent variable and 1 dependent variable

Significance of correlation matrix:

KMO measure is used to test sampling adequacy and bartletts test is used to test significance of correlation matrix. This was done for zoom platform with 14 statements.

"KMO and Bartlett's Test"		
Kaiser-Meyer-Olkin Measure of SamplingAdequacy.		.735
Bartlett's Test ofSphericity	Approx. Chi-Square	463.319
	Df	91
	Sig.	.000

Interpretation: KMO value is 0.735 which is greater 0.05 which means sample size of 37 respondents is adequate

Hence, we can go ahead with Further Analysis (T test and Anova etc.)

To test the significance of correlation matrix, we use Bartlett's Test of Sphericity significant value (sig value) which is equal to 0.000 < alpha value 0.025 (level of

significance 2 tailed test). Since this is less, we conclude that correlation matrix is significant and therefore we can perform factor analysis

"Factor Analysis Method: The factor analysis is carried out using Principal Component Analysis (PCA). Thecumulative variation in the data is taken into account in PCA."

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums ofSquared Loadings			Rotation Sums ofSquared Loadings		
Compone nt	Total	% of Varianc e	Cumulative %	Total	% of Varianc e	Cumulative %	Total	% of Varianc e	Cumulative %
1	7.415	52.966	52.966	7.415	52.966	52.966	4.049	28.920	28.920
2	2.339	16.707	69.672	2.339	16.707	69.672	3.595	25.680	54.600
3	1.094	7.816	77.488	1.094	7.816	77.488	3.204	22.888	77.488
4	.713	5.093	82.582						
5	.644	4.599	87.180						
6	.461	3.295	90.475						
7	.370	2.645	93.120						
8	.254	1.815	94.935						
9	.211	1.508	96.443						
10	.166	1.185	97.628						
11	.139	.991	98.619						
12	.119	.847	99.466						
13	.053	.376	99.843						
14	.022	.157	100.000						
""Principal Component Analysis" is the extraction method.									

Interpretation: From the above table, it is observed that eigen value for 3 factors are more than 1 , hence 3 factors are extracted which accounts for 77 % of total variance

Rotated Component Matrix[a]			
	Component		
	1	2	3
Z9_ATTEND LECTURES ZOOM	.887		
Z16_CHAT MESSAGE CONZOOM	.830		

Z17_PREFERENCELAPTOP ZOOM	.766		
Z14_FILES VIDEOSSHARING ZOOM	.760		
Z18_PREFERENCE MOB ZOOM	.721		
Z15_FILES VIDEOS SHARING ZOOM	.629		
Z30_INTENT TO REFER/ENCOURAGE ZOOM		.861	
Z29_INTENT TO CONTINIOUS LEARN ZOOM		.836	
Z31_INTENT TO ADOPTION ZOOM		.830	
Z28_INTENT TO USE DAYS ZOOM		.735	
Z20_HIGH ENCRYPTION ZOOM			.904
Z19_HIGHEST SECURITY ZOOM			.874
Z22_ENCRYPTION AT REST ZOOM			.824
Z21_NO INTRUDERSZOOM			.693
"Principal Component Analysis was used as the extractio n method. Varimax with Kaiser Normalization is the rotation method."			
"a. In 5 iterations, the rotation converged."			

The features were extracted using the Varimax rotation process. These three new variables were created in variable screen respectively for each of the 3 platforms. Compute variable formula process was used to transform and create the new variables

Correlation Analysis

Analysis **ZOOM** # Correlation
Relation: Relationship between Intent to Select Virtual Interaction Platform with variable relative advantage and Security
H0RA (Null Hypotheses): There is no significant correlation between Intent to select the ZOOM Virtual Interaction Platform with respect to Zoom`s Relative Advantage
H0SEC (Null Hypotheses): There is no significant correlation between Intent to select the ZOOM Virtual Interaction Platform with respect to Zoom`s Security
H1RA (Alternative Null Hypotheses): It is clear that, there is a significant difference in Intent to select the ZOOM Virtual Interaction Platform with respect to Zoom`s Relative Advantage
H1SEC (Alternative Null Hypotheses): It is clear that, there is a significant difference in Intent to select the ZOOM Virtual Interaction Platform with respect to Zoom`s Security

Correlations

		DV_INTENT_ZOOM	IDV_RA_ZOOM	IDV_SEC_ZOOM
DV_INTENT_ZOOM	Pearson`s Correlation	1	.650[**]	.585[**]
	Sig. (2-tailed)		.000	.000
	N	37	37	37
IDV_RA_ZOOM	Pearson Correlatio n	.650[**]	1	.347[*]
	Sig. (2-tailed)	.000		.035
	N	37	37	37
IDV_SEC_ZOOM	Pearson Correlatio n	.585[**]	.347[*]	1
	Sig. (2-tailed)	.000	.035	
	N	37	37	37

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Interpretation

1. Karl Pearson`s corelation value for Intent to use virtual platform as Zoom and Relative advantage is 0.650. Which means there is 65% correlation between above two variables. These two variables are moderately and positively corelated

2. Pearson corelation value for Intent to use virtual platform as Zoom and Security advantage is 0.585. Which means there is 58.5% correlation between above two variables. These two variables are moderately and positively corelated

3. The Sig 2 tailed values of Relative advantage and Security with Intent to select the Virtual Interaction Platform as Zoom is 0.000 which is less than 0.025.

Hence corelation is statistically significant

Conclusion

Following point's t were observed through the statistical analysis

- Zoom is the most favourite platform. It is also most preferred for hosting/participating in the meetings
- Zoom is also the preferred choice of platform across all the ages groups
- Intention for the Selection of Platform is been influenced by Relative advantage and Security
- The Chi Square results demonstrates no significance between Computer Literacy and Selection of Hosting Platform, However Computer Literacy and Gender shows significant relationship
- Correlation Analysis shows Security and Intention to selection either of 3 platforms, moderately and positively corelated

Reference

1. https://zoom.us/
2. https://meet.google.com/
3. https://www.webex.com/
4. https://www.skype.com

CLASSIFICATION OF SENTIMENTS BY SELECTING MULTIPLE FEATURES

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ABSTRACT

Sentiment Analysis (SA) is the extraction of users' opinions from the available review documents. As the Feature Vector has a problem of higher dimensionality when sentiment classification is done with the use of Machine Learning methods, hence, a method of selection of features is needed for eliminating the noise and features that are not relevant, from the feature vector meant for the Machine Learning Algorithms to work efficiently. A useful concept for reduction of features, known as reduct is provided by the (RST) Rough Set Theory. The computation of the reduct set is a high cost process and is influenced highly by the attributes' size of the dataset, where the issue of reduct finding is proven as a hard problem. For different sets of data, different groups of features are applied and the results obtained by multiple experiments divulge that as compared to IG, mRMR is a superior technique for classification of sentiment. As compared to the previously developed methods, the selection method with hybrid features, based on RST is a better option too. The methods proposed are analyzed and examined based on the standard sets of data, like Product review datasets (DVDs, electronics and books) and movie reviews and the results divulge that that the method of selection with hybrid features is much better than the techniques used for feature selection for classification of sentiments.

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Keywords: Information gain, Methods of Feature Selection, Sentiment Analysis, Rough Set, mRMR (Minimum Redundancy Maximum Relevancy)

1. Introduction

A new field in data mining is OM (Opinion Mining), which is in relation to the opinions that are deduced from documents. Opinion Mining consists of three main tasks: Developing the linguistic resources, Classifying of sentiments and summarizing the opinions, as seen in Figure 1. The procedure of finding an opinion, which may be either positive or negative, from the textual documents like movie reviews, product reviews, etc., is called Sentiment Analysis.

Users have been generating an ever increasing amount of data each day on the World Wide Web. There is a need for organizations to know the sentiments of the customers regarding their products and this leads to a natural increase in the need to explore the field of sentiment analysis. The opinions are expressed by people about their products, movies, candidates etc. on social media, web blogs, networking sites and forums of discussions, etc.
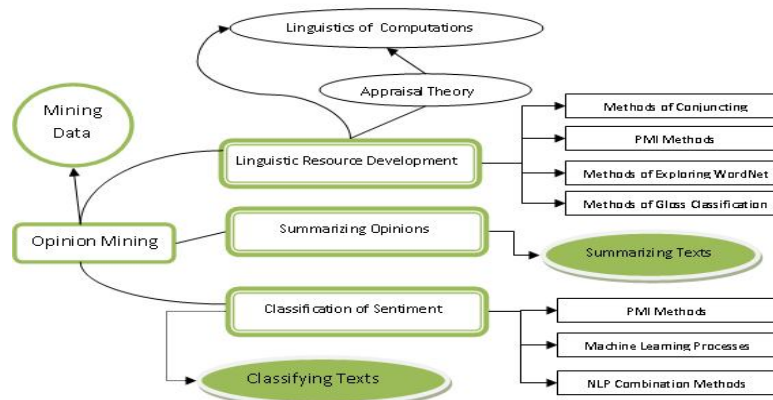
Fig. 1: Opinion Mining Tasks and their interrelationships with related fields

Thus the area of sentiment analysis is one of great use to the end users and the businesses, as the online content has seen a dramatic increase in the available content for analysis.

For the end users, it is imperative to know the experiences that other users have had in the past about the services or products that they themselves are deciding about whether to buy the product or not. The companies are able to use the analyzed sentiment for improving the products they are putting out or the services that their customers are being provided, on the basis of the criticism or praise given by users' about the organization's products on E-commerce websites, blogs, social media, etc. This helps them in knowing the present trends about their products, For example, if we need to reach a conclusion about which mobile phone model is preferred by the customers, we can know it by analyzing the user sentiment.

A commonly used representation is BOW (Bag of Words), which is used to classify sentiment by using machine learning methods. Feature vectors are developed by the words that are present in every document. In general, this feature vector has a large dimension which is used by the methods of machine learning. The methods of Machine Learning have traditionally been used extensively for classifying sentiment [1].

The BOW representation is used commonly for classifying sentiment, which results in a much higher dimensionality of the space of features. This high dimensional space of features can be handled by machine learning algorithms with the utilization of methods for selection of features that exclude the irrelevant and noisy attributes [2]. RST (Rough Set Theory) which was put forth in 1982 by Pawlak, was a mathematical tool to analyze data for extracting important patterns from information based on the data that may otherwise be incomplete.

The RST gives us a mathematical tool for use in finding every possible subset of features. This theory has successfully been used as a tool for selection for discovering the dependency on data and reduction of the varied attributes that make up the data in the dataset by simple methods that are structural purely. If we have a dataset with values of attributes that are discredited, the subset (reduct) can be found from the attribute present originally, using rough sets. These Rough sets contain most of the information of the attributes that can be gained from the dataset with minimum loss of information [3].

One of the most significant concepts in the rough implementation of data mining is 'Reduct'. It is denoted as the attributes' minimalistic subset which includes some significant characteristics pertaining to the set of original attributes. For classifying data, a reduct is the minimalistic attribute which is set to preserve the power of classification of the dataset initially. The reducts are of various types, like relative reduct, absolute reduct, approximation reduct and optimal reduct. The computation on reducts either uses a strategy of search that is random or one that is heuristic. A significant technique of this type us the algorithm for Quick Reduct, as proposed in [4]. This algorithm initiates a search for a reduct, while not attempting to find the other subsets of reduct on the basis of the data collected. An empty subset is used to initiate the search, followed by the feature that is most significant is added, thus increasing the degree of rough dependency in the subset. These are the iterative steps then followed till value of the dependency reaches the dataset's maximum value.

Hence, the main contributions this paper makes, are as follows:

1) Creation of different sets of features with the use of unigram which performs better than the other features.
2) Performing Sentiment Analysis by using the IG method of selecting features.
3) Analysing Sentiment, using mRMR method of feature selection.
4) Comparing the performances of mRMR and IG for analyzing sentiment, with section of hybrid features on the basis of IG and RST and finding that the hybrid approach is better performing than the IG method.
5) Evaluating the method proposed on four typical datasets on a varied set of domains that are reviewed.

The organization of this paper is as follows:

In section two, a defined discussion of the previous research is given. Section three discusses the methods for feature selection, which find use in reducing the size of feature

vector. The algorithms for machine learning, which are used for the experiments, are explained in section four. Section five discusses the Experimental setup and the dataset and the conclusions are given in section six.

2. Review of Related Work

The classification of sentiment is aimed at distinguishing from their reviews, if the people at large like or dislike a product. Sentiment analysis is an emergent area of research, which is still in its nascent stage but still there is existing research in various areas of sentiment analysis. This paper is bound by its goals; hence it focuses only on the associated work that pertains to the product reviews and their classification of sentiment. Initially, we review the research on the word classification based on the semantic orientation of these words. Secondly, we shall discuss the researches that have been carried out for selecting features for classification of sentiment by using ML methods.

In some researches the article polarity is in relation to the semantic orientation shown by the words that form the article, as in McKeown and Hatzivassiloglou [5]. The vocabulary was extended to both adverbs and adjectives by Littman and Turney [6]. They used the Latent Semantic Analysis and PMI (Pointwise Mutual Information) for calculating the semantic orientation of the keywords which have been extracted in accordance with the seed words' co-occurrences like *terrible* and *outstanding.*

In the researches conducted in recent times, there was a proposal for a structure that drove its inspiration from the working of the explorer robots [7]. As opposed to limiting the word level analysis, O'Keefe et al. evaluated the methods of selecting three features in addition to the scheme for weighting features to classify the sentiments [8]. A new technique for feature selection, based on Fisher's Discriminate Ratio was proposed by Wang et al. for the classification of sentiment that is expressed by the users in the text [9]. An improvement in the accuracy of the sentiment classification was found to be obtained from genetic algorithms or information gain. They also combined both of these and put forth EWGA (Entropy Weighted Genetic Algorithm), which gives a higher accuracy. Using this algorithm, the sentiment can be analyzed at the level of articles.

The classification of Movie Reviews was done by Pang et al., into negative and positive reviews, with the use of mainly three classifiers; namely SVM, Naïve Bayes and Maximum Entropy [10]. They further tested various combinations of features like Unigrams Bigrams, Unigrams POS (Parts of Speech) tags and Unigrams alone. The conclusions from their experiments proved that the combination of Unigrams with SVM gave the best results. In further research, Pang and Lee added the detection of subjectivity for avoiding the classifiers of sentiment while handling the objective sentences that may not be relevant. For extending their research, we analyze the usage of n-grams of higher order in classifying sentiments as it's our belief that the longer the phrases, the less ambiguity they have. In addition to this, Pang and Lee found that the performance of SVM is the best.

A simpler classifiers available online was applied by Hurst and Nigam [11] for classifying the sentiment polarity of documents They suggested that human agreements can only achieve a precision of 75 to 80 percent and can recall on the prediction of polarity. Winnow obtained a recall that was poor, with only a 43% for positive reviews and 16% for negative reviews. In the evaluations done by us, we have included the classifier proposed by Winnow. Methods of selection with four properties are discussed by Tan, namely MI (Mutual Information), IG, DF (Document Frequency) and CHI (Chi Square) for classification of sentiments expressed in documents in Chinese, with the utilization of majorly five algorithms for machine learning, namely, Centroid Classifier, K- Nearest Neighbor, SVM, NB and Winnow Classifier [12].

It is our observation that out of these methods for feature selection, the best performance is obtained from IG and from the machine learning algorithms; the most excellent results are obtained from SVM.

3. Proposed Techniques

3.1 Definition of Problem:

The aim of selecting features is to determine a minimal portion of features from the whole domain of the problem, while a decently high accuracy is retained for representation of the novel features. The main motivation for this study is to try to provide a working tool to optimize the problem of selecting features, the count of reducts which are found and the accuracy of the classification with the application to classifying datasets that may be real world and hence complex.

3.2 RST (Rough Set Theory):

RST is a mathematical approach [13] to handle vagueness and uncertainty in analysis of data. Because of the limits of the information available, the objects may not be discernable. The characteristics of a rough set are mainly a pair of concepts that are precise and are known as the lower and upper approximation that use the indiscernability of the object for generating them. The major issues relate to the attribute reduction and generating the rules of decision. The approach of rough set is of a major importance to cognitive sciences and artificial intelligence, mainly in the machine learning area, analyzing decisions, acquiring knowledge, expert system, discovering knowledge from databases, pattern recognition and inducting reasoning.

Z. Pawlak proposed RST as it provided a method for insights into the properties of data and this method does not require any information that is not locally present. A primary issue in RST is that the FS is based on the concept of reduct. Since reduct partitions the universe, it is able to execute classifications. Reducts are used to select and reduce the attributes, as studied by multiple authors. This advantageous alternative is even then limited due to the complexity in computation of the reducts that are calculated. The question of finding a reduct that is globally minimal, remains for a given system of information.

Good methods of approximation to calculate reducts, have been built with the use of heuristic search. RST [14] can handle uncertainties and a deficient data analysis. Redundant information or features are eliminated by the algorithm for reduction of attributes and a selection of the subset of

features is done, which are equally discernable as the first feature set. In data analysis, the RST has a main advantage of not needing any additional or preliminary information of the data, like the statistical probability or the membership grade or the possibility value in a FST (Fuzzy Set Theory). Many researchers use Rough Set due to the following Advantages:

- The algorithms that are supposedly efficient to find patterns in data that is not obvious, are most suitable for parallel processing.
- Evaluation of Data Significance.
- Generation of valuable and concise decision rules sets.
- Data reduction by discovering minimal data sets.
- Functions of Membership and setting of parameters beforehand are not included in RST (Rough Set Methods) as these are much simple.

A higher accuracy of classification is exhibited by the RST algorithm for classification than DT (Decision Tree) algorithms like C4.5 and ID3. The rules generated hence are easier to understand than the ones produced by DT methods.

3.3 Quick Reduct Algorithm

The attempt of the QRA (Quick Reduct Algorithm) is the calculation of a reduct without the exhaustive generation of every subset possible. It begins with an empty set and further adds these attributes one at a time, which leads to the largest increase in the dependency metric of rough set till it produces the data set which has the maximum value possible.

In accordance with the algorithm, every attribute's dependency is calculated and then we choose the best candidate. The highest degree of dependency is generated by the d attribute, for choosing the attribute and evaluating the sets of {a,d}, {b,d} and {c,d}. This process goes on till the reduct dependency is equal to the dataset's consistency (For a consistent dataset, it is 1). In the example given, after evaluation of the {b,d} subset, the algorithm is terminated. The reduct generated, shows the method of reduction in the original dataset's dimensionality by elimination of

those attributes that are conditional and are not a part of the set.

```
QUICKREDUCT(C,D)
    C, the set of all conditional features;
    D, the set of decision features.

(1) R ← {}
(2) do
(3)     T ← R
(4)     ∀x ∈ (C − R)
(5)         if γ_{R∪{x}}(D) > γ_T(D)
(6)             T ← R ∪ {x}
(7)     R ← T
(8) until γ_R(D) = γ_C(D)
(9) return R
```

Fig. 2: Algorithm for Quick Reduct

3.4 IG (Information Gain)

IG (Information Gain) is an important technique to select features for classification of sentiment. It is used for selecting vital features, related to the properties of the class. IG is measured by reducing the improbability in identifying of the class attribute with a known feature value. The most significant features are chosen to reduce the size of the feature vector, which leads to better results of the classification.

3.5 mRMR (Minimum Redundancy Maximum Relevance)

mRMR is a technique of selection of these features or properties [15] used for recognizing the notable features defining a class. mRMR is used for selection of features which depend highly to a class, which shows maximum relevance and a minimum dependence amongst the features, showing a minimum redundancy. Many a times, features which are relevant and which have a maximum relevance for the class, may include redundancy in addition to other features.

Whenever there is a redundancy in two features, then once a single feature is removed, there doesn't remain much difference in the discrimination of class [16]. For calculating the dependency or the correlation between two or more attributes of the class and features, mutual information is used. Feature selection Technique of mRMR helps in selection of features that have higher mutual information with maximum relevance, with the attributes of the classes. Then the features having a higher mutual information and correlation are eliminated, and thus leading to a minimum redundancy.

3.6 mRMR Advantages

The advantages of mRMR are as follows:
- Redundancy and Relevancy are problems with a low dimension, like they involve just two variables.
- It is easier than the direct estimation of mutual information or multivariate density in a space with high dimensions.
- Its speed is faster.
- The estimations are more reliable.

4. Algorithm for Machine Learning

4.1 SVM (Support Vector Machine)

SVMs or Support Vector Machines are relatively newer supervised processes of learning. These are highly affected by the significant increase in the computation capacity of computers in past few years and progress in SLT (Statistical Learning Theory) [17]. A hyperplane is found by the SVM, which divides the documents for training in a way that both the data points in the class are divisible to the maximum.

SVM has proved to be much more superior to other algorithms of machine learning, in cases which have training samples that are suffient in number. In past many years, a large and ever-growing number of applications in the field of handwriting recognition and image classification and various other fields too.
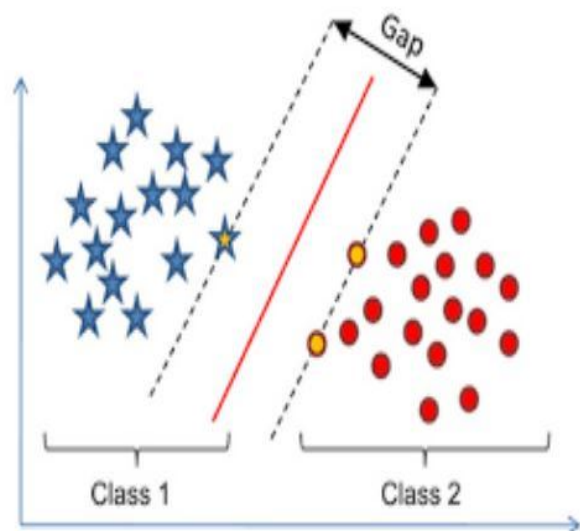
Fig. 3: SVM (Space Vector Machine)

Before SVM was discovered, there was not much success in machines for tasks related to generalization and learning. SVMs have since been extensively used to classify texts [18] and analyzing sentiment [19]. SVMs learn with the help of examples, just like human brains learn. For every example, there are n number of data points $(x_1, x_2, x_3,..., x_n)$, followed by a target or a label, which shall be considered later by us in the classification of two classes and is calculated to be -1 or +1. -1 represents one of the states and +1 represents the other state.

Both these classes are further divided by a hyper-plane that is optimum, as shown in Figure 3. This reduces the distance between the +1 and -1 points that are the closest and thus are known as support vectors. On the right side of the hyperplane, the +1 class is represented and on the left side, the -1 class is represented.

4.2 NB (Naïve Bayes)

Naïve Bayes is an intuitive and simple method with a performance just like the other techniques. It merges the reasonable accuracy and the optimal time performance or the overall efficiency. Theoretically, the main drawback of the Naïve Bayes method is the assumption of conditional independence amongst the linguistic features. Since the tokens which are derived from the texts are the main features, it is hence evident that these may not be considered independent as the co-occuring words in a text are one way or the other linked by various types of semantic and syntactic dependencies. However, even when Naïve Bayes produces a model that is overly simplified [20], the decisions of the classification taken by it are astoundingly accurate.

5. Dataset, Setup of Experiment and Results

5.1 Dataset

To evaluate the method proposed, we use one of the most popularly available public dataset for movie reviews [21]. This is a standard dataset with 2000 movie reviews including 1000 each of positive reviews and negative reviews. Blitzer et al. [22] developed a dataset including product review which includes product reviews obtained from Amazon. For the experiments, we have used reviews of DVDs, Electronics and books. Every domain includes 1000 each of negative and positive reviews that are labeled.

5.2 Metrics of Evaluation

Recall, Precision, F-Measure and Accuracy are used to evaluate the performance of the sentiment classification [23]. The Class C has an accuracy which is a fraction of the total documents' number which are classified correctly and all the documents which are classified under Class C or the sum total of TP (True positives) and FP (False Positives).

The fraction of the over all number of documents that are classified correctly to the total number of Class C documents (TP + FN or True positive plus False negative) is called Recall. The F-Measure here is a combination of recall and precision, both, and is denoted by:

$$\text{F-Measure} = 2 \times \frac{(Precision \times Recall)}{(Precision + Recall)}$$

This F-Measure is used for reporting the classifiers' performance for the classification of sentiment.

5.3 Sentiment Analysis using Method of Selecting Different Features

The Information Gain on the basis of methods of selection of features establishes the importance of the same features in the documents. Still we have a disadvantage that is needs a threshold value to begin with, which is not generally known. This method does not consider the attributes' redundancy. In addition to this, it returns a big number of features when a huge number of documents have to be put in consideration.

The mRMR method of selection of features has a better performance than IG, as the Information Gain chooses the features which are relevant on the grounds of uncertainty reduction in identifying the class, after the value of the feature is known. The features which are redundant are not eliminated. The mRMR however discards the features that are redundant which have a higher correlation between features. It retains the features which are relevant and include a minimum correlation.

Most of the noisy features which are not relevant can be reduced by RSAR. This

minimizes the redundancy in the features. Its advantage is mainly that dependency of the blend of features is considered by it on the attributes of the decision, as opposed to the other methods of selection with features that are conventional [24]. It, however, has many drawbacks.

To deduce a reduct that is optimal, firstly is a hard Problem and some algorithms that are meta-heuristic are used for getting an approximate reduction. It is a time consuming process. Hence a method that is integrated is built, which may reduce almost all the redundant features and gets a minimal set of features with a time complexity to classify sentiments. This is an algorithm that is hybrid and works in two subsequent steps.

At first, the IG or Information Gain of every feature is calculated and each of the features is selected, which has an IG value of greater than zero. As initially, the removal of noisy features and features which are initially irrelevant, from the feature vector is done, this reduces a lot of effort on computations. The main motivation and assumption for executing this step is that Information Gain eliminated the most likely irrelevant and noisy features. Further, to the RSAR method of feature selection, a reduced set of features is sent for getting a subset with optimal features. Hence, by combining together these methods, a selection of features is anticipated, which has more efficiency with respect to the time complexity and computation.

5.4 Result Analysis

In the beginning, the unigram features are derived from the review documents. The set of features is taken as the baseline, with using any technique of selecting features. The use of mRMR and IG is mainly to compare the proposed technique of selecting features, as IG is considered amongst one of the best methods of selection of features for classification of sentiment. For our experiments, we have used the reviews of products like Electronics, DVD and Books. Every domain consists of 1000 negative labeled and 1000 positive labeled reviews. The initial pre-processing of the documents is done in the following steps:

Firstly, the negation is handled by appending NOT to each word that occurs after the word for negation, like never, no, isn't, not, can't, didn't, don't, couldn't, wouldn't, etc. [25] and the first occurring punctuation mark in the statement.

Secondly, the words that occur in lesser than three documents are omitted from the set of features.

The features that are noisy and irrelevant are omitted from the generated feature vector after the various methods of feature selection are preprocessed. Further, the algorithms for machine learning use top feature vectors. NB and SVM classifiers are mostly employed to classify the sentiment. The results which are obtained from the NB classifier and the SVM classifiers are hereby reported to classify the review documents into negative or positive polarity of sentiment. For evaluating the methods proposed, a tenfold method for cross validating is used. The value of F-Measure is concluded as a benchmark of performance of different classifiers [26].

For multiple features that are used, the lengths of the feature vector used for classifying sentiment of various datasets are depicted in Table 1. The experiments that are conducted, apply the RSAR algorithm first, for getting the optimal best subset of features.

Table 1: Four Datasets and the Feature Lengths of the used Features

	Electronics	DVD	Books	Movies
Hybrid F	406	404	411	331
mRMR F	381	321	361	281
IG F	372	351	311	264
Rough F	372	351	311	264
Unigram F	4271	5956	5392	9046

Further, in accordance to the size of this subset of features, obtained using the RSAR method, the IG threshold is set to obtain the feature vector, which is further used for the classification [27]. The conducting of these experiments in this manner so that there can be a comparison of the results obtained from the IG and the Rough features.
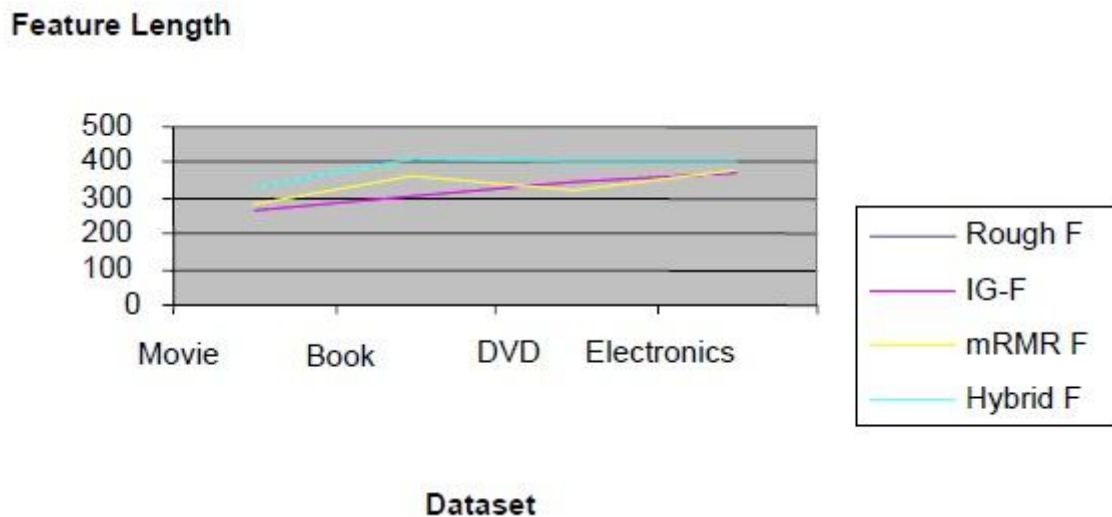
Feature Length

Fig. 4: Different Features' Length Using Four Datasets

These Experiments show that both Information Gain and mRMR have a much better output with the resultant features that are optimal for classifying the instances and compare these to the results reported in the literature from previous researches. It was observed during these experiments that both IG and mRMR make a selection of about 65-70% features commonly for all the datasets considered.

Moreover, the remaining features amounting to 30-35 percent in the set of Information Gain are observed to be the features that had a correlation with other features. The feature-selection method of mRMR was able to delete those features that were redundant for including more features that are relevant, which was not possible with the IG method.

Table 2: Percentage of F-Measure for Features using the Four Datasets

	Electronics		DVD		Book		Movie	
	NB	SVM	NB	SVM	NB	SVM	NB	SVM
Hybrid F	79.1	84.5	79.1	84.2	80.1	81.2	81.9	88.7
mRMR	80.0	83.7	78.2	80.2	79.3	80.3	80.4	87.0
IG F	76.2	82.1	76.1	80.1	77.3	78.0	79.6	86.9
Rough F	76.5	83.9	77.5	81.4	75.9	79.0	79.1	86.6
Unigram F	75.5	77.5	75.2	78.3	75.4	77.2	78.1	85.2

The noisy features that were not relevant were discarded by mRMR and made only the selection of Optimal Features for analyzing sentiment and only features which have a minimum correlation between the features. Due to this, the mRMR method of selecting features had a better performance than the IG method. The experimental results and observations show that both the methods used for selecting features (IG and RSAR) have the ability to advance the progress of the performance from the baseline level, as can be seen from Table 2. In Table 2, for example, the increase in F-Measure from 85.2% to 86.9% (+2.1%) and 86.6% (+1.6%) and 87.0% (+2.2%) for the Rough Features and mRMR and IG features, respectively from 85.2% to 86.9% (+2.1%) and

86.6% (+1.0%) for Rough and IG features, respectively, with the SVM Classifier in consideration with the dataset of the movie reviews. In the same way, while using the dataset for Electronics, the performance is increased from 77.5% to 83.9% (+8.3%) and 82.1% (+6.01%) and 83.7% (+8.1%), by use of the SVM Classifier for Rough, IG and mRMR features, respectively.

This holds true due to the removal of redundancy using the RSAR Algorithm and the selection of the subset of prominent features. IG chooses the features that are top ranked due to their importance for the attribute 'class' and noisy and unwanted features are discarded by the mRMR, with the Optimal Selection of Features. While using the approach of selection

with hybrid features for the dataset of movie reviews, There is an increase in F-Measure form 85.2% to 88.7% (+4.15%), as seen in Table 1 for the SVM Classifier.

A better result for classification is given by Hybrid IG Rough Features, in comparison with the other features, having a significantly smaller length of feature vectors. This happens because in the first phase, IS eliminated noisy and irrelevant features followed by the RSAR algorithm in the second phase, reducing the feature redundancy and extracting the subset of optimal features. With a combination of both these methods, the method for feature selection thus developed is more robust for classifying of sentiment, having a higher efficiency in selection of the set of optimal features for a substantial dataset. Due to much more time taken by the RSAR algorithm, in case of a large sized dataset, the IG algorithm has a problem with a bigger sized feature set and in the presetting of the threshold-value.

6. Future Plans and Conclusions

We have employed various methods of feature selection in this paper to analyze sentiment. A Rough set is able to reduce redundancy in the attributes. Methods based on Rough sets can compute the best possible subset of features on the basis of a minimization in redundancy as opposed to the IG that computes the attributes' importance on the basis of the entropy. mRMR and IG methods of selection are used to extract the features that are predominant.

The assessment comparing the performances of mRMR and IG is done for the classification of sentiment and we observe that out of the two, mRMR has a better performance than IG. As the mRMR method of selection of features is able to select more relevant features and is capable of eliminating the redundant features, which is not possible in IG, where just the computation of the selection method of features which are hybrid, is proposed. This is bases on IG and RSAR. It is proven by the experiments that the method of selection of Hybrid Features which has much lesser features, gives a result that is better, in comparison to the other methods of selecting features.

Experiments are conducted for every method with the same four sets of data. One can explore other unexplored methods too, to make the method of feature selection on the basis of rough sets, more efficient computationally, with the inclusion of the approaches that are evolutionary, for selection of the subset of features.

This approach can be examined for other kinds of datasets for exploring the possibilities of finding other techniques for selection of a feature set that is optimal. This leads to identifying of various methods for classification, which improve the results significantly. This algorithm finds application in different kinds of datasets that are compulsory for the reduction in dimensionality and in turn, the classification of sentiment.

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AIR QUALITY MONITORING STATUS AROUND GUDHA LIGNITE MINES AND THERMAL POWER PLANT AT BIKANER, RAJASTHAN

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ABSTRACT

Bikaner district is the part of Bikaner –Nagaur basin of tertiary age and having rich deposits of Lignite. At Village Gudha, of Bikaner district a captive use Lignite Mine is operating for 1x135MW pit head Thermal Power Plant. Lignite mining operations and thermal power plant disperse many pollutants in the environment which cause adverse effects on air quality of surroundings. The current study is an effort to assess the impact of Lignite mining and Thermal Power Plant on air quality around a mine and plant site. Air quality monitoring for $PM_{2.5}$, PM_{10}, SO_2 and NO_2 at eight locations around the study area was done from Jan - Dec 2020. The study showed that concentration of above mentioned pollutants at any monitoring station varies with change in season and distance of monitoring stations from mine and plant site. Activities corresponding to mining and combustion of Lignite for power generation are the major factors responsible for generation of air pollutants.

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Keywords: Air Quality, Lignite Mine, Power Plant, Pollutants

Introduction

Mineral resource is a gift given by nature to human for his development and prosperity. The economic development of any county depends upon the availability of mineral wealth in its perimeters. Among this mineral wealth, energy producing minerals like coal plays an important role to generate power and contributing in sustainable development of any country. India is a fast growing nation and the third largest producer and consumer of electricity in the world (Tripathi B., 2018). Coal mining is the major energy production industry playing imperative role in the progress of India (Chaulya and Chakraborty, 1995; Kumar, 1996). In India large reserves of a variety of coal - Lignite are found, mainly in tertiary sediments. Rajasthan state hosts about 4907.01 MT reserves of Lignite out of which 1094.71 MT reserves at Bikaner district (IBM, 2012). In Bikaner district, Department of Mines and Geology, Rajasthan has reported a large reserve of Lignite at various areas/blocks like Barsingsar, Gurha, Bithnok, Diyatra, Bigga-Abhaysinghpura, Hadla, Pyau, Riri, Raneri, Ambasar and many others. Out of these areas at present mining is under process at two places, Gurha and Barsingsar.

Gudha Lignite Mine and thermal power plant is operated by VS Lignite Power Private Limited. Activities related to mining and power generation - like excavation, machinery operations, Loading-unloading, crushing of Lignite, spontaneous burning of Lignite in open air, etc. are producing pollutants causing environmental disturbances. Pollutants like Suspended Particulate Matter (SPM), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), etc. are common pollution agents that decline the quality of Air surrounding the mining areas (Singh et. al., 1991) which in turn also affects the health of human beings and flora-fauna. Modern mining technology of fully Mechanized system using heavy equipments and machineries like earth movers have enhanced the degradation of air quality in the last few years (Singh and Sharma, 1991; Sharma and Singh, 1992). Thus we can say that there is a direct or indirect relation between to mining and air pollution (Baldauf et. al., 2001; Collins et. al., 2001).

Ambient Air quality monitoring is needed to evaluate the impact of mining activity and thermal power plant on quality of air around study area. The present study was conducted for one year duration to measure the geographical and seasonal variations in concentrations of air pollutants around Lignite mine and Thermal Plant located at Village Gudha of Bikaner district.

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Study Area

Gudha Lignite mines is approximately 60 km from Bikaner on the NH-15 towards Jaisalmer, and falls in survey of India Topo sheet No. 45A/13 **(Fig.1).** At Gudha village lignite mining activity is carried out by company named VS Lignite power Pvt. Limted. As transportation of lignite is costly and difficult due to its physical property of self burning, company is operating thermal power plant near mines.

70 Km Long and 30 Km wide succession of Lignite is of age early Paleogene (Paleocene-Eocene) associated with Palana and Kolayat sub-basin (Aggarwal, et. al., 2011). First of all Lignite was reported by Geological Survey of India at this region. Further detailed exploration was done by Department of Mines and Geology, Rajasthan and Lignite seams of 20 to 26.90 mts. Thickness were reported at depth of 38 m to 148.0 mts. Particularly at Gudha, Lignite Seam with thickness of 38.5 m was found below the surface at depth of 105m (Shukla et. al., 2014). Estimated reserves of approximately 38.00 MT have been reported in area with Lignite - overburden ratio of about 1:15. Various quality specifications of Lignite found in Bikaner region is as follows Average ash content 11.9%, V.M. 31.81, Fixed Carbon 38.21 to 43.90 wt% (Dinesh kumar et. Al., 2021) and calorific value 2867 K Cal/ kg

Material and Methods

Eight air quality monitoring locations namely "Mine Lease Area at Camp, Gudha Village, Mine Lease Area at Rasemadaniya, Power Plant (Admin Building), Sankhala ki Basti Village, Madh Village, Chakdadar Village and Deh Village" were chosen in different directions and distances **(Fig. 2).** Monitoring for PM_{10}, $PM_{2.5}$, NO_2, and SO_2 was carried out from Jan-Dec 2020 at above mentioned eight different locations. Fine Particulate Samplers (FPS) Model No. APM-550 BL DTC -205 was used for $PM_{2.5}$ monitoring as per CPCB Guidelines. Respirable Dust Samplers (RDS) Model No. APM-460 BL SAL/RDS/01 with gaseous attachment was used for PM_{10}, SO_2, and NO_2 Sampling. SO_2 concentration was measured by Improved West and Geake method and NO_2 by Jacob and Hochheiser

modified (Na-Arsenite) method. Regular monitoring was carried out, by taking monthly eight readings, two readings in a week. The monitoring year is sub-divided into four seasons: January to February as winter, March to June as Pre-monsoon, July to September as Monsoon, and October to December as Post-monsoon season (Choudhary et. al., 2009).

Results and Discussion

Analysis of data related to Air quality monitoring at different locations of study area it is clear that all pollutants ($PM_{2.5}$, PM_{10}, NO_2, and SO_2) have significant spatial and seasonal variation (Table 1). The concentration of all gaseous pollutants was highest in winter and lowest in monsoon season with intermediate concentration during Pre and Post monsoon (Table 1, Fig.3-10). A similar trend has been reported for various mining locations of India like Jharia coalfield (Ghose and Majee, 2000b), city of Dhanbad (Jain and Saxena, 2002), Raniganj–Asansol region (Reddy and Ruj, 2003), and Sambalpur area, (Chaulya, 2004). The concentration of all gaseous pollutants shows variation as per seasons and distance of sites from source of pollution. The concentrations of pollutants were observed higher at Mine Lease Area at Camp, Mine Lease Area at Rasemadaniya, Gudha Village, and Power Plant (Admin Building), situated nearer to the mine site and the Thermal Plant (Fig. 2), as compared to other monitoring sites. The concentrations of all pollutants at all monitoring stations were found under the prescribed limit of NAAQS (500µg m3; CPCW 1995).

The concentration of PM_{10} during the winter season at eight monitoring stations in the year 2020 is respectively 64.7, 59.9, 59.3, 73.8, 61.9, 57.4, 52.0, and 62.5. During all the seasons, the highest concentration was found at the Power plant (Admin building) as compared to other monitoring locations (Table 1). The concentration of $PM_{2.5}$ at Mining lease area at Camp, Gudha, Rasmadaniya, Power plant, Sankhla ki Basti, Madh Village, Chakdhar, and Deh Village were recorded as 33.3, 31.0, 30.0, 37.1, 31.1, 29.1, 26.4, and 32.4 respectively during the winter season (Table 1). The lowest concentration of particulates is noticed at

Chakdadar Village because the site is far from the mining areas.

The active mining operations and combustion of Lignite in the Thermal Plant is the main source of particulates at monitoring sites around the study area. In case of open cast coal mining main cause of air pollution is the coal dust produced during mining operations (Vallack and Shillito, 1998). The dust is produced at mining sites due to various mining related activities like haulage of over burden and mineral, blasting, heavy machinery operations, mineral stockpiles, transportation and restoration of mining site (Appleton et. al., 2006). The coarse particles (PM_{10}) is generated due to grinding, crushing, and abrasion of surfaces, evaporation of sprays, and deferment clouds of dust (Cole and Zapert, 1995) near mining areas. Fine particles ($PM_{2.5}$) and (PM_{10}) are formed by chemical reaction, coagulation, evaporation of smog, and cloud dews in which gases also dissolve and react with them (Wilson and Suh, 1997).

Concentrations of particulates and dispersion mechanisms of any pollutant at any geographical location depend on topography and climatic conditions of that place (Charron and Harrison, 2005). During winter season atmospheric temperature is low and wind speed is also normally low, thus pollutant are mixed in air to lower heights and rate of dispersion of pollutants is also less. Hence during winter season particulate matter get concentrated near source of such pollutants. Concentrations of Particulate matter were reduced in pre-monsoon as compared to winter because of higher dispersion due to increase in velocity of wind during pre monsoon season. The concentration was observed lowest during the monsoon season, because higher relative humidity and rain had washed out the pollutants. (Table 1; Fig.3-10), which reduces the re-suspension of dust.

The SO_2 concentrations were found high around the Gudha Lignite mine and thermal plant during winter season (Table 1). The results reflected that there is a significant variation in concentrations of SO_2 for different locations of monitoring stations, while it is not much significant for different seasons at the same monitoring location (Table1). During winter season the inclination of the average

concentration of NO_2 was Power Plant (Admin Building)> Mine lease area at camp >Sankhla ki Basti> Mining lease area at Rasmadaniya> Deh Village> Gudha village> Madh Village> Chakdadar Village (Table 1, Fig.3-10).

In monsoon season, the lowest concentration of SO_2 may be explained due to settling down of pollutants with rain. Higher SO_2 near the mine and plant site is due to the combustion of Lignite. Discharges of NO_2 in the area may be mostly due to Lignite combustion and vehicle exhaust. The seasonal variations in NO_2 concentrations can be explained by the change in duration of length of the day time over the year. NO_2 can exist in atmosphere for longer duration in absence of solar light (Li, Matthews, Sinha, 2008), hence higher concentration of NO_2 can be easily explained during winter season (short solar exposure). Higher concentrations of NO_2 at four sites, around the study area also due to the active mine workings, vehicle movement for mineral transportation, and other mining activities.

Conclusion

It is observed that around Gudha Lignite mine and thermal power plant all gaseous pollutants ($PM_{2.5}$, PM_{10}, NO_2, and SO_2) have significant spatial and seasonal variation. This variation depends on the mechanisms of the pollutant's discharge and diffusion. It is also affected by local climatological circumstances and the distance from the source. Velocity of wind, temperature, relative humidity, and rainfall are the main parameters responsible for variations in concentrations of pollutant in particular area. Lignite mining activities and combustion of Lignite at the Thermal power plant are the mazor factors responsible for generation of air pollutants in the study area. Emission of Vehicles and dust produced and transported by wind action over overburdens piles and unpaved roads are the other causes of air quality deterioration. Concentrations of different pollutants at all monitoring stations were found under prescribed limits of NAAQS is due to the adoption of the latest mining technologies, advanced methods of mining, and proper follow of MOEF rules and regulations. The emission of pollutants must be controlled, maintained and can be improved further to save the surrounding environment and the health of

local people. The outcomes of this study will be helpful in proper retain of the area in prescribing limit of NAAQS and for preventive measures.

Acknowledgement

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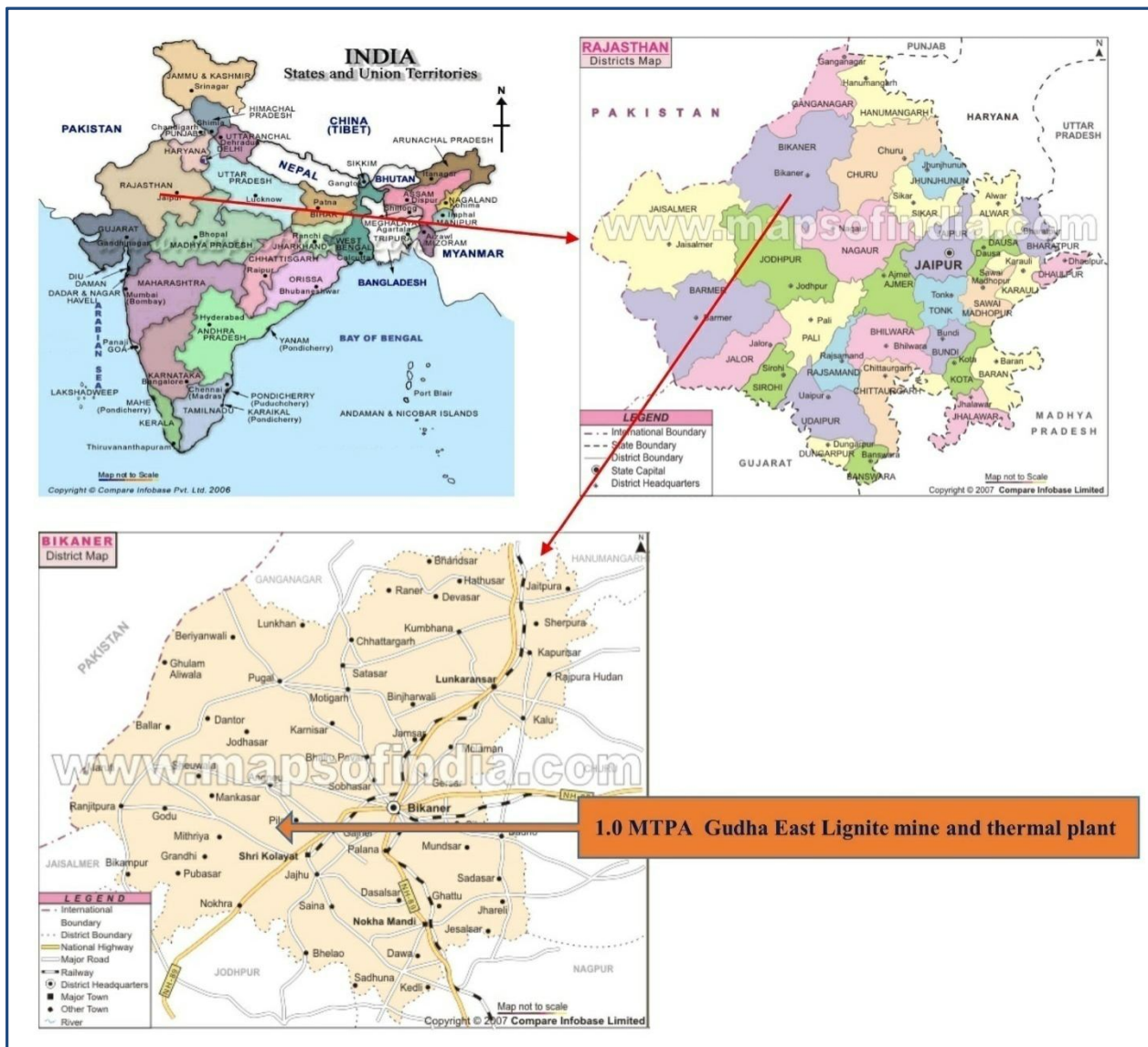
Fig 1: Location of Gudha East lignite mine and Thermal Power plant.
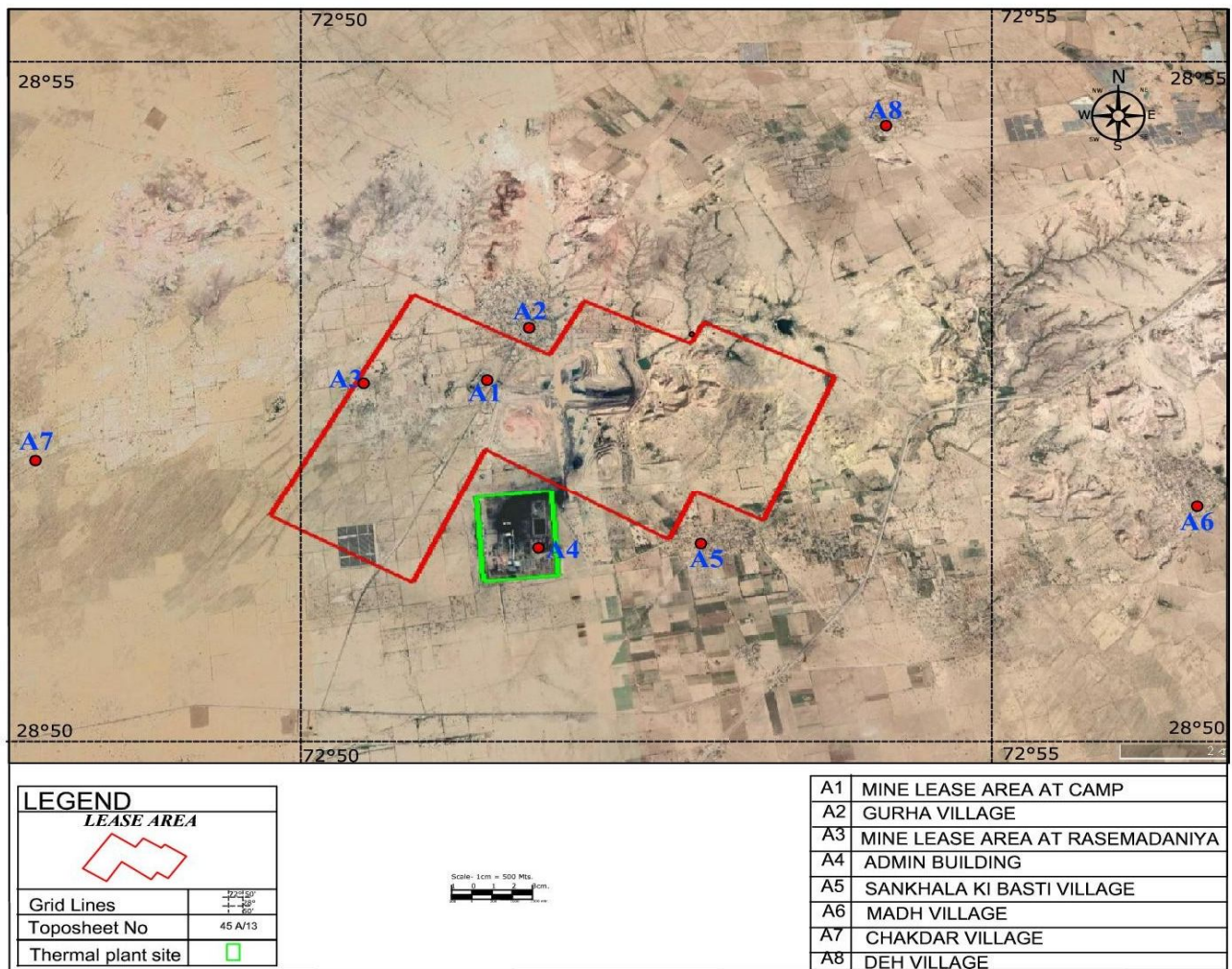
Fig. 2: Google location map showing Lease boundary of Gudha Lignite mine, Thermal Plant Site and Air Quality monitoring site locations.

Season/ Pollutant	PM_{10}	$PM_{2.5}$	SO_2	NO_2
	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$
Mine Lease area at camp-A1				
Winter	64.7	33.3	9.0	24.9
Pre-Monsoon	62.8	32.4	8.6	23.3
Monsoon	54.5	27.3	7.0	20.7
Post-Monsoon	56.7	28.5	7.6	21.5
Gudha Village -A2				
Winter	59.9	31.0	8.1	21.9
Pre-Monsoon	56.9	28.6	7.8	20.4
Monsoon	51.2	25.2	6.7	18.7
Post-Monsoon	55.4	27.5	7.5	20.6
Mining lease area at Rasmadaniya-A3				
Winter	59.3	30.0	8.0	21.4
Pre-Monsoon	58.8	29.6	7.9	21.3
Monsoon	55.4	27.6	7.1	19.4
Post-Monsoon	57.3	28.9	7.8	20.9
Power Plant(Admin Building)-A4				
Winter	73.8	37.1	11.1	28.5

Pre-Monsoon	72.7	36.6	10.2	26.4
Monsoon	64.3	32.4	9.3	24.9
Post-Monsoon	71.4	35.0	11.0	26.0
Sankhala ki Basti Village –A5				
Winter	61.9	31.1	8.4	21.9
Pre-Monsoon	60.4	29.7	8.3	21.9
Monsoon	52.0	25.9	7.0	18.7
Post-Monsoon	61.1	30.4	8.1	21.9
Madh Village -A6				
Winter	57.4	29.1	8.0	21.4
Pre-Monsoon	56.7	28.8	7.5	21.0
Monsoon	51.4	26.0	6.4	17.2
Post-Monsoon	53.5	28.6	7.6	18.3
Chakdadar Village-A7				
Winter	52.0	26.4	6.3	17.0
Pre-Monsoon	50.5	26.3	6.0	16.7
Monsoon	40.8	20.3	5.0	12.7
Post-Monsoon	48.8	24.2	5.4	13.2
Deh Village – A8				
Winter	62.5	32.4	11.0	21.6
Pre-Monsoon	60.4	30.3	8.2	21.4
Monsoon	54.0	26.7	7.4	18.7
Post-Monsoon	56.2	28.2	8.0	20.4

Table 1.1   Average of AQM Data for different Locations during different seasons of year 2020.
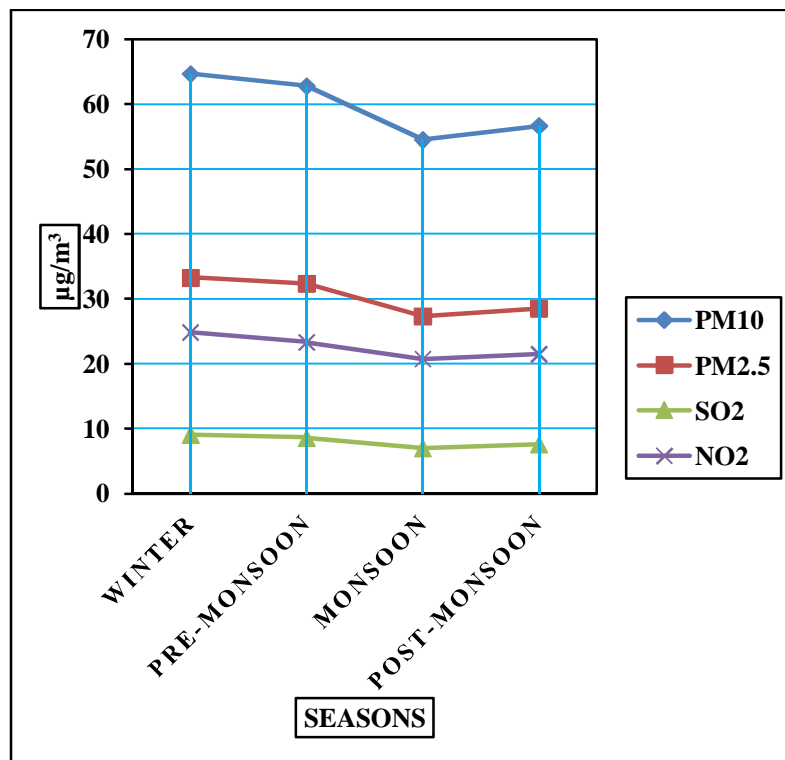
Fig. 3: Graphical presentation showing variation of pollutants concentration with seasons at Location A1 (Mine Lease Area at Camp)
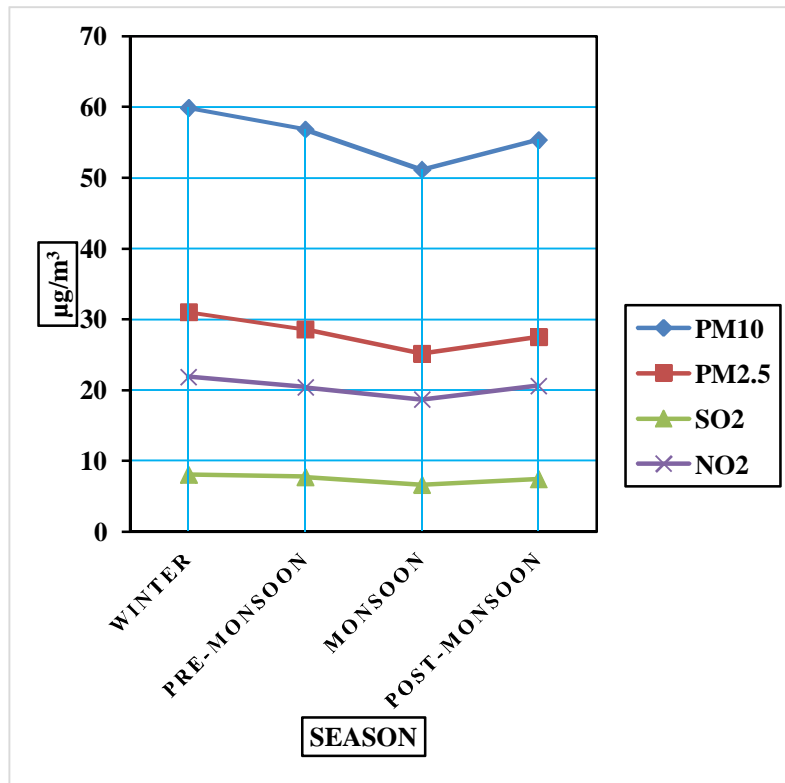
Fig. 4: Graphical presentation showing variation of pollutants concentration with seasons at Location A2 (Gudha Village)
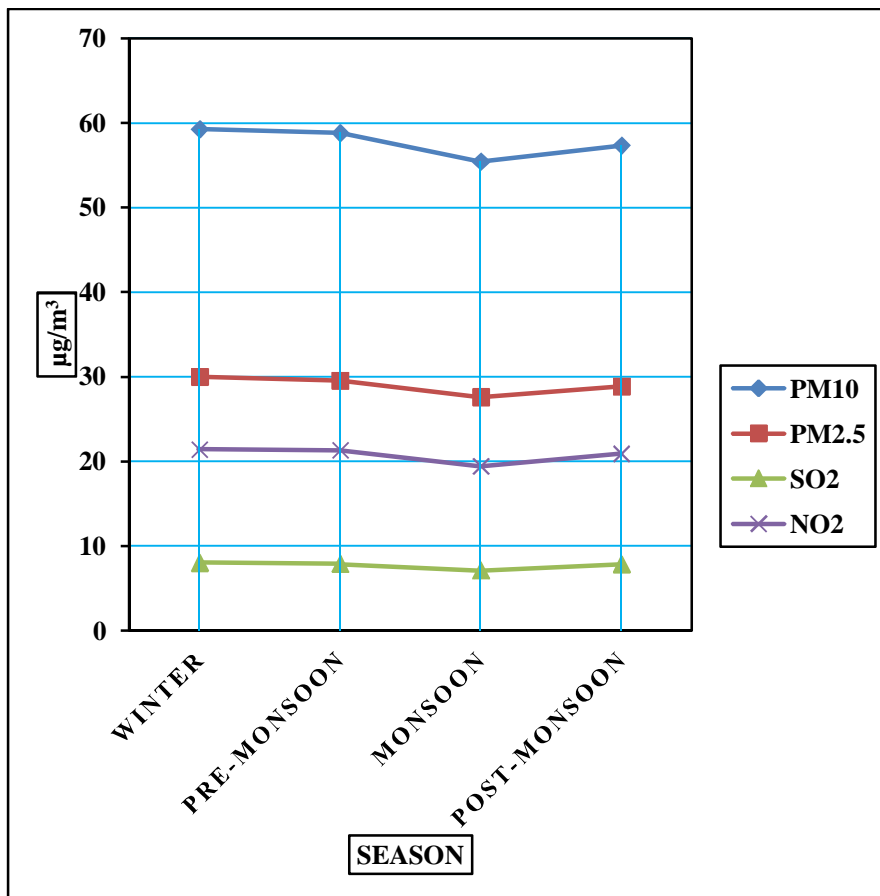
Fig. 5: Graphical presentation showing variation of pollutants concentration with seasons at Location A3 (Mine Lease Area at Rasemadaniya)
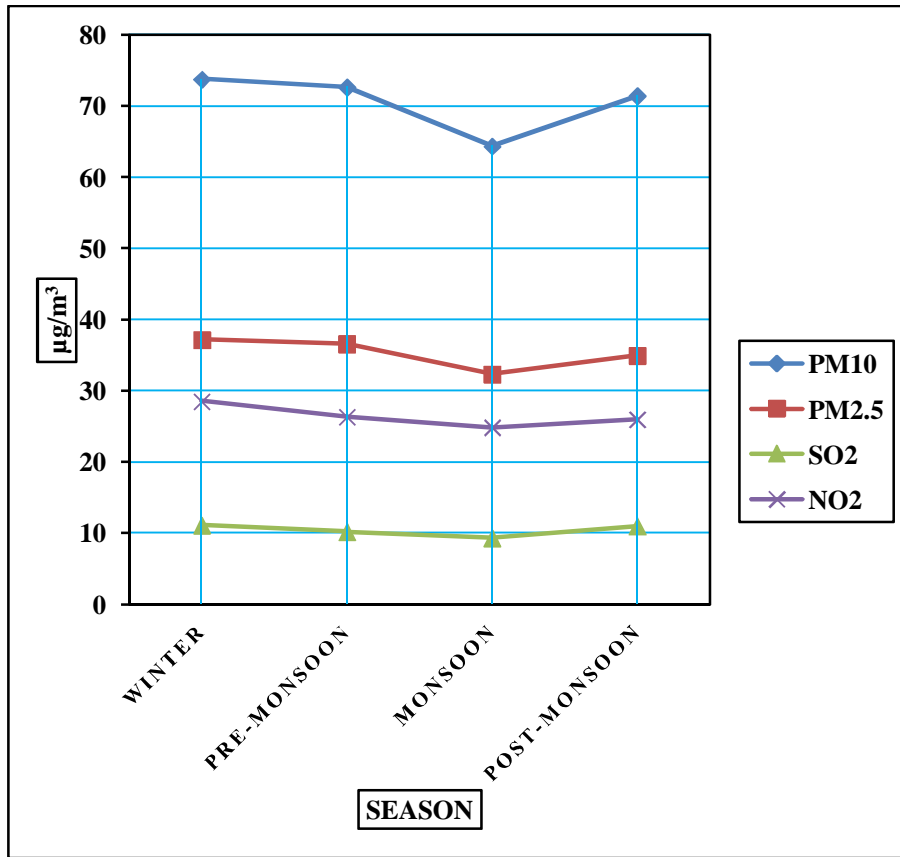
Fig. 6: Graphical presentation showing variation of pollutants concentration with seasons at Location A4 (Power Plant Admin Building)
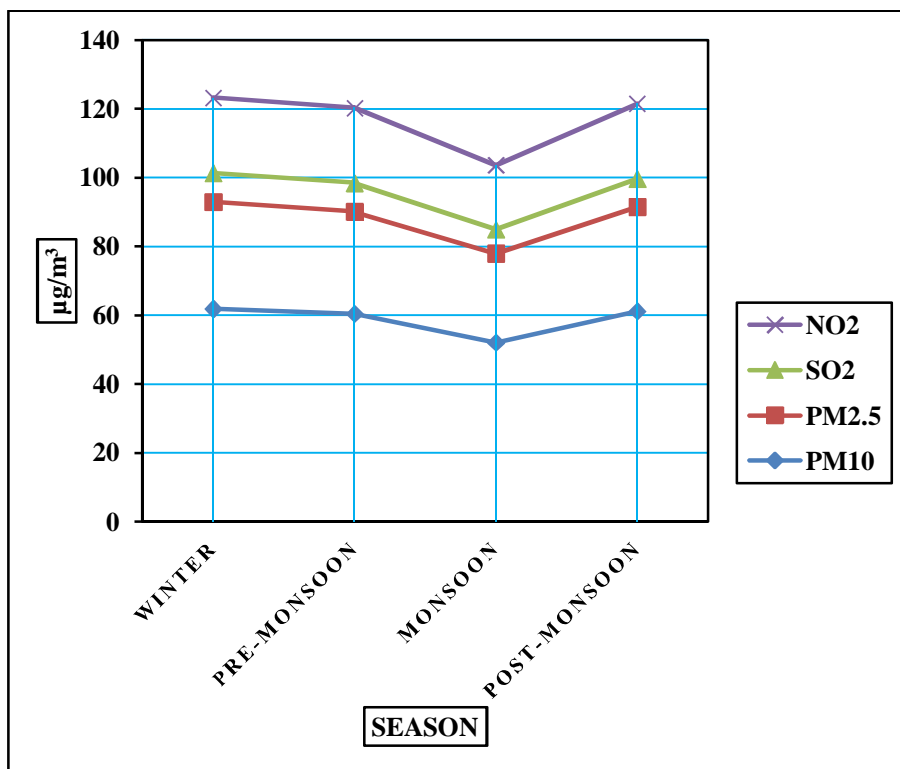
Fig. 7: Graphical presentation showing variation of pollutants concentration with seasons at Location A5 (Sankhala ki Basti Village)
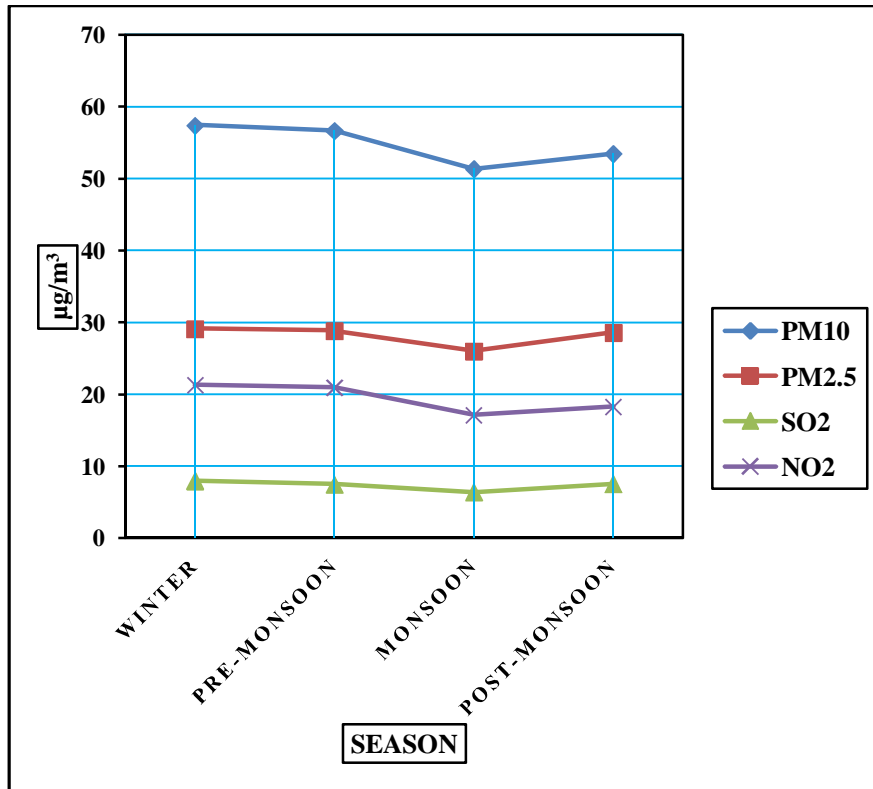
Fig. 8: Graphical presentation showing variation of pollutants concentration with seasons at Location A6 (Madh Village)
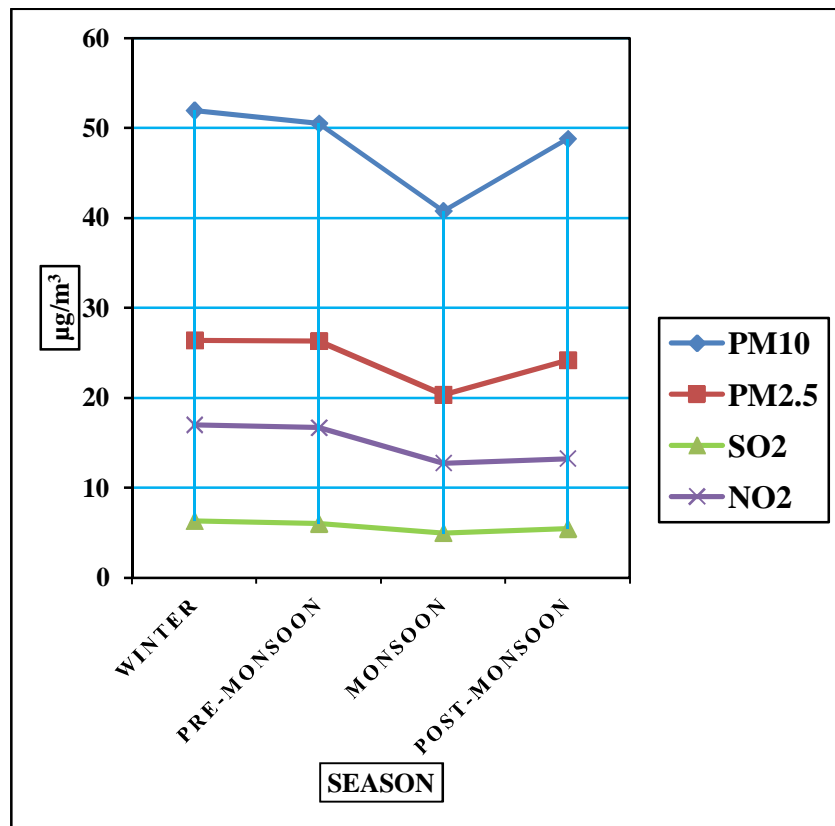
Fig. 9: Graphical presentation showing variation of pollutants concentration with seasons at Location A7 (Chakdadar Village)
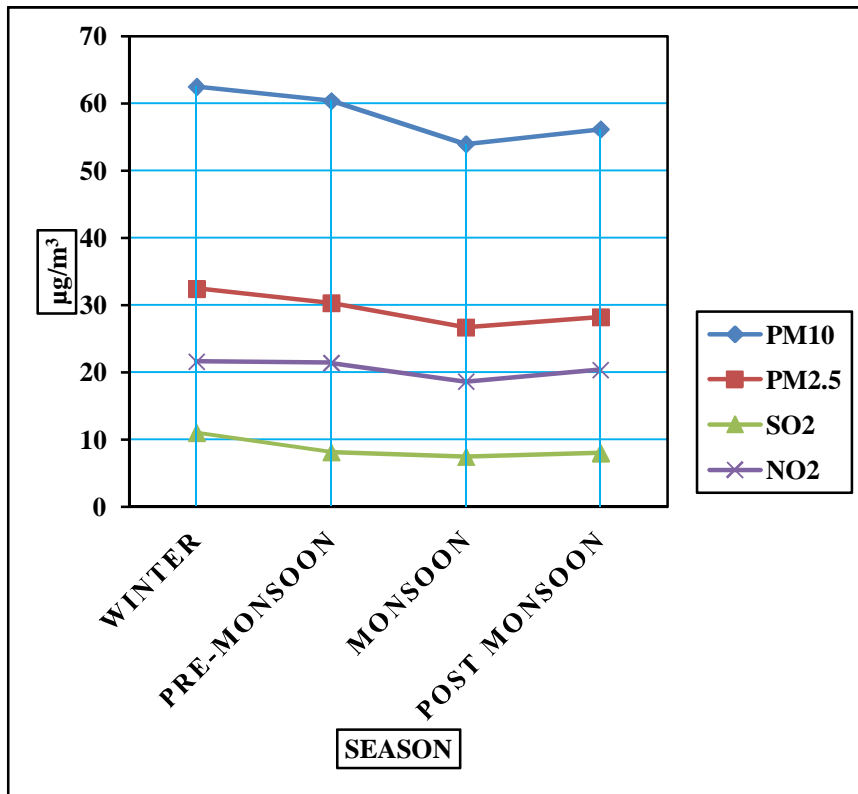
Fig. 10: Graphical presentation showing variation of pollutants concentration with seasons at Location A8 (Deh Village)

A WEBOMETRIC ANALYSIS OF THE STATUS OF HIGHER EDUCATIONAL DIGITAL INITIATIVES IN UNIVERSITIES OF HARYANA: A STUDY

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ABSTRACT

In this ocean of information, where new information emerges every day in many forms. With the advancement and increase in digital information, an up-to-date web platform is required for its presentation and utilisation. Any higher education institution's website serves as a showcase. The major goal of this article is to assess the status of digital initiatives in higher education on the university's website by using the Alexa tool and checklist, as well as to raise awareness about how to make the best use of them. MHRD (Ministry of Human Resource Development) has undertaken digital drive/initiatives to bring all information together on a single platform. All of these projects and programmes were initiated by the Ministry of Human Resources and Development with the goal of improving educational and research quality. This research shows how to make a website more useful and inspiring for using digital resources. This study examines university strategies for bridging the gap between what is necessary and accessible in using digital initiatives in education.

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Introduction

Websites have evolved into an essential aspect of communication and are now utilised to give services to its users. The World Wide Web (WWW) is a web that can be referred to as an information system. This includes the URLs for each document as well as other resources. Webometrics examines the amount and types of hyperlinks available on the internet in a quantitative manner. For webometric ranking, any university website's page size and visibility are measured. The amount of webpages and richfiles available on the university's website is assessed by size, while the number of links to external documents or information is measured by visibility. From the bottom up, relevant data can be linked to rank advancement.

The website is extremely important in the fields of education, research, and technology. Information can be presented in a variety of ways. The way of presenting the information has an impact on its use. The utilisation of information will rise as a result of a better and easier presentation, and the website's global ranking will improve. The uploading of various forms of content can help to boost rankings. Through diverse techniques such as collaboration, marketing, and promoting scholarly research publications, the Webometrics ranking enhances the quality of research and education in academic institutions.

Review of Literature

Pal, Sarkar and Bhattacharya [1] (2019) studied on the web Impact Factor of websites of the Indian Open University. IGNOU has the best global and Indian rank. And Yashwantrao Chavan Maharashtra Open University (YCMOU) comes on last number. Rudra and Kumar [2] (2019) studied on webpages, links, web Impact factor of library websites of Central Universities of India. Google, Yahoo and search engine optimisation tools were used to collect data. It is found that maximum library websites of central university have WebPages in higher number while links are less. Stephen [3] (2019) used the Alexa Internet Tool to examine the webpages of Central University of the North Eastern Region. The goal was to assess the website and determine its significance. As per the report of study, NEHU and TU have the best traffic rankings of 8484 and 8511, respectively. Nagaland University receives the most daily page views by users, averaging 4.1 per day. With 55.7 percent, Sikkim University is the most upstream site. Sikkim University has the highest bounce rate of 42.50. This

demonstrates its poor performance. Khamla, Makri and Najirine [4] (2018) studied webometric analysis with the aim to assess quality in education and research. To measure webometric rankings, they looked at three aspects of webpages are visibility, impact and activity. The data of daily visitors on the concerned website and external links were also collected. It can be used as a trustworthy indicator of activity and visibility in terms of global performance and reputation of the university. To evaluate academic and research, it is considered an indirect way. Sapna Rani and Pyare Lal [5] (2018) conducted webometrics to assess the State Health Science University of India's ICT status by using Alexa Traffic Rank and Google Page Rank data. To view PDF and DOC files, used the Google Search Engine. Dr NTR University of Health Science and Sri Venkateswara Institute of Medical Science were discovered to be at the top of the list. Telangana's Nizam Institute of Medical Science is placed top in the rich file. This research presents ideas for overcoming the challenges that have been encountered in the process of upgrading the website. So that the website has an impact and fulfilled the needs of all users. Varma and Brahma [6] (2017) conducted a webometric analysis of nine Indian library consortiums with the aim of ascertaining whether the website of each consortium contained the required information. Every day, information is growing. If these consortiums provide complete information on their websites. Then they can make a significant contribution in the field of education. They examined the impact factor of these consortiums on the total webpage, domain authority, equity links, internal and external links. It was found that the eShodhSindhu and DelCon are considered most famous consortiums. DelCon has higher linking root domains with 11RDs while highest domain authority of eShodh Sindhu is 56 (16.61%), and the page authority is 51 (21%). The study demonstrates that bringing these consortiums together can benefit everyone. Babu, Jayashankar, and Rao [7] (2010) analyzed the website of Central University of India with the aim to study number of links, webpages, self-links etc by

using Altavista search engine to collect data. Jalal, Biswas and Mukhopadhyay [8] (2009) examined the web presence of Indian Universities. On the basis of results It is found that University of Delhi comes on top rank and Sikkim University occupied the last.

Objectives

1. To highlight the present status of digital initiatives of Higher Education in university website.
2. To identify the use of digital initiatives of Higher Education on university website.
3. To develop the awareness of these digital initiatives.
4. Analysis the websites of the State and Central Universities of Haryana, as well as digital projects.
5. To see how much time users spend on university websites to access Digital Initiatives, as well as how many links they click and how many times they view each day.

Scope of the Study

Only academic and special university particularly of science and technology of Haryana state and portals of digital initiatives of Higher Education have selected as the sample.

Methodology

1. With the use of Alexa and a self-prepared check list, the current study analyses the website of Haryana's state and central universities. Various indices, such as webpages, links, views per day, time on site, rank, search traffic, bounce rate, and top keywords, have been selected for effective webometric analysis [9] (https://blog.alexa.com/full-glossary-web-analytics-terms-know/). The UGC website (http://www.ugc.ac.in) included a list of state and central universities as well as their URLs. The entire data collection process was completed in one day. To search out significant findings and conclusions, the acquired data was processed, tabulated, analysed, and evaluated.

Table 1: Selected Universities of Haryana to Study

University	Full Name of University	URL of University	Established
KUK	Kurukshetra University	http://www.kuk.ac.in	1956
MDU	Maharishi Dayanand University	http://www.mdurohtak.ac.in	1976
GJUST	Guru Jambeshwar University of Science and Technology	http://www.gju.ernet.in	1995
CCSHAU	Choudary Charan Singh Haryana Agricultural Univeersity	http://www.hau.ac.in	1970
CDLU	Chaudhary Devi Lal University	http://www.cdlu.in	2003
CBLU	Ch. Bansi Lal University	https://cblu.ac.in/	2014
CRSU	Chaudhary Ranbir Singh University	http://www.crsujind.org	2014
CUH	Central University, Haryana	https://cuh.ac.in/	
BPSMV	Bhagat Phool Singh Mahila Vishwavidyalaya	http://bpsmv.digitaluniversity.ac/	2006
DCRUST	Deen Bandhu Chhotu Ram University of Sciences & Technology	http://www.dcrusm.org	2006
PBDSUHS	Pt. Bhagwat Dayal Sharma University of Health Sciences	'http://www.uhsr.ac.in	2008
PDDUHS	Pandit Deen Dyal University of Health Science	Not has infrastructure	2016
YMCA	J. C. Bose University of Science & Technology, YMCA	http://ymcaust.ac.in	2009

Table 2: Portals of Digital Initiatives

Digital nitiatives	Website
INFLIBNET(eShodhSindhu,Shodhganga,Shodhshudhi,Vidwan, VidyaMitra,ePG-PathShala)	http://inflibnet.ac.in http://ess.inflibnet.ac.in http://vidwan.inflibnet.ac.in http://content.inflibnet.ac.in http://shodhganga.inflibnet.ac.in http://shodhshuddhi.inflibnet.ac.in http://epgp.inflibnet.ac.in
SWAYAM	http://swayam.gov.in
SWAYAMPRABHA	http://swayamprabha.gov.in
NDLI(National Digital Library of India)	http://ndl.gov.in

Figure 1: Programmes and Projects On Inflibnet

(Source: https://inflibnet.ac.in/)
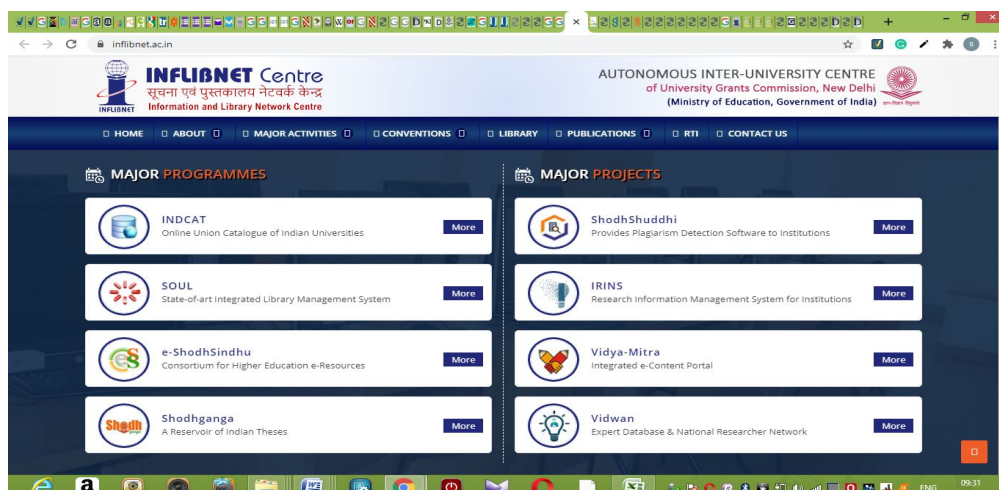
Data Analysis And Result

The data was analyzed using Frequency and Percentage through MS Excel and SPSS software.

Table 3: Cumulative Data Obtained From Alexa

	Before 90 days	Global Rank	India	Visitors from India	Daily Time on Site	Dailypage views per visitors	Search Traffic	Bounce Rate	Total site linking
CDLU	368466	518020	57707	100.00%	03:07	3.5	68.8	40.7	109
CCSHAU	776817	431763	32058	100.00%	04:05	3.2	39.3	31.8	88
GJUST	121320	198692	22553	84.2	02:24	2.2	44.7	57.9	359
KUK	32976	51990	4804	98.0%	04:49	3.5	36.1	36.9	723
MDU	202317	378279	47218	100.00%	00:49	1.3	43.8	76.2	622
CBLU	502605	345622	32988	100.00%	03:41	2.6	62.5	44.1	40
CRSU	0	6730253	0	0	0	1	70.4	0	27
CUH	362233	388294	37840	100.00%	02:40	2.0	68	55.8	165
BPSMV	27566	30763	2547	99.3%	10:34	6.5	33.2	22.7	955
DCRUST	0	0	0	0	0	0	0	0	7
YMCA	0	0	0	0	0	0	0	0	116
PBDSUMS	99635	111012	27816	100.00%	01:42	2.8	15	41.4	227

Links: The more links of a website has, the greater the popularity and reputation of that website. Links to all university and digital initiatives were obtained by Alexa. BPSMV has the highest links 955 and DCRUST has the fewest links 7 which shows the poor performance.

Figure 2: Total Site Linking Of All Selected University
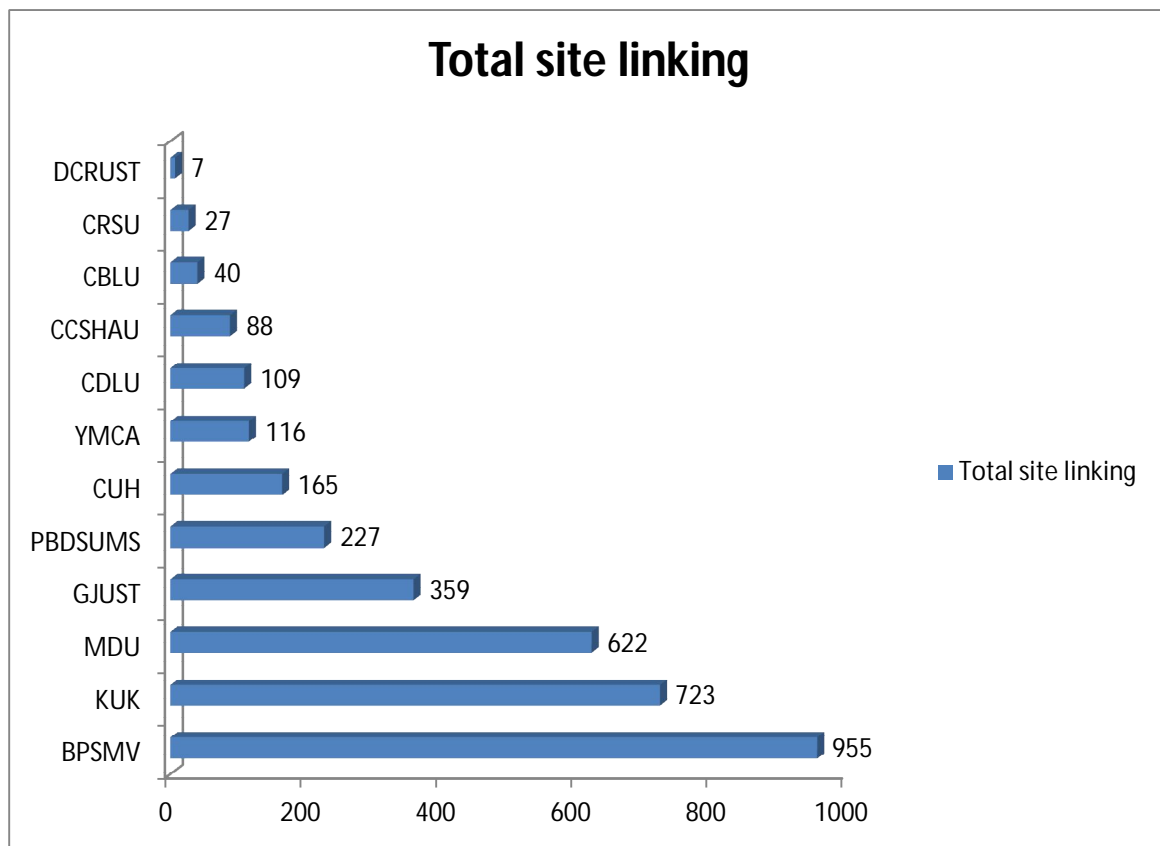
Bounce Rate: refers to how many users have opened and closed the website's homepage only once. The highest bounce rate shows the weak performance of that website. MDU shows highest bounce rate of 76.2% and GJUST with 57.9%. 22.7% is the lowest bounce rate of BPSMV.

Figure: 3 Bounce Rate Of All Selected University
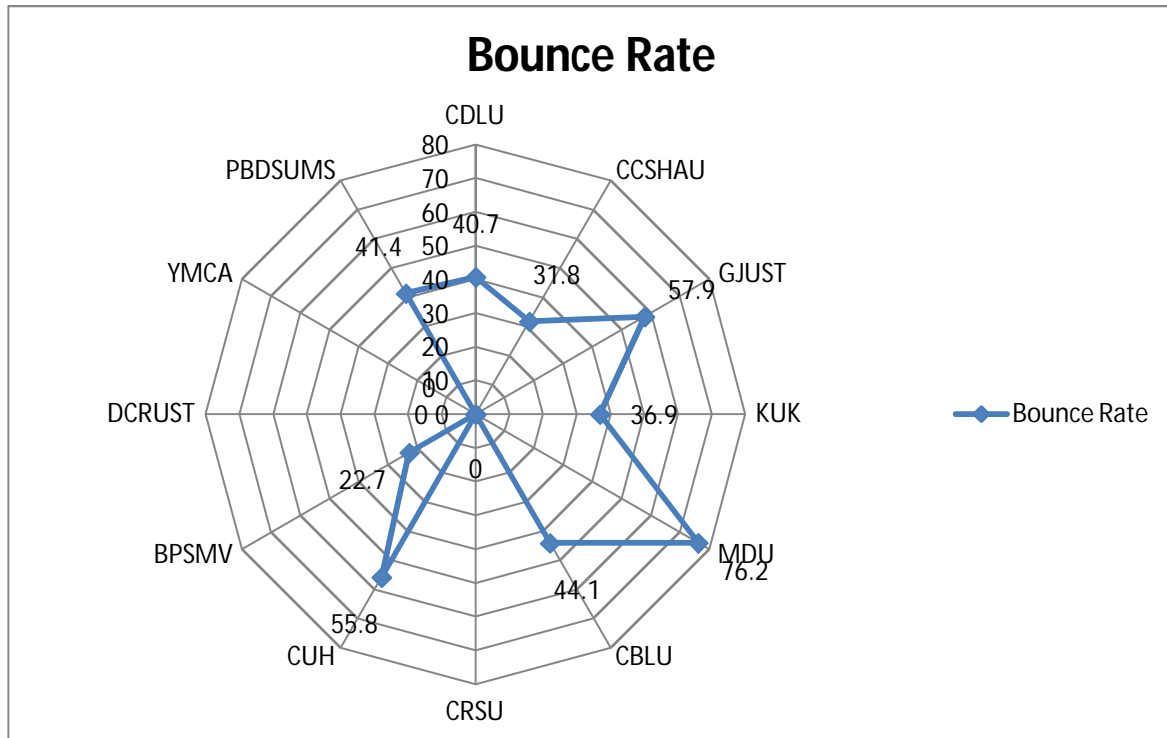
Search Traffic: CDLU (68.8) and CUH (68) have the highest search traffic and the search traffic on the website of PBDSUHS (15) is very low.

Figure 4: Search Traffic Of All Selected University
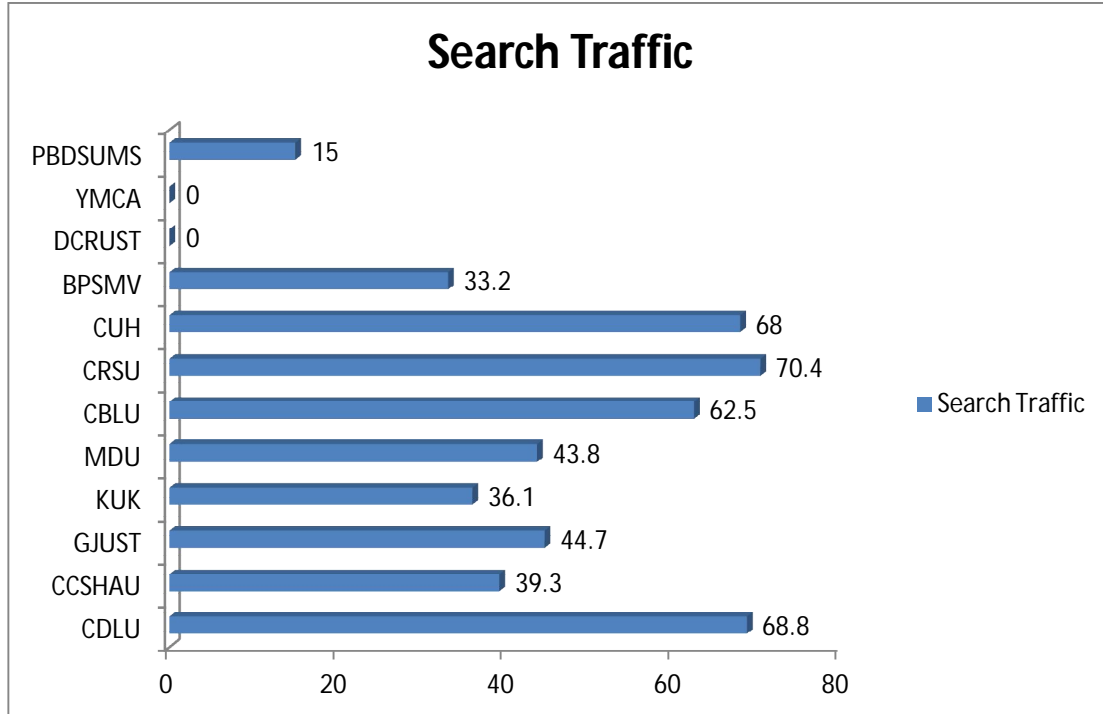
Daily time on site: According to the collected data, the time spent by the users on the BPSMV University website was the highest 10:34 minutes and followed by the users of KUK 4:49 minutes. The shortest time is spent to the MDU website with 0:49 minutes and 1:42 minutes on PBDSUMS. In this short time a lot cannot be search. These can be bounce rate users. Surfing time range of university website is 1:42 to 10:34 minutes.

Figure 5: Daily Time On Site Of Users Of All Selected University
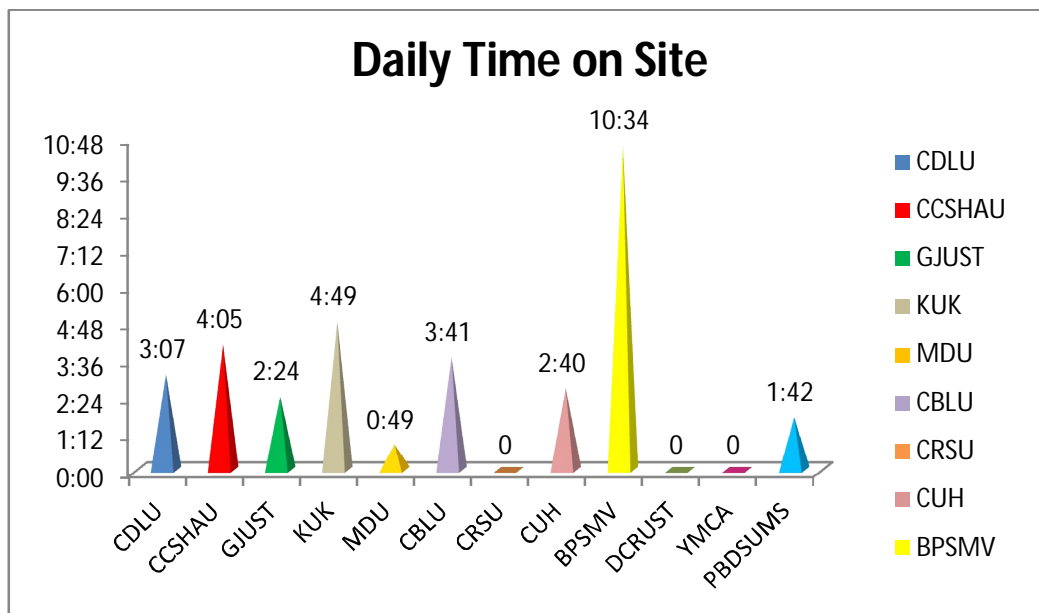
1. **Daily page views per visitors:** No matter how many times same user views a same page in the same day on the same site, they get only one point [10] (**https://support.alexa.com/hc/en-us/articles/200449744-How-are-Alexa-s-traffic-rankings-determined-**). In this way, the average number of pages viewed by a user is based on the unique user's page usage. When checked by Alexa, the figure 6 shows that BPSMV has a daily average page view of 6.5, followed by KUK and CDLU with 3.5 and CRSU has the lowest Page view 1 and MDU 1.3.

Figure 6: Daily Page Views By Per Visitor Of All Selected University
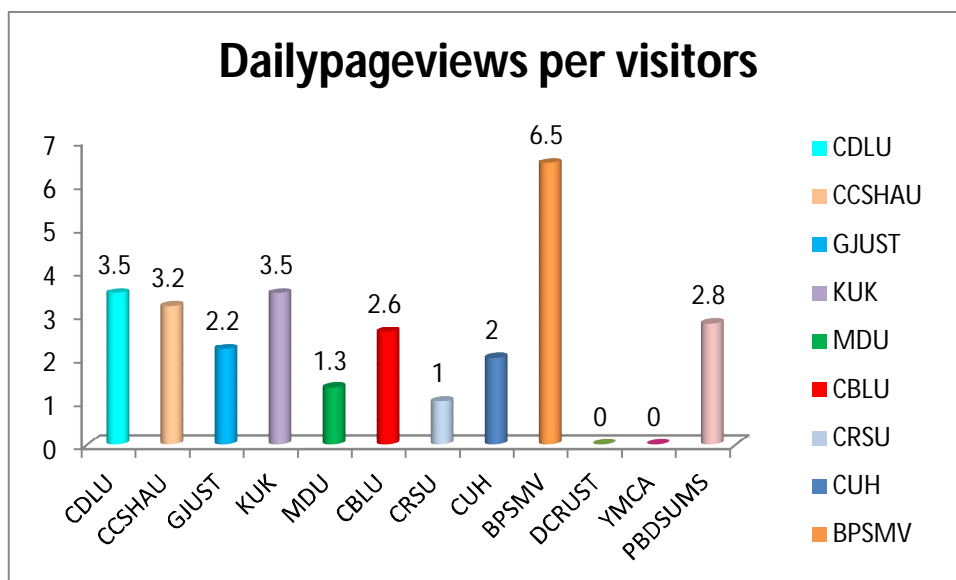
Ranks: are given on the basis of daily visits and daily page views. Out of thirteen, users accessing the nine university website are from India. The lower the rank of any university website, then that university website is more important. BPSMV's rank is the lowest at the global (30763) and India level (2547). KUK has the rank on global (51990) and Indian level (4804). CRSU has the highest rank 6730253 on global level, which has also increased compared to the last three months. While CCSHAU 's and CBLU rank has decreased with 431763 and 345622 compared to the last three months, its popularity has increased.

Figure 7: Rank Of All Selected University
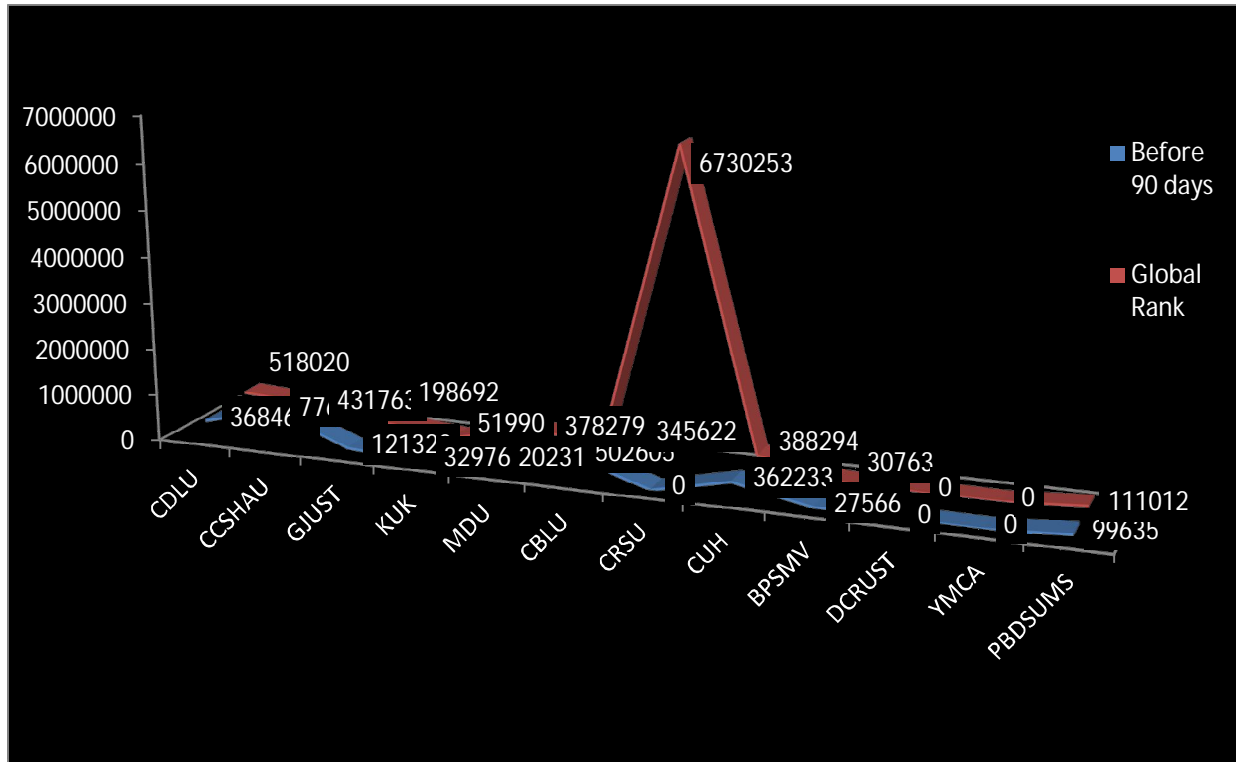
Top Keywords: Most of the websites were opened for viewing results, date sheet, admissions etc. in all the universities. Not for accessing digital initiatives and libraries.

Table 4: Top Keyword Used To Access All Selected University

	Top Keyword
CDLU	cdlu, chaudhary devi lal university, cdlu digital university, cdlu result
CCSHAU	hau, ccs hau, ccs hau admin, hau recruitment, ccshau
GJU	gju, guru jambheshwar university, guru jambheshwar university of science and technology, gju result, guru jambheshwar university hisar
KUK	kurukshetra university, kuk, kuk result, kuk student login, kurukshetra university address
MDU	mdu, mdu result, mdu rohtak, mdu notice, maharshi dayanand university
CBLU	cblu, chaudhary bansi lal university, cblu recruitment, cblu datesheet, cblu result
CRSU	crsu, chaudhary ranbir singh university, crsu jind, crsu datesheet, crsu result
CUH	central university, cuh, haryana university, centraluniversity
BPSMV	bhagat phool singh mahila university, bps khanpur, khanpur university, bhagat phool
DCRUST	dcrust, deenbandhu choturam university, dcrust edp, dcrust murthal, dcrustm ago
YMCA	bose institute, jagadish chander, jagadish chander bose institute,
PBDSUMS	uhsr, pgms rohtak. uhsr haryana, uhsr result, pandit bhagwat dyal sharma

Table 5: Cumulative Data Obtained From Alexa Of Digital Initiatives Websites

	Before 90 days	Global Rank	India	Visitors from India	Foreign	Daily Time on Site	Daily pageviews per visitors	Search Traffic	Bounce Rate	Total site linking in
INFLIBNET	18459	20206	2163	86.3%	13.7%	5:58	4.8%	61.5%	40.5%	3177
SWAYAM PRABHA	413878	441296	64085	100.00%	0	3:60	3.4%	…..	38.5%	114
SWAYAM	23424	30636	2578	94.1%	5.9	3:03	2.3	28.3%	30.30%	198

NDL	770478	1090767	….	….			5:23	9.17	…..	25	54
INFLIBNET	shodhganga, nlist, education,										
SWAYAMPRABHA	swayamprabha, swayam prabha, swayam, swayam login,										
SWAYAM	….										
NDL	Ndli, ndli login, ndl										

All the programs have been started by MHRD via INFLIBNET. The table shows that it has the highest bounce rate. Yet on average 5:58 minutes of time is spent on it. Its links have the highest 3177, which shows its reputation and popularity. It is also used in abroad. Its global rank 20206 and Indian rank 2163 is very good that shows website is fully developed with all appropriate contents. While the total number of link 114 is very less of Swayamprabha. Global rank and India rank is very high, which is not good. Looking at the top keywords used for INFLIBNET, SWAYAMPRABHA, SWAYAM and NDLI access shows that Shodhganga and eShodhSindhu are used a lot. And the links of the NDLI are 54, and SWAYAM has 198, despite being less, these are popular.

Table 6: Digital Initiatives On University Websites

	KUK	MDU	GJU	CDLU	CCS HAU	CBLU	CRSU	CUH	BPSMV	DCRUST	YMCA	PBDSUMS	Frequency (%)
SWAYAM	0	1	1	1	1	1	0	1	1	0	1	0	8(66.67%)
SWAYAMPRABHA	0	1	0	1	0	1	0	1	0	0	0	0	4(33.33%)
NDLI	0	1	1	1	0	1	0	1	1	0	1	0	7(58.33)
eShodhSindhu	1	1	1	1	0	1	0	1	1	0	1	0	8(66.67%)
Shodhganga	0	1	1	1	0	1	0	0	0	0	0	0	4(33.33%)
ShodhShudhi	0	0	1	0	0	0	0	0	0	0	0	0	1(8.33%)
ePG-PathShala	0	1	1	1	0	1	0	1	1	0	0	0	6(50%)
IndCat	0	0	0	0	0	0	0	0	0	0	0	0	0
VIDWAN	0	1	0	0	0	0	0	1	0	0	0	0	3(25%)
VIDYAMITRA	0	1	0	0	0	0	0	0	0	0	0	0	1(8.33%)

To analyse, which digital projects have been provided on the university's website, As per the study, eight universities have provided links to SWAYAM and eShodhSindhu. Seven universities have provided links for NDLI, six for ePG-Pathshala, four for SwayamPrabha and Shodhganga. While there is no attention on IndCat, VIDWAN (1), and VidyaMitra (1).

Table 7: Usability Features Of Higher Educational Digital Initiatives' Website

	SWAYAM	SWAYAMPRABHA	NDL	SHODHGANGA	SHODHSINDHU	SHODHSHUDHI	ePGPathShala	IndCat	VIDWAN	VIDYAMITRA	Frequency (%)
About that initiatives	1	1	1	1	1	1	1	1	1	1	10(100%)

Contact us Link	1	1	1	1	1	1	1	1	1	1	10(100%)
Guidelines	1	1	1	1	1	1	1	1	1	1	10(100%)
Easy Registration	1	1	1	1	1	1	1	1	1	1	10(100%)
Members	1	1	1	1	1	1	0	1	1	1	9(90%)
Advanced Search	1	1	1	1	1	1	1	1	1	1	10(100%)
Relevency	.gov	.gov	.gov	INFLIBNET of UGC	INFLIBNET of UGC	INFLIBNET of UGC	INFLIBNET of UGC	INFLIBNET of UGC	INFLIBNET of UGC	INFLIBNET of UGC	10(100%)
Services	1	1	1	1	1	1	1	1	1	1	10(100%)
Website update date	1	0	1	1	1	1	1	1	1	1	9(90%)
E-Resource Direct Link	1	1	1	1	1	1	1	1	1	1	10(100%)
Feedback	0	1	1	1	1	1	1	1	1	1	10(100%)
FAQ	0	1	1	0	0	0	0	1	0	0	3(30%)

All of these initiatives' webpages have been updated. They are easy to use and may be used by anyone. Each endeavour comes with detailed instructions and guidelines. It takes very little effort to register. This link can be found on the home page. These portals provide whatever resources they have. They can be accessible with a single click as well. IndCat, VIDWAN, and other databases offer advanced search options. The website is updated on a regular basis. In the event of a problem, the contact or FAQ facility can be used at any time. All of these projects and programmes were initiated by the Ministry of Human Resources and Development with the goal of improving educational and research quality. And, based on the findings, it appears that everyone would be benefited from these higher educational digital activities. These knowledge portals have been properly designed for this purpose. However, they must be used more frequently. It is essential that universities and colleges promote their use in this regard.

Table 8: Usability Feature Of Content Of Digital Initiatives On University Websites

	KUK	MDU	CDLU	CCSHAU	GJU	CBLU	CRSU	CUH	BPSMV	DCRUST	YMCA	PBDSUMS	Frequency(%)
Contact us Link	0	0	0	0	0	0	0	0	0	0	0	0	0(0%)
Homepage	1	1	0	1	1	1	0	1	1	0	0	0	7(58.33%)
Guidelines (How to use it)	0	0	0	0	0	0	0	0	0	0	0	0	0(0%)

													Total
About digital initiatives	0	0	0	0	0	0	0	0	0	0	0	0	0(0%)
Committee	1	0	0	0	0	0	0	0	0	0	0	0	1(8.33%)
Direct Link with digital initiatives	1	1	1	0	1	1	1	1	1	0	1	0	9(75%)
Search	1	1	1	1	1	1	1	1	1	1	1	1	12(100%)
Library webpage	1	1	1	0	1	0	0	1	1	0	1	0	7(58.33%)
Website update	0	0	04-01-2021	04-01-2021	0	2021	2020	0	0	21-05-2019	05-01-2021	24-04-2017	7(58.33%)
Services	0	0	0	0	0	0	0	0	0	0	0	0	0(0%)
Feedback	0	0	0	0	0	0	0	0	0	0	0	0	0(0%)

The e-resources given by digital initiatives should be used to their full potential. As a result, a survey of all university websites was conducted by using a checklist to ensure that the university has provided where, how, and how much space on their website for the use of the digital initiative's sources. There are no rules or guidelines for using it at any university. Furthermore, 75% of institutions have provided direct links to various digital initiatives on their websites.

A direct link of digital initiatives has been provided by 58.33 percent of university's home page. In which KUK has simply reported about the meeting regarding digital initiatives on university website. 58.33 percent of universities have provided access to eShodhSindhu through their library's webpage. Seven universities are updated their websites regularly. Furthermore, some universities neither update their websites frequently nor pay attention to digital efforts.

Interpretation And Discussion

On the basis of results, the websites of BPSMV and KUK have been accessed more than another universities. CRSU, DCRUST and YMCA have no web rank, search traffic and bounce rate. As per the search traffic of BPSMV, its bounce rate is very high. However, looking at the most often used top keywords reveals that these universities' websites have been visited frequently to view datesheets, examinations, results, and prospectuses, among other things. The top keyword search reveals why the user visited to the page. The time spent on the site, top keywords in searching, and daily page views by the users can all be used to determine what information users viewed and for how long. These universities do not have access to the resources supplied by digital initiatives or libraries.

Alexa can only assess a domain, not a subdomain or a specific webpage. As a result, the websites of VIDWAN, VIDYAMITRA, e-ShodhSindhu, and other INFLIBNET (UGC) projects are not studied independently. The INFLIBNET website is quite powerful. Shodhganga is widely used, as evidenced by keywords. As a result, this website becomes more powerful and its global ranking is correct. It is popular not only in India but also internationally. As found in the study of Maqbool [11] (2019), Shodhganga has a very good global and Indian rank and web impact

factor is the highest of NDLI. The daily views per visitor to the portal itself are 6.66 pages and its bounce rate is low. The study found that the daily time spent on site is 9:66 minutes. And it is very famous. Daily time spent at NDLI site is 6:48 minutes.

Based on the findings of the checklist, it can be concluded that all of the websites of digital projects provide full and up to date information. However, when assess the usage and status of digital initiatives in universities, only few universities have provided link to the Digital Initiative on their websites. However, they have not provided necessary full information. Furthermore, little efforts have been made to raise their knowledge and awareness about the usage of resources provided by higher educational digital initiatives.

Finding And Suggestion

1. The library should organise workshops and orientation programs to encourage users to use it.
2. Any information should be presented on the website in a straightforward, user-friendly, appealing, and useful manner.
3. It is necessary to make efforts to create awareness among researchers, faculty, and students.
4. To improve university websites, we will need to provide detailed information about digital projects in higher education.
5. Websites must be updated on a regular basis because they are a significant source for accessing various types of e-resources.
6. Users should be regularly encouraged, accustomed, and updated through training programmes.

Conclusion

All digital programmes of INFLIBNET such as eShodhSindhu, Shodhganga, ePG-PathShala, and URKUND, are being made available by the library since its arrival. As eShodhSindhu is comprising of three consortiums UGC INFONET, N-LIST, and INDEST-AICTE. However, in order to boost their utilisation and create user awareness, the website must be improved. The digital presence of students and staff has an impact on the status and use of the university's website. The findings demonstrate that these universities' websites were used for information about results, examinations, datesheets, and admissions, rather than for the digital initiative's resources. There has been little information regarding digital projects on some universities. The more information there is on the website, the more people will use it.

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SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL ACTIVITY OF SOME NOVEL BI-PYRAZOLYL DERIVATIVES

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ABSTRACT

Bi-pyrazolyl and its derivatives, an important class of heterocyclic compound, are of both biological and chemical interest. This study is concerned with the synthesis and characterization of Bi-pyrazolyl derivatives derived from substituted acetophenones and substituted hydrazine by two step reaction. The first step synthesis of 1-substituted-3-aryl-1H-pyrazole-4-carbaldehydes derivatives was synthesized by substituted acetophenones, substituted hydrazine, and DMF in phosphorus trichloride (POCl$_3$) in the scientific microwave oven 20%, 140 watts.   In second step substituted hydrazine, acetone, and 10% NaOH react with 1-substituted-3-aryl-1H-pyrazole-4-carbaldehydes derivatives in the scientific microwave oven (20%, 140 watts) gave different phenyl-2H, 1'H-[3, 4'] bipyrazolyl derivatives with good yield. All the prepared compounds were characterized by FT-IR, H^{1}NMR, and ^{13}CNMR. All the prepared compounds were studied biologically active by PASS.

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Introduction

In 1893, the first bipyrazolyl series was produced[1]. Since then, there have been several publications about bipyrazolyl derivatives in the literature [2]. Such compounds are a very remarkable class of heterocycles that have significant pharmacological activities. For example, they were reported to take potential antitumor[3], anti-inflamatory[4-6], antimicrobial[7], cytotoxic[8,9], antiallergic[10], cardiovascular[11], and diuretic[12] activities. Bipyrazoles were also found to be beneficial as insecticides[13], herbicides[14], fungicides[15-17], in the photographic and paint industry[18-20], and in the synthesis of heat resistant polymers[21]. Furthermore, bipyrazole derivatives have been utilised to prevent or treat a variety of disorders caused by active oxygen[22], and as scavenging agents for free radicals[23].

In most cases, Bipyrazolyl derivatives are often made through cyclization processes[24]. However, one of the most versatile techniques for the production of five-membered heterocycles is 1, 3-dipolar cycloaddition[25], and Diarylnitrilimines[26] or diazocompounds[27] as reagents have also been used to make bipyrazoles in these processes. Hydrazones produce azomethine imine intermediates that can undergo a 1,3-dipolar cycloaddition process by causing a thermal 1,2-hydrogen shift that has been known since 1978[28]. It has been reported that if a carbonyl group is present in an appropriate place, a protonated substrate can intramolecularly help the hydrazone-azomethine imine isomerization under mild conditions[29]. However, in most cases the intermolecular cycloaddition of thermally produced azomethine imines with highly activated dipolarophiles must be carried out under reflux in high-boiling solvents with long reaction times [30]. These necessities reduce the synthetic utility of the reaction.

Observing to the importance of bipyrazolyl derivatives, we intended to synthesize new entities like 2-(2, 4-Dinitro-phenyl)-5-methyl-3'-phenyl-2H,1'H-[3,4']bipyrazolyl [5-a], 5-Methyl-2,3'-diphenyl-2H,1'H-[3,4']bipyrazolyl [5-b], 3'-(4-Methoxy-phenyl)-5-methyl-2-phenyl-2H,1'H-[3,4']bipyrazolyl [5-c], 2-(2,4-Dinitro-phenyl)-3'-(4-methoxy-phenyl)-5-methyl-2H,1'H-[3,4']bipyrazolyl [5-d], 3'-(4-Methoxy-phenyl)-5-methyl-2,1'-diphenyl-2H,1'H-[3,4']bipyrazolyl [5-e], 2-(2,4-Dinitro-phenyl)-3'-(4-methoxy-phenyl)-5-methyl-1'-phenyl-2H,1'H-[3,4'] bipyrazolyl [5-f], 5-Methyl-3'-(4-nitro-phenyl)-2-phenyl-2H,1'H-[3,4']bipyrazolyl [5-g], 2-(2,4-Dinitro-phenyl)-5-methyl-3'-(4-nitro-phenyl)-2H,1'H-[3,4'] bipyrazolyl [5-h], 5-Methyl-3'-(4-nitro-phenyl)-2,1'-diphenyl-2H,1'H-[3,4'] bipyrazolyl [5-i] and 2-(2,4-Dinitro-phenyl)-5-methyl-3'-(4-nitro-phenyl)-1'-phenyl -2H,1'H-[3,4'] bipyrazolyl [5-j].

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PASS

PASS is a software program that predicts 565 probable biological activities of a user-selected (set of) compound(s). These activities contain 5-hydroxytryptamine antagonists, neuromuscular blocking agents, Antibiotics, antidepressants, antiviral agents, contraceptives, tumor necrosis factor antagonists, and many others. Novel pharmacological compounds with anxiolytic, anti-inflammatory, antihypertensive, anticancer, and other effects have been discovered using PASS predictions. PASS applies to chemical library having millions of compounds.

The biological activities of chemical substances are correlated to their physicochemical properties by some functions as shown in equation (1).

Biological activity = f (physicochemical properties)…….. (1)

Thus, "the biological activity spectrum" is defined as the "intrinsic" property of a substance that depends only on its structure and physicochemical characteristics. Prediction of this spectrum by PASS is based on SAR analysis of the training set containing thousands of compounds that have several types of biological activities. In PASS *biological activities* are described qualitatively.

Importance of PASS

1. Experimental determination of the biological activity of a drug is a time and Cost-consuming method, so making the use of PASS is usually significant.
2. PASS can be efficiently used for the discovery of compounds with required properties and without undesirable side effects.
3. It is used for choosing the most probable compounds from the set of available samples for a specific screening.
4. For determining more related screens for a particular compound.

Due to the importance of PASS, it is used in the current study as a tool to design the drug with the highest probable activity.

Experimental

The Melting points were determined in open capillary tubes and are uncorrected. The IR spectra were recorded in KBr pellets on a Nicolet 400D spectrometer and ^{1}H NMR spectra were measured in $CDCl_3$ with TMS as internal standard on a Bruker spectrometer at 400 MHz. LC-MS of selected samples taken on LC-MSD-Trap-SL_01046 Purity of the compounds was checked by TLC on silica- G plates. Anti-microbial activities are check by using pass software.

Synthesis of 1-substituted-3-aryl-1H-pyrazole-4-carbaldehydes (3a-e): In 100 mL round bottom flask 0.02 mol substituted acetophenone **(1a-c)**, 0.02 mol substituted hydrazine **(2a-b)** and 10 mL DMF were mixed in ethanol (30 mL). $POCl_3$ solution (1 mL) was added and microwaves were used to irradiate the reaction mixture for 4-5 minutes at 20% microwave power (140 W). TLC was used to confirm the reaction's completion (Ethyl acetate: Hexane 1:9). The reaction mixture was allowed to cool at room temperature, transferred into crushed ice. The solid was filtered, washed with a little amount of ethanol, and then refined by recrystallization from ethanol to get pure products **(3a-e)** (**Scheme-I**).

Synthesis of phenyl-2H, 1'H-[3, 4'] bipyrazolyl (5a-j): A 100 mL round bottom flask 0.001 mol 3-Phenyl-1H-pyrazole-4-carbaldehyde **(3a-e)**, 0.001 mol substituted hydrazine **(4a-b)**, 10 mL acetone were mixed in ethanol (30 mL) and 10% NaOH solution were added. Microwaves were used to irradiate the reaction mixture for 5-7 minutes at 20% microwave power (140 W). TLC was used to confirm the reaction's completion (Ethyl acetate: Hexane 1:9). The reaction mixture was allowed to cool at room temperature, transferred into crushed ice. The solid was filtered, washed with a little amount of ethanol, and then refined by recrystallization from ethanol to get pure products **(5a-j)** (**Scheme-II**). Details of the synthesis of bipyrazolyl under microwave irradiation are summarized in Table-1.
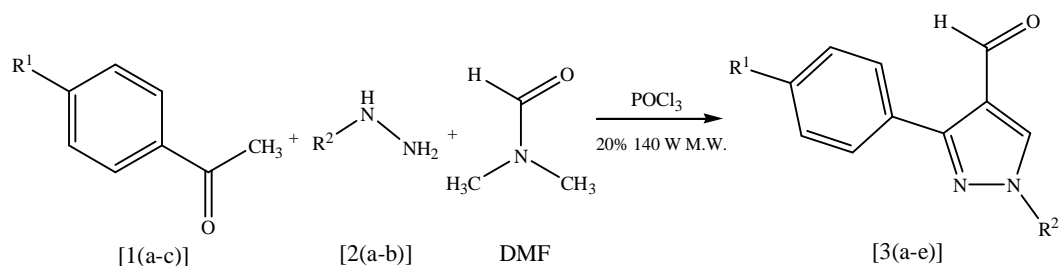
Scheme-I: Synthesis of 1-substituted-3-aryl-1H-pyrazole-4- carbaldehydes
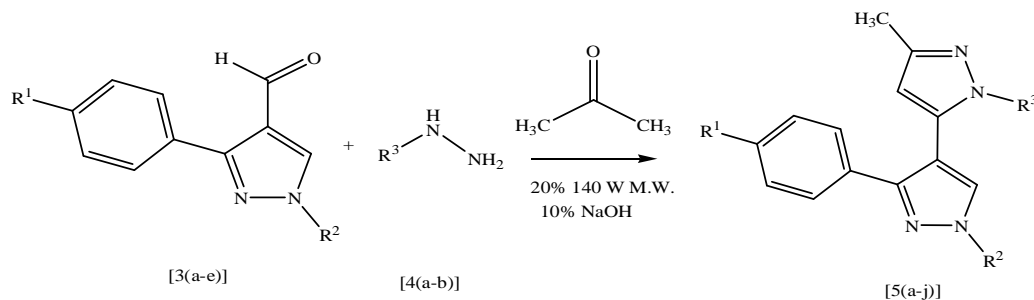
Scheme-II: Synthesis of phenyl-2H, 1'H-[3, 4'] bipyrazolyl

2-(2, 4-Dinitro-phenyl)-5-methyl-3'-phenyl-2H, 1'H-[3, 4'] bipyrazolyl (5a): Yield: 83%; Time (min.): 5; m.p. 214 ^{0}C; m. f. $C_{19}H_{14}N_6O_4$; IR (KBr, v_{max}, cm^{-1}): 1124.14 (C- N), 1241.86 (N-N), 1492.90 (-NO$_2$), 1583.56 (C=N), 3095.75 (Ar-CH), 3309.85 (NH); ^{1}H NMR (δ ppm): 2.33 (s, 3H, CH$_3$), 6.45 (s, 1H, =CH), 7.42-7.44 (d, 1H, =CH), 7.61-7.64 (m, 5H, C$_6$H$_5$), 7.81-7.84 (d, 1H, =CH), 8.44-8.47 (d, 1H, =CH), 8.75 (s,1H, =CH), 9.52 (s, 1H, NH) ; ^{13}C NMR(δ ppm): 13.50(–CH$_3$), 108.03(=CH), 115.16(=C<), 121.58(=CH), 126.58(2×=CH), 127.58(=CH), 128.20(=CH),129.00(2×=CH), 130.50(=CH), 136.34(=C<), 137.17(=C<), 138.60(=CH), 142.34(=C<), 144.30(=C<), 145.20 (=C<), 146.58(=C<), 150.00(=C<); MS: *m/z* (M$^+$1 390).

5-Methyl-2, 3'-diphenyl-2H, 1'H-[3, 4'] bipyrazolyl (5b): Yield: 76%; Time (min.): 5; m. p. 209^{0}C; m. f. $C_{19}H_{16}N_4$; IR (KBr, v_{max}, cm^{-1}): 1075.24(C-N), 1217.24 (N-N), 1504.20(C=C), 1600.35(C=N), 3021.24(Ar-CH), 3300.56(NH) ; ^{1}H NMR (δ ppm): 2.33(s, 3H, CH$_3$), 6.45(s, 1H, =CH), 7.37- 7.40 (m, 5H, C$_6$H$_5$), 7.60-7.64(m, 5H, C$_6$H$_5$), 7.91 (s, 1H, =CH), 9.52 (s, 1H, NH); ^{13}C NMR(δ ppm):13.47(–CH$_3$), 108.48(=CH), 115.16(=C<), 124.21 (2×=CH), 126.23(2×=CH), 127.58(=CH), 128.00(=CH), 128.43(2×=CH), 128.94(2×=CH), 137.17(=C<), 138.60(=CH), 139.71(=C<),

142.22(=C<), 144.40(=C<), 149.78 (=C<); MS : *m/z* (M$^+$1 300).

3'-(4-Methoxy-phenyl)-5-methyl-2-phenyl-2H, 1'H-[3,4'] bipyrazolyl (5c): Yield:78%; Time(min.): 6; m. p. 217^{0}C; m. f. $C_{20}H_{18}N_4O$; IR (KBr, v_{max}, cm^{-1}): 1160.36(OCH$_3$), 1217.24(N-N), 1500.04(C=C), 1577.84(C=N), 3012.04(Ar-CH), 3300.56(NH) ; ^{1}H NMR (δ ppm): δ 2.36(s, 3H, CH$_3$), 4.00(s, 3H, OCH3), 6.44(s, 1H, =CH), 7.51-7.54 (m, 5H, C$_6$H$_5$), 7.71-7.74(m, 4H, C$_6$H$_4$), 7.89(s, 1H, =CH), 9.59(s, 1H, NH); ^{13}C NMR(δ ppm):13.43(–CH$_3$), 55.34(OCH$_3$), 108.46(=CH),114.23(2×CH), 115.10(=C<), 124.65(2×=CH), 127.34(=CH), 128.41(2×=CH), 128.94(2×=CH), 137.15(=C<), 138.83(=C<), 139.74(=C<), 142.35(-CH), 144.41(=C<), 149.48(=C<), 160.04(=C<); MS : *m/z* (M$^+$1 330).

2-(2,4-Dinitro-phenyl)-3'-(4-methoxy-phenyl)-5-methyl-2H,1'H-[3,4'] bipyrazolyl (5d): Yield:81%; Time(min.): 6; m. p. 229^{0}C; m. f. $C_{20}H_{16}N_6O_5$; IR (KBr, v_{max}, cm^{-1}): 1295(C-O), 1515(-NO$_2$), 1595(C=N), 1600 (C=C), 3040(Ar-H), 3333(-NH); ^{1}H NMR (δ ppm): δ 2.33(3H,s,CH$_3$), 3.80(3H,s,OCH$_3$), 6.44(H,s,=CH), 6.97-7.73(4H,m,C$_6$H$_4$), 7.42(H,d,=CH), 7.93(H,d,=CH), 8.48(H,d,=CH), 8.78(H,s,=CH), 9.52(H,d,NH); ^{13}C NMR(δ ppm): 13.44(–CH$_3$), 55.37(OCH$_3$), 108.47(=CH), 114.21(2×=CH),115.07(=C<), 121.22(=CH), 128.22 (=CH), 128.40(2×=CH), 130.13(=CH),

136.81(=C<),   137.14(=C<),   138.84(=CH), 142.38 (=C<), 144.42(=C<), 145.41(=C<), 146.51(=C<), 149.50(=C<), 160.07(=C<); MS : *m/z* (M$^+$1 496).

3'-(4-Methoxy-phenyl)-5-methyl-2,1'-diphenyl-2H,1'H-[3,4']bipyrazolyl (5e):

Yield:79%; Time(min.): 6; m. p. 212^{0}C; m. f C$_{26}$H$_{22}$N$_4$O; IR (KBr, $\nu_{max,}$ cm^{-1}): 1293(C-O), 1598(C=N), 1605 (C=C), 3042(Ar-H),.; ^{1}H NMR (δ ppm): δ 2.36(3H,s,-CH$_3$), 3.82(3H,s,OCH$_3$), 6.44(H,s,=CH), 6.97-7.73(4H, m, C$_6$H$_4$), 7.11-7.31(5H,m,C$_6$H$_5$), 7.33-7.72(5H,m,C$_6$H$_5$), 8.27(H,s,=CH); ^{13}C NMR(δ ppm): 13.45(–CH$_3$), 55.35(OCH$_3$), 108.48(=CH), 114.23(2×=CH) ,115.09(=C<), 118.95(2×=CH),   124.36(=CH), 124.68(2×=CH), 126.85 (=C<), 127.36 (=C<), 128.41(2×=CH),   128.96(2×=CH), 129.50(2×=CH),137.17(=C<),   139.71(=C<), 139.90 (=C<), 142.37(=C<), 144.40 (=C<), 149.49(=C<), 160.05(=C<); MS : *m/z* (M$^+$1 406).

2-(2,4-Dinitro-phenyl)-3'-(4-methoxy-phenyl)-5-methyl-1'-phenyl-2H,1'H-[3,4'] bipyrazolyl (5f):

Yield:83%; Time(min.): 6; m. p. 241^{0}C; m. f. C$_{26}$H$_{20}$N$_6$O$_5$; IR (KBr, $\nu_{max,}$ cm^{-1}): 1288(C-O), 1515 (-NO$_2$), 1583(C=N), 1585 (C=C), 3045(Ar-CH); ^{1}H NMR (δ ppm): δ 2.37(3H,s,-CH$_3$), 3.82(3H,s,OCH$_3$), 6.44 (H,s,=CH), 6.96-7.72(4H,m ,C$_6$H$_4$) , 7.31-7.70(5H,m,C$_6$H$_5$),   7.41(H,d,=CH), 8.26(H,s,=CH), 8.47(H, d,=CH) ,8.79 (H, s, =CH); ^{13}C NMR(δ ppm): 13.43(–CH$_3$), 55.36(OCH$_3$), 108.50(=CH), 114.24(2×=CH), 115.11(=C<) , 118.96(2×=CH), 121.21(=CH), 124.37 (=CH) 126.86(=C<), 128.21(=CH), 128.42(2×=CH),   129.51(2×=CH), 130.11(=CH),   136.81(=C<),137.18(=C<), 139.91(=C<),   142.36(=C<), 144.41(=C<),145.41(=C<),146.51(=C<),149.51(=C<),160.06(=C<); MS : *m/z* (M$^+$1 496).

5-Methyl-3'-(4-nitro-phenyl)-2-phenyl-2H,1'H-[3,4']bipyrazolyl (5g):

Yield: 81%; Time (min.): 7; m. p. 249^{0}C; m. f. C$_{19}$H$_{15}$N$_5$O$_2$,;   IR (KBr, $\nu_{max,}$ cm^{-1}): 1062.78(C-N), 1217.08(N-N), 1421.54(-NO$_2$), 1589.34(C=N),1614.42(C=C),   3095.75(Ar-CH), 3309.85(NH) ; ^{1}H NMR (δ ppm): 2.38(s, 3H, CH$_3$), 6.46(s, 1H, =CH), 7.41-7.44(m, 5H, C$_6$H$_5$), 7.90(s, 1H, =CH), 8.21-8.24(m, 4H, C$_6$H$_4$), 9.56(s, 1H,NH); ^{13}C NMR(δ ppm): 13.42(-CH$_3$),   108.47(=CH),   115.09(=C<),

123.88(2×=CH),   124.68(2×=CH), 127.32(=CH),   127.93(2×=CH), 128.94(2×=CH), 137.17(=C<), 138.79(=CH), 139.70(=C<), 142.37(=C<), 144.39(=C<), 147.49(=C<), 149.52 (=C<); MS : *m/z* (M$^+$1 345).

2-(2,4-Dinitro-phenyl)-5-methyl-3'-(4-nitro-phenyl)-2H,1'H-[3,4']bipyrazolyl(5h):

Yield:76%; Time(min.): 6; m. p. 239^{0}C; m. f. C$_{19}$H$_{13}$N$_7$O$_6$; IR (KBr, $\nu_{max,}$ cm^{-1}): 1594 (C=C), 1520(-NO$_2$), 1598(C=N), 3033 (Ar-CH), 3330 (-NH); ^{1}H NMR (δ ppm): δ 2.34(3H,s,-CH$_3$), 6.44(H,s,=CH), 7.41(H, d, =CH), 7.80-8.24(4H,   m,   C$_6$H$_4$),   7.90(H,d,=CH), 8.47(H,d,=CH), 8.77(H,s,=CH) 9.51(H,d,NH),.; ^{13}C NMR(δ ppm): 13.44(–CH$_3$), 108.47(=CH), 115.07(=C<), 121.21(=CH), 123.96(2×=CH), 127.92(2×=CH), 128.21(=CH), 130.11(=CH), 136.81(=C<),   137.19(=C<),   138.83(=CH), 142.36(=C<), 144.42 (=C<), 145.02(=C<), 146.52(=C<), 147.50 (=C<), 149.48(=C<); MS : *m/z* (M$^+$1 435).

5-Methyl-3'-(4-nitro-phenyl)-2,1'-diphenyl-2H,1'H-[3,4']bipyrazolyl(5i):

Yield:77%; Time(min.): 6; m. p. 232^{0}C; m. f. C$_{25}$H$_{19}$N$_5$O$_2$; IR (KBr, $\nu_{max,}$ cm^{-1}): 1513(-NO$_2$), 1595 (C=N), 1600 (C=C), 3040 (Ar-CH); ^{1}H NMR (δ ppm): δ   2.36(3H,s,-CH$_3$),   6.45(H,s,=CH),   7.11-7.31(5H, m, C$_6$H$_5$), 7.33-7.72(5H,m,C$_6$H$_5$), 7.80-8.24(4H,m,C$_6$H$_4$),8.27(H,s,=CH); ^{13}C NMR(δ ppm): 13.43(–CH$_3$), 108.49(=CH), 115.09(=C<), 118.95(2×=CH), 121.20(=CH), 123.94(2×=CH), 124.36(=CH), 126.85 (=C<), 127.91(2×=CH),   128.20(=CH), 129.50(2×=CH), 130.10(=CH), 136.80(=C<), 137.17(=C<), 139.90 (=C<), 142.37(=C<), 144.40   (=C<),   145.00(=C<)146.50(=C<), 147.49 (=C<), 149.50(=C<); MS : *m/z* (M$^+$1 421).
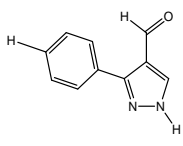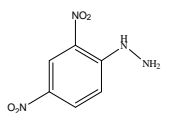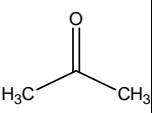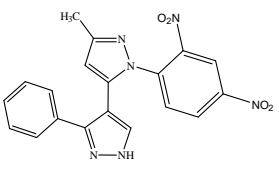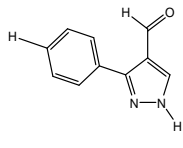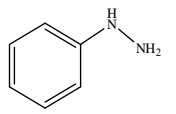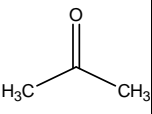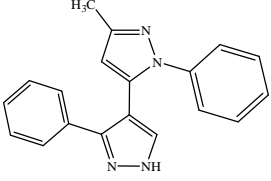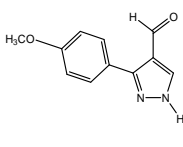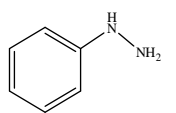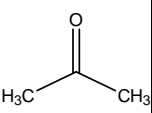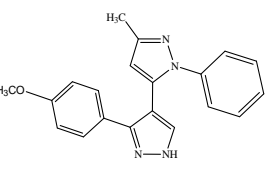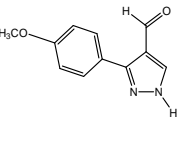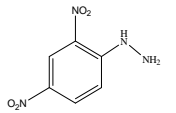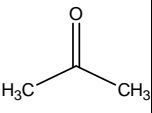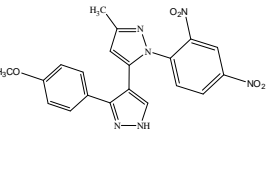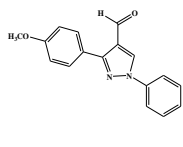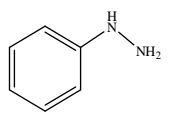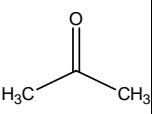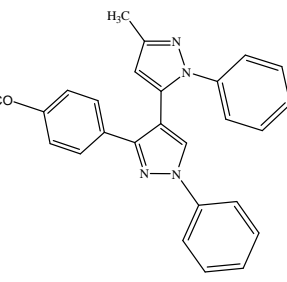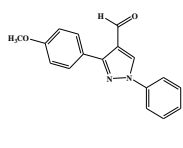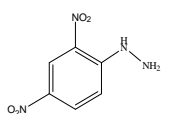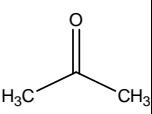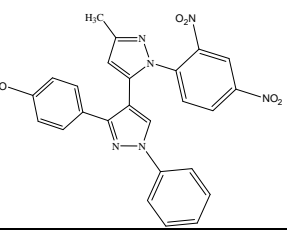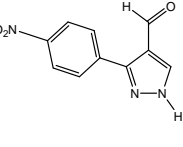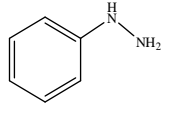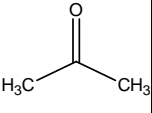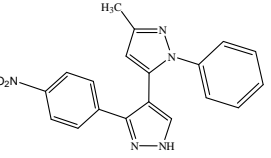
2-(2,4-Dinitro-phenyl)-5-methyl-3'-(4-nitro-phenyl)-1'-phenyl-2H,1'H-[3,4']bipyrazolyl (5j):

Yield:79%; Time(min.):6; m. p. 237^{0}C; m. f. C$_{25}$H$_{17}$N$_7$O$_6$; IR (KBr, $\nu_{max,}$ cm^{-1}): 1525(-NO$_2$), 1610 (C=C), 1635 (C=N), 3050 (Ar-CH); ^{1}H NMR (δ ppm): δ 2.34(3H,s,-CH$_3$), 6.47(H,s,=CH), 7.33-7.72(5H,m,C$_6$H$_5$), 7.80-8.24(4H,m,C$_6$H$_4$),   7.42(H,   d,=CH), 8.26(H,s,=CH),   8.48(H, d,=CH),   8.78 (H,s,=CH); ^{13}C NMR(δ ppm): 13.42(–CH$_3$), 108.44(=CH), 115.06(=C<), 118.95(2×=CH), 121.22(=CH), 123.94(2×=CH),124.34(=CH), 126.85 (=C<), 127.93(2×=CH), 128.25(=CH),

129.50(2×=CH), 130.12(=CH),136.80(=C<), 137.16(=C<), 139.91 (=C<), 142.36(=C<), 144.43 (=C<), 145.03(=C<) 146.51(=C<), 147.49 (=C<),149.52(=C<); MS : *m/z* (M$^+$1 511).

Table-1: Preparation of Bipyrazolyl Under Microwave Irradiation

Comp.	Substrate			Product	Time (min.)	m.p. (^{0}C)	Yield (%)
	1	2	3				
5a					5	215	84
5b					5	209	74
5c					5	215	78
5d					6	229	81
5e					5	212	79
5f					6	241	83
5g					7	249	81

5h	(structure)	(structure)	(structure)	(structure)	6	239	69
5i	(structure)	(structure)	(structure)	(structure)	5	232	77
5j	(structure)	(structure)	(structure)	(structure)	5	237	79

Result and Discussion

1. The compounds [3(a-e)] to [5(a-j)] show the variety of probable biological activities.

2. Only two activities viz. HMGCS2 expression enhancer and Liver fibrosis treatment are expected from nearly all the compounds [3(a-e)] to [5(a-j)].

3. Spectacular HMGCS2 expression enhancer activity is expected from the compounds [5-g] and [5-i]. Moreover [5-g] is expected to be more active than the monocyclic compound [5-i] due to the phenyl ring.

4. Liver fibrosis treatment activity is expected from each compound [3(a-e)] and [5(a-j)]. But the compound [5-b] is probably most active as compared to all.

5. Spectacular Signal transduction pathways inhibitor activity is also expected from bipyrazolyl compound [5-b]. This has more probable Cyclin-dependent kinase 2 inhibitor substrate activity.

6. MAP3K5 inhibitor, Hepatic disorders treatment, CDK9/cyclin T1 inhibitor, UGT2B12 substrate, Cyclin-dependent kinase inhibitor, and CYP19A1 expression inhibitor activities are also expected from certain of the compounds of this series.

7. Many of the compounds have Pa values between 0.5 and 0.7 and thus the compounds are possible to exhibit the activities and are most likely the new chemical entities due to the dissimilarities from the known pharmaceutical agents.

The compounds [5-g] and [5-i] are suggested for the HMGCS2 expression enhancer activity is a gene that regulates the ketone body production in the liver and extrahepatic tissues.

QSAR Analysis of Activities with PASS

The computer programme PASS was used to investigate the relationship between structure and several biological functions. Software was used to predict the probabilities of being active [Pa] and inactive [Pi] for a set of biological activities using the structures of derivatives [5(a-j)]. For the series of compounds [5(a-j)], the following three activities were predicted to have the highest probability.

(i) HMGCS2 expression enhancer (ii) MAP3K5 inhibitor (iii) Liver fibrosis treatment.

(i) HMGCS2 expression enhancer

HMGCS2, the gene that controls the production of ketone bodies, is carried in the liver and various extrahepatic organs, including the colon. In CaCo-2 colonic epithelial cells, the appearance of this gene

changes with cell differentiation. As a result of immunohistochemistry using particular antibodies, HMGCS2 is found mostly in differentiated cells of the human colonic epithelium. HMGCS2 is a direct target of c-Myc, which contains HMGCS2 transcriptional activity, according to the test. c-Myc trans repression is intermediated by blockade of the trans activating activity of Miz-1, which occurs generally through an Sp1-binding site in the proximal promoter of the gene. Human HMGCS2 expression is reduced in 90% of Myc-dependent colon and rectum cancers. In moderately and poorly differentiated carcinomas, HMGCS2 protein expression is down-regulated. It is also down-regulated in 80% of Myc-independent cancers in the small intestine.

(ii) MAP3K5 inhibitor

In the harbor, 288 melanomas with the MAP3K5 popularity screen remained. The wild form of BRAF was found in all MAP3K5-mutated samples, indicating that both mutations are mutually exclusive. The lowering of MKK4 activation due to greater binding of the inhibitory protein thioredoxin resulted in higher proliferation and anchorage-independent development of melanoma cells, according to functional study of the MAP3K5 R256C mutation. This mutation denotes a potential target for the design of original therapies to treat melanoma.

(iii)Liver fibrosis treatment

Liver fibrosis denotes the excessive removal of fibrous connective tissue in the liver, which is the effect of imbalance among fibrous hyperplasia and fibrous decomposition. Fibrous hyperplasia is a repair reaction of the body to damage. Reiterated chronic liver parenchyma inflammation and necrosis produced by many causes can lead to nonstop fibrous hyperplasia of the liver and form liver fibrosis. From the pathological changes of several chronic liver diseases, liver fibrosis is the essential stage for chronic liver diseases to develop into liver cirrhosis. It is said that liver fibrosis may be reversed to regular, but liver cirrhosis is not.

Table 2: Predictions of Biological Activities by Pass

Comp.	HMGCS2 expression enhancer	MAP3K5 inhibitor	Liver fibrosis treatment
	Pa	Pa	Pa
5a	0.606	0.498	0.438
5b	0.606	0.576	0.605
5c	0.539	0.521	0.442
5d	0.553	0.459	0.358
5e	0.511	0.513	0.250
5f	0.577	0.434	0.207
5g	0.702	0.516	0.472
5h	0.609	0.501	0.448
5i	0.694	0.507	0.260
5j	0.636	0.478	0.252

Conclusion

In conclusion, we have devised an effective approach for the selective synthesis of new 5-methyl-2, 1, 3'-triphenyl-2H, 1'H-[3, 4'] bipyrazolyl in an aqueous medium that takes 5-7 minutes and could be useful for drug development.

Acknowledgments

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ANALYSIS OF CONSUMER PERCEPTION ABOUT DIGITAL MODE OF PAYMENTS WITH SPECIFIC SURVEY IN MUMBAI SUBURBAN AREA DURING COVID-19

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ABSTRACT

When Western Union first time processed an electronic fund transfer in 1871, the efforts started to evaluate this mode of payments further but at very slow pace till 1960. In the year 1959 American Express brought the idea of plastic money in the form of cards as electronic payments. In the year 1972, Automated Clearing House (ACH) was developed so as to process a batch of large volumes of transactions. In the year 1960 ARPANET, a precursor to modern Web, was developed. It was built for military network to improve communication. Since 1990 the banks started offering online banking services to its customers. These first online payment systems were not user-friendly and required specific encryption knowledge and also the use of data transfer protocols. Initially there used to be a requirement of special equipment and software to send a payment for goods. Later the innovation of Web 2.0 was introduced for online sites to participate in online business which is known as e-commerce. In the year 1994 Amazon the pioneers of e-Commerce was founded, and a few other e-commerce websites were also started, which boosted the online payment and receipt transactions to larger extent. On the other hand it necessitated a robust security framework to safeguard these online payment transactions in e-commerce business. In today's world payment and acceptance can be integrated into websites and at the point-of-sale for betterment amongst merchants whether it is big or small[1] the researcher wishes to understand from common public of Mumbai suburban area about their opinion about using digital modes of payments vis-à-vis traditional payment methods. The survey has been conducted during the pandemic and lockdown situation in the state, when outside movement of people was restricted and all were advised to stay at home. The researcher has tried to ascertain though this study whether there is a shift in the mindset of public from physically visiting the bank branches or ATM centers etc. for doing financial transactions or to prefer the digital modes to pay utility bills, grocery shopping, insurance premium etc.

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Keywords: Digital modes of payment, E-Commerce, Internet access, Pandemic

Introduction

With the advent of electronic platform for retail shopping, majority of India's population has been attracted towards online shopping sites for various requirements. People who are not much acquainted with digital payment platforms are still opting for cash on delivery option for paying towards their purchases. Covid-19 and the consequent lockdown required people to stay home and this triggered the spike in online shopping and using online platform to work from home, for social and official meetings etc. Even the students started attending their schools, colleges and the classes on electronic platform. Those who used to prefer visiting banks physically for financial transactions or cutting cheques for making utility payments started exploring digital modes for these transactions. No doubt the online platform saves time and energy but the flip side of the same such as exposure to mobile or computer screen harming the eyesight and health, incremental cost of

internet and wifi is yet to be ascertained and compared. Separate study can be undertaken to find out the same. Mumbai being financial capital of India and is equipped with the latest technology, the researcher has chosen residents of Mumbai suburban area for the purpose of this study. Responses from 100 respondents have been gathered during the pandemic situation to find out their perception about the digital modes of payments.

Literature Review

1. Prof. Sana Khan Ms. Shreya Jain (2018)[2] In this paper they have studied the usage of e-payments and growth opportunity. In today's world you will notice that the number of customers using online payment mode is increasing day by day. Customers are moving from traditional shopping to online mode of shopping there are many reasons for this shift like convenience, variety, smart devices etc. Online shopping has really boomed as it provides the ease of purchasing and selling of the products, or

services, availability. As people's trust in this type of shopping is increasing this increasing the use of online payments also. Although there are many people who have started using the online mode of payment there still are few people who prefer the paying the cash on the delivery if the product. So basically, it is important for online business to the understand what are the consumer demands for better growth. This study was conducted by selecting 100 respondent's who use online payment options on the basis of ages, reason for using this payment, various problems faced by them. In conclusion we can say that the technology has also changed the consumer behaviour as well. It was also seen that organizations can also give a good experience and discounts to people if used electronic payment options.

2. Witold Chmielarz And Marek Zborowski (2017)[3] The aim of this article was to analyse the collected views of the customers that use electronic banking services by the clients in Poland by the end of 2016. The Research was done by using the CAWI method. There was a survey questionnaire which was cross verified by the finance experts, which was made available for the respondents on the server of the university of Warsaw. The analysis presented its diversity in the views of the customers in using e-banking system to meet the day-to-day work of the customer. We can notice that there is a new trend consisting the fact that the use of mobile has increased prominently, browsing through mobile based tools and using mobile based apps etc. We can also say that the change is evident and irreversibly this also accounts to the expectations and the demands of the customer as well.

3. Awais Ahmed, Abdul Aziz, Muhammad Muneeb (2019)[4] In this article they have studied the electronic transfer. In today's times electronic payments are rapidly increasing due to online shopping or Internet based banking. In todays twenty-first century electronic payments are becoming the first option for online money transfer. Use of Visa card, smart cards, debit cards, credit cards, e- wallets, UPI are

few of the options for e-payments. The important reason for the acceptance of the new payment method are three factors time, cost and security per transaction that takes place. In the paper the background of the study, types of electronic payments systems which are available and what do the customers choose is selected. In this research they have also identified the challenges that have been faced by e-payments and suggestion to solve this problem. The important motive of this paper is to introduces more people to the internet banking and e-payments.

4. Zlatko Bezhovski (2016)[5] As the internet developed and after arrival of the e-commerce this rapidly increase in the use of the electronic payment options like use of credit or debit cards, UPI, Net Banking, Mobile wallets method etc. The popularity of the mobile payment services is rapidly increasing and heading towards a promising future of tentative possibilities with innovation as well. In this paper they have evaluated the current state and growth of mobile payment and other e-payments options. They have analysed various systems of electronic payment, issues related to the security and the future of mobile payments modes as well. In this paper it is also examined the factors which are affecting the adoption of mobile payment. However, several barriers have been identified to the adoption for this payment method. The research was aimed to embrace the possible issues with electronic payment methods and consumer adoption of e-commerce to make payments easy.

5. S Fatonah, A Yulandari and F W Wibowo (2018)[6], the era of Information Communication Technology (ICT) had led to digital innovation which leads to changes in the business environment where e-payments are done. The electronic payment system was not introduced to replace the traditional cash but was introduce as a better alternative. E-payments can be understood as a payment mechanism using electrical media. That does not involve cash in hand. It is a very important part of e-commerce. This study

highlights e-payment systems on e-commerce with a view of the scope for e-payment system. In the scope there is a need to collect more information for research on how to increase the trust in electronic payment systems by the customer interest in for electronic payment systems and also the importance of the security in electronic payment systems as well.

Objectives and Need of the study

With Narsimham committee recommendations followed by the liberalization in Indian banking sector, Indian banking witnessed many positive changes in overall banking business. The approach was shifted to consumer friendly banking and many policies were initiated to support this approach[9]. Online banking services[8] was one of the initiatives, which enabled the customers to transact online and avail bank facilities, which were otherwise required actual bank visit. Digital or online fund transfer through net banking facility, such as RTGS, NEFT, IMPS or payment wallets and mobile apps further helped the customers to transfer the funds or to make and receive the funds immediately. These modes of payments have considerably reduced dependence on the traditional mode of payments, like cheques, demand drafts etc. and have also accelerated actual realization of money, which in turn has helped the business. When we have all these facilities in place, it is also necessary to find out the awareness among the people and their views about these facilities. Online payments involve blend of banking and technology and requires use of computer or smart phone to make use of different payment apps or mobile banking services. Hence, various parameters such as demographic factors, safety and security concerns have been set for this research and accordingly below objectives have been decided.

Objectives

1. To study the impact of certain demographic factors on usage of electronic payments options
2. To understand the most preferred option among available avenues to make e-payments

3. To understand the security issues, if any, affecting the preference of making online payments vis-à-vis offline payments
4. To find out the public opinion about offline and online mode of payments given the situation of Covid-19

Conceptual Framework

1. Digital modes of payments: The word digital payment refers to electronic payment which doesn't require actual movement of hard cash. Hence, it rules out need of handling or carrying physical cash and thus, its safety. The prerequisite of electronic payment is processing device like a computer or a phone and the education to operate it. Further, the net banking facility from the bank, wherein you are maintaining your bank account and wish to do electronic payment. Once these things are in place, one can make an electronic payment to the beneficiary by obtaining correct beneficiary bank account details. Electronic or digital modes involve banking cards or debit/credit cards, unstructured supplementary service data facilitating customers who struggle to get internet facility, Aadhaar enabled payment system enabling transfer of money between aadhaar linked bank accounts, Unified payment interface (UPI), mobile wallets, bank prepaid cards, internet banking[7].

2. E-Commerce: Doing business through online modes is E-commerce. Here the suppliers can reach out to entire world for showcasing their products or services and the customers get lot of variety from multiple suppliers. Easy access, facility of comparing the product features, competitive pricing, time saving etc. are to name a few among the benefits.

3. Internet access: For connecting to various electronic modes like e-commerce sites, payment apps, online platforms, internet connectivity is essential. Moreover high speed wifi or internet access serves better connectivity to all these digital modes. During pandemic there was lot of pressure on the internet service providers to facilitate uninterrupted internet service to every individual to support online classes, work from home and so on.

Analysis

1. Demographic factors:
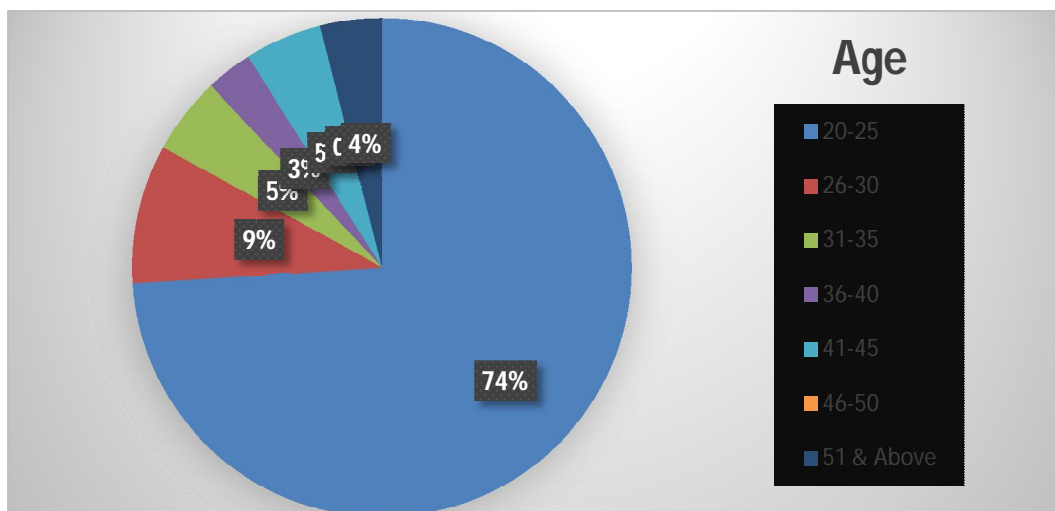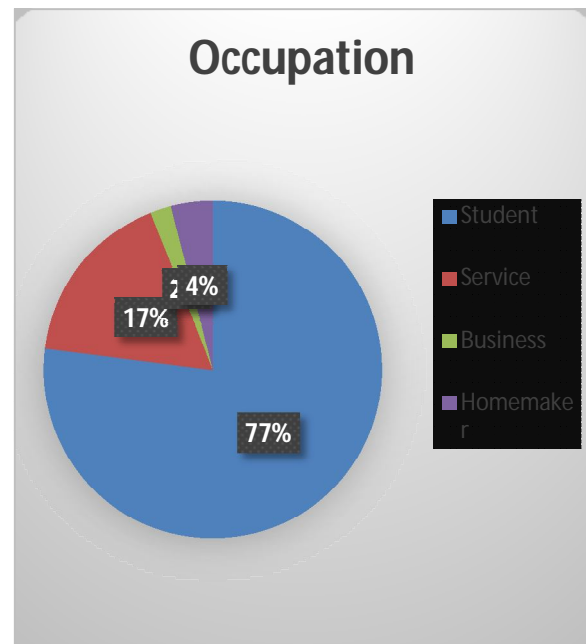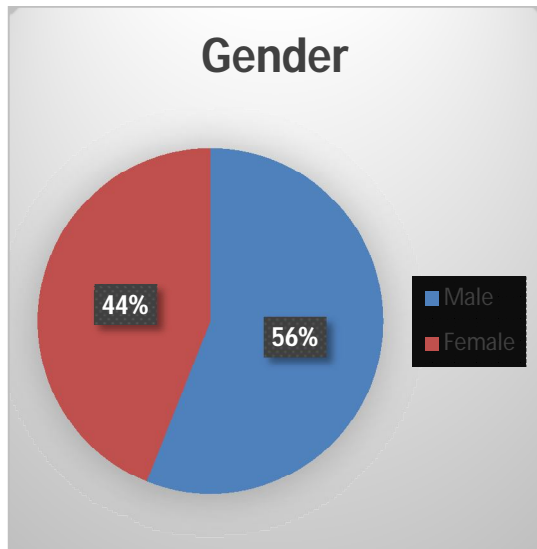
Out of 100 respondents approached, 44 were males and 56 were females. Occupation break up shows 77% students, 17% in service, 2% doing business and 4% are homemakers. Purposely more students have been considered for the survey since young generation is found to be more adaptable and up to date with the information due to higher exposure to the social media and their fast learning ability and willingness due to young age. The distribution of occupation is also reflecting in the selected age groups. Respondents ageing 20 and above have been considered for the purpose of this survey since, it was necessary to blend the knowledge of technology with processing payments, which involved money handling.
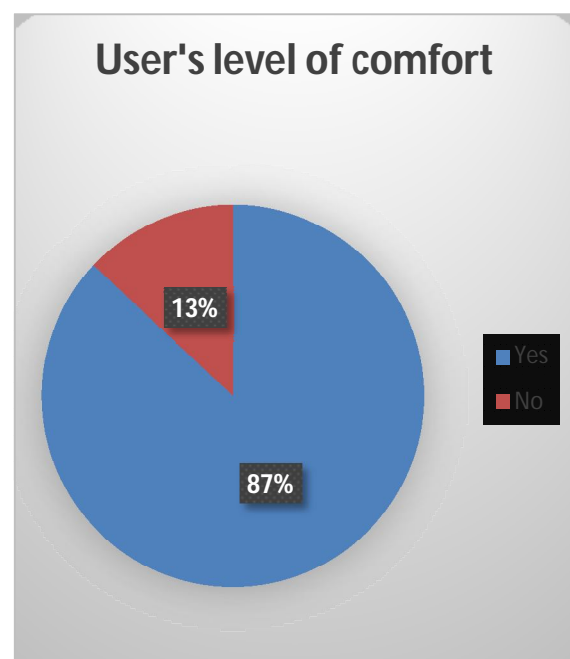
2. Factors related to user's safety about usage of online mode of fund transfer:

Victims to any Security threat

User's comfort of using online modes in terms of amount

Security measures
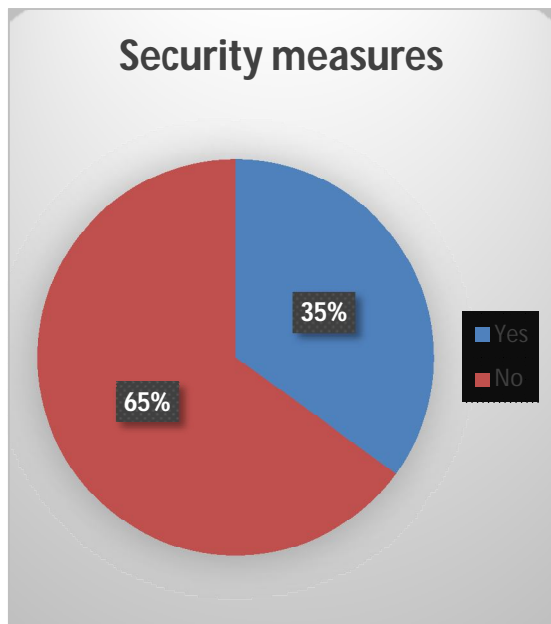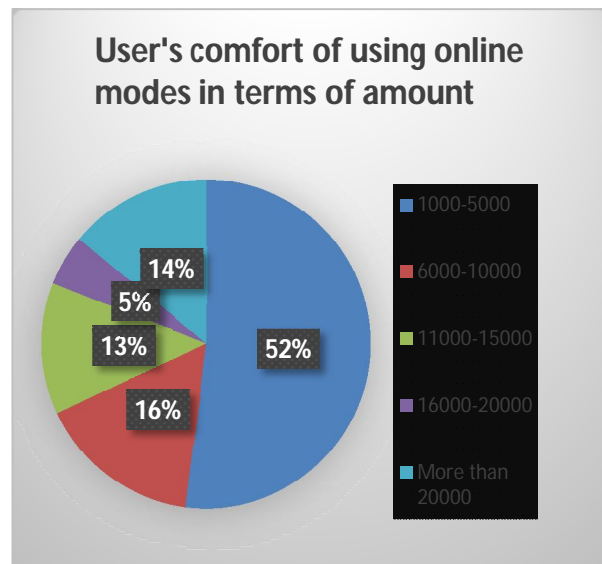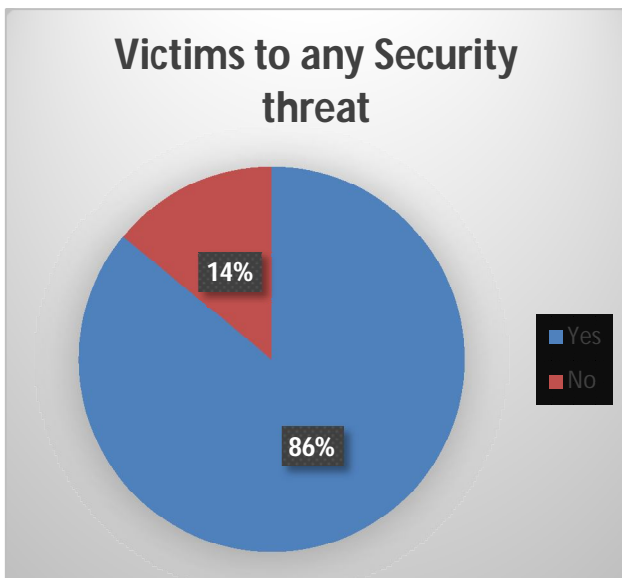
When it comes to money, everyone becomes more cautious and it's natural. When the respondents were approached with specific questions related to their views on security aspects of online fund transfer and whether they have faced any security threat in the past, we realized that 13% of respondents are comfortable and 14% of the respondents have so far faced the security threat. 35% of the respondents have taken security measures to mitigate the risk arising from online fund transfer. Interestingly, we have also observed that 52% and 16% people have set upper limit of Rs. 5,000 and Rs. 10,000 respectively for using online mode of payments and thus, have controlled the risk arising from using such payment modes. Only 14% of the population is comfortable for online transferring the amount beyond Rs. 20,000.

3. User preference towards online payment options:
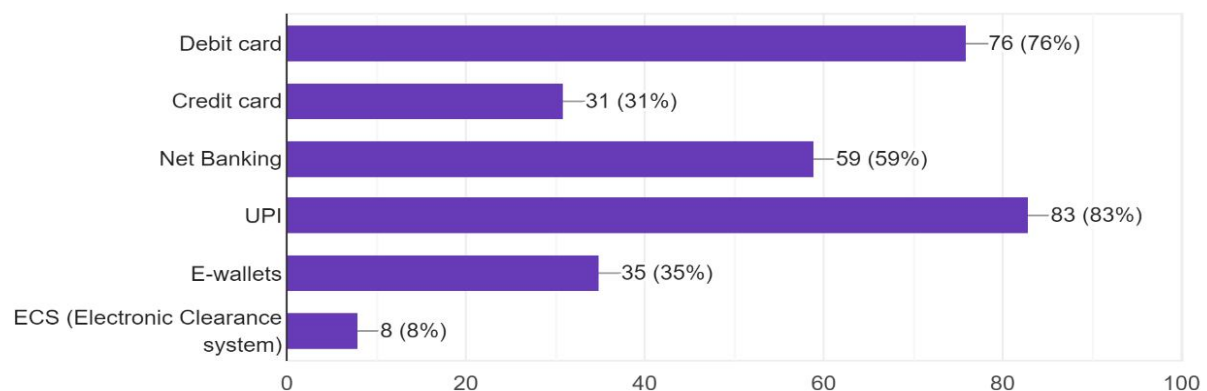
Data above clearly shows the users inclination towards UPI is the most, followed by debit card and net banking.
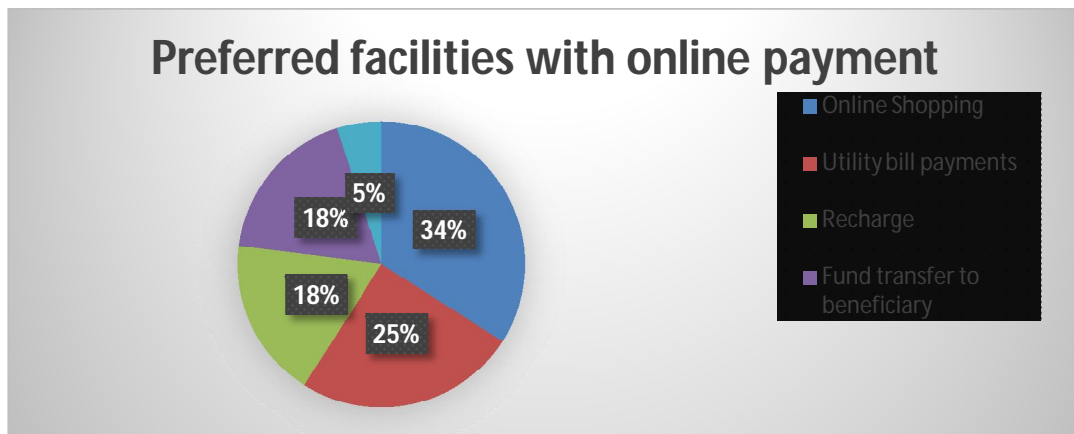
The chart shows highest usage of online payments for online shopping, followed by utility bill payments and usage for grocery shopping seems minuscule.
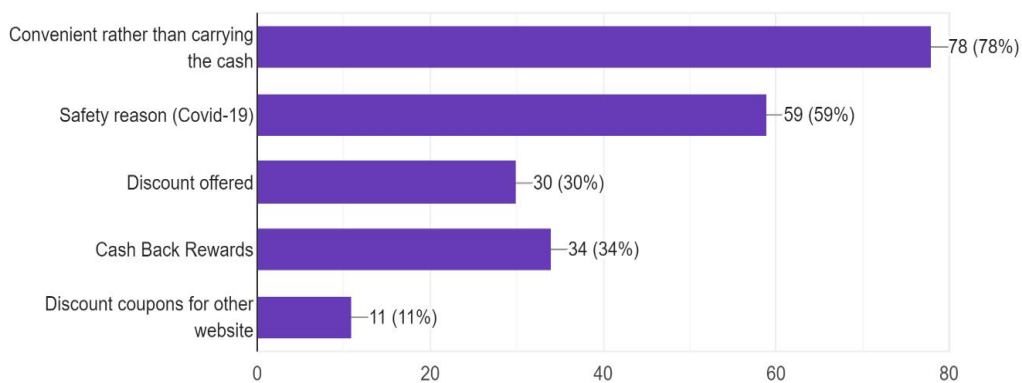
Above graph clearly indicates that people prefer online payment options as they find it as the most convenient option. During pandemic and lockdown situation, when people were not allowed to go out for their own safety, people started exploring online or digital mode of fund transfer for buying their requirements, such as grocery or other necessities. In a way pandemic situation helped the people and in turn digital banking. Further, people also get attracted towards the discounts and various schemes offered by the online payment options.
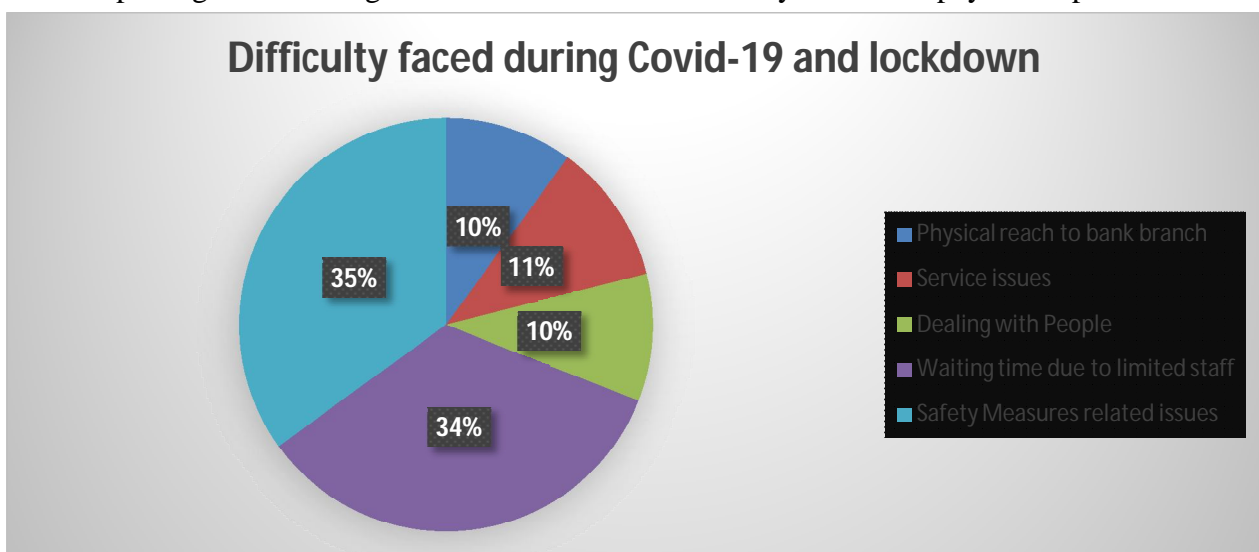
During Covid-19 first wave and the lockdown in the last year, when banks were operational as a part of essential services, how the respondents managed to do the banking transactions, and whether their experience had any impact on their mindset about online or offline transactions has been analysed for this study. The observations highlight that the majority of the people, nearly 35%, were concerned about the safety measures and social distancing norms which were being followed outside and they preferred staying back at home and preferred online modes. Physically visiting branch was a challenge for nearly 10% of the people while 35% of the respondents were suffered from the waiting time due to lesser serving staff and changed bank branch timing. These reasons, if looked at positively, contributed to the change in the mindset of the people, and required those who were not in favour of online payment and receipt options, to actually explore the same. This in turn helped the promotion of digital modes of fund transfer and banking transactions to the larger extent.

Conclusion

The survey here involved respondents from Mumbai, the most developed and modern city in the country. Considering the response, it is apparent that the young generation that is the age group of 20-25 is more inclined towards online payments and online shopping. Still the ticket size in terms of the value of the transaction is small. People have faced security threats during online transactions, and that might be the reason of their reluctance towards the same. It has also been observed that the people are still not aware of many apps and are under the impression that these modes are being used to get the discounts and reward points. Though younger crowd is switching from offline to online mode in many ways such as making utility bill payments or banking transactions or online shopping, the senior people still prefer to offline purchase and local retailers or the bank branches. They still feel the importance of human touch. Covid-19 and the resultant lockdown when disrupted the normal life, many people actually started thinking about online modes of transactions for payment or shopping grocery and other necessities. Indian government has been taking various initiatives towards encouraging cashless economy. To boost this motto it is necessary to educate all age groups and bring them into the gamut of online payments and the facilities. Current pandemic situation though proved devastating for the economy and the normal life, it helped creating realization among people including senior people about the importance of usage of online modes for making payments for utility bill, groceries, insurance payments etc., when their outside movement was restricted due to the lockdown.

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ESTIMATION OF CROP YIELD USING POST-STRATIFICATION BASED ON SATELLITE DATA

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ABSTRACT

Utilized LANDSAT spectral data and imagery to post-stratify the crop area in terms of vegetation vigor and obtained improved crop yield estimates. However, in this use of special imagery for post-stratification, there is some uncertainty involved in the classification of units onto different strata. Chhikara and Mckeon [3] proposed a set of models that can be used to describe the classification errors for the units that are post-stratified based on their spectral responses. In the present investigation a simulation study has been conducted based on an error model to examine the effect of misclassification of units on the bias and relative efficiency of different post-stratified estimators of crop yield. It is shown that both the bias and efficiency are adversely affected in the presence of misclassification of sample units in the post-strata.

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Introduction

Crop production statistics are of vital importance to India and of course, for that matter, to any other country in the world. These statistics consist of two major components: (i) the area under crop and (ii) the yield per unit area. Under the present system in India, the crop area is estimation surveys based on crop cutting experiments. A stratified multi-stage sampling design is used for the yield surveys: The community development blocks in a district from the strata, the villages in a block from the primary sampling units, crop fields within a village form the second stage sampling units, and a plot of specified dimensions is selected from each of the sampled crop fields for crop harvesting. Fuller [4] and Hot and Smith [5] have discussed the use of post-stratification for improving the efficiency of estimators in surveys. Singh et.al. [7] investigated the use of satellite multi spectral data for post-stratification of crop areas into the average and high vegetation classes and developed an improved yield estimate for the 2019 wheat crop for the district of Rajkot, Gujarat.

For this study used Landsat satellite Thematic Mapper (TM) data acquired for the district on February 20, 2019 to post-stratify the district cropland. This was achieved by transforming the multi spectral data into certain indices which reflect the vegetation vigour and thus are called vegetation indices Tucker, et.al., [9]. A stratification of the district area was developed using the vegetation indices into three post-strata, namely, non-vegitation, vegetation vigour and high vegetation vigour; of which only the last two post-strata were utilized. The sample units were assigned to the post-strata based on use of topographical maps and the visual interpretation of satellite imagery. One may refer to Singh, et.al. [7] for further details on the post stratification and the empirical results obtained for this application. This method of assigning sample units to the post-strata may result into some errors of classification. The accuracy of classification depends on several factors such as the ability of the image analyst, quality of the sensors, spectral and spatial resolution, ect. The extent of such misclassification and its effect on the efficiency of the estimator may be of interest. Since theoretically it is not feasible to study the effect of such misclassification on the accuracy and efficiency of a post-stratified estimator, in the present investigation a simulation study has been conducted to investigate some post-stratified estimators of crop yield. In this study only a single stage stratified sampling design is considered where the average plot yield from the two crop fields from a village represent the average yield for that village; and hence a village is the sampling unit. In simulations, the actual 2019 data set was utilized to estimate the parameters and a statistical model to generate a

large population with the parameters replaced by their estimated values.

Estimator without Using Spectral Data

For estimating the mean crop yield in a district, consider it to be a population of N units (villages) divided into L strata such that N_i units belong to the ith stratum. Let a stratified sample of size n be selected, where n_i units are selected for the ith stratum with allocation of units being made in proportion to the strata crop areas, and $\sum n_i$ = n. Let Y_{ij} denote the crop yield for the jth unit of the ith stratum. An unbiased estimator of the mean crop yield is given by

$T_1 = \sum_{i=1}^{L} W_i \bar{Y}_i$ (1)

Where $W_i = \frac{N_i}{N}$ and $\bar{Y}_i = \frac{1}{n_i} \sum_{j=1}^{n_i} Y_{ij}$

The variance of T_i is given by

$V(T_1) = \sum_{i=1}^{L} w_i^2 (\frac{1}{n_i} - \frac{1}{N_1}) S_i^2$ (2)

where S_i^2 denotes the variance for the ith stratum.

Post-stratified Estimators Using Spectral Data

The stratification in crop yield surveys is based on geographical and political boundaries and hence may not be very effective in term of the efficiency of the estimator. Singh et.al.[7] showed that the use of spectral data for post-stratification of the crop area based on vegetation vigour led to more efficient estimates. Therefore some post-stratified estimators of crop yield are presented which make use of regular yield data obtained from the yield estimation surveys along with remotely sensed satellite spectral data used for post-stratification of the crop area.

Consider a population of N units divided into L strata and a stratified sample of size n selected such that n_i units are selected from the i-th stratum. Further, let the crop area for the population of N units (villages) be post-stratified into L' post-strata based on vegetation indices derived from satellite spectral data. Let N_{ih} and n_{ih} denote the number of population units and sample units, respectively, falling in the overlap between the h-th post-stratum and i-th initial stratum.

If each n_{ih} (i=1….L, h = 1….L') is non-zero, an unbiased post stratified estimator of the mean crop yield is given by

$T_2 = \sum_{h=1}^{L'} \sum_{i=1}^{L} W_{ih} \bar{Y}_{ih}$ (3)

Where $W_{ih} = \frac{N_{ih}}{N}$ and $\bar{Y}_{ih} = \frac{1}{n_{ih}} \sum_{k=1}^{n_{ih}} Y_{ihk}$

The conditional variance of T_2, given that n_{ih} is fixed, is easily seen to be as following:

$V(T_2 \mid n_{ih}) = \sum_h \sum_i w_{ih}^2 (\frac{1}{n_{ih}} - \frac{1}{N_{ih}}) S_{ih}^2$

where S_{ih}^2 is the variance for the overlap area between the hth post-stratum and the ith initial stratum. The unconditional variance of T_2 is then approximately given by

$V(T_2) = \sum_h \sum_i w_{ih}^2 [\frac{1}{n w_{ih}} + \frac{1 - w_{ih}}{n^2 w_{ih}^2} - \frac{1}{N_{ih}}] S_{ih}^2$ (4)

which follows by using the approximate result due to Stephen [8],

$E(\frac{1}{n_{ih}}) = \frac{1}{n W_{ih}} + \frac{1 - W_{ih}}{n^2 W_{ih}^2}$

(Ignoring terms of order $\frac{1}{n^r}$; r > 2)

But in situations when some of the n_{ih} are zero, the estimator given in (3) is no longer unbiased. In this case an alternative estimator, based on first pooling the sampled units from across the post-strata and then utilizing suitable weights for the initial strata, may be more appropriate as defined by

$T_3 = \sum_{i=1}^{L} W_i \frac{\sum_{h=1}^{L'_i} W_{ih} \bar{Y}_{ih}}{\sum_{h=1}^{L'_i} W_{ih}}$ (5)

Where, L'_i is the number of post-strata corresponding to sample units from the ith initial stratum. The revised weight for the ith strata in this situation will be

$W_i = \sum_{h=1}^{L'_i} W_{ih}$

Similarly, another estimator can be developed, first by pooling the sample units over the initial strata and then making use of suitable weights for the post-strata, as defined by

$T_4 = \sum_{i=1}^{L'} W_i \frac{\sum_{h=1}^{L_h} W_{ih} \bar{Y}_{ih}}{\sum_{h=1}^{L_h} W_{ih}}$ (6)

Where L_h is the number of initial strata from which sample units have fallen into the hth post-stratum. The post-stratum weight is

$W_h = \sum_{i=1}^{L_h} W_{ih}$

Clearly the estimators given in (3), (5) and (6) take into consideration simultaneously the effect of initial strata based on geographical boundaries and the post-strata based on vegetation vigor. Hence these estimators can be expected to be better than the estimator given in (1).

What if all W_{ih} are not known? This may happen in the case of post-stratification based on vegetation vigor using satellite data since it would require a complete enumeration of units to obtain each W_{ih} and this may not be feasible. However, the post-strata weights in terms of total areas for the post-stratified classes may be easily obtained by aggregating all pixels falling in each post-stratum. On the other hand, if the initial sample allocation is made in proportion to the crop area, N_{it} may be estimated as

$N_{ih} = (n_{ih}/n_h) N_h$,

and an alternative estimator of the mean crop yield can be obtained from (6) with N_{ih} replaced by $\widehat{N}_{ih}$. The form of this estimator is

$T_5 = \sum_{h=1}^{L'} W_h \bar{Y}_h (7)$

Where $\bar{Y}_h$ is sample mean based on all sample units falling into the hth post-stratum and W_h is the hth post-stratum weight. This estimator is beast when post-strata weight W_h are known. Hence this estimator may prove quite efficient in the case of post-stratification of crop area based on spectral data where W_h is available based on spectral data where W_h is available based on either on either the estimated N_{ih} or total area for the post-strata as discussed above. The estimators T_3, T_4 and T_5 are based on complex survey design and hence the expression for their Mean Square Errors will be quite complicated and will not be of comparable form. Therefore the efficiencies of these estimators are examined empirically through a simulation study.

Errors of Classification

The vegetation vigor is measured in terms of certain vegetation indices obtained by transforming the satellite multi spectral data. In the past, one or more crop growth variables have been defined and utilized as vegetation indices Barnett and Thompson [1]. Based on the computed values of these indices, a color composite imagery is prepared for the area of interest. The analyst interprets the image and manually delineates the vegetation vigor classes which can subsequently be used as post-strata Singh et.al [7].

For a post-stratification of the crop area into vegetation vigour classes using satellite data, the sample units are first identified on the FCC imagery and then each unit is classified or assigned to a post-stratum. This process involves a manual procedure to identify unit of the purpose of its assignment to one of the vegetation vigour classes.

Hence some of the sample units may get misclassified, i.e. a unit may be classified belonging to a class other than its actual class Chhikara [2].

From a classification of all the n sample units into the two post-strata (say, PSI and PS2) suppose one has the following:

n_1 = actual number of units in PS1

n_2 = actual number of units in PS2

n_{11} = number of units correctly classified to PS1

n_{12} = number of units classified from PS1 to PS2

n_{22} = number of units correctly classified to PS2

Next, define

$\theta = E\left(\frac{n_{12}}{n_1}\right)$,

the expected proportion of units misclassified from PS1 to PS2, and

$\varphi = E\left(\frac{n_{21}}{n_2}\right)$,

the expected proportion of units misclassified from PS2 to PS1.

Chhikara and Mckeon [3] provide a set of models that can be used to describe the misclassification of units. In the present contex, the most suitable model is their exponential model. Under this model the chance of misclassification for an individual unit increase as the variable value deviates further away from the mean of its true class in the direction of the mean of the other class.

$g_{12}(t) = 1 - \exp\left[-k_1 (t - \mu_1^2)/2\sigma_1^2\right]$, (8)

a monotone increase function, and

$g_{21}(t) = 1 - \exp\left[-k_2 \frac{(t-\mu_2)^2}{2\sigma_2^2}\right]$ (9)

a monotone decreasing function with t, the variable value to lie on the axis joining the means μ_1 and μ_2 of the two post-strata PS1 and PS2. $\mu_1 < t < \mu_2$ and K_1, $K_2 > 0$. Let $h_i(t)dt$, $i = 1,2$ denote the probability that an individual unit belongs to PSi. In the present study $h_i(t)$ is taken as the normal pdf,

$$h_i(t) = \frac{1}{2\pi\sigma_i}\exp\left[\frac{-(t-\mu_i)^2}{2\sigma_i^2}\right], i = 1,2. \ (10)$$

Accordingly, the expected error rates are

$\theta = \int_{-\infty}^{\infty} g_{12}(t)h_1(t)dt$, and

$\varphi = \int_{-\infty}^{\infty} g_{21}(t) h_2(t) dt.$ (11)

In is easily seen that when some of the sample units are misclassified in terms of their post-strata, this may introduce certain amount of bias and also increase in the variance of a post-stratified estimator. Since it is not possible to examine these effects theoretically, we now consider simulations to study these effects.

A Simulation Study

To study the effect of misclassification on the bias and relative efficiency for the different post-stratified estimators of crop yield an empirical study based on simulated data has been undertaken. A discrete population of size N is generated randomly, where associated with each unit is a parametric value generated as the average yield of the unit. For the present study the size of the simulated population is taken to be 96 (which is equal to the number of village in the district of Rajkot). The wheat yields for the units are generated using the normal distribution with the parametric values estimated from the real wheat crop yields obtained from crop cutting experiments in the district. The estimated parametric values were as: Mean = 20.12 (quintal/hectare) and Standard Deviation = 5.91. For more details on generating normal variate values one may refer to Marsagalia and Maclaren [6].

Based on the observed yield data, the district of Rajkot can be stratified into 6 homogeneous strata. Therefore, the simulated population is also divided into six initial strata of sizes N_1, N_2, ...N_6 to represent the blocks in the district. For the post-stratifications the yield simulated for the units are arranged in ascending order and the units are divided into two groups of specified sizes, say N_p and N_q (such that $N_p + N_q = N$) representing the two post-strata of average yield and high yield, PS1 and PS2, respectively. The basic idea is that a high vegetation vigour leads to a higher crop yield and a low to moderate vegetation vigour would result in an average yield for the crop.

The classification of sample units into the two post-strata PS1 and PS2 are based on the exponential model assumed for the errors of classification as discussed in Section 4. Suppose $\hat{\mu}_1$ and $\hat{\mu}_2$ are the average vegetation indices obtained for PS1 and PS2 respectively,

and $\hat{\sigma}_1$ and $\hat{\sigma}_2$ are their corresponding standard deviations. Then the following methods is used for the classification of sample units: For an individual unit to belong to PS1, let

$g_{12}(t) = 0, t \le \hat{\mu}_1$
$= 1 - \exp[-k_1(t-\hat{\mu}_1)^2 / 2\hat{\sigma}_1^2], t > \hat{\mu}_1$

and for the unit to belong to PS2, let

$g_{21}(t) = 0, t \le \hat{\mu}_2$
$= 1 - \exp[-k_2(t-\hat{\mu}_2)^2 / 2\hat{\sigma}_2^2], t > \hat{\mu}_2$

Where k_1 and k_2 are easily obtained for the specified values of θ and φ. After replacement μ_1 by $\hat{\mu}_1$ and σ_1 by $\hat{\sigma}_1$ in (10), it follows from equation (11) that

$$\theta = \int_{\mu_1}^{\infty} [1 - \exp{-k1 t - \mu 1 2 2 \sigma 1 2}] \frac{1}{2\pi\sigma 1} \exp{-t - \mu 1 2 2 \sigma 1 2} dt$$

$$= \frac{1}{2} - \frac{1}{\sqrt{2\pi\sigma_1}} \int_{\mu_1}^{\infty} \exp\left[\frac{-(k_1+1)(t-\hat{\mu}_1)^2}{2\sigma_1^2}\right] dt$$

$$= \frac{1}{2} - \frac{1}{2}\left(\sqrt{k_1+1}\right)^{-1}$$

Hence $k_1 = (1 - 2\theta)^{-2} - 1$.
Similarly, $k_2 = (1 - 2\varphi)^{-2} - 1$.

For some sample units satisfying $t \le \hat{\mu}_1$, or $t \ge \hat{\mu}_2$ the allocation is obvious. To classify the units satisfying the condition $\hat{\mu}_1 < t < \hat{\mu}_2$, we generate a uniform random variable u. For $t \in$ PS1, classify t to PS1 if $u > g_{12}(t)$, Otherwise to PS1. Similarly for $t \in$ PS2, classify t to PS1 if $u \le g_{12}(t)$, otherwise to PS2.

Two separate cases were considered for the population units to be subdivided into the two post-strata. These corresponded to the two proportions of P = 0.75 and 0.50 for the average vegetation post-stratum and consequently the proportions of P = 0.25 and 0.50, respectively, for the high vegetation post-stratum. For the misclassification rates we considered θ = 0.00, 0.10, 0.20 and φ = 0.00, 0.10, 0.20 where θ is misclassification rate units in the average vegetation class but classified into the high vegetation class, and φ is the misclassification rat for the units in the high vegetation class, and φ is the misclassification rate for the units in the high vegetation class but classified to the average vegetation class. For the sample size, two cases of n = 90 and 30 were considered. Moreover, to estimate the mean crop yield in the district, stratified random samples of sizes 90 and 30

units each were generated repeatedly 500 times as well as 1000 times, and these samples were each time post-stratified into two post-strata. However, it was observed that there is no significant difference in the results based on 500 samples and 1000 samples and hence the results are presented only for the case of 500 repeated samples.

For each simulated sample, five estimates of the mean yield using estimators given in (1), (3), (5), (6) and (7) were computed, and then the average was computed from the 500 estimates obtained corresponding to each estimator. The observed relative bias and variance from repeated samples are computed as follows:

For the ith estimator, say T_1,

Relative bias $= \frac{\bar{T}_i - \bar{Y}}{\bar{Y}} \times 100$

Where $\bar{T}_i = \frac{1}{k}\sum_j T_{ij}$, and

Variance $= \frac{1}{k-1}\sum_j (T_{ij} - \bar{T}_i)^2$. (12)

Here k = 500 and T_{ij} denotes the jth estimate corresponding to i^{th} estimator, j = 1,2, …500.

Results and Discussions

Table 1-2 give the results obtained for relative bias, relative efficiency based on variance and the relative efficiency based on mean square error of different estimator of average wheat yield for various misclassification rates and post-strata proportion. From these results it can be seen that when φ = O and θ = O i.e. there is no misclassification the estimator T_5 is most efficient and estimators T_2, T_3, T_4 also perform far better as compared to T_1. When φ = O and θ $\neq$ O then in most of the cases the estimator tend to underestimate the average yield and this tendency to underestimate becomes more pronounced with an increase in the value of θ. For θ = O and φ $\neq$ O then the average yield is generally over estimated for N = 90 and the over estimation is increase in the value of φ. When sample size is reduced to 30 the direction in the similarity of results still holds, though generally estimator T_2 showed higher under estimation as the misclassification rate is increased.

A perusal of the relative efficiencies of the estimators compared to T_1 based on variance showed that in general T_5 is most efficient followed by T_4, T_3 and T_2 respectively and

when the sample size is large the estimators T_3, T_4, and T_5 are fairly competitive. Also in most of the cases the efficiency of an estimator decrease with an increase in misclassification rates θ and φ. The decrease is relatively more in case of 0.75 than for p = 50.

But in case of relative efficiency based on mean square error the efficiency of most of the estimators T_2, T_3, T_4 and T_5 is considerably reduced indicating that the bias in the new estimator also is not reduced in case of misclassification.

From these results it has also been observed that the efficiency of the post-stratified estimators except T_2 is not affected much by reducing the sample size which suggests that there is a scope to compensate the additional cost incurred from the use of satellite data for post-stratification by reducing the size of the sample of crop cutting experiments.

Nathan and Holt [4] have shown that if Q = 1, in which case the bias of b_{12} becomes of O (n^{-1}), then $V(b_{12}) \geq (\hat{\beta}_{12})$. This is true under all the three different situations. In situation C, when the dependent variable itself is used as the design variable, $V(\hat{\beta}_{12})$ is less than MSE (b_{12}) in all the three sample designs considered. Science for simple random sampling, sampling inclusion probability π_α = n/N, the weighted and the unweighted estimators coincide i.e. b_{12} = b_{12}^* and $\hat{\beta}_{12}$ - $\hat{\beta}_{12}^*$, so $V(b_{12})$ and $V(b_{12}^*)$, and $V(\hat{\beta}_{12})$ and $V(\hat{\beta}_{12}^*)$ under all the 3 situations don't differ much from each other. Under the sample design (b) and (e) in which only few values are selected from last stratum, the weighted estimator comes out to be better than unweighted estimator.

Further weighted estimator seems relatively insensitive to the sample design. But since the weighted estimators are model free, they may be more robust to departures from the model upon which the properties of b_{12} and $\hat{\beta}_{12}$ are based. The results which hold for situation A extend to the situation B also, where double sampling has been adopted as a method of design for estimating regression coefficients when the design variable X_3 is already available from the survey or can be measured cheaply. Under the situation C, when X_1 is measured at the first phase and so the dependent variable is used as the design

dependent variable itself, the bias for b_{12} is more in comparison to the situation A and B.

But in this case also, the results of situation A are applicable.

Table 1. Relative bias B, Relative efficiency based on variance E_1 and relative efficiency based on $MSEE_2$ of various yield estimators for different rates of misclassification based on 500 samples of size 90 and 30 for P = 0.75.

θ	Estimator	φ	0.00		0.10		0.20	
			90	30	90	30	90	30
0.00	T_1	B	-0.02	-0.12	-0.11	0.06	0.05	0.32
		E_1	1.00	1.00	1.00	1.00	1.00	1.00
		E_2	1.00	1.00	1.00	1.00	1.00	1.00
	T_2	B	-0.66	-7.66	0.34	-7.86	0.97	-7.24
		E_1	1.34	0.63	1.21	0.55	0.97	0.52
		E_2	1.26	0.29	1.20	0.25	0.86	0.27
	T_3	B	-0.18	-2.69	0.93	-1.79	1.83	-1.03
		E_1	1.97	1.42	1.91	1.35	1.69	1.31
		E_2	1.96	1.07	1.62	1.18	1.07	1.24
	T_4	B	0.09	-0.08	1.27	1.41	2.33	0.37
		E_1	2.09	2.01	2.06	1.85	1.93	1.94
		E_2	2.09	2.01	1.51	1.64	0.93	1.42
	T_5	B	0.19	0.00	1.37	1.54	2.40	2.49
		E_1	2.35	2.28	2.21	2.06	2.07	2.18
		E_2	2.33	2.27	1.52	1.76	0.93	1.50
0.10	T_1	B	-0.18	0.07	-0.23	-0.30	-0.77	0.32
		E_1	1.00	1.00	1.00	1.00	1.00	1.00
		E_2	1.00	1.00	1.00	1.00	1.00	1.00
	T_2	B	-3.18	-8.98	-2.05	-7.91	-1.79	-7.50
		E_1	1.84	0.82	1.58	0.66	1.15	0.70
		E_2	0.47	0.26	0.84	0.28	0.86	0.30
	T_3	B	-3.07	-4.84	-2.31	-3.72	-1.36	-2.81
		E_1	2.01	1.52	1.95	1.39	1.54	1.38
		E_2	0.50	0.71	1.01	0.85	1.22	1.01
	T_4	B	-3.46	-3.48	-2.21	-2.12	-1.13	-0.73
		E_1	2.01	2.00	2.08	1.18	1.60	1.67
		E_2	0.51	1.12	1.09	1.42	1.35	1.63
	T_5	B	-3.53	-3.28	-2.26	-2.08	-1.05	-0.67
		E_1	2.10	2.36	2.28	2.04	1.78	1.93
		E_2	0.55	1.29	1.13	1.57	1.51	1.88
0.20	T_1	B	-0.29	-0.10	0.01	0.18	-0.23	-0.37
		E_1	1.00	1.00	1.00	1.00	1.00	1.00
		E_2	1.00	1.00	1.00	1.00	1.00	1.00
	T_2	B	-7.79	-10.90	-6.22	-9.96	-4.84	-8.74
		E_1	1.77	1.02	1.81	0.79	1.49	0.91
		E_2	0.15	0.20	0.22	0.23	0.34	0.27
	T_3	B	-7.76	-7.63	-6.18	-6.32	-4.76	-5.31
		E_1	1.81	1.51	1.84	1.30	1.59	1.39
		E_2	0.15	0.39	0.22	0.49	0.35	0.60
	T_4	B	-7.74	-7.59	-6.16	-6.10	-4.71	-4.46

		E$_1$	1.81	1.90	1.83	1.54	1.62	1.48
		E$_2$	0.15	0.41	0.22	0.56	0.36	0.74
		B	-7.70	-7.44	-6.16	-5.90	-4.56	-4.42
	T$_5$	E$_1$	1.94	2.30	1.96	1.81	1.72	1.87
		E$_2$	0.15	0.44	0.22	0.60	0.38	0.84

Table 2. Relative bias B, Relative efficiency based on variance E$_1$ and relative efficiency based on MSEE$_2$ of various yield estimators for different rates of misclassification based on 500 samples of size 90 and 30 for P = 0.50.

θ	Estimator	φ	0.00		0.10		0.20	
			90	30	90	30	90	30
0.00	T$_1$	B	-0.02	0.00	0.00	-0.11	-0.06	-0.30
		E$_1$	1.00	1.00	1.00	1.00	1.00	1.00
		E$_2$	1.00	1.00	1.00	1.00	1.00	1.00
	T$_2$	B	-0.14	-3.88	2.06	-3.01	5.14	-1.70
		E$_1$	2.61	0.95	1.89	0.76	1.69	0.54
		E$_2$	2.63	0.64	0.99	0.62	0.31	0.51
	T$_3$	B	-0.13	-0.05	2.09	1.23	5.22	3.15
		E$_1$	2.65	1.83	2.04	1.63	1.94	1.45
		E$_2$	2.67	1.83	1.02	1.51	0.31	0.98
	T$_4$	B	-0.13	-0.03	2.11	1.95	5.27	4.86
		E$_1$	2.67	2.64	2.07	2.13	1.98	2.10
		E$_2$	2.18	2.64	1.01	1.68	0.31	0.79
	T$_5$	B	-0.04	0.12	2.16	2.19	5.38	4.97
		E$_1$	2.96	3.25	2.32	2.63	2.19	2.58
		E$_2$	2.99	3.24	1.04	1.86	0.30	0.85
0.10	T$_1$	B	-0.02	0.17	0.11	-0.10	0.10	-0.59
		E$_1$	1.00	1.00	1.00	1.00	1.00	1.00
		E$_2$	1.00	1.00	1.00	1.00	1.00	1.00
	T$_2$	B	-2.44	-5.66	0.59	-3.78	2.91	-2.80
		E$_1$	2.26	1.13	2.13	0.73	1.84	0.56
		E$_2$	0.45	0.55	1.97	0.53	0.74	0.49
	T$_3$	B	-2.41	-1.55	0.60	0.13	2.98	1.47
		E$_1$	2.31	1.59	2.13	1.52	2.07	1.34
		E$_2$	0.97	1.43	1.97	1.52	0.75	1.23
	T$_4$	B	-2.42	-2.12	0.71	0.48	3.01	2.58
		E$_1$	2.34	2.26	2.44	1.92	2.10	1.60
		E$_2$	0.97	1.75	2.16	1.88	0.75	1.18
	T$_5$	B	-2.34	-2.07	0.09	0.53	3.05	2.62
		E$_1$	2.65	2.71	1.00	2.21	2.35	2.00
		E$_2$	1.06	2.03	1.00	2.16	0.76	1.36
0.20	T$_1$	B	-0.25	0.39	-2.47	0.53	-0.12	-0.39
		E$_1$	1.00	1.00	2.15	1.00	1.00	1.00
		E$_2$	1.00	1.00	0.94	1.00	1.00	1.00
	T$_2$	B	-5.03	-9.02	-2.47	-5.97	-0.04	-4.12
		E$_1$	2.22	1.11	2.15	0.87	1.89	0.85
		E$_2$	0.34	0.29	0.94	0.42	1.89	0.58
	T$_3$	B	-4.91	-3.10	-2.43	-1.37	-0.02	-0.22

		E_1	2.28	1.53	2.16	1.39	1.93	1.51
		E_2	0.36	1.04	0.96	1.29	1.93	1.51
		B	-4.96	-4.87	-2.45	-2.14	-0.03	-0.22
	T_4	E_1	2.33	2.32	2.18	1.78	1.93	1.79
		E_2	0.36	0.84	0.96	1.40	1.93	1.79
		B	-4.91	-4.78	-2.34	-2.25	-0.05	-0.05
	T_5	E_1	2.63	2.67	2.43	2.13	2.06	2.11
		E_2	0.37	0.90	1.06	1.56	2.06	2.12

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EXPECTED CREDIT LOSS (ECL) AS PER IND-AS 109, A CHALLENGE FOR THE FINANCIAL REPORTING FOR NBFCS IN THE COVID ERA

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ABSTRACT

NBFCs are abiding by Ind-AS 109-Financial Instruments, as per this standard, provision for credit loss is to be reported based on the Expected Credit Loss Model. NBFCs are more susceptible in the COVID-19 situation against Banks, as they are coping up with operational hitches and also adopting Ind-AS, this is taxing to decide the quantum of loss on Debts required to be provided in the financial statements based on the future expectations in this uncertainty. As per Ind-AS, NBFCs are required to evaluate their loan assets, based on future expected losses by predicting the rate of default. Because of the outbreak, the loan asset quality has gone down considerably so they have to re-evaluate their assets and gauge the classification of stages according to the number of days past due also they have to ponder into the qualitative criteria for these loan assets. They also have to measure the impact on the Effective Interest Rate (EIR) as per Ind-AS. They have to evaluate the collaterals all over again by looking into the COVID-19 circumstances. Financial Guarantees are also to be re-checked. This is a crucial process as it involves management judgment, assumptions, and estimates. They have to update themselves on the macroeconomic aspects which will have a huge impact on these financials. However, there are quite a few regulatory intrusions as well as reliefs by the Ministry of Corporate Affairs and the Reserve Bank of India, etc. They have announced extensions of deadlines and other reliefs to offer some breathing time and fairness to NBFCs, as a COVID-19 reprieve.This paper is an attempt to discourse erstwhile provisions of Indian GAAP Vs Financial Reporting as per Ind-AS, to comprehend the challenge of the Expected Credit Loss Model (ECL)as per Ind-AS 109 for the NBFCs in India in the COVID-19 outbreak.

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Introduction

In the year 2018-19, for Non-Banking Financial Companies (NBFCs) it was the first Phase of adoption of a converged form of IFRS i.e. Indian Accounting Standards (Ind-AS) for Financial Reporting. And the year 2019-20, as the second phase of implementation. NBFC sector is battling with the already chaotic situation with their issues, the situation got worsen because of COVID-19 uncertainty. As compared to the Banks, NBFCs are required to make higher percentage provision as NBFCs are supposed to follow the Ind-AS. The Expected Credit Loss (ECL) Method of Ind-AS asks for provisions based on future credit losses as 'Expected' to be incurred.

Objectives

- To comprehend the concept of Expected Credit Loss (ECL) of Ind-AS 109 in the case of NBFCs.
- To understand the related changes in recognition of Interest Income with throwing some light on the Expected Interest Rate concept of Ind-AS 109

- To comprehend the Ind-AS application Challenges for NBFCs Financial Reporting in the Covid-19 outbreak.
- To throw some light on the enormous scope of further research on this topic.

Literature Review

Scenario Out of India

(Barnoussi 2020.; Bodellini 2020; Ch Andrea Minto Graduand Wally Elisa Ceresato, 2020; I. H.-Y. Chiu et al., 2020; I. H. Y. Chiu et al., 2021; Stability & 2016, 2016)
All these studies talk about the crisis's impact on the Financial Reporting of various companies, especially in the finance sector, and the overall increase in the Expected Credit Loss (ECL).

Observations and Study by BIG Four

EY Study (Mar 2019) In the Phase-I of implementation of Ind-AS, EY studied the Separate Financial Statements of 51 NBFCs, and they have observed as the allowance for Expected Credit Loss (ECL) has gone up in more than 50% of the NBFCs and Housing

Finance Companies (HFCs) as per Ind-AS as compared to the same as per Indian GAAP. Out of 34 NBFCs – in 27 NBFCs there is an increase in the provision of ECL. Out of 17 HFCs- in 9 HFCs there is an increase in the provision of ECL. (EY Report 2019.)

EY (Aug 2020) in their analysis of COVID-19 impact on NBFCs financial Reporting-They have commented about the extra cushioning provision as ECL allowances created by the NBFCs to cope up with the COVID-19 uncertainty. These cushions will help to sustain that extra stress which may cause due to small corporate loans may turn into NPAs.

As per this study, there's an additional provision because of COVID-19, of Rs. 258 Crores (Banking, Financial Services, and Insurance Sectors taken together) by 25 companies of the sample.

There is an adverse impact on the profitability because the quality of loans has gone down, the reason being slow down in the businesses and add-on provisioning for NPAs amid COVID-19. In one of the NBFCs, the customer's percentage opted for the moratorium is 75%, and while it is 25% in another NBFC, which is a BIG one as compared to the earlier one. NBFCs with a higher portion of loans that falls under the category of secured ones are more equipped to tackle the COVID-19 uncertainty situation as compared to the NBFCs having more unsecured and MSME Loans. As the lockdown conditions were different in the city Vs the countryside, the loans have been studied as rural against urban areas.

It's the era to focus on the Firm's future aim and to predict and adapt the prospects to achieve that goal. To make the efforts ongoing in that direction (EY Aug 2020)

EY Study (Dec 2020)- In this EY analysis, they studied the Financial Statements of 42 NBFCs. Revealed that there is a significant increase in the Non-performing assets of NBFCs. They have studied the stage-wise loans quantum increase or decrease; Allowances of ECL, and the change from 2018-19 to 2019-20. The main reasons for the increase in ECL are COVID-19 and macroeconomic aspects. They have studied varied methods implemented by NBFCs to gauge the COVID-19 bearing on the ECL and

the robust risk management for NBFCs. (EY Report 2020)

KPMG (Apr 2020)- They have analysed the implications of COVID-19 on the Financial Reporting of Various sectors. For NBFCs, a few issues highlighted while reporting as per Ind-AS in the COVID era are substantial disturbances caused by COVID-19 in the functioning of already troubled NBFCs. ECL model has to take extra caution to reflect the current scenario.

Also, RBI Regulation and relief in the form of moratorium and NBFC should check whether their loan assets need amendments in the covenants also confirm whether they need re-classification.

Advisory and other Regulatory Notifications issued for considering the impact of COVID-19

The advisory issued by the Accounting Standards Board (ASB) and Auditing & Assurance Standards Board (AASB) of ICAI regarding the Financial Reporting and the impact amid COVID-19. Under the guidance of the Ministry of Corporate Affairs (MCA) (March 2020) (ICAI Advisory)

The advisory mentions that NBFCs have to follow the RBI circular issued on 13th March 2020, regarding the adoption of Ind-AS Financial Reporting. Consider essentially the present and the anticipated macro-economic aspects and probabilistic model of various situations under COVID-19. While evaluating ECL consider the parameters of borrower's Credit Risk as there is negative implication because of halt in the business activities. Check reduction in the collateral's value as well as dicey financial guarantees and negative impact on the cash flows. Losses will increase.

RBI notification for the NBFCs and impact on ECL (RBI Press release on 27th March 2020)(RBI Notification March 2020)

Effect of Moratorium on the loan assets have to be figured out by NBFCs and accordingly re-classification of assets needed; Borrowing powers of customers to be re-evaluated; Loan Covenants to be re-worked; Loan assets to be re-checked for stage-wise classification as per the assessment of Risk and ECL to be provided for. Impact on the amount of Interest because

of postponement is to be assessed and reported for.

Ministry of Corporate Affairs (MCA)- In their notifications allowed some extensions to the companies in holding meetings and permission for E-voting for the general meetings, which got a breather to NBFCs to present its Financial Statements as per the norms of Ind-AS in this turbulent time of COVID-19. (MCA General Circular 18-2020)

SEBI

SEBI has also issued an advisory on disclosures of material impact of the COVID-19 pandemic on listed entities under the SEBI LODR. (SEBI Circular April 2020)

Experts take on ECL and Ind-AS Financial Reporting in COVID-Era for NBFCs

(ETCFO.com, Mint, Bloomberg Quint)

Sandip Khetan, Partner and National Leader, FAAS, EY India (Dec 2020)

He expressed his concern about the COVID crisis will hamper the ability of NBFCs to convert their financial assets. RBI has granted some reliefs, NBFCs have halted the days past due position and they have made add-on COVID provisions ECL losses have gone significantly up in the year 2019-20 as compared to 2018-19, averaging 19% as a COVID-19 implication. (ETCFO NPAs_ Dec 2020', CFO News)

Rajiv Sabharwal, Chief Executive of Tata Capital (Oct 2020)

He pointed out the disparity in requirements for Financial Reporting for NBFCs and that of Banks in India. NBFCs are needed to follow complex Ind-AS and but Banks are into old Indian GAAP. Unfair for NBFCs especially in the COVID-era. (Mint Report Oct 2020)

Bloomberg Quint Opinion (March 2020)

There could be added pressure in the lending as there is tremendous uncertainty because of COVID-19, in the already havocked NBFC sector. There is a ray of hope if Firms follow the regulations religiously ultimately for the betterment. (Ind-AS & NBFCs Bloomberg Quint Opinion March 2020)

Ramanujam Narayan (Apr 2020)

He Summarised the challenges met by NBFCs while following Ind-AS-

It's a huge cost involved in the preparation of set-up for Ind-AS reporting, not only the infrastructure costs for software, etc. but also the expertise requirements have to be fulfilled.

Preparation Time granted was less and that's the concern for a few NBFCs as they were wrongly estimated shorter time than required.

For ECL purposes there is a requirement of large historical data as well as requirements of expertise for future predictions which is a huge challenge in the available resources. (Linkedin Apr 2020)

Review and Excerpts from Annual Reports of a few NBFCs

Bajaj Finance Ltd. (Annual Report 2029-20)

Estimation of impairment allowance on financial assets amidst COVID-19 pandemic

Estimates and associated assumptions, especially for determining the impairment allowance for Company's financial assets, are based on historical experience and other emerging factors on account of the pandemic which may also have an effect on the expected credit loss. The Company believes that the factors considered are reasonable under the current circumstances. The Company has used early indicators of moratorium and delayed repayment metrics observed along with an estimation of potential stress on probability of default and exposure at default due to COVID-19 situation in developing the estimates and assumptions to assess the expected credit losses on loans. Given the dynamic nature of the pandemic situation, these estimates are subject to uncertainty and may be affected by the severity and duration of the pandemic.

Source: (Bajaj Finance Ltd._ Annual Reports_2019-2020)

Auditor's Observations for L&T Finance Ltd. (Annual Report 2019-20)

Credit Risk

Your Company implemented a comprehensive underwriting framework to guide individual businesses to optimum credit decisions. This is backed by clearly defined risk limits across various parameters including products, sector, geography and counterparty. Further, effective review mechanism with state-of-the-art early warning signals are in place to promptly identify potentially weak credit with a high emphasis on maintaining "Zero DPD". Your Company has been able to ensure stable asset quality through volatile times in the difficult lending environment further exacerbated by COVID-19 pandemic, by stringently adhering to the aforementioned prudent risk norms and institutionalised processes.

Your Company has a conservative and prudent provisioning policy. As per the recent RBI notification on acceptance of IND AS for regulatory reporting, it computes provision as per IND AS 109 as well as per extant prudential norms on Income Recognition, Asset Classification and Provisioning (IRACP). If the impairment allowance in aggregate, under Ind AS 109, is lower than the provisioning required under IRACP (including standard asset provisioning), the difference is appropriated from net profit or loss after tax to a separate 'Impairment Reserve'. Your Company has taken incremental provisions to strengthen the balance sheet against the after effect of the pandemic.

Source: L&T Finance Ltd. (Annual Report 2019-20)

HDFC Ltd. (Annual Report 2019-20)

COVID-19 - Further, the Corporation has also evaluated its individual and non-individual portfolio to determine any specific category of customers which may reflect higher credit losses (e.g. based on specific sectors) or where the recoveries may be affected due to potential reduction in valuation of the collaterals (e.g. type of collateral, customers where recoveries were expected through realisation of collaterals only etc.). Basis such determination, the Corporation has recognised provisions as management overlay for specific categories of customers identified or recognised additional provisions for specific customers where provisions were originally recognised based on recoverable value of underlying collaterals, as applicable.

Source: HDFC Ltd. Annual Report 2019-20)

Research Methodology

This paper is a descriptive review paper. It is based on secondary data. All the data is composed of various Journal papers; Annual Reports of selected NBFCs; Pronouncements of ICAI, RBI, MCA & SEBI; Papers/Research published by Big-Four Audit & Accounting Advisory Firms; Interviews of CFOs published on the webpages of Financial Newspapers, Articles published by Financial and other Newspapers/Periodicals.

Findings & Discussion

Ind-AS 109-Financial Instruments & Expected Credit Losses (ECL)

Ind-AS 109-Financial Instruments and related reporting itself is a very intricate issue. There are direct consequences of COVID-19 on the financial reporting of Corporates. Parameters and Consequences of Credit Risk have already

been recognized in the advisory issued by ICAI. For Banks and especially for the NBFCs, while adopting Ind-AS, implementing ECL provisions of Ind-AS 109 is a real test and challenge.

Erstwhile Regulation Vs Ind-AS provisions for Expected Credit Loss (ECL) & Effective Interest Rate (EIR)

Let's understand the entire mechanism of these provisioning norms.

There is a vast difference in the approach in the erstwhile Indian GAAP and the newly applicable Ind-AS for provisioning.

In Indian GAAP, we had RBI regulations that stated, how much to provide and it was broadly driven by the number of days the payment was overdue starting from 90 days, it was all based on rules.

For the Interest Income on these loans, the moment the overdue days cross 90, there was a

provision not to recognize Interest Income on these loans. The argument being, when the principal is doubtful, recognition of interest income would also be wrong hence not to recognize the same. It used to be stopped from the 91st day. The interest that was accrued from day 1 to day 90 would be 'reversed'

The terms used were Standard assets, Sub-standard assets, Doubtful Assets, Provisions for Bad Loans, Provisions for Doubtful Debts, etc.

As per Ind-AS regulations, Management, not the regulator, should estimate what its bad loans are. Some controls have been instituted so that management cannot be very aggressive in their stance. There is a huge scope for Managements' judgment, assumptions, and estimates. They would consider the past data of losses on loans, various loan arrangements

their designing for recovery, actual recovery time and the predicted recovery time, what is the expected future losses and defaults as per the probability model, and the overall evaluation of credit quality and the amount feasible to be recovered from the collaterals.

Another big difference is, Ind-AS seeks to recognize interest income on all loans, good ones, doubtful ones, bad ones under Effective Interest Rate (EIR) provision.

ECL methodology talks about 3 stages of loan assets. This method is based on the idea of Substantial Credit risk of loan assets from its inception.

Three Stages have been conceptualized by Ind-AS 109, it governs the loss to be recognized on the measurement date i.e. the Reporting Date.

Asset Classification	Loans/ Advances	How much of Allowance
Stage I-Zero to 30 days DPD	Standard Assets (Good)	12 months ECL
Stage II- 31 to 90 days DPD	Significant increase in credit risk (SICR)	Life time ECL
Stage III-above 90 days DPD	Impaired (Default)	Life time ECL

DPD= Days Past Due

When there are assets and the carrying value of those assets is to be reduced for loss/ impairment then, those are called '**Allowance**'

The 30 days and 90 days limits are quite hard and almost set in stone.

Let's discuss a few case examples

a) If someone has not paid for 132 days and if management is arguing that default has not happened, it is almost not feasible to do that. The standard does say that you have a rebuttable presumption - but in practice, the Auditors don't allow the firm to rebut.

b) There is a farmer loan and the farmer pays once in 6 months regularly, driven by his cash flows from his crops. This farmer will regularly get into default if the 90 days criterion is applied to him. If NBFC genuinely don't want the farmer to fall into default and bounce back every year, what should be done- Structure the due dates properly, should not have an EMI for him, if the due date is designed according to his crop season then it should be fine.

c) If someone is there on 32 DPD, then he falls into Stage II. Stage II requires higher provisioning than Stage I, For Management to argue that even though the loan is in

Stage II, please consider him as Stage I is difficult.

Suppose he repaid on day 30, but NBFC went on strike, the cheque can't be encashed and the payment got recorded on day 33, then maybe this can be regarded as a Stage I asset.

In this COVID era, there are practical challenges of following Ind-AS reporting while fitting loans in the prescribed three stages. Especially when NBFCs are hampered badly by the effects of COVID-19. Borrower's conditions depleted so as the quality of the loan and that directly hindered the repayment process to the NBFCs. There is the uncertainty of financial guarantees. Not extending the time limit is problematic from the NBFCs point of view.

Challenges and Complexities for the Management to Estimate ECL

30 days and 90 days are very strong thresholds. **Rebuttal** -The RBI circular of 13 March 2020, says that if the management wishes to relax 30 or 90 days, for any reason, these should be documented elaborately and the Audit Committee should provide its approval to such relaxations. But 30 days cannot be extended beyond 60 days in any case.

There are different methodologies for large loans and small loans which are handled at a portfolio level. This estimation will come from non-mathematical stuff depending upon the capacity, complications, and overall statistics of the Risk of NBFC.

NBFCs appoint a Risk Committee i.e. Audit Committee of the Board (ACB) for documenting the 'Expert Opinion'.

In the COVID-19 situation, the evaluation of Expected Credit requires substantial management judgment, as these can't be called equivalent or base on the past event for the future predictions. Managements have to study the macroeconomic aspects also recommendations from the Risk Committee and set up the risk which is not apprehended into the existing structure of their loans.

In the COVID-19 uncertainty situation, it is very crucial to focus on disclosures as the evaluation of the ECL process involves management judgment, assumptions, and estimates.

ECL evaluation is based on the following:

Expected Interest Rate (EIR), Time value of money & Probability Weighted Estimate

Let's throw some light on the Hitches of these Concepts

Expected Interest Rate (EIR)

Interest Income, and Expenses, have to be recorded in the Financial Statements. As per Old Indian GAAP, Fees for Loan Processing used to be recognized directly in the Profit and Loss Statement. Cost for Loan Processing (originating) also used to be shown on incurred basis. As per Ind-AS, under the Effective Interest concept, the cost for Loan Processing (originating) has to be deducted from the upfront fees for Loan processing and the net amount is required to be amortized. The amortization has to be spread over for the life of that loan. For Expected Interest Rate, estimated future cash flows for the loan assets, repayment models are to be estimated. EIR is the discount rate at which the estimated discounted Cash flows will be equal to the carrying amount of that loan asset.

Issues & Challenges in EIR Method for Loan Assets

What are these Loan processing costs?

Legal Fees, Valuation Fees, CIBIL Charges, etc.

But if NBFCs are maintaining Three ledger accounts for these costs, it is very cumbersome to maintain a separate record for each cost loan-wise. Another problem is to decide which of these costs are even qualify as origination costs. The costs which are attributable to the loan will qualify for the same. If this loan had not happened, would that cost have been avoided? If the answer to this is 'Yes' means the cost is incremental cost and can be considered as the cost attributable to this loan. Marketing and selling costs are not covered. Only post-application processing costs can be covered. You spoke to 100 people, 2 people applied for your loan and paid you Rs 2,000 processing fees. You have incurred costs on all 100 people (you paid Rs 10,000) - how many of these costs qualify as origination costs. All of zero.

Other Practical Challenges in the adoption of ECL and EIR Concepts of Ind-AS

1) In many cases, loans are disbursed in tranches. On day one the amounts and dates of future tranches are not known. So, making a clean table of cash flows is not possible.
2) In tranches, when should we begin amortization is a big question.
3) If the interest rate is floating, the Loan amortization table is messy.

You change the table every time the interest rate changes (on a going-forward basis)

This can be complex. Management applies tons of shortcuts, which the auditors and regulators should be sympathetic to, make an amortization table based on conditions prevailing on day one and leave it at that as far as upfront fees are concerned.

ECL and Time value of money & Probability Weighted Estimate

NBFCs first to estimate cash flow, Cash Flows to be discounted at the EIR applicable to that loan. To bring the carrying amount of Loans to the expected value on the Measurement date

Total Present Value of Future Cash Flows is to be reduced by the Carrying Value to get the

Expected Credit Loss allowance required to be created.

Where estimated cash flows didn't realize, NBFCs again have to take the matter to the Risk Committee and re-assess the same thing i.e. how much and when to realize the cash flows on those loans. New Estimate has to be prepared and incremental ECL is to be created. This is called Truing up of ECL.

Probability of Default (PD) - Loss Given Default (LGD), Stage-wise calculations for Expected Credit Loss (ECL) for NBFCs

Retail Loans

PD - Probability of Default

Probability of default (PD), is the possibility/chances that a borrower is unable to pay back the loan and interest

LGD - Loss given Default

Loss given default (LGD), is the sum NBFC is unable to receive when a there is default of the borrower. This has been shown as a ratio/proportion of total loan at the measurement date (Default date).

How do NBFCs quantify with LGD?

NBFCs have to figure out all those cases where loans crossed 90 days sometime in their life Then cash flows till the end of the loan period have to be mapped.

(i) On the 91st day, what was the exposure

(ii) First, map the simple undiscounted cash flows Post 91 days, what are the cash flows from these loans till the end of the loan.

(iii) Then discount them to the 90th day using the EIR of each loan

(iv) What did we not collect (loss) =(i)-(iii)

(v) Loss given Default= [(iv)/(i)] *100

Cash flows include collections from the borrower himself, sale proceeds of the loan, sale of collateral, encashment of third party guarantees, sale proceeds from auctions, etc.

Any attributable costs for these collections will be reduced.

And ECL = Present Day Loan Exposure* PD *LGD

For Stage III loans assume PD = 100%

For Stage I loans, PD will be calculated by quantifying 12 months losses. Of the balance loans, how many are likely to be sitting in Stage III by the end of the year (within 12 months). This has to be observed for the past few years and the average has to be taken.

For Stage II loans, for PD calculation they have to figure out the following two things-

(i) How many loans ever touched 31 days in their lifetime (anytime),

(ii) How many ever touched 91 days in their lifetime (anytime)

Here they have to look for something called **Conditional Probability**.

From someone to be 91 years old, he ought to have been 31 years old sometime in his life.

Hence (ii) above is a subset of (i)

i.e. PD = [(ii)/(i)] *100 This is the PD in the **Static Pool Approach**

Additional Provisions Required by Ind-AS

Ind-AS asks to make **provisions on loan commitments** also-

Sanctioned but not yet disbursed; Partly not yet disbursed;

For securitized assets, liable due to credit enhancements, then those are also required to be brought into the ECL.

Management Overlay

Suppose NBFC has derived an ECL based on history. The economy in the next 2-3 years may not be the same as that of history. Management is required to make forward-looking adjustments to this history-based number. If in the past GDP growth was 5.2%, management may expect a lower growth as COVID-19 has its impact, Employment data is not looking good, etc. Hence ECL will be higher. Econometric models may establish a more mathematical link between PD and economic indicators. Management may imagine three scenarios - Down, Up, Normal After attributing probabilities to each of them, a weighted average ECL number can be arrived at. Some companies may say we don't think that economic indicators will drive the ability & intentions of our borrowers, we don't see the link, so we'll go by history.

Corporate Loans

Largely in India NBFCs are guided by credit rating agencies like CRISIL, ICRA, etc. These agencies do publish data on PD. The concept here is, AAA-rated companies are less likely to default than a BBB. But in a situation like the COVID-19, life can surprise us and a AA could turn into a D very quickly. Ind-AS wants NBFCs, to develop their credit models, as lenders. They map their models to models of Credit Rating Agencies.

For example, NBFCs have their model, their AAA is equivalent to Credit Rating Agency's A as this company's borrowers are not BIG companies but there are smaller borrowers of lower quality.

Excerpts from the Analytical Studies and Annual Reports to observe and sense the extra provisioning for Expected Credit Loss (ECL) amid Covid-19

1) Excerpts of EY Studies of 42 Non-Banking Financial Companies (NBFCs) for the year 2019-2020 and implications of COVID-19 on their financials

Expected Credit Loss Allowance is 19% because of COVID-19.

Expected Credit Loss Expenses has gone up by a whopping 219% against the previous year.

Expected Credit Loss Expenses, 32% of total ECL Expenses, is because of COVID-19.

Provision reporting has gone up by 26% against that of in the year 2018-19

Ratio of Cost of Risk has gone up by a huge 202% as against the previous year.

(Source: EY Report)

2) As per the Excerpts of Bajaj Finance Ltd. Annual Report 2019-20

Particulars	31st March 2020 (Rs. In Cr)	31st March 2019 (Rs. In Cr)
Expected Credit Loss (Reported)	3603.74	2028.37
Ratio of Expected Credit Loss Coverage	3.08%	2.09%
Management overlay for COVID-19 and macro-economic aspects	869.35	19.35

Source: Bajaj Finance Ltd. Annual Report 2019-20

3) L&T Finance Ltd. Annual Report 2019-20

Year-wise Expected Credit Loss (Rs. In Cr)

Particulars	Stage 1	Stage 2	Stage 3	Total
31st March 2019	397.97	106.13	1238.75	1742.85
31st March 2020	418.73	167.93	1826.13	2412.79

Source: L & T Ltd. Annual report 2019-20

4) HDFC Ltd Annual Report 2019-20

Year-wise Expected Credit Loss (Rs. In Cr)

Particulars	Stage 1	Stage 2	Stage 3	Total
31st March 2019	240.89	3134.84	2471.70	5847.43
31st March 2020	346.12	5750.29	4863.07	10,959.48

Source: HDFC Ltd. Annual report 2019-20

In (3) & (4) above

Stage 1 = ECL Allowance measured at 12 months ECL

Stage 2 = ECL Allowance measured at Lifetime ECL for which Credit risk has increased considerably but not considered as credit impaired.

Stage 3 = ECL Allowance measured at Lifetime ECL for which Credit risk has increased considerably and also it is considered as credit impaired.

Conclusion

It is evident that NBFCs that are under the Ind-AS regime, have allocated extra allowances to deal with Ind-AS provisions of ECL and futuristic provision for losses. Being COVID-19 situation of panic and ambiguity, together with excessive technicalities and futuristic approach of Ind-AS provisions, this has proved a massive test and challenge for NBFCs. Reliefs granted by Regulatory authorities have not been enough to reduce the troubles of

Financial Reporting of NBFCs. It's high time to adapt to ECL and also with the other complexities of Ind-AS Financial Reporting with the help of advanced technical help.

Road Ahead

NBFCs should regulate and corroborate the nitty-gritty required for adopting ECL provisions as required by Ind-AS. It is essential to take the help of tech firms to develop their models. Managing risk should be the essence of NBFCs and the ECL model is a step to aid NBFCs to achieve this goal.

Scope for Future Research

- Financial Reporting Challenges of Ind-AS other than ECL for NBFCs can be explored in the COVID era.
- Operating and allied issues for NBFCs can be studied in detail.
- Expected Credit Loss (ECL) can be studied for other Sectors for COVID impact.
- Researchers can dig further to see how NBFCs are successfully handling the Ind-AS reporting challenge Post-COVID.

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TRENDS IN SMARTPHONE USAGE AND INCREASING RISK OF ADDICTION AMONG ADOLESCENTS

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ABSTRACT

Mobile phone serves an important role in communication in this super connected world. Today everyone has their own cell phone including young children, as an essential part of our everyday life. The most fundamental function of mobile phone is to receive and make calls, helps to improve communication skills, messaging, songs, videos, gaming, reminders, surfing the internet, mails, getting guidance about the direction and location and preparation of notes or presentations from the comfort of a single device. This technology has really boosted the individual's capability to deal with emergency situations. Despite having major advantages, mobile technology also gained some negative points, one of most important being the addiction to mobile phones for social networking. The emission of low levels radio frequency radiations damage tissues around the eyes and testicles, causing headache, insomnia, memory loss and even cancer. The mobile phone has a shown a great effect on the study of teenagers. In addition, the exposure of unhealthy stuff has led to the potential loss of moral values in youngsters that is the matter of concern. However, the mobile phone is both a boon and curse for human life and the excess use of mobile phone is dangerous for our health. The positive use of mobile phone can change our whole life and helps in the development of our country. The present survey aims to study the latest trends in mobile phone usage and the behavioral dependency of youngsters on social sites that is making them addicted and reducing their will power and patience. The study also objectifies to create awareness about the possible harmful impacts on the overall behavior and health risks associated with its prolonged usage.

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Keywords: Behavior, smartphone, dependency, addiction, health, social sites

Introduction

The mobile phone has gained popularity among the teen in the world and has become an indispensable part of our life. There are 5.20 billion unique mobile phone users in the world today (GSMA Intelligence). The total number of unique mobile users around the world grew by 102 million in the past 12 months. China, India and the United States are the countries that have reported highest number of smartphone users, with easily surpassing the 100 million user mark. There are 1148 million subscribers in India (September, 2020) which creates a need to understand the possible trends in mobile phone usage and their impact on our life. Considering the current situation of COVID-19 pandemic, the usage of mobile phones has increased manifolds as compared to what was before it. Students and teachers have been the direct targets of this increased usage due to switching from offline to online mode of education. This calls for an assessment of mobile phone usage pattern and its impacts especially on youth. The networks used have also evolved from 2G to 5G. There is a marked difference between 2G, 3G, 4G, 5G where, the

"G" stands for generation, associated with cellular network. The 5G system uses higher frequency waves and a closer cell structure, which changes the networking style and promises greater bandwidth for users. The telecommunications industry is on an exponential expansion as per the present view. Mobile phones today are more commonly called as smartphones because they accommodate web browsers, games, cameras, video players, navigation, extra voice and data services. A dominant model called 5G is being unrolled throughout the world. Electromagnetic (EM) radiation, a form of energy exists in many forms, such as radio waves, microwaves, X-rays and gamma rays. It is created when an electron, is accelerated by an electric field and is divided into seven regions (radio waves, microwaves, infrared (IR), visible light, ultraviolet (UV), X-rays and gamma rays.), in order of decreasing wavelength and increasing energy and frequency. Out of these, Radio waves are used primarily for communications including voice, data and entertainment media with wavelengths longer than infrared light having frequencies as high as 300 gigahertz

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(GHz) with the corresponding wavelength is 1 mm to as low as 30 hertz (Hz) with the corresponding wavelength is 10,000 km. These waves travel at the speed of light in vacuum and are emitted naturally by lightning and astronomical objects, received by radio receivers, such as antennas. Radio waves have been widely used in modern technology for broadcasting, radar, fixed and mobile radio communication, radio navigation systems, communications satellites, wireless computer networks and many other applications.

Emission by cell phones

When in use, cell phones emit low levels of non-ionizing radiation, also referred to as radio frequency (RF) energy. Mobile phones communicate by transmitting radio waves through a network of fixed antennas called base stations. Radiofrequency waves are electromagnetic fields, can neither break chemical bonds nor cause ionization in the human body. Mobile phones operate in the radiofrequency range of the electromagnetic spectrum, from several hundred MHz to several GHz, to enable wireless phone calls and data transfer, including communication through the internet. The exact frequency band used differs between technologies (GSM, UMTS, 4G, 5G, etc.) and between countries.

Sources of Non-Ionizing Radiations

Major sources include Radio, Television, Microwave, Electrical appliances, Power lines, Mobile phones, Mobile phone towers, Wi-Fi Devices.

- The 1980's brought the first generation or 1G of networks with voice-only service. The top speed of data transmission on a 1G network reached around 2.4kbps.
- 2G Networks allowed for call and text encryption as well as SMS, picture messaging and MMS. The maximum speed for 2G was about 50kbps.
- 3G Network was the advent of a network with more data, video calling, and mobile internet began in 1998. 3G networks reach 2mbps on stationary or non-moving devices and 384kbps on devices in moving vehicles.
- 4G Networks, the current standard of cellular networks, was released in the late

2000s and is 500 times faster than 3G. It has been able to support high-definition mobile TV, video conferencing and much more.

Impact of radiations on flora, fauna and humans

➢ The impact of mobile radiations has been observed on male fertility, reproductive system, decreased sperm count, increased oxidative stress, tiredness, rapid exhaustibility, headache, physical illness, headache, ear-ache, tinnitus, pain in fingers, restlessness, risk of poor sleep quality (De Iuliis, 2009; Kesari *et al.,* 2010; Agarwal *et al.,* 2011; La Vignera *et al.,* 2012; Schoeni *et al.,* 2015; Stalin *et al.,* 2016; Lee *et al.,* 2017). D' Silva *et al.,* 2017 showed more pronounced changes in 3G experimental group. The impact of radiations depends on its type in Electromagnetic Spectrum. Ionizing radiation (IR) such as X-rays and gamma rays have capability to cause changes in atoms or molecules in the body leading to severe tissue damage such as cancer. Non-ionising radiation (NIR) which do not cause severe changes but enable molecules to vibrate that lead to rise in temperature, as well as other effects (Ultraviolet radiations in sunlight, visible light, light bulbs, infrared radiation, microwave energy and radiofrequency energy).

➢ Studies on the impact of mobile radiation on male fertility are conflicting and the effects of the radiofrequency electromagnetic radiation (RF-EMR) emitted by these devices on the reproductive system are currently under active debate. Agarwal *et al.* (2014) reviewed that RF-EMR decreased sperm count and motility and increased oxidative stress. Schoeni *et al.,* 2015 observed that nocturnal mobile phone use among Swiss adolescents was associated with an increase in health symptoms reports such as tiredness, rapid exhaustibility, headache and physical ill-being, but not with memory and concentration capacity. Stalin *et al.,* 2016 suggested the positive association of health problems like headache, earache, tinnitus, painful fingers and restlessness

with mobile phone usage. Lee *et al.,* 2017 examined 1125 students to study the relationship between mobile phone addiction and the incidence of poor sleep quality and short sleep duration in adolescents. It was found that three of ten teenagers in Korea were addicted to mobile phones and high mobile phone addiction (mobile phone addiction score > 20) that increased the risk of poor sleep quality.

➤ Mobile phone screen is a major carrier of germs, Oxidative stress, Cancer, Behavioral effects (Increasing Addiction, Restlessness, Irritation, Frustration, Difficulty in socializing with people in person, Depression, Loss of Confidence). Other than humans, mobile phone radiations had affected plants (adverse seed germination, abnormal growth, wrinkling, inhibition of root growth), birds (Disorientation and Navigational problems, death by collisions) in and other mammals (Still births, spontaneous abortions, birth deformities, behavioral problems reduction in milk yield, changed milk composition and fertility problems in cows, impaired immune system in sheep, reproductive and developmental problems in dogs and cats, anxiety and alarm in rabbits, frequent death of domestic animals), significant decline in honey bee colony strength, in the egg laying rate of the queen and caused a negative influence on the behavior of exposed foragers leading to a great loss in the production of honey as well as bee pollen.

➤ However, contradictory reports are available regarding the structural changes in various tissues like retina, liver, kidney and testis in different animal models on exposure to electromagnetic radiation of 900- 1800 MHz. The exposure resulted in impaired retinal growth, malformed brain (Fatima, 2012) hyperpigmentation of Retinal Pigment Epithelium (RPE) (Zareen *et al.*, 2009) structural changes in the retina (Amer and Hamza, 2013) and lens (D'Silva, 2014). Structural changes were also observed in the kidney (Ingole and Ghosh, 2006) and liver (Lahijani *et al.*, 2009; Topal *et al.*, 2015; Tarantino *et al.*, 2005) of different animal models on RFR

exposure. Ozguner *et al.*, 2006 studied the effect of longterm exposure of albino Wistar rats to radiofrequency from 900 MHz mobile phones that resulted in decreased concentration of antioxidant enzyme Glutathione Peroxidase, catalase and Superoxide Dismutase and increased Reactive Oxygen Species.

The present study is and attempt that suggests that most of the respondents under study were aware of the basic impact of Mobile phone usage i.e. Loss of concentration, road accidents, excessive wastage of money on latest gadgets, major cause of distraction, cause of social distancing even before COVID-19, and it is a major platform for increasing cybercrimes.

Objectives of the Study

Apart from elders, smartphone has become status symbol even for kids & this is the reason that every day the market is being dumped with new models of smartphones. Because mobile phone use is so widespread, public concerns about the possible health effects of mobile phones receive a lot of coverage in the media. Therefore, the aim of the present study was to highlight the latest trends of mobile phone usage and its addiction frequency among a sample of studied population. The study also aimed to create awareness about the limits of smartphones usage and its possible impacts on behavior and health risks associated with its prolonged usage in public.

The study focused on the following objectives:
1) To identify the extent of mobile use.
2) To find out the mobile phone usage for different purposes other than

Methodology

Since, cell phone is extensively used among college goers, it is a leading cause of insomnia and headaches. To accomplish the above objectives, a structured questionnaire was designed and circulated to 300 individuals (age group 15 – 50 years) with different subject backgrounds such as Science, Medicine, Information technology, Engineering, Social Science and Library Science. A total of 276 (92%) filled-in questionnaires were received and the same were used for data analysis. The

results give an idea of association of mobile usage with adverse psychological effects.

Results and discussion

The study clearly reflects an association between extensive cell phone usage and irritability along with other psychological changes like lack of concentration. In the present study, about 87.6% respondents belonged to age group 15-25 years, 10.9% ranged from 26-50 years while only 2.1 % respondents were above 50 years (Fig. 1.1). The participants of age group 15-25 years reflected the most vulnerable population which is undergoing brain and neuronal development. The results were comparable to the studies done by Link *et al.*, 2007 in US, where mobile phone users were excessive among the 18–34 years age group (that included employed people, single people and households with children). The survey included 91.5% female respondents as compared to 8.3% male participants (Fig. 1.2). About 65.9% respondents belonged to Tricity (Chandigarh, Mohali and Panchkula) while 34.1 % respondents were from different states i.e. from States of Himachal Pradesh, Haryana, Panjab, Uttarakhand, Ladakh etc. (Fig. 1.3).

A lot of variation in responses was observed with respect to network usage by the participants. A huge number of respondents were seen using Jio sim network (44.4%), followed by Airtel with good numbers (33.7%). However, the usage of other networks was very low with Idea users (9.6%), Vodafone (8%) and BSNL 4.7% respectively (Fig. 1.4). This might be due to the analytical data claimed by company Tutel, that Reliance Jio provides the best basic consistent quality data network to its consumers, whereas Airtel's network is better for more demanding requirements as it offers the best average 4G data downloading speed, whereas Jio has the slowest average 4G download speed. However, across the entire country, Jio had shown the best overall consistent quality meeting the standards for either basic or excellent consistent quality. That is why the students preferred to be a Jio's user for convenient video calling, online classes, email checking, fast internet surfing and to use most basic apps with high and consistent quality.

The present study revealed that about 88.7% respondents used prepaid connections (Fig. 1.5). This high percentage may be attributed to the prepaid plans that have recently became insanely cheap with unlimited voice calling plans with a high amount of data in range of Rs. 300 - Rs 350/month. In addition to these benefits, there are no hidden charges, no chance of spending a huge amount of money like postpaid bills, there is **100% control on self-spending,** you pay what you use and there is n**o stress of high bills or misuse. However, in case of postpaid connections, a single** ISD call may generate enormous bill or just watching a YouTube video on Full HD for a couple of hours might exhaust your data limit. Another reason for low postpaid connections is that usually there are very few companies which endure the postpaid bills of their employers. It is a well-known fact that today everyone is spending more time at their home due to Coronavirus Pandemic. Some are working from home, some are doing online classes which require more data. In such a situation, prepaid plans with more data are of great use. This owes to the high percentage of respondents as revealed in our study. In India, 2014 data indicated that total prepaid subscription was 886 million with an average monthly prepaid churn of 14% in India. This clearly depicts that the prepaid subscription increases with increase in churn rate in tandem years (Rajeswari, and Sadasivan, 2019). The study showed that maximum users (61.7%) were using 3-month package data plan while 35.1% restricted themselves to 1-month plan. Very few users corresponding to about (3.2%) opted for 6 months or yearly package. (Fig. 1.6) This is mainly because the target user of all the networks is majorly students for their extensive internet surfing addiction. This forces the companies to provide economical tariffs plans for students. A survey conducted during 2015 in developing countries on the use of Internet found that about three- fourths of adult Internet users across 40 countries use the Internet at least once a day (Poushter, 2016). The present survey also revealed that about 35.1% respondents used mobile phones for 15 minutes once followed by 28.6% respondents with usage of 30 minutes. A good number corresponding to 17.3% and 12.5% used their

phones for continuously one hour and more than 2 hours respectively. (Fig 1.7) However, 6.5% respondents checked their phones and used only for 5 minutes at a time. This data shows a high psychological dependency on social media. The companies target this audience and use similar strategies to attract them by creating and including pull-to-refresh buttons and infinite scroll features. The time spent on phones at once can include checking of emails, news reading and browsing social media. Moreover, Olufadi, 2015 suggested that the student himself is aware of the problem of dependence but does not exclude the existence of reality. In the present study, 43.5% of college students choose to use mobile phones 'once a minute', 'once an hour' were 26.36%, 'once a few hours' were 22.58% and 'several times a day' were 7.56%. This high percentage clearly show that most college students are dependent on mobile phones and in a day, they use mobile phones to accomplish many things which has increased due to pandemic (Wang and Zheng, 2020). Close to half of the respondents i.e 46.4% used the internet daily for 1-2 hours and 31.2% of them used for 3-4 hours. The data indicates that respondents are active internet users so most of them (92.8%) use internet for 1-6 hours daily. Our results clearly go in accordance with the study done by Somipam and Chennupati, 2019 that identified the purpose(s) of using the Internet i.e. for reading, for social networking (Facebook, Twitter, WhatsApp, Instagram, etc.), for downloading music and video files, for playing online games and for sending and receiving emails.

An internet is extensively used for surfing the required information quickly and for social networking (Haddon & Kim, 2007; West & Mace, 2010). In our study, as expected 94.3% respondents used their mobile phones for WhatsApp very frequently, followed by Facebook users (81.1%), Instagram users (52.4%). A good number of participants i.e. 90.4% and 98.2% respondents did not used other social networking sites like twitter and tiktok, respectively. However, a high percentage of 44.3% users binged on snap chat. (Fig., 1.8-1.13). The survey showed that WhatsApp and Facebook are the most widely used social platforms among the seven online social media platforms and messaging apps. These platforms are mainly chosen due to their distinctive features. Since **WhatsApp** is a messaging platform and one of the most widely used digital platforms that allows users to send text messages and other media, as well as make phone and video calls and is also available in up to 60 languages, while **Facebook** is a social networking platform with availability in over 100 languages. **The percentage of Instagram** users has recently increased as it is a photo- and video-sharing platform available in up to 36 languages. Similarly, **Snapchat** users are on a high side, as it is a multimedia messaging and entertainment platform available in 22 languages. Comparatively, **Twitter** is a social networking and microblogging platform available in 47 languages that is not used frequently by the students. Due to ban of Tiktok app in India, its use has been drastically decreased with only 1.8% users in our survey. Kenya and India are the only countries where most adults do *not* use at least one of these social media or messaging services.

In an interesting scenario, 57.3% respondents checked their phones as soon as a message or a call was received, 22.5% users checked their every hour while 12.1 % and 8.1% checked their phones every 30 minutes and 15 minutes respectively. (Fig.1.14) Usually the phone is usually within arm's reach, which seems to be typical of everyone, old and young, who includes a phone as their essential belongings, along with their keys and wallet. It justifies the internet ephemera for a living habit of filter-feeding through social media. There were 22.5% users who checked their phones every hour that also shows that people are finding a balance in their personal life and phone usage for shopping, dining, etc. and they are trying to reduce time on their phones and spend time with those around them. In a study done by Arumugam *et al*., 2014, it was seen that majority of the students were spending less than one hour on hearing music, on games and on mobile internet that accounted for 49% (105), 63.3 (135) and 45.5% (97) respectively. The study also studied the behavioral pattern in which about 90% (192) participants kept their mobile under the pillow or near the bed, 45% (96) respondents checked their mobiles for missed calls and messages at midnight, 48.8%

(104) of them checked the mobile as soon they got up from the bed. Almost (111) 52% of the study participants replied that they can't live without mobile phones.

Similary Babadi-Akashe *et al*., 2014, conducted another study among university students of Shahrekord, Iran, that revealed the addiction to mobile phones of about 21.49% of the respondents, 17.30% participants showed depressive disorder, 14.20% participants had obsessive-compulsive disorder, and 13.80% had interpersonal sensitivity. Another study discovered that 72% of South Korean children between age group 11–12 years spend 5.4 hours a day on mobile phones, accounting for 25% children addicted to smartphones (Jeong *et al*., 2016). Parasuraman *et al*., 2017 revealed that 39.6% of their study participants checked their mobile phone on an average of 21–30 times a day, and 11.7% of the study participants checked their mobile phone more than 30 times a day. Recently, Chae 2020 compared the time usage of cell phones per day before and after COVID-19 pandemic. The number of users with usage less than an hour were 11.5% to 8.3% lower, and the number of users who used it for 3 to 4 hours were also on reducing side, but the number of user for 5 to 6 hours and over 7 hours showed the highest increase from 12.9% and 13.4%. A huge number of respondents (85.6%) used the online shopping applications once a month only, while a very meagre number used every day, once a week or 3-4 times a week. More than one-third (35%) of people surveyed who use shopping apps more than once per month tend to engage with these e-commerce apps between 2 and 5 times a week. Others use shopping apps at least once a week (19%), 2 to 3 times a month (18%), and several times a day (16%). (Visual objects 2019 E commerce app survey).

Pandemic, although it was considered an unlikely event for a long time before the COVID-19 outbreak, has been identified as one of the key threats to businesses, according to a survey conducted in 2007. Mobile food ordering and food delivery is one of most popular area of mobile application development (Islam *et al*., 2010). A similar pattern was seen for usage of food delivery apps (Fig.1.15). Jadhav, 2018 reported that around 20% users used these shopping apps only once a week. 66% of the respondents believed that the food ordering app will be the most preferred tool for food ordering in the future. 12% of the customer respondents have never used the app, whereas majority of the respondents have used the app sometime or frequently, making it a popular tool used for ordering food. Similar trends were observed for usage of food delivery apps by the users. As we know that it is best to order one's favorite comfort food from the couch while bingeing the latest shows and having it delivered at the front door. Also, the parents who don't have time to cook utilize online food delivery apps. In the present survey, 92% users used food delivery apps only once a month, while about 9% used once a week (Fig. 1.16). The data showed the variation in food intake during the COVID-19 emergency. The low usage of food delivery apps can be justified due to increase of homemade recipes (e.g. sweets, pizza and bread), cereals, legumes, white meat and hot beverages consumption, and a decrease of fresh and packaging sweets, baked products, delivery food and alcoholics intake. It also suggests that during the COVID-19 lockdown, the population had healthy food (fruit, vegetables, nuts and legumes). The advent of online food delivery services has allowed restaurants and customers to connect even when facing unfavorable weather. Restaurants can field steady business and customers stay well fed. The present data revealed that 52.7% users across the globe preferred mobile as their primary platform for watching serials, movies, music videos, reality shows, matches and TV shows (Fig.1. 17). These findings further show that the users have growing trend of long form content consumption via the mobile, instead of TV. The change is because the smartphones have become more ubiquitous and the ways people use their devices has shifted.

Conclusion

The impact of mobile phones is visible in all areas of life including business, education, health, marketing, social life etc. But it is not out of place to mention here that every technology has its pros and cons within. It has also caused various health hazards and brought miseries to people especially children which

include Eye strain, Neck and back pain, Hypertension, etc. Overall, the survey was an attempt to get a thorough information from the participants about mobile phone usage and their possible impacts on individuals and further to asses various precautionary measures that could be taken to minimize the usage. This qquestionnaire based study revealed that every college student possessed a mobile phone with smartphones more prevalent than feature phones. The average time of mobile phone usage was 2-5 hours among maximum students and a lower percentage of students was even more addicted, with usage time 7-10 hours. The extremely high percentage of respondents (94.3%) used their mobile phones for WhatsApp, followed by Facebook users (81.1%), Instagram users (52.4%), snapchat (44.3%) suggested a high psychological dependency on social media. The data also revealed the addiction to the mobile device and lack of will power of respondents to stay away from frequent checking of their phones. The trends of using mobile phones for online shopping's, food delivery apps have been on a high side. The pandemic period has made large number of populations to use their mobile as the primary platform for watching serials, movies, music videos, reality shows, matches and TV shows. This smartphone addiction has developed an unavoidable place in one's life making young generation highly dependent upon it. The candidates are possibly expected to suffer from headache, tiredness, sleeplessness, restlessness and other health risks in future. To date, this research has not shown any such health effects. The overall evaluation of all the research on RF EMF fields as emitted by mobile phones leads to the conclusion that RF EMF exposure below the thermal threshold is unlikely to be associated with adverse health effects. However, studies are ongoing to more fully assess potential long-term effects of mobile phone use. There is a need to develop public information materials and to promotes dialogue among scientists, governments, industry and the public to raise the level of understanding about potential adverse health risks of mobile phones. During lockdown mobile phones came as saviours for online educational system. The need of the hour is to analyse the situation wisely and find out ways to keep the use of mobile phones among young students in check without causing any hamper to the positive applications and usage of this tool so as to build the foundation of an intelligent and sociable youth having a strong will power. The findings reported that, use of mobiles among the college student was 100% but there was not proper use of the mobiles for their academic up gradation. It is misused due to many reasons. The parents, teachers and community must take responsibility to reduce the misuse of mobiles among students.

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CRITICAL EVALUATION OF CUSTOMER RELATIONSHIP MANAGEMENT IN THE HEALTHCARE INDUSTRY

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ABSTRACT

Faced with mounting pressures to contain cost and mandates to adopt continuous quality improvement process, the health care industry is actively engaged in relationship marketing and partnering activities. Customer's relationship management (CRM) has overriding significance for hospital services. Hospitals are most important elements in any health care delivery system. A hospital plays a major role in maintaining and restoring the health of the people. It involves to the outpatient and inpatient hospital services and on many occasions emergency medical services. In health care, CRM practices are essentially patient - focused strategies that involves effective management of hospital interface and interaction with patients. Effective CRM practices in a hospital may mean providing services related information to a patient very quickly. Responding to the patent appointment and an admission requests promptly, dealing with patient queries and complaints expeditiously, exercising all kind s of flexibilities in serving patients to the patients. Both primary and secondary data were used for the present study. The primary data has been collected from sample respondents in Meenakshi Mission Hospital & Research Center, Madurai. Interviews were collected from 180 respondents from this hospital.
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Keywords: Health Care Industry, Hospitals, Customer's Relationship Management, Patient

Introduction

Faced with mounting pressures to contain cost and mandates to adopt continuous quality improvement process, the health care industry is actively engaged in relationship marketing and partnering activities. Customer's relationship management (CRM) which has overriding significance for any businesses no less significant for hospital services (Salam, 2000). Hospitals are most important elements in any health care delivery system. A hospital plays a major role in maintaining and restoring the health of the people .Care of the sick and injured, preventive health care, health research, and training of medical and paramedical staff are general broad functions of a hospital. It involves to the outpatient and inpatient hospital services and on many occasions emergency medical services. An important resource in a hospital is a human resource. This should be particularly emphasized. This should be particularly emphasized in the content of a hospital since relationship of medical staff plays important role in treating patients - the hospital customers .In health care, CRM practices are essentially patient - focused strategies that involves effective management of hospital interface and interaction with patients. Effective CRM practices in a hospital may mean providing services related information to a patient very quickly. Responding to the patent appointment and an admission requests promptly, dealing with patient queries and complaints expeditiously, exercising all kind s of flexibilities in serving patients to the patients.

In today's world, the medical sector is finding the need to know more and more about its current and prospective clients. The more efficient service hospitals can give their patients, the further they will go in retaining them.

Review of Literature

The hospital market has today changed from a seller's market to a buyer's market. Where the patient is all important one needs to understand the fact the patients do not flock to a hospital just because it services are cheap, but because of its good name and good image. (Berman and Dave 1994: Engel Elial 2004).

At the same time, the congestion for customers, along with abundant customer's choice, has pushed customer expectations new heights. Who has the patience for a provider the doesn't deliver on time with quality – and with a burning desire the satisfy their needs? Who wants to be bombarded with the same promotion after saying "yes" the first time adding to the challenge, a company is

providing more across points than ever before to reach and interacts with customers.

(Revathy, 2003, Saran 2004, Harsan 2003)

Not only the companies have more channels to manage and integrate, channels like the Internet have made it easier for customers to shop for the best service and deals, creating base, Customers are demanding that you are accessible and easy to do business with. Well, does CRM have any role in improving business performance? While the path to winning the hearts and wallets of your customers are as varied as your customers themselves, the first step is to define the stages of the customer experience from the customer's point of view. Then you must determine how to invest in each stage to generate the greatest customer and business impact. Global companies are beginning to implement CRM strategies, tools and infrastructure to acquire new and beverage existing relationships.

(Kothari, 1990; Kotler 2000; Umukoro etial 2009).

According to **Brown (2000)**, CRM Is neither a concept nor a project, Instead a business strategy, which aims to understand, anticipated and manages the needs of the organizational current and potential customer. It is a journey of strategic, process, organizational and technical change where by, a company seeks to better manage it is own enterprise around customer behaviors. CRM is the process of acquiring, retaining and growing profitable customers. It requires a clear focus on the service attributes that represent value of the customer and create loyalty.

According to **(Handen, 2000)**, CRM consists of five elements, strategy, technology segmentation process and organization.

CRM is the point of view of **Harris (Harris 2000)** is a technology – enabled steategy to convert data driven into business actions in response to, and in anticipation of actual customer behaviors, from a technology perspective CRM represents a process to measure and allocate organizational resources to activity that has the greatest returns and impact on profitable customer relationship.

Statement of the Problem

The new millennium is in midst of explosive change witnessing rapidly changing market conditions, volatile equity markets, reconstructed value chains and new global competitors and customer themselves are changing - natural customer loyalty is a thing of the past. Little wonder then, the concept of customer relationship management (CRM) has taken center stage in the business world for sustainable business advantages. Long- term success requires a great Customer Relationship Management strategy.

Importance of the Study

The study is of great importance to Management/Healthcare administrators to help them provide a better patient relationship management to satisfy the Patient's needs and wants for a sustainable "Customer" loyalty. Effective Healthcare is important to individuals and nations alike. Indeed, it is a basic ingredient in the formula for a stable productive society. Today however, there is growing concern over a looming crisis in healthcare.

According to Wanless D (2010), the challenges are so complex, that healthcare systems around the world need to fundamentally change the way they do business without such change, projections suggest, the current system will eventually collapse.

Research Objectives

The development of Customer Relationship Management has been very essential to many business organizations, in ensuring good customer relations at all cost. In this regard, this dissertation generally aims on identifying the impact of CRM on organizational performance of "MEENAKSHI MISSION HOSPITAL & RESEARCH CENTER".

In particular, this study aims to achieve the following objectives:

1. To study about CRM in MEENAKSHI MISSION HOSPITAL & RESEARCH CENTER – some theoretical aspects.
2. To examine the socio-economic factors impacts on the various schemes in MEENAKSHI MISSION HOSPITAL & RESEARCH CENTER.

3. To offer suitable suggestion based on the analysis to improve the services in the hospital.

Research Methodology

The validity of any research is based on the systematic method of data collection and analysis. Both primary and secondary data were used for the present study. The primary data has been collected from sample respondents in MEENAKSHI MISSION HOSPITAL & RESEARCH CENTER, MADURAI for this purpose satisfied random sampling method was used to select the samples the researcher has approached the management of the MEENAKSHI MISSION HOSPITAL & RESEARCH CENTER, MADURAI city to collect the list of customers in the hospital.

The interviews were collected from 180 respondents from this hospital. The present study highlights the extent of utilization of the hospital services by the selected sample respondents. It is also shed light on the common problems faced by the respondents. The major features of the service sector especially on hospital performance is protected in order to utilize the services as per the expectation of the patient (customer).

For this study data have been collected from both primary and secondary source. An exclusive field study and interview have been conducted secondary data have also been collected for the study from books, leading journals, newspapers, magazines and textbooks related to study and from the internet source. The collected data were analyzed through percentage, average, range, standard deviation and weighted average. In Connection with this two way tables were prepared and chi-square test were also employed to find the association ship, Like's scaling technique is used to identify the customer preference and satisfaction on the hospital services. Henry Garrets ranking method is also used to judge the ranking especially on the hospital services.

Sample Size and Sampling Method

A sample source will be achieved by the use of purposive sampling. A purposive sample is a sample selected a deliberative and non – random fashion to achieve a certain goal. In a

focus group, for example , we went to seek out respondents at both ends of a spectrum (as well as some in the middle) to insure that all viewpoints are adequately represented. We also preferentially recruits subjects who have the best knowledge and experience in an area.

In order to achieve experimental diversification, participants were identified by purposive selection (Galloway A 2008). The Inpatients (N=60) and Outpatients (N =60) for the customer side. In the Management side Nurses and Doctors (N=30) were solicited through directors of professional services Management staff

Data Processing and Analysis

Data collected were mainly quantitative from the Interviews. However, there were a few qualitative data, In analyzing all qualitative data collected, the close - ended responses from the interviews were listed, categorized and transcribed. These responses were further reduced and ordered or coded. The data were summarized into tables and conclusion were drawn from the summaries. The Statistical Package for social scientists was used analyze descriptive statics (Quantitative Data).

Customer Relationship Management in Meenakshi Mission Hospital & Research Center

MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER Healthcare has a major presence in South India with a network of world-class hospitals. In each of our facilities the ultimate focus of our services is the health and happiness of people, our patients and their near & dear ones. Patients experience this sensitivity whether you are an in-patient attending an OPD or simply accompanying a family member.

In the patient-friendly environment in MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER hospital, the layout of departments has been planned so as to save patient time and minimize in-patient movement. The Hospital Information System (HIS) and Electronic Patient Record (EPR) instantly provide patient history details and latest test results to the desktop of the MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER Healthcare specialist

you are consulting, saving valuable time. The welcoming guest relations officers and counselors at the MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER hospital assist in accessing the services-even such conveniences as the cafeteria, ATM or prayer room. There is a section on the website which provides helpful information for visitors and also highlights some of the special services available to our patients and their families.

The expanding MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER Healthcare network ensures accessibility to large sections of the population and ease of medical information transfer (Electronic Medical Records). The network has the convenience of outpatient medical services and diagnostic testing all under the same roof. Our facilities are built with our patients in mind. Ease and convenience for the visitors and patients are incorporated into each facility we design.

Socio-Economic Impacts of this Three Schemes in Meenakshi Mission Hospital and Research Center

Although project findings to date show broad benefits, these are generally associated with feasibility activity, and seldom measure the impact of this three schemes on the social determinants of health. For example, poverty, social isolation, independent living, and identified needs of special populations. New evaluation and research activities should employ methodologies which enable the study of such factors. Patients' views and interests, social effects, quality controls and wider organizational effects are seldom considered.

Our study shows that there are a growing number of evaluation frameworks for use by policy- and decision-makers when developing accepted evaluation approaches that could be consistently applied. For example, generic evaluation frameworks, benefit-cost analysis and consumer care pattern guidelines, as well as effects- oriented and risk analysis frameworks. These have been provided. These schemes also helpful to the people those who are in the level of poverty. It also helpful to the people to get out from the illness.

Table 4.2: Sample Size of the Respondents

S. No	Particulars	Frequency (f)	Percentage
1	CM Scheme	20	33.3
2	FF Scheme	20	33.3
3	ST Scheme	20	33.4
	Total	60	100

Source: Primary Data

Where,

f stands for Frequency
% stands for Percentage
CM Scheme – Tamil Nadu Chief Minister's Comprehensive Health Insurance Scheme
FF Scheme – Free Food Scheme
ST Scheme – Smile Train Scheme
Out of 60 respondents, 20(33.3%) Chief Minister Health Insurance Scheme Patients were answered, 20(33.3%) Free Food Scheme Patients were answered, 20(33.4%) Smile Train Scheme Patients were answered in Meenakshi Mission Hospital and Research Center. Welfare Schemes are useful for Middle Class People and Low Class People. Then only this hospital follows lot of Special Schemes to help the Poor People.

Table 4.3: Gender of the respondents in each Schemes

S. No	Gender	Frequency (f)			Total Frequency	Percentage
		CM	FF	ST		
1	Male	9	7	10	26	43.3
2	Female	11	13	10	34	56.7
	Total	20	20	20	60	100

Source: Primary data.

From the consisting of 60 respondents, 26 were Males (i.e., CM Scheme 9 Males, FF Scheme 7 males, ST Scheme 10 males) Which represent 43.3 % while 34 females (i.e. CM scheme 11 females , FF Scheme 13 females, ST Scheme 10 females) which represent 56.7 %

It is evident that Female population is higher and they are ready to take risk comparatively than the Male in Chief Minister Scheme.

It is evident that Female Population is higher and they are ready to take risk comparatively than the Male in Free Food Scheme.

It is evident that Male and Female are answered equally.

Table 4.4: CM scheme in meenakshi mission hospital and research center

S. No	Statement of Service in MMHRC	Percentage (%)	Mean	Standard Deviation
1	At Reception	100	3.00	0.00
2	At Admission	100	3.00	0.00
3	In Ward	100	3.00	0.00
4	Hygiene	100	3.00	0.00
5	Medical Care	95	3.05	0.22
6	Nursing Care	100	3.00	0.00
7	Treatment Given	95	3.05	0.22
8	Post OP Care	100	3.00	0.00
9	At Discharge	100	3.00	0.00

Source: Primary data.

Major Findings

❖ Customer Relationship Management (CRM) is about customer care and business strategy and the use of IT to achieve the objective of profitability through enhanced customer relations.

❖ PRM transposes the philosophy of Customer Relationship Management to the world of healthcare. This study has been dedicated to assess and see how to enhance PRM implementation in Madurai Meenakshi Mission Hospital & Research Center. (MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER).

❖ To this purpose, interviews have been held and a questionnaire has been designed and submitted to a sample of respondents in Madurai Meenakshi Mission Hospital & Research Center. (MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER).

❖ 48.3% of the respondents were female and 51.7% were male. Accurately 54.15% had a Bachelor degree or above; and nearly 76.7% of respondents had more than Ten years experience.

Conclusions
Managerial Side

❖ The Analytical CRM and Operational CRM paved the way for health service providers to understand consumer behavior. It is primarily important for service providers to retain patients and co-create value if they intend to enrich staff-patient interaction quality.

❖ This goes with the service-dominant concept as well. In this study, all items related to the interaction with patients (customers) scored average scores. To improve physician- patient Collaborative interactions, physicians must demonstrate while delivering services, concern for the patient as individuals as all items have.

❖ Furthermore, they must allow themselves to truly care about and sympathize with their patients, though it is not easy to do so, given the number of patients a staff must see each day in Madurai Meenakshi Mission Hospital & Research Center (MEENAKSHI MISSION HOSPITAL AND RESEARCH CENTER). Moreover, it is also difficult for the staff, which sees misfortune every day, to continue expressing concern and sympathy and to keep from being depressed are negative outcomes. Yet, these are exactly the things that the staff must deliver in order to satisfy and retain patients' role of co-creating firm value.

Patients Side

❖ The benefit of effective interactions with physicians, nursing and support staff results in early recovery, improved quality, increased length of life of a patient and above all, higher patient satisfaction. Increased quality of patient empowerment and level of compliance will improve by

working in concert with the physician, nursing and other staff. This subsequently improves patients' health, mental and psychological condition in a more effective manner.

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ON   NON-HOMOGENEOUS QUINTIC EQUATION WITH FIVE UNKNOWNS
$$3(x^4 - y^4) = 4(z^2 - w^2)T^3$$

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ABSTRACT

The process of obtaining non-zero distinct integer solutions to the non-homogeneous quintic equation with five unknowns given by $3(x^4 - y^4) = 4(z^2 - w^2)T^3$ *is illustrated.*

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Keywords: non-homogeneous quintic, quintic with five unknowns, integer solutions

Introduction

The theory of Diophantine equations offers a rich variety of fascinating problems [1-4]. Particularly, in [5-8] quintic equations with three unknowns are studied for their integral solutions. In [9,10] quintic equations with four unknowns for their non-zero integer solutions are analyzed. [11-15] analyze quintic equations with five unknowns for their non-zero integer solutions. This communication concerns with yet another interesting non-homogeneous quintic equation with five unknowns given by $3(x^4 - y^4) = 4(z^2 - w^2)T^3$ for finding its infinitely many non-zero distinct integer solutions.

Method of analysis

The non-homogeneous quintic equation with five unknowns to be solved is
$$3(x^4 - y^4) = 4(z^2 - w^2)T^3 \quad (1)$$
Different ways of solving (1) for its integer solutions are presented below:

Way: 1

Introduction of the linear transformations
$$x = 2p, y = 2q, z = 4p + 2q, w = 2p + 4q \quad (2)$$
in (1) leads to
$$p^2 + q^2 = T^3 \quad (3)$$
which is satisfied by
$$p = m(m^2 + n^2), q = n(m^2 + n^2) \quad (4)$$
$$T = m^2 + n^2 \quad (5)$$
Using (4) in (2), one has

$$x = 2m(m^2 + n^2), y = 2n(m^2 + n^2)$$
$$, z = 2(2m + n)(m^2 + n^2), w = 2(m + 2n)(m^2 + n^2), \quad (6)$$

Thus, (5) and (6) represent the integer solutions to (1).

Note: 1

It is worth to note that (3) is also satisfied by
$$p = m^3 - 3mn^2, q = 3m^2n - n^3, T = m^2 + n^2$$
In this case, the corresponding integer solutions to (1) are given by

$$x = 2(m^3 - 3mn^2), y = 2(3m^2n - n^3), z = 4(m^3 - 3mn^2) + 2(3m^2n - n^3),$$
$$w = 2(m^3 - 3mn^2) + 4(3m^2n - n^3), T = m^2 + n^2$$

Way: 2

Introduction of the linear transformations
$$x = u + v, \ y = u - v, z = 3u + v, w = 3u - v \quad (7)$$
In (1) leads to
$$u^2 + v^2 = 2T^3 \quad (8)$$
Solving (8) through different methods and using (7), one obtains different sets of integer solutions to (1) which are illustrated as follows:

Set: 1

Let $T = a^2 + b^2 \quad (9)$
Write 2 as
$$2 = (1 + i)(1 - i) \quad (10)$$
Using (9) and (10) in (8) and employing the method of factorization, define
$$u + iv = (1 + i)(a + ib)^3$$
Equating real and imaginary parts, we get

$$u = a^3 - 3ab^2 - 3a^2b + b^3$$

$$v = a^3 - 3ab^2 + 3a^2b - b^3$$

Thus, in view of (7), the values of x, y, z, w are given by

$$\left.\begin{array}{l} x = 2\left(a^3 - 3ab^2\right) \\ y = 2\left(b^3 - 3a^2b\right) \\ z = 4\left(a^3 - 3ab^2\right) - 2\left(3a^2b - b^3\right) \\ w = 2\left(a^3 - 3ab^2\right) - 4\left(3a^2b - b^3\right) \end{array}\right\} \quad (11)$$

Thus (11) and (9) represents the integer solutions to (1)

Set: 2

Replacing u by

$$u = (2k+1)v \quad (12)$$

In (8) and performing some algebra, we set

$$T = \left(2k^2 + 2k + 1\right)\alpha^2 \quad (13)$$

$$u = (2k+1)\left(2k^2 + 2k + 1\right)\alpha^3$$

$$v = \left(2k^2 + 2k + 1\right)\alpha^3$$

Using the above values of u and v in (7), we have

$$\left.\begin{array}{l} x = (2k+2)\left(2k^2 + 2k + 1\right)\alpha^3 \\ y = 2k\left(2k^2 + 2k + 1\right)\alpha^3 \\ z = \left(2k^2 + 2k + 1\right)(6k+4)\alpha^3 \\ w = \left(2k^2 + 2k + 1\right)(6k+2)\alpha^3 \end{array}\right\} \quad (14)$$

Thus (13) and (14) represent the integer solutions to (1)

Set: 3

Replacing u by

$$u = 2kv$$

In (8) and performing some algebra, we get

$$T = 2\left(4k^2 + 1\right)\alpha^2 \quad (15)$$

$$u = 8k\left(4k^2 + 1\right)\alpha^3$$

$$v = 4\left(4k^2 + 1\right)\alpha^3$$

Using the above values of u and v in (7), we have

$$\left.\begin{array}{l} x = (8k+4)\left(4k^2 + 1\right)\alpha^3 \\ y = (8k-4)\left(4k^2 + 1\right)\alpha^3 \\ z = \left(4k^2 + 1\right)(24k+4)\alpha^3 \\ w = \left(4k^2 + 1\right)(24k-4)\alpha^3 \end{array}\right\} \quad (16)$$

Thus (15) and (16) represent the integer solutions to (1)

Way: 3

Consider the linear transformations

$$x = u + v, \ y = u - v, \ z = 6u + v, \ w = 6u - v \ (17)$$

In (1) leads to

$$u^2 + v^2 = 4T^3 \quad (18)$$

Write 4 as

$$4 = \frac{(8+6i)(8-6i)}{25} \quad (19)$$

Using (9) and (19) in (18) and employing the method of factorization, define

$$u + iv = \frac{(8+6i)}{5}\left[\left(a^3 - 3ab^2\right) + i\left(3a^2b - b^3\right)\right]$$

Equating real & imaginary parts and replacing a by 5A, b by 5B, we have

$$u = 25\left[8\left(A^3 - 3AB^2\right) - 6\left(3a^2b - b^3\right)\right]$$

$$v = 25\left[6\left(A^3 - 3AB^2\right) + 8\left(3A^2B - B^3\right)\right]$$

In view of (7), the values of x, y, z and w are given by

$$\left.\begin{array}{l} x = 25\left[14\left(A^3 - 3AB^2\right) + 2\left(3A^2B - B^3\right)\right] \\[2ex] y = 25\left[2\left(A^3 - 3AB^2\right) - 14\left(3A^2B - B^3\right)\right] \\[2ex] z = 25\left[54\left(A^3 - 3AB^2\right) - 28\left(3A^2B - B^3\right)\right] \\[2ex] w = 25\left[42\left(A^3 - 3AB^2\right) - 44\left(3A^2B - B^3\right)\right] \end{array}\right\}$$

(20)

Thus, (9) and (20) represent the integer solutions to (1)

Note: 1

In addition to (19), one may also consider 4 as

$$4 = \frac{(6+8i)(6-8i)}{25}$$

which leads to a different set of solutions to (1)

Note: 2

Observe that (18) is also satisfied by

$$u = 2m\left(m^2 + n^2\right)$$

$$v = 2n\left(m^2 + n^2\right)$$

$$T = \left(m^2 + n^2\right)$$

In this case, the corresponding values of x, y, z and w satisfying (1) are given by

$$x = 2(m+n)(m^2+n^2)$$
$$y = 2(m-n)(m^2+n^2)$$
$$z = (12m+2n)(m^2+n^2)$$
$$w = (12m-2n)(m^2+n^2)$$

Remark

It is worth mentioning here, that one may in general, consider the linear transformations
$$x = u+v,\ y = u-v,\ z = 3ku+v,\ w = 3ku-v$$
After performing a few calculations, the values of x, y, z, w and T satisfying (1) are seen to be
$$x = 4k^2(m+n)(m^2+n^2)$$
$$y = 4k^2(m-n)(m^2+n^2)$$

$$z = 4k^2(3km+n)(m^2+n^2)$$
$$w = 4k^2(3km-n)(m^2+n^2)$$
$$T = 2k(m^2+n^2)$$

Conclusion

In this paper, we have made an attempt to determine different patterns of non-zero distinct integer solutions to the non-homogeneous quintic equations with five unknowns given by $3(x^4-y^4) = 4(z^2-w^2)T^3$. As the quintic equations are rich in variety, one may search for other forms of quintic equation with variables greater than or equal to five.

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ESTIMATION OF SELECTED HEAVY METALS IN RESPIRABLE PARTICULATE MATTERS AT AN INDUSTRIAL CITY KOTA, INDIA UNDER METEOROLOGICAL INFLUENCE

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ABSTRACT

Evaluation of some heavy metals' concentrations in respirable particulate matter (RPM) samples collected from five zones situated in Kota city during both summer (March, April, May & October) and winter (January, February, November & December) of 2012-13 has been carried out. At all zones, winter season is found to have higher mean concentrations of anthropogenic origin metals (Pb, Zn, Cu and Cd) and lower load of crustal origin metals (Ca, Mg and Fe) while summers face the higher scourge of crustal origin metals and lower anthropogenic origin metals . The concentration trends in different seasons were influenced by various meteorological conditions such as temperature, relative humidity, wind velocity and wind direction. Enrichment factor and principal component analysis indicate that coal based Kota Super Thermal Power Station (KSTPS) is the major source of heavy metals besides other industrial activities in the study area.

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I. Introduction

Ambient particulate matters , suspension of solid and liquid droplets, are conglomerates of many pollutants, potentially comprising of different organic and inorganic species in the atmosphere. Both anthropogenic and natural sources contribute to the PM in the atmosphere [1, 2]. These days, the coal based thermal power plants all over the world are being cited as one of the major sources of pollution affecting the general aesthetics of environment in terms of land use and health hazards [3].

Airborne particles up to 100 μm in size constitute SPM causing nuisance, allergic manifestations etc. while inhalable fraction with size less than 10 μm constitute RPM resulting in significant health risks as heavy metals after getting released from different sources in urban environment get adsorbed on them and cause morbidity and mortality[4, 5].

Size of particulate matter has an important role in heavy metal accumulation and its effects. Finer particles having greater surface area accumulate heavy metals more effectively than coarser PM. The fine and ultra-fine particles with their potential of entering the blood stream, carry along with them their constituents such as iron, zinc, copper, cadmium and lead thereby enabling them to have toxicological and carcinogenic effects [6, 7].

Considering the greater concern over the particulate and gaseous emission of pollutants in Kota, an industrial town of western Rajasthan, the present study has been carried out.

Kota has three distinct seasons; summer, rainy and winter amongst which only two seasons i.e. winter (January, February, November & December) and summer (March, April, May & October) of 2012-13 were chosen for the study excluding rainy season as relatively high rainfall and humidity cause very less amount of PM.

The present study is conducted with the main aims: i) to evaluate the composition of RPM in terms of crustal (Fe, Ca and Mg) and anthropogenic origin (Cu, Cd, Zn and Pb) metals at various sampling sites; ii) to determine possible sources of heavy metals associated with RPM through statistics analysis; iii) to assess the influnce of climate on the concentrations of heavy metals as a function of sampling sites, distance from point source, seasons and different meteorological parameters.

II. Materials and Methods

Sampling sites: With the help of cartographic charts, field job and Global Positioning System the sampling sites were chosen using some criteria laid earlier [8]. These criteria were: i) distance from point source; ii) predominant wind direction; iii) the distance from obstacles interfering in sampling ; and iv) logistics. The entire city was divided into five zones (Figure 1) whose location is given in Table 1.
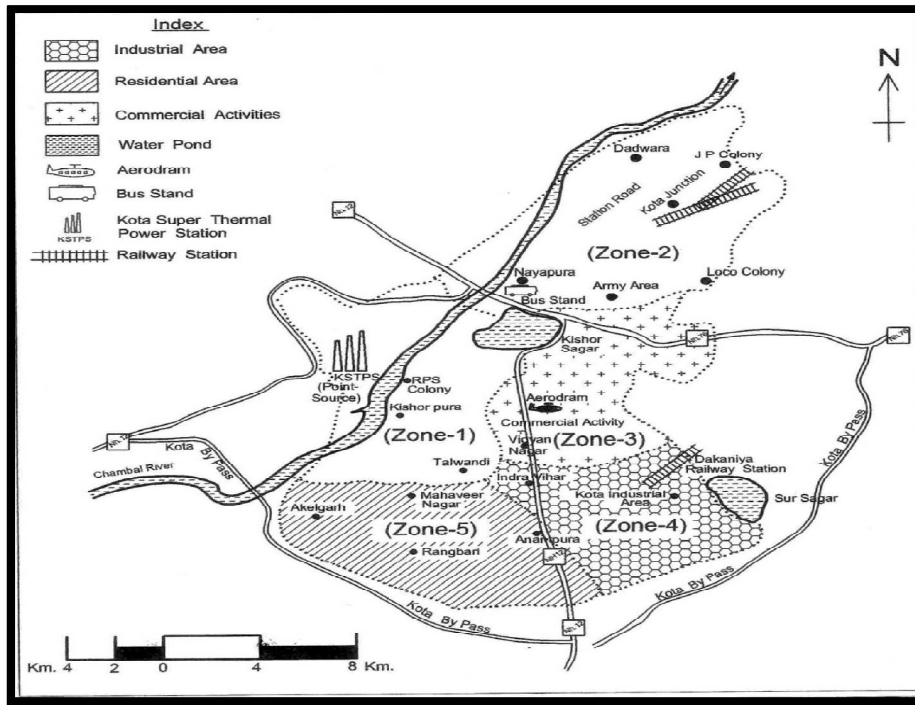
Figure: 1. Kota city map. (*Source: www.mapsofindia.com*)

Table 1: Location of different zones of Kota city and characteristics.

Zone No.	Location with reference to point source (KSTPS)	Characteristics
Zone-1	Within 2 Km. radii surrounding KSTPS	Coal dust and Fly ash emission from KSTPS; Soil; High population density and traffic
Zone-2	2-10 Km. towards North-east direction from KSTPS	Fly ash blown through wind; Soil dust; Traffic dust
Zone-3	2-7 Km. towards East direction from KSTPS	Fly ash; Soil and High traffic dust; Commercial activities; High population density
Zone-4	2-12 Km. towards East-south direction from KSTPS	Fly ash; Soil and High traffic dust; Various industries; High population density
Zone-5	2-8 Km. towards South direction from KSTPS	Fly ash and Soil; Residential and Stone mining

Sampling methods: A high volume respirable dust sampler (model IPM 165) was used for RPM ($< PM_{10}$). A total of 307 samples of RPM were collected at various sampling sites on 8 hourly basis and afterwards taking their average for 24 hour data (twice a week) during entire study period on clear days without wet precipitation.

Chemical analysis: Each filter disc (containing RPM) was extracted using similar open acid digestion procedures as reported in literature [9 - 11]. After digestion, the concentrations of 6 metals (Fe, Zn, Cu, Cd, Mg and Pb) were measured by Direct Air – Acetylene Flame (Atomic Absorption Spectrophotometer - Shimadzu-6300) and Ca was determined using Flame Photometer (Systronics -128).

Statistical analysis: An automated Weather Station (model number: DCPAWS02) mounted at the Kota Aerodrome, India was used for the collection of the meteorological data.

Seasonwise wind roses of study period were drawn with the help of enviroware wind rose software. The SPSS version 16 software was used for principal components analysis (PCA).

III. Result and Discussion

Metal analysis in RPM samples: For RPM (Tables 2 and 3), looking at crustal metals (Ca,

Mg & Fe), Z_5 zone has highest while Z_1 faces the lowest in both seasons. It is inferred that the activities of residential areas of zone 5 cause erosion of upper layer of earth crust leading to their higher concentrations while these activities were less in Z_1 causing their reduction.

Table 2: Concentration (mg/L) of studied metals in RPM during winter.

Parameter		Zone 1 (n=32)	Zone 2 (n=30)	Zone 3 (n=31)	Zone 4 (n=32)	Zone 5 (n=30)
Ca	Mean	215.38	256.85	267.15	278.27	324.87
	Geo. mean	208.76	245.68	261.96	272.42	321.98
	Stdev.	±7.82	±6.72	±5.81	±5.94	±4.25
Mg	Mean	0.9039	1.2053	1.6355	2.2823	3.9514
	Geo. mean	1.8224	2.1911	2.5632	3.2721	4.9115
	Stdev.	±0.2243	±0.1322	±0.2115	±0.0988	±0.0974
Fe	Mean	14.4101	16.6943	17.2333	18.1188	20.0770
	Geo. mean	13.1125	14.4693	17.7892	18.6842	19.8862
	Stdev.	±2.6879	±2.7596	±1.9989	±0.9463	±0.8125
Pb	Mean	2.8876	2.6066	2.5442	2.4239	1.7021
	Geo. mean	1.2123	0.7936	0.7824	0.7432	0.3513
	Stdev.	±0.0866	±0.1093	±0.0768	±0.0664	±0.0739
Zn	Mean	8.5134	7.8845	7.2479	6.6840	4.3152
	Geo. mean	8.4225	7.7339	7.1116	6.5212	4.2115
	Stdev.	±0.3395	±0.2662	±0.2139	±0.2242	±0.1884
Cu	Mean	2.1757	1.8744	1.7566	1.3222	0.8675
	Geo. mean	1.2114	1.7126	0.6626	0.9936	0.4251
	Stdev.	±0.5219	±0.3112	±0.3065	±0.2823	±0.2625
Cd	Mean	0.0844	0.0679	0.0575	0.0567	0.0549
	Geo. mean	0.0405	0.0276	0.0173	0.0162	0.0079
	Stdev.	±0.0102	±0.0099	±0.0086	±0.0059	±0.0013

Table 3: Concentration (mg/L) of studied metals in RPM during summer.

Parameter		Zone 1 (n=31)	Zone 2 (n=30)	Zone 3 (n=30)	Zone 4 (n=32)	Zone 5 (n=29)
Ca	Mean	293.09	342.31	346.83	350.54	352.56
	Geo. mean	286.15	338.12	331.96	328.64	347.95
	Stdev.	± 8.96	± 9.95	± 4.71	± 5.57	± 5.14
Mg	Mean	0.3426	2.2101	2.8852	3.9198	3.9867
	Geo. mean	0.2619	1.7631	1.9369	3.0665	3.7256
	Stdev.	±0.2496	±0.2663	±0.3325	±0.1926	±0.1883
Fe	Mean	18.3316	20.7664	21.6789	21.8612	23.0087
	Geo. mean	17.7854	19.9624	20.6869	20.6652	22.0011
	Stdev.	±2.6172	±2.4566	±2.1819	±1.9256	±0.9339
Pb	Mean	2.0814	1.3453	1.3853	0.3445	1.3855
	Geo. mean	1.8768	1.2832	1.3001	0.3369	1.0112
	Stdev.	±0.0966	±0.0979	±0.0855	±0.0669	±0.0656
Zn	Mean	7.5010	5.4534	5.8345	3.7445	6.3977
	Geo. mean	7.4665	5.3291	5.7665	3.6226	6.2113
	Stdev.	±0.1539	±0.2663	±0.1939	±0.1836	±0.2003
Cu	Mean	1.9887	1.3089	1.3112	0.9875	1.3254
	Geo. mean	1.5321	1.1369	1.2024	0.8435	1.2892
	Stdev.	±0.5321	±0.4669	±0.3532	±0.4113	±0.2115
Cd	Mean	0.0573	0.0178	0.0415	0.0099	0.0537
	Geo. Mean	0.0481	0.0177	0.0399	0.0098	0.0436
	Stdev.	±0.0083	±0.0063	±0.0091	±0.0016	±0.0079

The effect of fly ash emissions and Kota stone factories can be observed by the higher values of crustal elements than anthropogenic elements at five zones. Furthermore, being original components of earth and dust they exist at elevated levels.

While considering the average concentrations of heavy metals i.e. Cu, Cd, Zn and Pb in RPM, these were highest in zone 1 due to its closer vicinity to KSTPS while zone 5, is found to have lowest concentrations in both the seasons. Their worrying level in zone 1 were encourged by North-east, North and North-west wind direction from KSTPS bringing in fly ash with them. As evident from wind roses (Figure 2), above mentioned wind direction from KSTPS result in their alarming concentrations at other zones (after zone 1). Their relative abundances follow the order Zn > Pb > Cu > Cd in all zones.
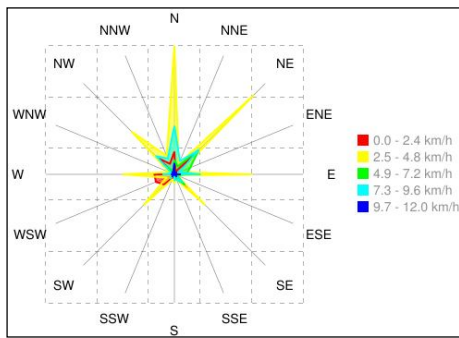
(a)
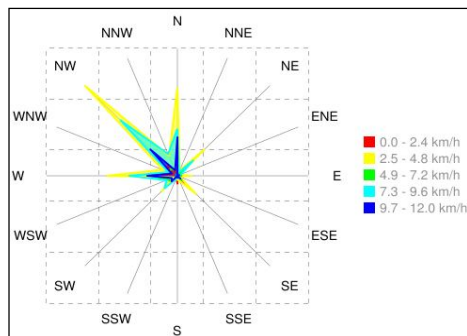
(b)

Figure 2: Wind roses of Kota city during (a) winter and (b) summer.

In all the zones, concentrations of crustal metal species were lower in winter and higher in summer while heavy metal concentrations are higher in winter and lower in summer because in winter, low average temperature, higher relative humidity and low wind speed cause

higher levels of anthropogenic metal species in ambient air while high average temperature, low relative humidity and high average wind speed lessen them during summer (Table 4) [12, 13].

Table 4: Meteorological conditions of Kota city.

Parameter	Winter	Summer
Temperature (^{0}C)	19.0 ± 2.1	30.0 ± 4.24
Humidity (RH) (%)	39.3 ± 7.27	21.0 ± 8.71
Wind speed (km/h)	2.0 ± 0.8	5.2 ± 2.98
Rain fall (mm)	0.0	34.4

IV. Data Analysis

Enrichment factor: To determine the source of heavy metals in RPM, enrichment factors are calculated from the data set. Ca is normally used as the crustal indicator [14, 15] using the EF calculation formula (1):

$$EF = \frac{(X/C)\,\text{precipitation}}{(X/C)\,\text{reference meterial}} \quad (1)$$

Where, X is the concentration of the metal of interest and C is the concentration of the reference metal i.e. Ca

For the enrichment coefficient values (EF) > 2, there is no anthropogenic pollution, between 2 to 5 indicate temperate, from 5 to 20 significant and over 20 indicate high heavy metal enrichment from anthropogenic sources [16].

As shown in Figure 3, the mean EF value for both Fe and Mg is approximate 1.0 indicating its origin from soil introduced into the atmospheric aqueous phase by particulate resuspension of soil. Therefore it is assumed that Fe content is present in atmospheric particulate sample as various oxides. Presence of Mg is due to lime mining carried out at study area besides being a constituent of earth crust.
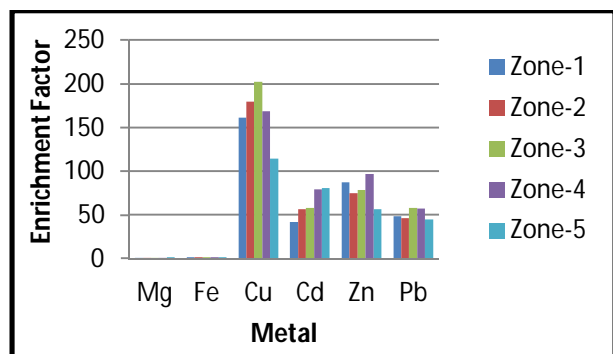
(a) Winter
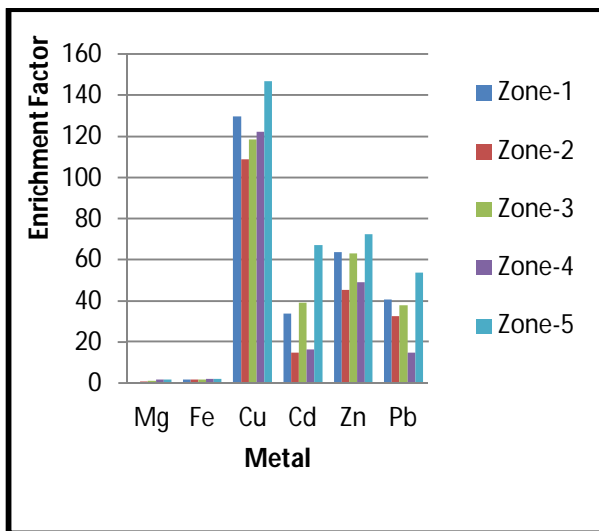
(b) Summer

Figure 3: EF of metals in RPM in Kota city.

The higher EF values for Cu, Cd, Pb and Zn suggest a substantial point source input for them as all these metals are components of fly ash. Earlier vehicular emission, before ban of leaded gasoline, is responsible for persistent Pb in road dust because of its long residence time in the environment besides fly ash emission.

The seasonal EF values of metals (Cu, Cd, Zn and Pb) are observed to be higher during winter season than in summer which may be attributed to influence of stable and calm meteorological conditions in winter during transport of fly ash from point source KSTPS.

The high EF values of Cu, Cd, Zn and Pb in RPM suggest that Kota city is more exposed to these toxic metals associated with fine particles than those associated with coarse particles causing more adverse health effects is supported by earlier reports [17,18].

Principal component analysis: PCA is a statistical procedure using an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The factors whose eigenvalue is greater than 1 are taken into consideration [19, 20].

The results of PCA showed that only two eigenvalues are >1 describing over 65.01% & 63.83% of variance in RPM in both winter & summer, respectively. All the seven metals analyzed are explained by two factors (varimax factors 1 and 2) as shown in rotated component matrix (Table 5).

Table 5: Varimax rotation of PCA results showing loading of seven variables with 2 independents varimax factors (VF) in RPM.

Variables	Component (RPM)			
	Winter		Summer	
	VF 1	VF 2	VF 1	VF 2
Ca	-0.535	0.713	-0.364	0.746
Mg	-0.182	0.745	-0.219	0.779
Fe	-0.267	0.762	-0.241	0.699
Pb	0.839	-0.238	0.728	-0.225
Zn	0.776	-0.229	0.769	-0.188
Cu	0.823	-0.494	0.802	-0.231
Cd	0.668	-0.101	0.614	-0.128
% of variance	35.93	29.08	31.63	32.20
Cumulative (%)	35.93	65.01	31.63	63.83

The first factor (VF 1), which explained over 35.93% & 31.63% in RPM in winter & summer of variance, showed high loading of the heavy metals such as Pb, Zn, Cu and Cd indicating the influence of anthropogenic activities mainly coal combustion at KSTPS. VF 2 that accounted for 29.08% & 32.20% in RPM in winter & summer of the layout variance indicated high loading of Ca, Fe and Mg showing the influence of aerosols originated from crustal composition.

V. Conclusion

The monitoring of PM levels in atmosphere is important as finer particles are related to stronger health effects hence it is crucial to quantify and identify the main sources contributing to these RPM.

It is concluded that in both winter & summer, the zone which is in close vicinity of point source KSTPS has highest anthropogenic concentrations. Less metal burden was found in distant zones lying in opposite direction of wind blow with low traffic. Thus, anthropogenic activities mainly the coal combustion at KSTPS and prevailing winds blowing during those time are the major contributor for the metal pollutants in RPM.

Controlled by meteorological factors, concentrations of anthropogenic elements in RPM are higher in winter and lower in

summer, while those of crustal elements are higher in summer and lower in winter.

EF and PCA showed that the dominant pollution source of heavy metal is mainly coal based KSTPS along with industrial activities. Pb has its origin from both fly ash and earlier vehicular emission. The predominant sources for crustal metals are resuspended soil and mining.

VI. Acknowledgements

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RPA- ROBOTIC PROCESS AUTOMATION REVIEW FROM BUSINESS PERSPECTIVE

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ABSTRACT

Robotic automation process is a branch of computer science in which the software robots are deployed to do repeated task done by humans and are replaced by computers program. RPA is a program, which is designed to mimic like humans while doing the daily routine repeated tasks. It is widely used in many organizations and verticals such as banks finance manufacturing and customer related activities. This gives lot of saving for organization and give scope for further development and induction of new technical in addition to cost saving.

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1. Introduction

Robotic Process Automation: As the computer applications developed during the course of time, one of the advancements is automation of various processes done by humans with the help of computers some of these processes are unique in nature and others are repeated in nature, based on certain rule or a principle. The RPA application program which is the latest development of computer science picks up this repeated part of the daily work, which is based on principles and fix rules, to be done on computers by humans, this program mimics all functions like humans such as entering values pressing various buttons on the keyboard of computer and connecting with other programs links saving that sending mails etc. Robotic automation process is a branch of automation where software robots are used to perform the task which are available 24x7 all across the year. There is no dependence on humans to take a decision such as in case of banking finance and manufacturing off products.

2. RPA- Functions and Features

Robotic automation process which is an application mimics the actions a human user would perform on a PC, there are various functions performed by RPA program such as,

A. Emulate human execution of repeated process with existing application.
B. Rich-analytical Suite
C. Security
D. Easy Interface for Bot creation
E. Source Control
F. Deployment and Hosting
G. Debugging

H. Rule based handling of exception

3. RPA-Advantages

There are various advantages off using RPA in an organization with an objective of cost saving and profit making.

A. **Human errors are largely reduced:** Whenever a human does various activities on computers it does number of errors while typing, selecting, linking to various applications websites etc, This error further increases the iteration of completing a program and checking it again and again to reduce the errors as a result the overall time of performing a task increases which may never be perfected, resulting to more resource requirement and adding cost.

B. **Reduction in cycle time**: since there are a smaller number of errors or maybe zero also the cycle time to complete a task reduces to a larger extent and it is made available without any delay to the users, which results in overall reduction of cycle time. The same activity if it is performed by humans takes more time and couple of iterations to make it perfect.

C. **Improve accuracy:** As robotic automation process makes lesser or zero mistakes the accuracy of the data increases to a highest level, the data becomes more reliable and easier to manage in most of the time the data can be directly used for analysis whereas in case of humans entering the same data are more error pone and carry many mistakes.

D. **Monitoring across 24x7x365:** In case of organizations which has spread across the

world having different Offices and subsidiaries which work at different timelines and different geographies can always take benefit of the RPA applications whenever required, so there is no delay in delivery or entry of the data to the functional applications, the RPA application is available all 365 days 24 hrs and seven days, this also reduces overall dependencies on more humans which results in further cost reduction since it is performed by machines therefore they don't require any leave power holidays which is a normal function in case of humans.

E. **Faster implementation:** Since the processes are performed by robots therefore the understanding of each and every activity is very clear which increase the performance, quality and this makes implementation of the process much faster.

F. **The work shift focuses on value added task:** Since most of the work which is repeated in nature is performed by RPA program the humans are free to take up task which are more complex in nature, which need some innovative thinking this adds value to the work.

G. **Create a frictionless straight thought process:** Since there is no intervention from the humans or other disturbing elements the thought process is very clear and straightforward based on the principles and the rules which have been established to perform a task which is normally not happening in case of humans, they have so many different ideas and concepts and disturbing elements. Overall, the thought process becomes much more easy, clear and straightforward.

H. **Reusable process elements:** Since the entire RPA program is based on repeated task automation therefore the entire process uses reusable programs functions and elements to it.

I. **Less human capital required:** Automation also leads to reduction in employees and facilities to be provided to humans, such as office furniture parking air conditioning building space performance appraisals salary increments leaves and holidays. Overall, the cost of maintaining the organization functions reduces as there is no human involved in it.

J. Most of the RRP application runs on simple drag drop steps in process and a user can easily drag and drop icons, select functions from the menu available in the RPA applications for programming, a code is generally automated on the back end which makes RPA very easy to use and develop.

4. RPA-Disadvantages

There are many disadvantages also for organizations in deploying an RPA program for their various functions needs

A. **Budgetary reason:** Cost of each software licenses of RPA is very high therefore an organization has to think twice before planning to deploy RPA in their organization since each license is associated with number of users limited number of finances can be spent on purchasing the licenses.

B. **Major organization shift**: Deploying RPA in organization is a major paradigm shift in the thinking of the organization as this leads to more skilled labour requirement to maintain and run the application overall the organization thinking changes form a simple to more complex in nature, as we deploy RPA program since normal activities are now performed by RPA application The planning for the organization growth and development plan for resources, people employment changes to a larger extent.

C. **More technical skills required:** An organization culture is mixed off people having various skills levels, experience and technical abilities based on their skills various roles have been created and assigned to them and their skills assessment is done on periodic basis which becomes the benchmark for promotion and salaries increments With the deployment of RPA in the organization the minimum skill level bar reaches to a higher level therefore more skilled people are required specially trained on RPA application development and maintenance and highly skilled people are more required which adds to the cost of organization.

D. **Insecurity in employees:** This is one of the major reasons in number of organizations whenever the RPA application is being develop and implemented the number of people start feeling insecure and look for a change in the job or move to different organizations this overall impacts the organization culture people tends to feel insecure about their job and future.

5. RPA for Business

RPA can be used for various business purposes such as banking, hospital, education, small business, finance and manufacturing sectors etc.

The Robotic Process Automation (RPA) Opportunity Varies by Industry and Function

Regulated industries with high-volume and transactional business processes offer the most potential

RPA adoption potential by buyer industry and function
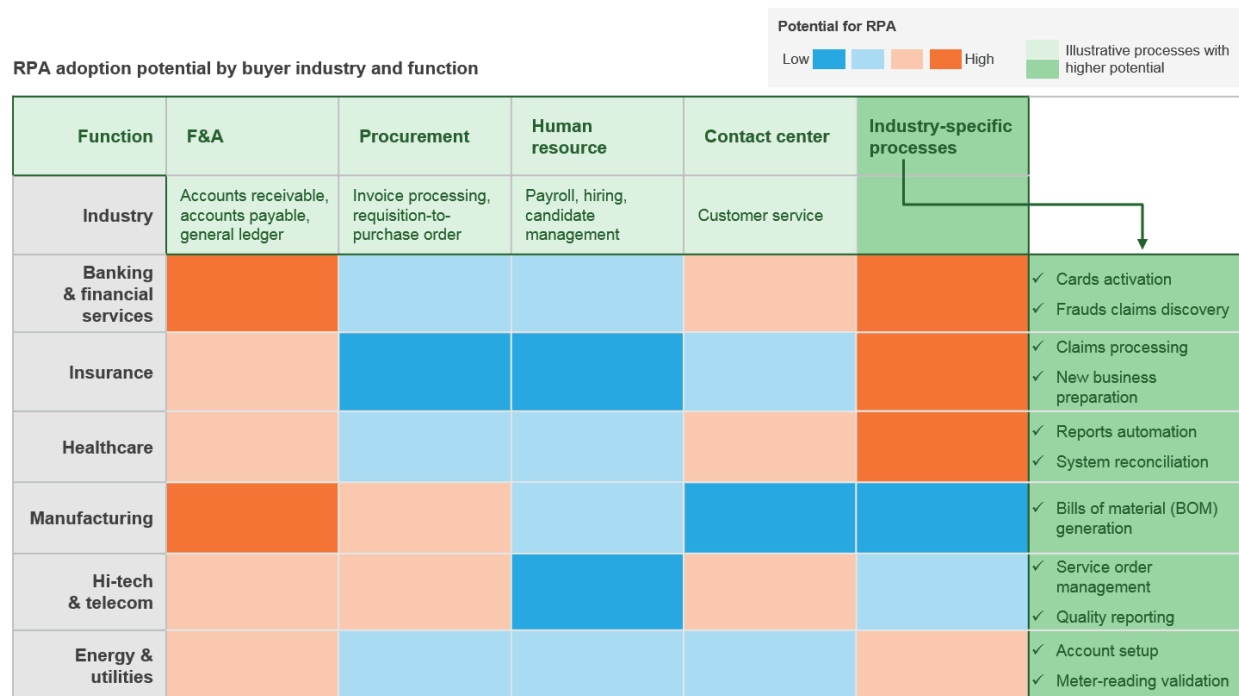
Everest Group Seizing the Robotic Process Automation (RPA) Market Opportunity

A. Banking sector, since banking operations requires repeated and routine tasks to be performed by humans, they are the most suitable industry where RPA can be very successfully deployed for various processes such as reconciliation trade finance, corporate loans, retail credit assessment, retail fraud detection.

B. Health sector, with the use of RPA the time required to carry out the same functioning of each and every customer reduces which greatly improves the functionality of the organization, there are many forms and records available in the hospital related of patients which need to be searched referred by customer relationship team and the operational part. It improves productivity as compared to humans which eliminates the waste and makes organization more efficient in response and functions.

C. Insurance & Finance sector, since finance also follows certain standard rules regulations principles it is also ideally suited for finance sector to deploy RPA program for their daily functions sales like banks such as loan mortgages, collateral securities, collections, recoveries of loan and various mail messaging which needs to be sent to the customers, users and the potential customers RPA be very easily deployed and managed..

D. Telecommunication sector, this is also one of the most suitable sectors where RPA can be very easily and effectively deployed for overall cost effectiveness and increasing efficiencies of the organization, since the

functions of each and all department activities are similar and repeated in nature, they are ideally suited for RPA deployment, such as customer relationship, billing reconciliation, verification of the documents automated support system etc.

6. RPA Software's

There are many organizations in the world which have their RPA software applications develop for different sectors some of them has customize their application for each and every sector so that a smaller number of iterations are required to customize or to tune up the application for their specific uses many of

these applications are common in nature they we just required small tuning to make that application suitable for an organisation, supported by standard case studies and references. There are many RPA products manufacturers such as,

- Automation anywhere
- Blue prism
- UI Path
- Work fusion
- NICE
- Pegasystems
- Kofax,
- Kryon systems etc.,
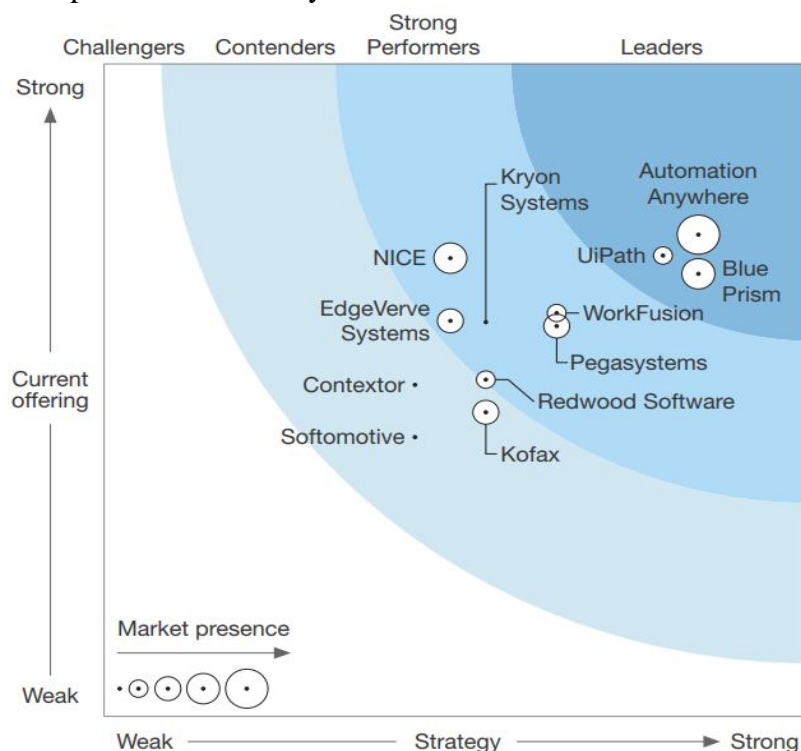
RPA Tools Comparison - Updated [August 2020] | ACTE

Most of these software applications provide similar activities with slight differences in their structure and functioning some uses manual coding for the applications customsation for organization fitment and some uses simple drag and drop functions provided in the RPA application, few software applications are desktop based and other are Enterprise ready - cloud supportive. Out of these applications automation anywhere is leading the marketspace followed by blue prism and UI path.

7. RPA Adaptability

As the organizations across the world are getting acquainted by RPA applications their adaptability is also increasing with a proof of concept and case studies, the benefits of deployment of RPA are very clear to most of the organizations as there is a significant cost reduction in the output as compared to humans, therefore this leads to more adaptability of the RPA application in the organisations. There are various studies which shows that the deployment of RPA has increased the productivity and reduces the cost of labour to a larger extent this also increase the analytical abilities of the organizations which helps in future planning there are various studies which are available for reviews done by various

researchers, they have found that the organization which has deployed RPA has benefit out of it therefore this becomes the benchmark for other organizations to deploy the program.

the IT infrastructure requirement, therefore the future of RPA and integration with new emerging technologies cloud, AI, big data analytics will be a big next game changer in future.

8. Future of RPA

As discussed in various reviews done by various researchers it is almost certain and very clear that most of the business organization will use RPA in any form since it can be used/deployed without affecting the existing system such as in manufacturing, big data analytics, legal, manufacturing, hospitals, education, banking and finance etc,.

All processes which are governed by rules, protocols by humans at present will be managed with the help of RPA. Further the RPA application can be clubbed with new emerging technologies such as AI, where the RPA program can be self-correcting, self-updating also. The RPA program augmented by AI will be a great advantage in future for the organizations in reducing the cost of production, since cloud services are also available worldwide, a single location hosting can work and provide services to entire organization needs, which will overall reduce

9. Conclusion

The most important and the main advantage of RPA is cost reduction while providing the same productivity which results in better utilization of the resources. As RPA program does not store data and it runs on the presentation layer without affecting the applications run by the organization therefore it makes RPA easy to configure and integrate with the existing applications of the organization which they are running, since there is no application or programming language used in most of the RPA programs it is easier to deploy, learn and implement. The future of RPA also looks very happening as the new technologies are emerging as artificial intelligence analytics etc, which can augment to the RPA functionality and provide more support for the organization profit making objectives making it more desirable and suitable for meeting organization overall objectives.

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A STUDY ON ONLINE CLASSES AFFECTED THE STUDENT'S MENTAL HEALTH IN THIS PANDAMIC SITUATION

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ABSTRACT

There's a decent side to online classes and a terrible side as well. Schools that can furnish drawing in online classes alongside co-educational exercises and customary shared cooperation have seen better emotional wellness among understudies. For other people, it has gotten tedious, which has prompted an ascent in nervousness and hyperactivity among kids. In such manner, EducationWorld talked with a couple of kid specialists to know why they think this is occurring and how it tends to be tended to.

Introduction

Numerous schools, including Syracuse College, have dumped most face to face addresses this fall and have changed to on the web and mixture guidance. Understudies have adjusted to new schedules and learning conditions, yet many have experienced issues changing in accordance with this new typical. Nobody knows how long the pandemic will last, however schools ought to consider changing the manner in which they grade understudies during this troublesome chance to consider the genuine medical problems understudies are confronting.

"Similarly as understudies are being adaptable with educators who are evaluating on the web strategies interestingly, it appears to be reasonable that instructors ought to stretch out that equivalent adaptability back to understudies," said Katie Lear, an emotional wellness advisor who has practical experience in injury and tension treatment. "Educators who change their assumptions for what this semester ought to resemble may wind up with more joyful, better understudies."

Review of Literature

Dr Kannan Gireesh, psychiatrist, psychotherapist and founder, Live Life Education says, "What they are lacking is peer-to-peer learning. Social learning is not happening as they do not have friends to talk to and build new friendships. Building friendships is very important especially in the lower age groups, which gives them security and self-esteem that gives them a sense of belonging."

UK-based internationally recognised parenting expert, broadcaster, speaker and author of Parenting Made Easy — How to Raise Happy Children (2012) **Sue Atkins** explained, "With the sudden halt to in-person learning, many students have missed their friends, yearned to be out of the house, developed erratic sleep habits and drove their (often working) parents crazy. On top of that, many were dealing with the trauma of a sick or dying family member, economic hardship and major changes to the life they once had.

"As educational practitioners, we are committed to the wholesome development of the child and as we know, learning is not only about book knowledge, but also the physical, emotional, social and mental wellbeing of the child," says **Prema Muralidhar**, principal of Ajman-based Woodlem Park School.

Objective of the Study

The following are the objectives of the study
1. To review the previous related literature
2. To analyze the impact of the online classes
3. To analyze the advantages and disadvantages of online classes
4. To offer suggestions

Methodology

Due to the current COVID-19 situation, the survey was conducted online using whatsapp questionnaire. Students from Madurai colleges and universities which were conducting online classes were approached and asked to complete the survey. 200 respondents were taken for this study.

Impacts of Online Classes

Utilizing the web for amusement is normal, yet for online exercises is a major test. Instructors may not be knowledgeable with making computerized content, and passing on it viably on the web. An unexpected assumption from them to overhaul, and from understudies to adjust, is ridiculous. Non-verbal communication and eye to eye connection, which are significant prompts for the educator, are hard to see in an online class. "I don't get persistent input as understudies' responses during on the web meetings, which lessens the viability of educating", says a school educator in rural Mumbai. What number of understudies have focused in a class? Of those, what number of comprehended the exercise? Is the showing pace okay? Are a few understudies getting abandoned? These inquiries emerge even in customary study halls, however they are more diligently to address in online classes.

A parent of a 8‑year-old going to a tuition based school in Gurgaon says, "There shouldn't be online classes for such small children. Their fixation length is little and they don't focus inevitably." The 8‑year-old added, "I disdain them (online classes)!"

Indeed, even understudies appear to esteem the in-class actual learning experience significantly more than a virtual one. Many recognize that telephones can be very diverting. Also, science and innovation programs frequently remember hands-for research center meetings, thesis ventures and field outings to supplement hypothetical investigations. This part of learning is seriously restricted in online instruction.

At last, training isn't just about subject information yet additionally about creating social abilities and sportsmanship among the understudies, which is worked over years. Depending exclusively on online instruction might thwart the all encompassing advancement of youngsters, and many might fail to meet expectations later in their expert and individual lives.

Table:1: Impact of online classes:

S.NO	FACTORS	SATISFIED	AGREE	DISAGREE	NOT SATISFIED	TOTAL	RANK
1	Students do not take online classes seriously	52	13	31	4	100	I
2	Students make lot more excuse not attending online classes and the reliability of it cannot be assessed	29	15	28	28	100	IX
3	Students show lack of interest and involvement during online classes	46	28	11	15	100	II
4	Students feel motivated to participate in online class discussions	28	22	28	22	100	X
5	Students find it difficult to understand and follow online classes	43	28	16	13	100	III
6	Lack of computer skills makes the students uncomfortable during online classes	39	29	12	20	100	VIII
7	Students get easily distracted and difficult to concentrate the online classes	38	32	14	16	100	IV
8	Students get technical issues during online classes	30	22	41	7	100	VII
9	Students doubts not to be cleared during online classes because of	32	21	32	15	100	VI

	timing						
10	Students get more disturbance from house during online classes	36	11	18	25	100	V

Source: Primary Data

In this table described the factors of online classes affected the students education.

Advantages

1. Keeps students regular and disciplined

A virtual homeroom expects understudies to be available on schedule and get the class together with a mindful brain. It has helped in reproducing an everyday practice for them with the goal that they have a specific objective for every day and they don't sit around doing immaterial exercises. They get schoolwork and tasks that assistance in keeping the understudies submitted and trained towards their examinations. Thusly, the online classes guarantee that the understudies keep on learning regardless of the schools closing down

2. Cost of education is reduced

This can be viewed as a vital benefit in this period when the pandemic has hit the spending plan of numerous families. Online classes have let down the enormous measure of cash for both the schools and understudies. Because of the schools being shut, the expense of their foundation and support has diminished. This, thus, has caused a drop in the school charges of understudies making training more monetary for them. Internet learning has likewise disposed of the expense of transportation.

3. Saves students from exposure to infections

In virtual classes, understudies don't need to go to class and interact with others. This saves them from getting any sort of diseases from others that aides in keeping their resistant framework solid. Besides, being at home allows them an opportunity to eat new and quality food sources the entire day that is quite needed for boosting their safe framework to battle any manifestations of Coronavirus.

Disadvantages

1. Screen exposure may cause health issues among students

During on the web classes, understudies need to sit before the screens of their gadgets for extensive stretches of time. The classes might require 4-5 hours that can be very tiring for understudies. A few understudies might experience the ill effects of vision issues. Long openness to screens may likewise instigate migraine in numerous understudies. Now and again understudies can likewise foster terrible stance and other actual issues because of inclining towards their screens.

2. Students struggle to focus on the screen

For taking online classes, one's device must be connected to the internet. This makes various social media and other sites easily accessible that comes to be the biggest distraction for students. Thus, while listening to the online lectures for long hours, the biggest challenge for students is to stay focused. Such situations can be avoided by being an active learner and keeping up the meaningful and relevant conversation with the teacher.

3. Network breakdown and other technology issues

This perhaps is the most common and the biggest disadvantage of online learning. Though the countries have worked far better for developing a good internet system, a consistent connection with decent speed is still a problem in many smaller cities and villages. Breakdown of internet connection or poor range of internet can break the continuity in learning for the child. This may discourage students from attending classes regularly and learning their curriculum.

4. Lack of social interaction

When in school, students get to learn a lot from their peers. While being with friends, they learn to be patient, get rid of disappointment and compete as well. There are many students who are habitual of enhancing their learning by participating in group studies and lively group discussions. However, in an online class, there is minimum or no physical interactions

between students and teachers. This may result in a sense of isolation for the students that can affect their studies quite badly.

5. Increased the responsibility of parents

Online education has increased the responsibility of the parents of students as they are required to observe their kids more closely what was earlier done by the teachers in the class. They have to keep an eye on their kids to check if they are being attentive in the virtual class and are not wasting time in other activities. Due to this extra role of the invigilator, many parents are feeling tiresome in handling their own work and their kids' classes at the same time.

Findings and Suggestion

1. Students do not take online classes seriously in this factor got 1st rank
2. Students show lack of interest and involvement during online classes got 2nd rank
3. Students find it difficult to understand and follow online classes got 3rd rank.

Finally, students involvement of online must be improve with any other different activities. Not only classes to be improve the knowledge, knowledge gives other activities also. We must change our teaching methods.

Conclusion

Internet instructing has assumed an essential part during the pandemic, yet its results can not be overlooked. The online classes can not be gotten to by every understudy because of the inaccessibility of cell phones, workstations and mobiles organization to particularly helpless families and far off regions. This makes segregation among the understudies of poor and rich or metropolitan and rustic. The understudies under 14 years don't know about the screen impact and get dependent on versatile that causes mental and eye issues. Consequently, internet educating can not take the situation of customary study hall instructing for quite a while and we should return to conventional educating after a pandemic closures.

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CONSTRUCTION OF PHYSICAL FITNESS TEST BATTERY FOR 15 TO 17 YEARS HIGH SCHOOL BOYS OF DHARWAD DISTRICT

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ABSTRACT

The purpose of the study was to construct a physical fitness test battery for high school boys of Dharwad district. 100 high school boys from 10 different schools of Dharwad district are served as the subjects of the study (N=100). 23 physical fitness tests are selected for this study. Objectivity and Reliability coefficient of the twenty three tests are established. Further test are administered and gather the data. Further data was subjected to Factor analysis for selection of tests to construct the test battery. The physical fitness test battery consisting of five test items considering the administrative feasibility and educational application is recommended for high school boys of 15 to 17 years to assess their physical fitness. The implications of results are discussed.

Keywords: Physical fitness, test battery, factor analysis.

Introduction

Physical fitness is central to Physical Education and sports. For more than a century, the development of physical fitness has been in the focus of physical education profession (Nixon and Cozens, 1964). Since then there have been innumerable attempts to define the concept of 'Physical Fitness' and measure the same for evaluation. Everyone agrees that physical fitness is a basic necessity, without which one cannot perform or carry out an assigned task comfortably. Yet there never had been a unanimous consensus as to what constitutes physical fitness (Johnson and Nelson, 1979).

People the world over, irrespective of caste, creed, race or religion are conscious of the importance of physical fitness in day-to-day life. In any nation, the citizens who keep fit are the best assets and weak ones are a liability. Hence, it is the responsibility of every country to give priority to developing human resources. The development of physical fitness is one of the important objectives of physical education. Physical fitness is inevitable for sports performance. It is one of the essential qualities in human beings. A well-developed physique is the greatest asset to lead a satisfying life in the society. Physical fitness makes a person a complete man. Indulging in daily exercise, one can easily develop his physical fitness. Physical fitness is, "the ability to carry out reasonably well various forms of physical activities important to individuals' health and well being (Uppal,1990). Physical fitness is necessary for success in most of the games and sports. Without a high level of physical fitness and individual will not be able to withstand the stress and strain caused on the body by various games and sports. Physical fitness is the basic requirement for most of the tasks to be taken by an individual in his daily life (Deborah & Bucher, 1987). The government of India did feel the necessity for introducing a scheme of physical fitness, which was launched in the year 1959 in order to raise the physical fitness status of the Indian youth.

Norms are the essential things for rating the physical fitness or any such qualities of the individuals. They are necessary to interpret the raw test scores. Technically, norms permits conversion of raw score to a score capable of comparing and interpretations described (Barrow & McGee, 1979). Physical fitness tends to vary from one individual to another. Apparently it varies in accordance with the nature of a person, depending on whether he is sedentary or dynamic. As we see individual differences in characteristics of psychological studies, a similar evaluation could be said to hold good with respect to physical fitness also. There may be some generalized facts of individual fitness in a group, but each individual will differ in one or the other way as far as physical fitness is concerned. For example, strength is a factor in everyone. The level of strength one possesses is of specific quality of an individual.

There have been innumerable physical fitness test batteries developed abroad especially in the United States. In India too there have been two national attempts to develop such batteries, one 'National Physical Efficiency Drive' (NPED) and the other 'National Physical Fitness Programme' (NPFP), especially after the 1962 war with China. Most of these tests batteries, including the pre-1980 AAHPER youth fitness test battery, among other things, included the items that tested athletic ability, such as speed power and agility. Hence, these were termed as 'Motor Fitness Test Batteries'. The other components of fitness that have a lifelong bearing on our health as cardio respiratory endurance, muscular strength and endurance, body composition (obesity) and flexibility. There has been a considerable rethinking about the philosophy of physical fitness. Historically, the health professionals have not been able to separate concepts of fitness related to health and motor fitness. Only those fitness components that can prevent disease and/or promote health, viz., cardio respiratory endurance, muscular strength-endurance, body composition; and flexibility are included in the concept of health- related physical fitness. To assess motor fitness, a wide variety of abilities along with health related physical fitness components also need to be tested.

Purpose of the Study

The purpose of this study is to construct a physical fitness test battery for 15 to 17 years high school boys of Dharwad district.

Methodology

The study was designed to construct a physical fitness test battery for High School boys of Dharwad district. It involves identification of test items using factor analysis. 100 high school boys were randomly selected for the purpose. 10 subjects each will be selected from different high schools of Dharwad district. In order to ensure the full Co-operation from the subjects the investigator will very clearly explain the purpose of the study test administration and procedure will followed in the test prior to the administration of the test. Model performance by some of the subjects will also demonstrate to make the test clear to the subject. For this study, 23 physical fitness tests will be initially selected. The selected tests are as fallows. For Cardio vascular endurance 9 minute walk and run and 600 meters run. For muscular strength -Push – ups (15 seconds), Reverse sit – ups (10 seconds), Leg raise (10 seconds), Over head Medicine ball throw (3kg – sitting position), Basketball throw . For muscular endurance -Upper body raise (Seconds held), Burpee (Squat thrust), Push – ups, Sit – ups (Bent knee), Leg raise (Seconds Held). For Speed- 30 meters Dash, 6 second Dash, 50 meters run. For Explosive power - Standing broad jump, Vertical jump, sideward jump, Sit – ups (Bent knee 15 seconds). For Agility- Shuttle run (30 Feet), Agility Cycle, Cross step sideward running. For Flexibility - Sit and reach test, Bridge – up test. The data collected will be subjected to factor analysis in computer having SPSS -V.20 package.

Results

The purpose of the study was to construct a physical fitness test battery for 15 to 17years high school boys. Therefore the collection of the data on a number of tests the analysis called for data reduction. Statistical techniques, such as factor analysis was used to reduce the number variables. The results have been obtained through the Statistical Package for Social Science (SPSS). The SPSS software provides all the essential of statistical calculations from the basic to the advanced levels. Since Factor Analysis starts with the correlation matrix, correlation matrix was initially obtained. Principal Component Analysis method was used to extract factors, which generated four factors Verimax rotation (Kaiser's formalization) was used to get rotated factor matrix as provided for in the SPSS package.

Table-1 Mean and Standard Deviation of Test Scores of High School Boys

Mean and Standard Deviation of Test Scores of High School Boys			
Sl. No.	Tests	Mean	Std. Deviation
1	Push Ups (15 Sec.)	11.980	1.999

2	Revers Sit Ups (10 Sec)	10.390	1.543
3	Leg Rise (10 Sec.)	10.780	1.703
4	Medicine Ball Throw (3Kg)	2.865	0.777
5	Basketball Throw	21.844	3.249
6	Upper Body Raise (Sec. Held)	127.750	74.154
7	Burpee (Sq. Th.)	55.060	19.170
8	Push Ups (30 Sec.)	18.430	3.309
9	Sit Ups (30 Sec.)	19.970	3.503
10	Leg Rise (Sec. Held)	19.842	7.232
11	Bridge Up	47.210	4.774
12	Sit & Reach	65.130	10.007
13	30 meters Dash	5.585	0.632
14	6 Second Dash	29.595	1.197
15	50 meters run	8.079	0.633
16	Standing broad jump	2.029	0.168
17	Vertical jump	36.230	7.958
18	Sideward jump	9.020	1.271
19	Sit – ups (15)	11.540	1.591
20	Shuttle Run	17.294	5.005
21	Agility Cycle	14.267	1.028
22	9 Minute walk and Run	1694.200	112.977
23	600 meters Run	147.400	19.951
N = 100			

The mean scores and standard deviations of scores of 23 tests administered to 15 to 17 years high school boys are presented in Table-1.

Objectivity and Reliability

Objectivity and Reliability coefficient of the 23 tests represented in Table-2 for the age group of 15 to 17 years high school boys.

Factor Analysis

The factor analysis resulted in communalities, Eigen values, percentage variance, un-rotated component matrix and Kaiser's verimax rotated component matrix. The initial Eigen values, extraction sums of squared loadings and rotations sums of squared loadings are presented in Table-3 for the age group 15 to 17 years High school boys. A careful examination of the Table-3 suggests that five components are to be identified that account for 47.473% of total variance in the data set of twelve variables. Rest of the eight components, which account for the residual variance were treated as insignificant because of their low Eigen values and low variance in the total variance, hence were ignored. The five components, which were selected, contributed 12.933%, 11.159 %, 8.662%, 7.595% and 7.163% of the variance respectively.

Table-2 Objectivity and Reliability coefficient of the criterion Variables

Sl. No.	Tests	Objectivity	Reliability
1	Push Ups (15 Sec.)	.950	.813
2	Revers Sit Ups (10 Sec.)	.851	.790
3	Leg Rise (10 Sec.)	.895	.851
4	Medicine Ball Throw (3Kg)	.949	.913
5	Basketball Throw	.982	.971
6	Upper Body Raise (Sec. Held)	.894	.924
7	Burpee (Sq. Th.)	.924	.858
8	Push Ups (30 Sec.)	.870	.870
9	Sit Ups (30 Sec.)	.915	.890
10	Leg Rise (Sec. Held)	.902	.886
11	Bridge Up	.980	.956

12	Sit & Reach	.888	.660
13	30 meters Dash	.924	.968
14	6 Second Dash	.996	.914
15	50 meters run	.925	.978
16	Standing broad jump	.890	.888
17	Vertical jump	.984	.951
18	Sideward jump	.827	.682
19	Sit – ups (15 Sec.)	.903	.731
20	Shuttle Run	.975	.991
21	Agility Cycle	.984	.911
22	9 Minute walk and Run	.929	.994
23	600 meters Run	.898	.871

Table-3 Principle component Analysis showing Total Variance Explained 15 to 17 years High school boys

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.975	12.933	12.933	2.975	12.933	12.933	2.767	12.029	12.029
2	2.567	11.159	24.093	2.567	11.159	24.093	2.509	10.907	22.936
3	1.983	8.622	32.715	1.983	8.622	32.715	1.925	8.370	31.307
4	1.747	7.595	40.310	1.747	7.595	40.310	1.917	8.337	39.644
5	1.648	7.163	47.473	1.648	7.163	47.473	1.801	7.829	47.473
6	1.315	5.719	53.193						
7	1.260	5.477	58.669						
8	1.147	4.985	63.655						
9	1.037	4.510	68.164						
10	1.002	4.356	72.520						
11	.898	3.906	76.426						
12	.839	3.649	80.075						
13	.693	3.014	83.089						
14	.612	2.662	85.751						
15	.593	2.577	88.328						
16	.508	2.208	90.536						
17	.499	2.170	92.707						
18	.422	1.834	94.540						
19	.370	1.610	96.151						
20	.348	1.513	97.663						
21	.332	1.443	99.106						
22	.181	.789	99.895						
23	.024	.105	100.000						
Extraction Method: Principal Component Analysis.									
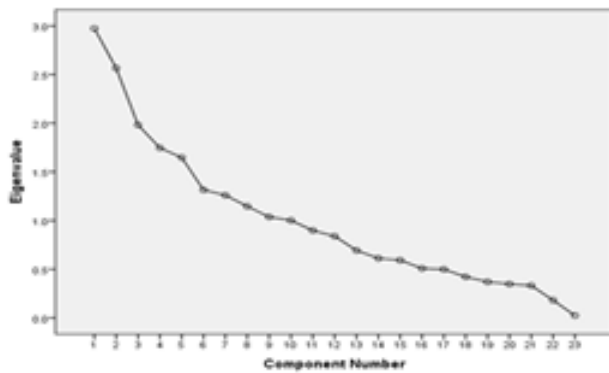
Figure 1: Scree plot for high school boys physical fitness test battery

Table-4. Varimax (Kaisers) rotated factor matrix of variables for 15 to 17 years High school boys

Rotated Component Matrix					
	Component				
	1	2	3	4	5
30 meters Dash	-.667	.079	-.070	.119	-.330
50 meters run	-.666	.042	-.104	.007	-.183
Leg Rise (10 Sec)	.655	.102	-.120	-.023	-.130
Leg Rise (Sec Held)	.590	-.084	-.089	-.030	-.197
Push Ups (15 Sec)	.528	.309	.331	.374	-.271
Burpee (Sq. Th.)	-.205	.855	-.149	-.007	.258
Push Ups (30 Sec)	-.218	.853	-.133	.002	.280
Sideward jump	.188	.515	.185	-.018	-.019
Sit & Reach	.029	.479	.223	.024	-.080
Vertical jump	-.140	-.049	.720	-.063	.180
Standing broad jump	.123	.102	.607	-.031	-.122
Sit ups (15)	.035	.157	.555	.096	-.006
Upper Body Raise (Sec Held)	.374	.305	-.476	.474	-.092
Agility Cycle	-.150	-.164	.366	.327	.153
9 Minute walk and Run	.052	-.003	-.080	-.666	-.163
600 meters Run	-.126	-.387	-.021	.655	.049
Revers Sit Ups (10 Sec)	.366	.300	-.120	.583	-.013
Medicine Ball Throw (3Kg)	.271	-.100	-.226	-.304	.010
Basketball Throw	-.056	.049	-.032	.040	.679
6 Second Dash	.473	-.035	-.012	.210	.655
Bridge Up	-.135	.153	.107	-.208	.511
Sit Ups (30 Sec)	.160	-.010	.107	.111	.315
Shuttle Run	.041	-.036	.047	-.087	-.137
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 9 iterations.					

Varimax (Kaisers) rotated factor matrix of variables for 15 to 17 years high school boys were presented in the Table-4. By the examination of the factor loading in the Table-4, the five components extracted i.e. Speed, Muscular Strength, Muscular Endurance, Explosive Power and Cardio Respiratory Endurance.

The test variables are selected through interpretation of rotated factor loading of various test variables. A factor loading of 0.45

and more is therefore, considered as significant for each factor analysis. When on a factor two or more related test variables load significantly, the one that loads highest is selected as the representative test item for that factor but in factor IV Second best test is selected because of administrative fusibilities. On the other hand, if test variable loads significantly in more than one factor, by theory of redundancy it was ignored in the factors except the one in which it loaded highest.

Table-5 Descriptive table on findings of constructed physical fitness test battery

Name of Test	Factor Loading					Identification of Components	Test Battery
	1	2	3	4	5		
30 meters Dash	-0.667	0.079	-0.070	0.119	-0.330	Speed	*
50 meters run	-0.666	0.042	-0.104	0.007	-0.183	Speed	
6 Second Dash	0.473	-0.035	-0.012	0.210	0.655	Speed	
Leg Rise (10 Sec)	0.655	0.102	-0.120	-0.023	-0.130	Muscular Strength	
Push Ups (15 Sec)	0.528	0.309	0.331	0.374	-0.271	Muscular Strength	
Revers Sit Ups (10 Sec)	0.366	0.300	-0.120	0.583	-0.013	Muscular Strength	
Medicine Ball Throw (3Kg)	0.271	-0.100	-0.226	-0.304	0.010	Muscular Strength	
Basketball Throw	-0.056	0.049	-0.032	0.040	0.679	Muscular Strength	*
Leg Rise (Sec Held)	0.590	-0.084	-0.089	-0.030	-0.197	Muscular Endurance	
Burpee (Sq. Th.)	-0.205	0.855	-0.149	-0.007	0.258	Muscular Endurance	*
Push Ups (30 Sec)	-0.218	0.853	-0.133	0.002	0.280	Muscular Endurance	
Upper Body Raise(Sec Held)	0.374	0.305	-0.476	0.474	-0.092	Muscular Endurance	
Sit Ups (30 Sec)	0.160	-0.010	0.107	0.111	0.315	Muscular Endurance	
Sit & Reach	0.029	0.479	0.223	0.024	-0.080	Flexibility	
Bridge Up	-0.135	0.153	0.107	-0.208	0.511	Flexibility	
Vertical jump	-0.140	-0.049	0.720	-0.063	0.180	Explosive Power	*
Standing broad jump	0.123	0.102	0.607	-0.031	-0.122	Explosive Power	
Sit ups (15)	0.035	0.157	0.555	0.096	-0.006	Explosive Power	
9 Minute walk and Run	0.052	-0.003	-0.080	-0.666	-0.163	Car. Vas. Endurance	
600 meters Run	-0.126	-0.387	-0.021	0.655	0.049	Car. Vas. Endurance	*
Agility Cycle	-0.150	-0.164	0.366	0.327	0.153	Agility	
Shuttle Run	0.041	-0.036	0.047	-0.087	-0.137	Agility	
Sideward jump	0.188	0.515	0.185	-0.018	-0.019	Agility	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.[a]							

Descriptive table on findings of constructed physical fitness test battery is presented in Table-5, for high school boys. The physical fitness test battery consisting of five test items considering the administrative feasibility and educational application is recommended for high school boys of 15 to 17 years to assess their physical fitness as follows:

For 15-17 Years High School Boys

Factor I	Speed	30 Meters Dash
Factor II	Muscular Endurance	Burpee (Sq. Th.)
Factor III	Explosive Power	Vertical Jump
Factor IV	Cardio-Vascular Endurance	600 Meters Run
Factor V	Muscular Strength	Basketball Throw

Summary and Conclusion

The main purpose of this study was to find out the significant test items for construction of physical fitness test battery for high school boys of Dharwad district. The collection of data was delimited to the Dharwad district. One hundred high school boys of Dharwad district where selected for the data collection. Selected 23 test items were administered for the purpose. The data collected will be compiled by using Microsoft office 2010 excel sheet, further subjected to factor analysis in computer having SPSS - V.20 package. It helps researches to select the test variables for construct test battery. From the analysis final we selected 5 test variables which are loaded high significance scores in different factors, they are 30 Meters dash, Burpee (Sq. Th.), vertical jump, 600 Meters Run and Basketball Throw. These physical fitness tests are suitable for 15 to 17 years high school boys of Dharwad district.

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FORMULATION AND EVALUATION OF VAGINAL BIOADHESIVE TABLETS OF ANTIVIRAL DRUGS

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ABSTRACT

Ritonavir is an anti-viral, which has been used in the treatment vaginal disorder. Ritonavir is almost completely absorbed after oral administration but has low bioavailability of about 10-15% because of first pass metabolism. As first pass metabolism removes approximately 85-90% of the drug, so for clinical efficacy of the drug it should be frequently administered. Hence an attempt has been made to produce sustained release dosage form of the ritonavir which can be specifically employed for the treatment of HIV infection. The Mucoadhesive tablets of ritonavir has been prepared by direct compression methods and evaluated for various parameters such as thickness, friability, hardness, drug content, weight variation, swelling index, surface pH, bioadhesive force, bioadhesive time, drug release etc. The kinetic data was applied to the optimized formulations. So formulation of ritonavir in a vaginal mucoadhesive tablet dosage form will decrease the frequency of administration, which can lead to an improvement in patient compliance and thereby improving its clinical efficacy.

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Keywords: Ritonavir, Vaginal tablets, Mucoadhesive polymer, Bioadhesion tiome

Introduction

The vagina, as a site for drug delivery, offers certain unique features that can be exploited in order to achieve desirable therapeutic effects. The vaginal epithelium is permeable to a wide range of drugs, like hormones, antimycotics, peptides and proteins [1]. The vagina provides a promising site for local effect as well as systemic drug delivery because of its large surface area, rich blood supply, and avoidance of the first-pass effect, relatively high permeability for many drugs and self-insertion [2, 3]. In addition, a prolonged contact of a delivery system with the vaginal mucosa may be achieved more easily than at other absorption sites like rectum or intestinal mucosa [4]. Conventional vaginal delivery systems include solutions, suspensions, gels, foams and tablets. Vaginal creams and gels provide lubrication, but tend to be messy and cluttered, and are easily washed off if they are water soluble and easily dispersive. Suspensions and solutions tend to spread widely in the vaginal cavity. Vaginal Foams are provided excessive lubrication and leakage from the vagina. Thus vaginal tablets are to be useful and most convenient dosage form as ease for application and portability [5]. The term "Mucoadhesion" describes materials that bind to biological substrates, such as mucosal members. Adhesion of bioadhesive drug delivery devices to the mucosal tissue offers the possibility of creating an intimate and prolonged contact at the site of administration. This prolonged residence time can result in enhanced absorption and in combination with a controlled release of drug also improved patient compliance by reducing the frequency of administration [6, 7].

It is an important route for local treatment of several gynecological conditions, such as infections and in hormonal therapy. This route provides advantages such as reducing or eliminating the incidence and severity of side effects, being a non-invasive route of administration and accessibility. These benefits could contribute to a better compliance, thus achieving improved therapeutic out come. Furthermore, the vagina possesses properties which include: large surface area of the vaginal wall, permeability, a rich blood supply and importantly, the ability to bypass first-pass liver metabolism. These properties are considered to be advantageous in relation to drug absorption [8]. However, their efficacy is often limited by a poor retention at the site of action due to the self-cleansing action of the vaginal tract. Furthermore, the vagina has unique features in terms of microflora, pH and cyclic changes, and these factors influence the

performance of the formulations and must be considered during the development and evaluation of vaginal delivery systems. Therefore, a successful delivery of drugs through the vagina represents a pharmaceutical challenge [9].

Ritonavir (RN) is a protease inhibitor widely prescribed in antiretroviral regimen. It blocks the HIV protease, thereby reducing the viral load in the infected individual [10]. This drug is mainly suffers with low oral bioavailability due to degradation of ritonavir by the cytochrome P450-3A4 (CYP3A4) isoenzymes in the distal intestine, efflux of the absorbed drug by counter transporter proteins (mainly P-glycoprotein) present in the distal intestine[11, 12] It shows pH-dependent solubility and solution stability[13].

Materials and Methods

Ritonavir obtained as a gift sample from Cipla Labs, Indore, India. Polymer such as Chitosan, HPMC, Guar gum and Xanthan gum were purchased from SD Fine Chemical Mumbai. All the solvents used were purchased from Qualigen, Mumbai and of analytical grade.

Preparation of buccoadhesive ritonavir tablets

Mucoadhesive ritonavir matrix tablets were prepared by direct compression method. Ritonavir and various concentrations of chitosan, HPMC, guar gum and xanthan gum were used as a Release retardant polymer. Chitosan was used as bioadhesive polymer. All the ingredients were sieved and then blended in mortar with pestle to obtain uniform mixing. Finally magnesium stearate and talc was added, which was then compressed by multi-station punch machine using 10 mm flat faced punch. The weight of tablet was adjusted to 400 mg and each tablet contained 100 mg Ritonavir[14].

Fourier Transform Infrared Spectroscopy (FTIR) Interpretation

To analyse the compatibility of drug and polymer the infrared spectrum of pure ritonavir sample and Combination of drug, with Chitosan, HPMC Xanthun gum and Gaur gum was recorded by using Fourier Transform Infrared Spectroscopy and the spectrum analysis was done [15].

Micromeritic Properties of Drug and Polymer

Tablets were prepared by direct compression method hence micromeritics studies (angle of repose, bulk density, tapped density, % compressibility) of powder blend were evaluated prior to manufacturing of compression coated tablets [16].

Post Compression Parameter

Thickness

Take five tablets from each batch of formulation and the thickness of the tablets were measured with the help of vernier caliper. The average thickness is calculated [17].

Hardness and Friability

The Monsanto hardness tester was used to determine the tablet hardness. The tablet was held between a fixed and moving jaw, the body of Monsanto hardness tester carries an adjustable scale which was set a zero against an index mark fixed to the compression plunger. When the tablet was held between the jaws. The load was gradually increased until the tablet fractured. The value of the load at the point gave a measure of the tablet hardness.

Friability was evaluated by means of friability test apparatus known as Roaches friabilator. Twenty weighed tablet were placed in the friabilator and then operated at 25 rpm for 4 minutes [18]. The tablets were then removed and weighed again. The difference in the two weights was used to calculate friability

$$F = 100 \ [1-W/W_0]$$

Where, W_O = Initial weight, W= Final weight

Weight variation test

Twenty tablets were weighed individually and the average weight was calculated. The individual weights were then compared with the average weight. The tablet pass the test if not more than two tablets fall outside the percentage limit and none of the tablets differ by more than double the percentage limit given[19].

Drug content uniformity

Weigh and powder 20 tablets. Weigh accurately a quantity of the powder containing about 100 mg of ritonavir, then it was dissolved in the acetate buffer pH 4.6. The absorbance of the solution was then measure at the maximum at about 238 nm, using acetate buffer pH 4.6 as the blank [20].

Swelling index

From each formulation, single tablet was taken and weighed, individually (W1) and placed separately in petridish containing 5 ml of acetate buffer PH 4.6. The petridish were kept at room temperature for 30 minutes, then vaginal tablets were removed from petridish and excess of water was removed carefully by using filter paper. The swollen vaginal tablets were weighed (W_2). Percentage swelling index was calculated, each experiment was performed in triplicate, and average reading was taken [21].

% Swelling index $= W_2-W_1/W_1 \times 100$

Where, W_1 = Initial weight, W_2 = Final weight

Surface p^H Study

The surface pH of the vaginal tablets was determined in order to investigate the possibility of any side effects *in-vivo*. As more acidic or alkaline pH may cause discomfort to the vaginal mucosa, the pH was maintained to weak acid as closely as possible. A combined glass electrode was used for this purpose. The tablet was allowed to swell by keeping it in contact with 1 ml of acetate buffer (pH 4.4 ± 0.05) for 2 h at room temperature. The pH was measured by bringing the electrode in contact with the surface of the tablet and allowing it to equilibrate for 1 ml acetae buffer (pH 4.4 ± 0.05) for 2 h at room temperature. The pH was measured by bringing the electrode in contact with the surface of the tablet and allowing it to equilibrate for 1 min [22].

Matrix erosion test

After swelling study, the swollen tablets were dried at 60°C for 24 h in an oven and kept in descicator for 48 h and reweighed (W3). Matrix erosion was calculated using following formula.

% Matrix erosion = [(W1-W3) ÷ W3] × 100

Bioadhesion strength

Bioadhesive strength of the vaginal tablets was measured on the "Modified Physical Balance method". The method used ship vaginal membrane as the model mucosal membrane. The fresh ship vaginal mucosa was cut into pieces and washed with acetate buffer pH 4.6. A piece of mucosa was tied to the glass slide which was moistened with acetate buffer pH 4.6. The tablet was stuck to the lower side of another glass slide with glue. The both pans were balanced by adding an appropriate weight on the left- hand pan. The glass slide with mucosa was placed with appropriate support, so that the tablet touches the mucosa. Previously weighed beaker was placed on the right hand pan and powder (equivalent to weight) was added slowly to it until the tablet detach from the mucosal surface. The weight required to detach the tablet from the mucosal surface gave the bioadhesive strength. The experiment was performed in triplicate and average value was calculated. Bioadhesive strength was assessed in terms of weight (gm) required to detach from membrane. Bioadhesion strength which was measured as force of adhesion in Newton by using formula [23].

Force of adhesion (N) = Mucoadhesive strength / 100 X 9.81

Bioadhesion time

The ex-vivo mucoadhesion time was examined after application of the vaginal tablet on freshly cut ship vaginal mucosa. The fresh ship vaginal mucosa was tied on the glass slide, and a mucoadhesive core side of each tablet was wetted with 1 drop of acetate buffer pH 4.6 and pasted to the sheep vaginal mucosa by applying a light force with a fingertip for 30 seconds. The glass slide was then put in the beaker, which was filled with 200 ml of the phosphate buffer pH 4.6 and kept at 37 ± 1°C. After 2 minutes, stirring was applied slowly to simulate the vaginal cavity environment, and tablet adhesion was monitored for 12 hr. The time for the tablet to detach from the sheep vaginal mucosa was recorded as the mucoadhesion time [23].

In-vitro dissolution study

The release rate of Ritonavir from Bioadhesive tablets was determined using USP dissolution

testing apparatus II (Paddle type, Electrolab, India). The dissolution test was performed using 900 ml pH 4.6 acetate buffer, at $37 \pm 0.5°C$ and 50 rpm. A sample (5ml) of the solution was withdrawn from the dissolution apparatus hourly for 12 h, and the samples were replaced with fresh dissolution medium. The absorbance of these solutions was measured at 238 nm [23].

Data treatment

In order to investigate the mode of release from the tablets the release data were analyzed with the following mathematical models. The application of kinetic to the release data was conducted by using PCP disso.

To study the *in-vitro* drug release kinetics, data was applied to kinetic models such aszero order, first order, Higuchi, HixsonCrowell and Korsmeyer- Pappas.

Stability Study

The best batch was subjected to stability study at elevated temperature (60^0C/ humidity) for six week. The sample of stability study were withdrawn at the end of six weeks and evaluated for the changes in the physical character and drug released pattern [23].

Result and Discussion

The Mucoadhesive tablets of ritonavir were prepared using direct compression methods. The bioadhesive polymer chitosan was used along with the rate retardant polymer such as HPMC, gaur gum and Xanthan gum. There is no alteration in the peaks of Ritonavir pure drug and optimized formulation, suggesting that there was no interaction takes place between drug and excipients and the spectrums are depicted in fig. 1 and 2.

Micromeritic Properties

The flow property of study such as the bulk density, tapped density,carr's index,hausners ratio and angle of repose for pure drug, chitosan, HPMC, Xanthan gum and gaur gum was found to be good and all parameter obtained within range as per official standard.

The results of bulk density formulations bearing F1 to F9 were reported in the

range of 0.48±0.08 g/cc–0.54±0.12 g/cc. The findings of tapped density formulations F1 to F9 were reported in the range of 0.56±0.15 g/cc–0.62±0.22 g/cc. The angle of repose of all the formulations was found to be satisfactory. The formulation F1 was having an angle of repose value of 20.01±0.01, and CI values existed found to be in range of 10.01–15.38%. These findings indicated that all batches of formulations exhibited good flow properties. Hausner's ratio values were in the range of 1.10–1.26% and values are shown in Table 2.

Mucoadhesion time and Mucoadhesion force

The Fig. 3 and Fig. 4 indicate that the bioadhesive time as well as bioadhesive force increased significantly with chitosanand other polymers. The time for the tablet to detach from ship vaginal mucosa was recorded as the mucoadhesion time. The formulation F1 containing higher Chitosan and HPMC showed higher mucoadhesion time (12.1 hour) and mucoadhesion force compare to other formulation which consist of chitosanand gaur gum, chitosanand xanthan gum. But also the remaining formulations show optimum mucoadhesion time. Mechanical and frictional irritation to the surrounding Bioadhesion is a surface phenomenon in which a material of natural or synthetic origin adheres or sticks to a biological surface, usually mucus membrane. Many hydrophilic polymers adhere to mucosal surfaces as they attract water from the mucus gel layer adhering to the epithelial surface and more force require breaks tablet and mucus membrane.

Swelling Index and % Erosion

All the tablet matrices were stable throughout the period of swelling, without any disintegration being observed. The swelling index of all formulations was found to be more or less superimposable, due to the low invariance amongst their chosen polymer compositions. The swelling index profile of all formulation, prepared as per the experimental design, is shown in Figure 5. The two polymers used, namely Chitosan and HPMC, showed an increase in the values of swelling index as their concentration was increased, formulation F1

consist of HPMC and chitosan showed the high swelling than F3< F6< F1.   HPMC is a hydrophilic polymer that swells to a significant extent upon contact with water. A high HPMC content results in a greater gel formation and forms a gelatinous barrier which retards drug release via diffusion through the gel and erosion of gel barrier in fig.6. On comparing the swelling indices of all formulations, it was observed that HPMC swelled more than gaur gum and xanthan gum formulations.

Dissolution

All the tablets showed a sustain release pattern of drug release up to 12 h. The results showed that as the concentration of polymer present within the formulation increased, the amount of drug released was retarded, showed that formulation F1 that contains the amount of chitosan and HPMC showed maximum be drug release but up to 12 hr . The overall rate of drug release at 12 hr tended to decrease with an increase in the amount of polymer in the formulations such as F1 < F2 < F7 < F8 < F9. The formulation F1 maximum released 96% drug up to 12 hr at optimum ratio of chitosan and HPMC. The comparison of the mechanism of drug release from swellable matrices could be determined by several physicochemical phenomena. Among them, polymer water uptake, gel layer formation and polymeric chain relaxation are primarily involved in the modulation of drug release. Chitosanis a cross-linked polymer with high molecular weight and viscosity, and when it comes in contact with water, it would swell and hold water inside its microgel network. This particular property may partially be responsible for the retarded drug release from Ritonavir tablets. In the case of HPMC, which is also a hydrophilic swellable polymer, a retarded drug release pattern was observed. A high HPMC content results in a greater amount of gel being formed . This gel layer increases the diffusion path length of the drug, hence controlling drug release via diffusion through the gel and erosion of the gel barrier. Its viscous nature also affect the diffusion coefficient of the drug . As a result, drug release was found to be decreased as the amount of HPMC was increased.

Drug release Kinetics

In case of most of the formulations the R^2 values were higher for First order model than for Zero order model indicating that the drug release from the formulation followed First order kinetics. Higuchi model,indicating that the drug release mechanism from the tablets was diffusion controlled. Obtained values of n lies between 0.5286 - 0.5922, indicating non-Fickian release kinetics, which is indicative of drug release mechanisms involving, diffusion mechanisms. Therefore, the release of drug from the prepared tablets is controlled by swelling of the polymers, followed by drug diffusion through the swelled polymer

Stability Study

The batch F1 was selected as the best batch among the all different formulations. Accelerated stability study on the selected batch was carried out to determine the rate of degradation of the formulation. There were no physical changes in the tablets after six weeks. All the parameters of the tablets are having no changes and also the drug release is similar after six weeks.
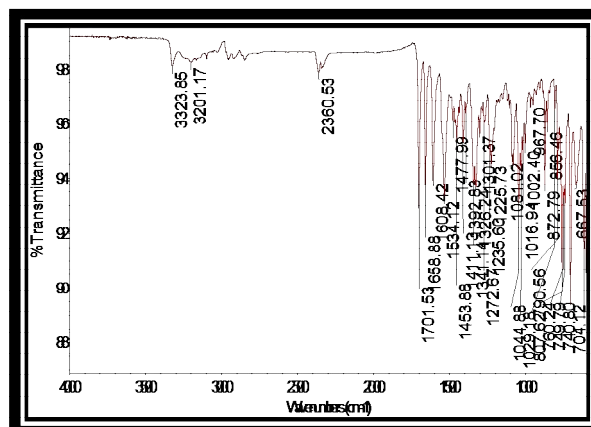
Fig. 1: FTIR spectrum of pure Ritonavir
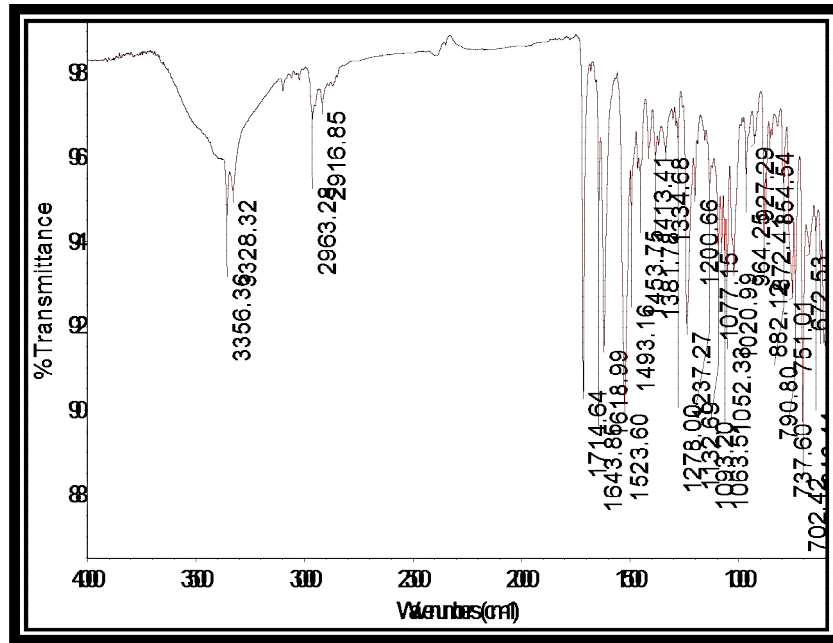
Fig. 2:   FTIR Spectra of physical mixture
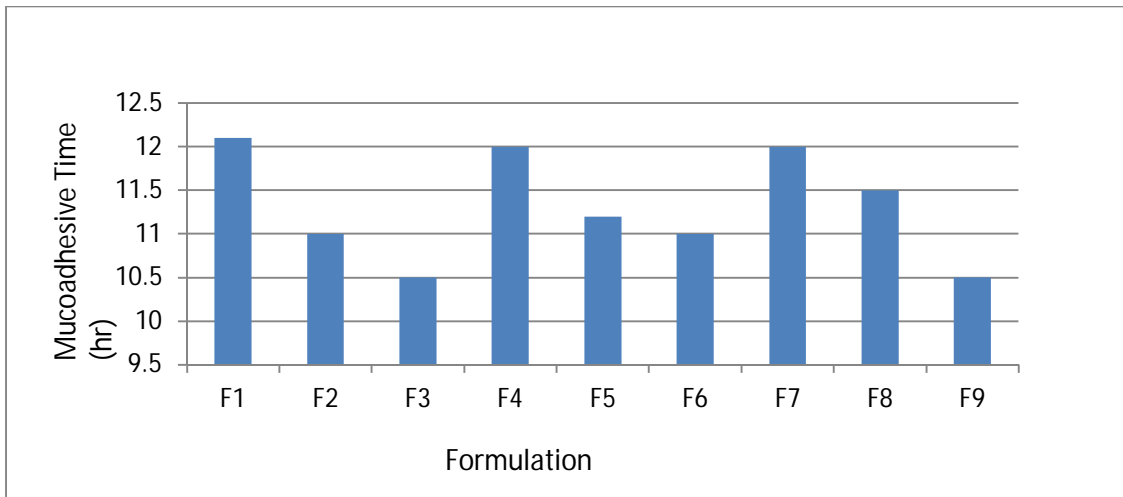
Figure 3: *In vitro* bioadhesion time study of optimization formulations
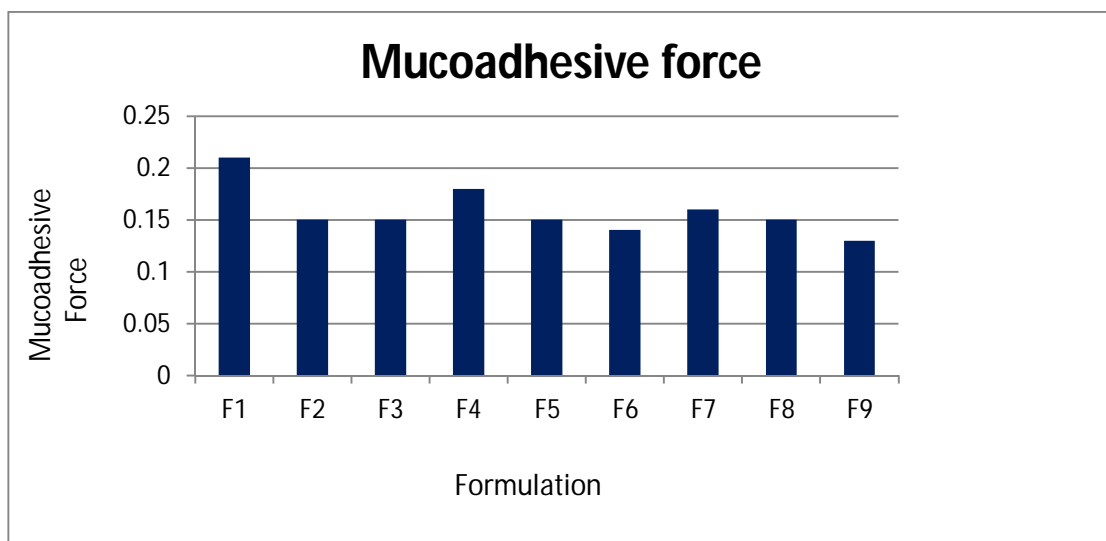
Figure 4: *In vitro* bioadhesion force study of optimization formulations
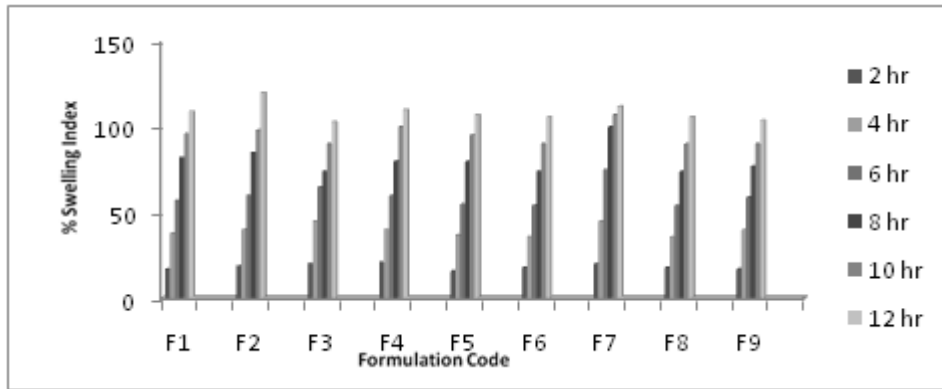
Figure 5: % Swelling index of optimization formulations
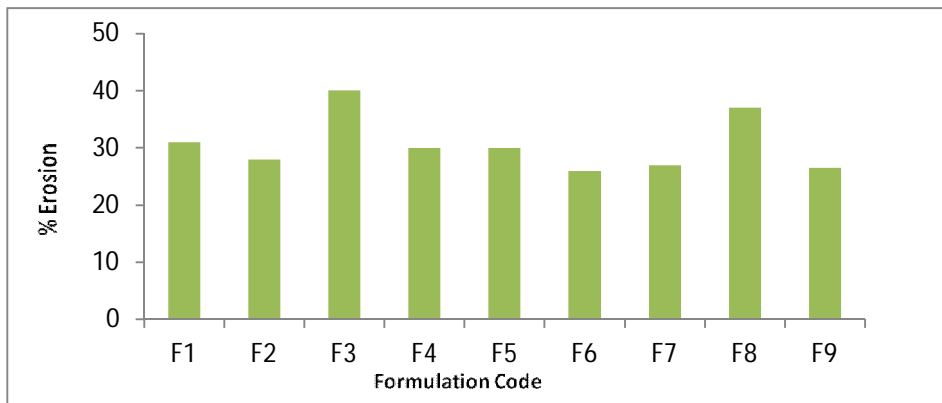
Figure 6: % Erosion of optimization formulation
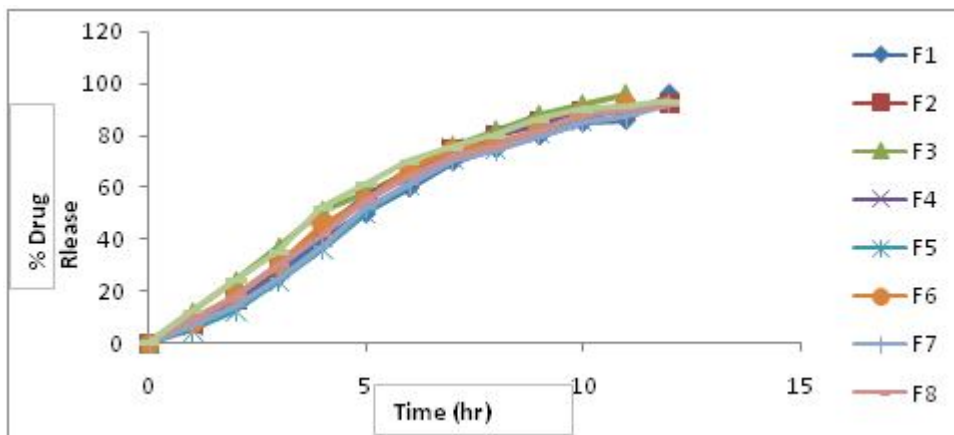
Figure 6: Dissolution profiles of Ritonavir Mucoadhesive vaginal tablet

Table 1: Formulation of Ritonavir Mucoadhesive vaginal tablet

Ingredients (mg)	Formulations								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
Ritonavir	100	100	100	100	100	100	100	100	100
Chitosan	100	100	100	100	100	100	100	100	100
HPMC	150	100	50	---	---	---	---	---	---
Guar gum	---	---	---	150	100	50	---	---	---
Xanthan Gum	---	---	---	---	---	---	150	100	50
MCC	45	95	145	45	95	145	45	95	145
Talc	5	5	5	5	5	5	5	5	5
Total	400	400	400	400	400	400	400	400	400

Table 2 : Micromeritic characterization of drug excipients blend

Parameters/	Ritonavir	Chitosan	HPMC	Xanthan Gum	Gaur Gum
Bulk density(g/cm3)	0.44± 0.02	0.221± 0.021	0.334±0.021	0.330±0.021	0.322±0.021
Tapped density (g/cm3)	0.48± 0.23	0.332± 0.022	0.470± 0.022	0.468±0.028	0.453±0.022
Carr's Index	15.50± 0.021	32.22±0.06	35.40±0.012	34.42±0.012	31.720.04
Hausner's ratio	1.10±0.1	1.24±0.021	1.26±0.012	1.24±0.012	1.15±0.011
Angle of repose	20.25±0.4	18.5±0.6	18.4±0.3	18.1±0.2	18.25±0.2

Table 3: Evaluation of Ritonavir Mucoadhesive vaginal tablet

Formulation	Thickness (mm)	Hardness (kg/cm2)	Friability (%)	Average weight (mg)	Drug content (%)	Surface P^H
F1	4.82±0.01	5.3±0.3	0.53± 0.06	390±0.5	100.15	4.51±0.02
F2	4.87±0.04	5.4±0.3	0.55 ±0.03	415±0.5	99.05	4.62±0.4
F3	4.90±0.02	5.5±0.2	0.54 ±0.08	405±0.5	98.62	4.58±0.2
F4	4.93±0.01	5.3±0.3	0.55 ±0.02	395±0.5	98.83	4.60±0.01
F5	4.82±0.01	5.6±0.3	0.55±0.05	410±0.5	99.82	4.52±0.04
F6	5.04±0.03	5.4±0.1	0.52 ±0.06	410±0.5	100.47	4.45±0.02
F7	5.14±0.05	5.2±0.2	0.59 ±0.05	415±0.5	101.22	4.45±0.3
F8	4.84±0.01	5.3±0.1	0.58 ±0.02	420±0.5	98.44	4.52±0.1
F9	5.10±0.04	5.4±0.2	0.56 ±0.06	415±0.5	99.223	4.62±0.01

Table 4: *Ex vivo* Mucoadhesion time and Mucoadhesion force

Formulation	*Ex vivo* Mucoadhesion time (hr)	Mucoadhesive force
F1	12.1±0.03	0.21±0.04
F2	11.0±0.23	0.15±0.02
F3	10.5±0.01	0.15±0.1
F4	12.0±0.02	0.18±0.01
F5	11.2±0.01	0.15±0.23
F6	11.0±0.01	0.14±0.12
F7	12.1±0.01	0.16±0.2
F8	11.5±0.20	0.15±0.01
F9	10.5±0.03	0.13±0.02

Conclusion

The present study was an attempt to develop a mucoadhesive vaginal drug delivery system for ritonavir. The main advantage achieved by this tablet dosage form resulted from its ability to prolong the local release of the drug in the vaginal cavity. The results suggest that ritonavir-containing mucoadhesive vaginal tablets would be useful as alternative routes of administration with reduced dosing intervals, lower systemic side effects and hence, improved patient compliance. The bioadhesive polymers along with the rate retardants were successfully employed for the bioadhesion and drug release for the period of 12 hrs.

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RESEARCH-UNIQUE EXPERIENCES- A STUDY

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ABSTRACT

In majority cases; Research Proceedings follow a typical pattern. However; as per one School of thought; Researchers' experiences are unique. Research Significance is going to increase after implementation of New Educational Policy when Multi-Disciplinary Research Universities are expected to focus exclusively on Research.The Research Scope and Objectives are adapted to Research Environment and Prevailing Circumstances. The Researcher may not come out with practical outcome always; still he knows different Research Areas.Under exceptional circumstances; the Researcher enjoys a right to comment "Although the Research Findings are showing something through Data Analysis and Interpretation; the Researcher himself strongly feels contrary to the Research Findings on the basis of the informal social clues; he has actually experienced while interviewing the respondents." In the words of Philip Kotler; "The Research Methodology has a deep impact on the Findings; thus; Conclusions of the Research." During the course of the Research; sometimes Researchers experience extra-ordinary or different factors or matters as Findings or Conclusions. In this Research Paper; the Researcher has tried to probe into the reasons for this situation.

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Keywords:(a) Research Environment (b) Advance Research (c) Research Specialist (d) Pseudo or Artificial Responses.

Introduction

In majority of the cases; the proceedings of the Research necessarily follow a typical or traditional; well proven or an established pattern. This means that overall the Researcher progresses quite neutrally and as far as the Research Findings and Observations are concerned; with unbiased or prejudiced and broad vision; ultimately; the he travels towards the Research Conclusions; impartially. However; as per one of the Schools of thought; the experiences obtained by the Researcher for a specific Research are no doubt; unique or undifferentiated in their character.

Rationale of the Research Paper

As a matter of fact; during the course of the Research; sometimes many Researchers experience or come across some such factors or matters respectively those are extra-ordinary in their nature or are little different in practical character from those which are actually expected or ideally intended; either as a Research Finding; consequently as a Research Conclusion. In this Research Paper; the Researcher has tried to probe into the reasons for this situation.

Increasing Importance of Research

The significance of Research as a practical concept is going to increase especially after the implementation of New Educational Policy; perhaps with effect from the ensuing Academic Year 2022-23; when there would be in existence four different kinds of Universities namely; Government Universities; Private Universities; Private Aided universities and Multi-Disciplinary Research Universities. Out of these Universities; the last category of University is expected to focus exclusively on Multi-Disciplinary Research; quite exclusively. In general; it is said that the fastest; most efficient; easiest and the best way of doing a thing is doing it in the organized way. The same statement is applicable to the concept of Research also.

Realities Regarding Research

Novel and Significant or Substantial Contribution as a Research in any field; in itself; is no doubt; a Revolution. However; the Scope and Objectives of the Research; as a matter of fact; get automatically and knowingly altered as per the Research Environment and the Prevailing Circumstances.

As Swami Vivekananda had observed; "Each Work has to pass through three stages; namely; Ridicule; Opposition and Acceptance;" Research as a concept is indeed no exception to the quote.

Real Education is experienced only through Research because it is criticized; quite

commonly; that the Educational Degree; though Post Graduate; is simply a piece of Paper and nothing else.

'Real Research' begins only after acquiring Ph. D. Degree; in the sense that the moment the others think that the Research is over; the real Researcher starts his Advance Research which can be interpreted as 'Real Research.'

Claude Levi-Strauss had said that the Scientist is not a person who gives the right answers; he is the one who asks the right questions. Likewise; the Researcher may not come out with the solution or outcome having practical application; always; but; he is the one who knows the Scope for Future Research that is different areas in which the Research is really required.

According to one of the Internationally Renowned and Eminent Professors Mr. S. K. Chakraborty; "The more we rush into Research; more we recede (retreat) from Realization (Understanding or Awareness or Recognition). The world needs; for peace and wholeness; not Research; but Realization. ----- Research tends towards Analysis; Realization leans towards Synthesis. Research is primarily experimental; Realization is Experiential."

In order to convince this point he has put forward the example of the Research in field of Quantum Physics. He contends that Quantum Physics has concluded several decades back that everything in the Universe is interconnected. In his opinion; still; the world is not a better place to live in; even today.

Like every other field; Research too has; no doubt; several limitations. However; this does not; at all; suggest that Research should not be conducted. On the other hand; it should be conducted in the light of its practical limitations; At the same time; there can be a serious controversy among the Research Experts as regards the Methodology to espouse in general and the tools or techniques to adopt; in particular; in order to conduct the Research.

Research Paper Objective

The following is the Objective of the Research Paper.

1. To Ascertain Unique Research Experiences during the Course of the Research

Research Paper Scope

The Scope of the Research Paper extends to the experiences of the Researcher himself and also to the number of other Researchers who have been interviewed for the purpose of this Research.

Research Paper Methodology

The Methodology adopted for writing the research Paper is 'Observation.' Besides, Primary Data is collected through informal or unofficial interactions with the Researchers with unstructured disguised questionnaire.

Research Experiences

Experience No. I

Whenever the Research is conducted with a Research Tool which is technically termed as Structured and Disguised Questionnaire; the respondents tend to reply a particular question not; at all; realistically or factually; but; in a Socially Desirable Manner. Thus; the Research Findings arrived at through Data Analysis and Interpretation; do not reveal the reality or the factual situation; social or official; sometimes; which is ideally expected through Research.

For example; in one of the very popular Reality Shows; during the course of the show; all the Respondents were asked a simple question as to how they would like to utilize the huge amount of the prize; if it; at all; it would be won by either of them. Almost all; that is; around ninety nine percent of the Respondents replied that they would like to invest the prize money; if earned; in the projects involving Public Welfare or for the benefit of the public; at large. As a dramatic irony; when the Reality Show was actually over and the prizes were distributed among the wining participants; the observations confirmed beyond a shadow of reasonable doubt that none of the respondents who obtained the prizes; invested the funds in the projects meant for the Public Welfare or Public Benefits; as publicly promised during the course of the show.

Likewise in another Social Research conducted; the Researcher asked the respondents a very simple and straight-forward question as to how they would like to utilize the amount of the prize; if it would be won by them. Thereafter; as per the regular Research

Procedure; on the basis of the responses obtained; of more than ninety five percent of the participants; the Researcher came to a rational conclusion that the Prize amount would be invested for the pure purpose of Public Welfare or for the benefit of the society; at large. While the Researcher was administering the said questionnaire and was recording the various responses for the above question; he was strongly suspecting about the reality hidden in the reply. Finally; he was compelled to come to a conclusion; as per the Data Collected; something exactly contrary to what he was feeling. It is needless to point out over here that Feelings; Perceptions; Experiences and Researchers' Expectations really play second fiddle to the Data (Primary) collected; in Research.

Under such crucial and critical circumstances; the Researcher does enjoy a right to comment as follows.

"Although the Research Findings are showing something through Data Analysis and Interpretation; the Researcher himself strongly feels contrary to the Research Findings on the basis of the informal social clues; he has actually experienced while interviewing majority of the respondents."

Researcher's Observations Regarding Responses

The Researcher should; at no time; during the course of the Research; get carried away by the Responses given by the Respondents. The Responses can either be totally Deceptive or Misleading or Misrepresenting or Socially Desirable in practical character. Thus; a wise Researcher; should be in a comfortable position to distinguish or differentiate between the 'Real Responses' and 'Pseudo or Artificial Responses.'

Experience No. II

Of late; the Researcher came across a questionnaire; meant for the Ph. D. Research; which progressed; to the utter surprise; with the exclusive focus on disproving a specific Hypothesis. This is; in principle; not at all correct. As a matter of fact; the Research Questionnaire; irrespective of the nature and the serious consequences of the findings and Conclusions of the Research; should proceed

neutrally and impartially; that is; without any Prejudice; interest; influence; involvement or Bias; as such. In the questionnaire referred to the above; whenever the experience of the Respondent was exactly contrary to what the Researcher had perceived or experienced or thought of; the questionnaire really turned totally useless and hopeless; basically because the responses were highly and irrationally restricted or illogically limited. In other words; whenever the Respondent had different kind or nature of experience; he could not reply either of the questions asked; through an option such as 'totally disagree' or 'Cannot say;' etc.; because such type of options were not given.

In general; whenever the questionnaire is framed under the Influence or Dominance or under the pressure of either proving or disproving the Hypothesis framed; or for fulfillment or non-fulfillment of a particular objective; it will definitely be full of bias or prejudice.

Researcher's Observations About Questionnaire

Such kind of questionnaire was; indeed; one of the bad questionnaires in Research to administer to the Respondents. It tempts or forces the Respondents to reply to the questions in a specific style or manner. Consequently; the Researcher can come to the Conclusions; he had predicted or forecasted. As a matter of fact; adoption of this type of Research Methodology; in itself; defeats the very (fundamental) purpose of conducting the Research.

All the other details related with the questionnaire; referred to above and also the questions as bad precedents and practical examples cannot be disclosed over here in the Research Paper; as that may act against prevailing Research Standards or Research Ethics. However; in order to bring in conviction as well as clarity in the contents of the Research Paper (which is ideally expected out of a Research-Paper writer); it can precisely be commented that the questionnaire was designed with the postulate or an assumption that the Service; under Research Study had miserably failed on the basis of a number of parameters; that too; on a number of occasions. As a result; all the questions

roughly revolved around the points of Service Failure; Service Recovery; Service Guarantee; Customer Compensation and most importantly; Service Improvement. As a matter of an interesting observation; all these factors associated with any Service would come into picture only after Service Failure and certainly not after obtaining success in Service Delivery. Whenever the Respondents had no absolute experience of Service Failure; they could reply the questions contained only in the first Section of the questionnaire which consisted of Respondent's Personal Profile; but the questions designed in the subsequent Sections could not be answered; at all; for want of proper Applicability. Furthermore; the same Section could have been called sound or balanced had it included the points related to the aspects; associated with the Success in the Service Delivery as a Process; like Increase in the level of Consumer Satisfaction; Enrichment in Customer Experience about Service; Betterment in Service Quality and Delivery; Enhancement or Extension of the Knowledge of the Service Personnel; Improvement in the Brand Name and Public Image of the Service Organization; to mention a few.

Moreover; in the same questionnaire; there should really have been included minimum one and maximum two sections focusing exclusively on the Respondents' Good Experiences about the Concerned Service. Thus; the Respondents who could not reply to the questions related to the Service Failure for want of such experience; could certainly have replied to the questions related to the Good Experiences about the Concerned Service. In other words; introduction of additional Sections; as aforesaid; could surely have made the questionnaire Sound as good as Balance in character.

As a general rule; each questionnaire should be verified thoroughly and thoughtfully before its administration to the Respondent by the Statistical Expert especially in the light of Application of varying Statistical Tests in order either to prove or disprove the Hypotheses; after Data Collection is over. On the other hand; if the questions are not found properly amenable or suitable for Data Analysis; in fact; it may turn out to be a very

difficult; time consuming and tedious task for the Researcher to recollect the Data either from the same or from different Respondents after rephrasing the questions for appropriate Data Analysis and consequent Data Interpretation.

General Observations Regarding Research

There is neither anything right or correct or wrong or incorrect; as far as Research is concerned. It all depends upon the Research Methodology adopted for conducting the Research. In the words of Philip Kotler; "The Research Methodology has a deep impact on the Findings; thus; Conclusions of the Research." In simple words; when the Research Methodology for the same Research Objective changes; Research Findings also change. This means that the Research Methodology and the Research Findings are the dependent factors in the sense that they are in direct proportion with each other.

At the same time; it may not be out of place to point out over here that there should not be unnecessary replication or insistence on imitation of the Research Methodology adopted by the other Researcher; though eminent or well recognized or reputed; even if the Research Objectives and Research Hypotheses are more or less identical or similar in their nature. Over and above; there should be emphasis on the development of the Original Research Design; preferably Novel still Suitable; in the given circumstances; and following suitable Research Methodology devised specially; differently and exclusively for the present Research. Moreover; the two decisive; thus; significant factors; namely Creative Research Approach and Original Research Attitude help to acquire the Status or Recognition as a Specialist Researcher.

While conducting the Research; the Researcher must necessarily and honestly attempt to perform his all the best and study in depth; always. Otherwise; the other Wise Researcher may abuse or misuse the earlier ordinary or superfluous Research Findings through their Intelligent Modification or Logical Extension and may come out with putting forward Superior Research Findings after illustrating some reliable practical examples. For Instance; if one attempts to study the Evolution of Management Thought in detail; especially in

its primitive stage or in traditional times; he would realize that several Management Thinkers; Practitioners and Executives have; no doubt; extended or modified the past Literature and proposed novel Management Theories; Principles and Practices. Sometimes; it is also noticed that the followers have forgotten the original contributor and wrongly recognized the newer one as a Pioneer of a specific thought operation.

When one of the Researchers was not convinced about the practices prevalent in the Personnel Department of one Organization; he compelled the Personnel Manager to alter the practices by revealing him the results of the Research; which he himself conducted; with the help of his few assistants from the same Organization; on the basis of the Secondary Data for last some years. The Research was conducted regarding the organizational practices related to Employee Punctuality; Leave Management and Reference Check (carried out while recruiting and selecting an employee).

At this juncture; in this context an inevitable fact needs to be admitted that in each Research Endeavor; the Researcher may not obtain the Research Results; as expected or desired. However; he must necessarily and honestly attempt his all the best to prove the point which he intends to. In case; he does not succeed in the Research Process and fails to prove the point; either for genuine or uncontrollable reasons whatsoever; he should accept the organizational practices as they stand.

Thus; logically; it should be remembered here that the Baseless Conclusion or Blind Acceptance (of an event; a phenomenon; a thing) (in the last example- organizational practices); without conducting Research; particularly when it is possible to conduct ; is not; at all; a sign of a good Researcher. Although the Researcher can believe or rely on his skills fully; he should also realize the Rational Restrictions or Realistic Limitations those may crop up while conducting the Research.

Research Paper Limitation

Full intellectual concurrence with all the Views as well as Opinions of the Researcher and also the other Respondents; interviewed for the purpose of the Research; is certainly not possible.

Scope for Future Research

During the Course of the Study of this Research Paper, the Researcher found out that there is an ample Scope and Potential for Research in future for the following topic.
1. Reasons for Lack of Quality in Research – An Exploratory Study

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A GEOGRAPHICAL STUDY OF SPATIAL PATTERN AND PLANNING OF PRIMARY HEALTH CENTERS IN TRIBAL AND NON-TRIBAL AREAS OF NASHIK DISTRICT, MAHARASHTRA

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ABSTRACT

The main aim of the present paper is to evaluate the status and planning of primary health centers in tribal and rural areas of Nashik District, Maharashtra. Nashik district is major agriculturally dominant district in the Maharashtra. Peth, Kalwan, Dindori, Surgana and Trimbak are five tribal tahasils. They are located in the north-western and western part of the District. Present study is based on the secondary source of data. Secondary data are obtained from the Nashik District Census Handbook (2001 & 2011), Socio-economic abstract of the Nashik District (2012 & 2020), & District Gazetteers. For the analysis of spatial distribution of Primary Health Centers (PHC) norms given by Government of India are used. Arithmetic Population Projection formula is used to calculate the population projection of the year 2021 and 2031. The results have been shown with the help of Choropleth map by using GIS software.

As per census 2011 data, the study area (Tribal and Rural population) had 3509814 total population and 104 PHC. As per the population data and national norms, the total number of PHC should be 133, but actually it was 104 which shows the deficit of 29 primary health centres. Dindori, Niphad, Nashik, Sinnar, Malegaon and Yeola tahsils are showing deficiency of PHCs as per their required population. After 2021, due to high rate of population growth the numbers of required primary health centre will be increase, from 151 primary health centers in 2021 to 169 primary health centers in 2031. In future, on the basis of projected population, new primary health centers should be started. Government should be established the primary health centers as per the number of population especially in tribal and hilly area, where the tribal and economically backward population is highly concentrated. This tribal people can't afford the private medical facilities which are available nearby urban part of study area.

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Kaywords: Tribal Area, Rural Area, Primary Health Centers, Health Care Facility & Population Projection

Introduction

The Alma-Ata Declaration of 1978 emerged as a major milestone of the twentieth century in the field of public health, and it identified primary health care as the key to the attainment of the goal of Health for All (Suresh, 2018).After this declaration most countries of the world give more propriety for health care facilities in their planning. Health care facilities help in maintaining the health of a community. Health care centres are one of the indices to identify the health care facilities of a region (Anbalagan & Valli, 2019). Health is defined as 'a state of complete physical, mental and social wellbeing and not merely the absence of diseases or infirmity (WHO, 1948). A sound health is a condition of being well as well as mental and physical prosperity which is inevitable to live a beneficial, productive and healthiest lifestyle (Deen, 2021). In India, health care is completely a governmental function. Health has been declared a fundamental human right and nation and state has a responsibility for health of its people

(Suryawanshi, 2007). Health infrastructure is the resources needed to deliver the essential public services to the people (Dipanwita De, 2014).Primary care level is the first level of contact of individuals, the family and community with the national health system where essential health care is provided (Park, 2007).The primary tire comprises three types of health care institutions such as Sub Centre (SC), Primary Health Centre (PHC) and Community Health Centre (CHC).In this system primary health center play very important role in providing health facilities in tribal and rural part of India. In India, Primary Health Centres play a crucial role in determining the health of rural people as they cater to the basic health facilities to them (Khandelwal & Kanchan, 2020). Primary Health centers are part of the government funded public health system in India and are the most basic units of this system.

In India, primary health centers are the cornerstone of rural healthcare. Primary health centers and their sub-centers are supposed to

meet the healthcare needs of rural population (Borse & Suryawanshi, 2014).The tribal areas generally mean areas having preponderance of tribal population, where tribal population is more than 50 percent of their total population. There are five tribal tahasils in the study region, where tribal population is more than 50 percent of their total population. These tahsils are Peth, Kalwan, Dindori, Surgana and Trimbak. They are located in the north-western and western part of the District.

Primary Health Center is the first contact point between village community and the Medical Officer. Primary health centers provided medical facilities to people. In tribal area, most of the economically backward people are using these facilities for their health. Health infrastructure is an important indicator for understanding the health care policy and welfare mechanism in a country and signifies the investment and priority accorded to creating the infrastructure in a region (Kiran Mann, 2020). For providing proper health facilities at local level in tribal and rural part of India, planning for crating health infrastructure is very important. The term health planning can be defined 'as the orderly process of defining community health problems, identifying unmet needs and surveying the resources to meet them, establishing priority goals, that are realistic and feasible and projecting administrative action to accomplish the purpose of the proposed programmed (W.H.O.-1984). The purpose of health planning is to meet the health needs and demands of the people (Suryawanshi & Ahire, 2014). Therefore, the Indian Government is also introduced health policy time to time. Indian Government emphasized the need of universal health coverage and launched the National Rural Health Mission in 2005 to revamp the public health system with special focus on primary healthcare institutions (Dey &

Chattopadhyay, 2018). In this study only tribal and rural part of study area is considered.

Study Area

Nashik District is situated partly in the Tapi basin and partly upper Godavari basin. It lies between 19° 33` to 20° 53` north latitude and 73° 15' to 75° 16' east Longitude. The district is surrounded by Dhule district in the north, Jalgaon and Aurangabad districts in the east, Ahemadnager district in the south, and Thane district in the south- west and Gujarat state in the north- west. Nashik district is the third largest district in Maharashtra in terms of population of 6,107,187 and occupying an area of 15,582 sq. kms in the north Maharashtra region *(Wikipedia).* Map No.1 shows the location of the study area. Out of 15 tahsils, Peth, Kalwan, Dindori, Surgana and Trimbak tahsils are tribal tahsils in the study region and these tribal population is consisting of more than 50 percent of their total population. They are located in the north-western and western part of the District. This tribal area covers 25.58 percent area and 15.88 percent population of the study area.

Nashik District is a noted for the mountains and hills occupying the north and north-east of its territory. The main system of hills is the sahyadries, which run north- south in the western portion of the district. From the main sahyadrian range three prominent spurs stretch out to the east. In the extreme north is selbari range, which approximately forms and boundary between Nashik and Dhule district. Next is the Satmala range which runs right across district. Kalsubai range is located in the south part of the district (Nashik District Gazetteer, 1983). The entire Nashik district is underlain by the basaltic lava flows.
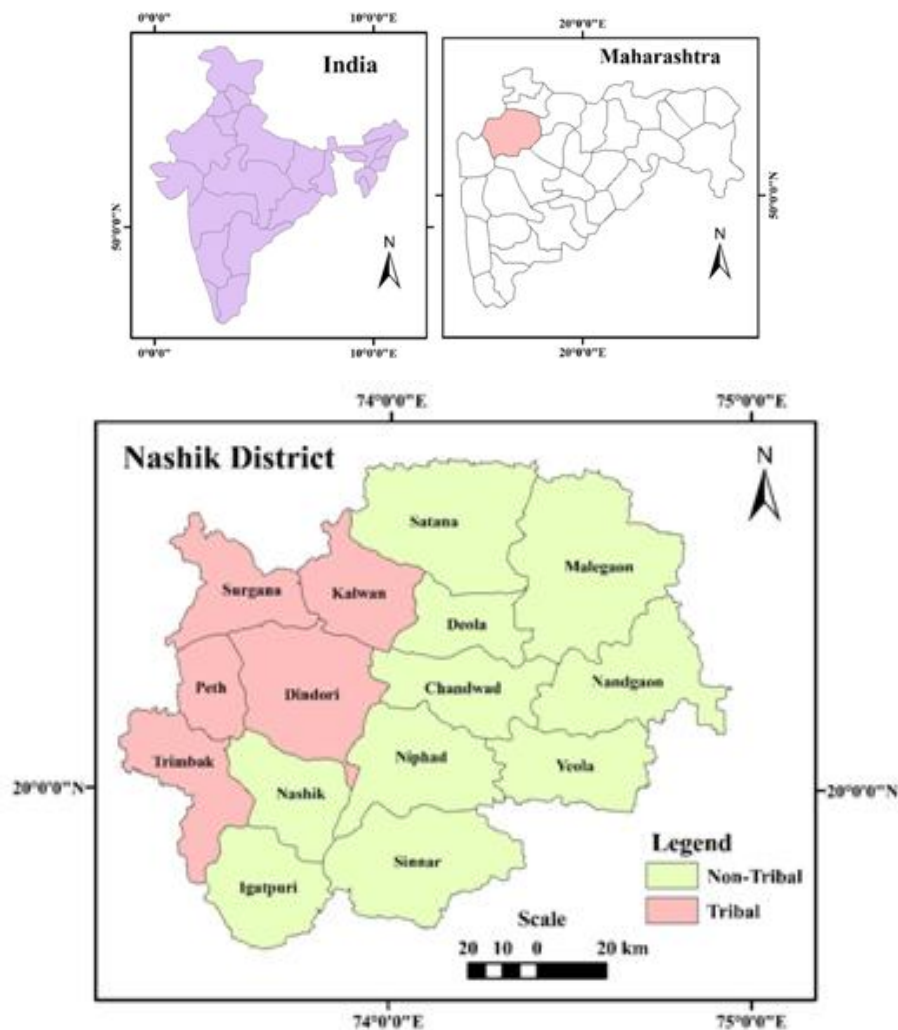
Map.No.1: Location Map

The district has two main rivers the Girna and the Godavari. Deep black, medium black, shallow black, brown red, laterite soils are found in the tribal area of the study region. The climate of the district is generally dry except during the monsoon season. Nashik District has a good network of road communications. Nashik Road Railway Station is the major railway, which is around 10 km from the Nashik city. Nashik's Ozar Airport is located at a distance of 20 km from the Nashik city center.

Objectives: The main objectives of the present paper are as fallows.

i) To study the spatial pattern of primary health centers in the study area.
ii) To evaluate the planning of primary health centers in the study area.

Data and Methodology

Present study is based on the secondary source of data. Secondary data are obtained from the Nashik District Census Handbook (2001 & 2011), Socio-economic abstract of the Nashik District (2012 & 2020), & District Gazetteers. The tahsil has been taken as a unit to evaluate the planning of primary health centers in the study area. Statistical tools like percentage, average etc. have been used in the study. The results have been shown with the help of Choropleth map by using GIS software. The population data of study area and available number of primary health centres were computed and analysed descriptively which is based on the World Health Organization (WHO) in 1997 and Government of India recommended standards. A typical Primary Health Centre covers a population of 20,000 in hilly, tribal, or difficult areas and 30,000 populations in plain areas. For the calculation of population projection, following formula is used.

Arithmetic Population Projection (Pp)

Pp=P1 +n (P1−P2) N
Where,
Pp=Population projection in the future;
P1 = Present population as per the recent census;
P2= Size of population in the previous census;
n = Number of years between the projection year and the previous census
N= Total number of years between the recent and previous census.

Results & Discussion

Primary health center is a basic part of the health care system in India. It is established to provide accessible and available primary health care to people, especially in tribal and rural part of India. The population data of study area and available number of primary health centres were computed and analysed descriptively base on the (***WHO, 1997***) and Government of India recommended standards. The gap between the required and the available primary health centre was obtained by dividing the total number of PHC by the threshold population of the primary health centre. The National norms of its provision in one PHCs for every 30000 person in plain areas and every 20000 persons in tribal or hilly areas.

Spatial Distribution of PHC (2011)

To study the spatial distribution of health care center per PHC Populations ratio has been calculated for each tahsils of the study area. As per the norms of WHO and the Government of India, expected numbers of primary health centers have been calculated for each tahsils. In terms of population PHC ratio, there is a significant disparities is observed at tahsil level in the study area. It is shown in Table No.1 and Fig.3. The result shows that only Peth tahsil (17120) has achieved PHC population ratio as per national norms related to the provision of PFCs in the study area. Remaining all tahsils don't have numbers of PHCs as per provision of PHC norms. There is a large gap between available and required PHCs as per available population (Table No.1). Among the non-tribal and rural tahsils such as Nashik (58649), Yeola (55330), Sinnar (46849), Niphad (46539) and Chandwad (40904) are the most vulnerable and poorly served (Table No.1) due to growth in population and its density. Even in some tribal tahsils, PHC Population ratio is not satisfied. It is more than expected (20000) person. It includes the tahsils such as Dindori (417673), Kalwan (293868), Surgana (230683) and Trambak (215875).

Table No.2 and Fig.2 indicates that maximum numbers of PHCs are located in Satana (11), Dindori (10), Niphad (09) and Malegaon (09), whereas minimum numbers of PHCs are observed in Nashik (03), Yeola (04), Chandwad (05), Nandgaon (05) and Deola (05).

Table No.1: Nashik District: Population-PHC Ratio-2011

Sr. No.	Name of Tahsil	Tribal/ Rural	Rural Population	Existing PHC	Required PHC	PHC-Pop. Ratio	Criteria Threshold Population
1	Surgana	Tribal	169553	8	8	1:21194	20000 (Tribal and hilly areas)
2	Kalwan	Tribal	208362	8	10	1:26045	
3	Dindori	Tribal	315709	10	16	1:31571	
4	Peth	Tribal	119838	7	6	1:17120	
5	Trambak	Tribal	156367	6	8	1:26061	
6	Deola	Rural	144522	5	5	1:28904	30000 (Plain Areas)
7	Satana	Rural	336734	11	11	1:30612	
8	Malegaon	Rural	368137	9	12	1:40904	
9	Nandgaon	Rural	185186	5	6	1:37037	
10	Chandwad	Rural	210508	5	7	1:42102	
11	Nashik	Rural	175948	3	6	1:58649	
12	Igatpuri	Rural	197686	8	7	1:24711	
13	Sinnar	Rural	281091	6	9	1:46849	

14	Niphad	Rural	418853	9	14	1:46539	
15	Yeola	Rural	221320	4	7	1:55330	
	District		3509814	104	133	1:33748	

Source: Computed by Researcher 2021 based on 2011 Population Census Data

Primary health care services in the public sector in tribal and rural areas in Nashik district is provided through a network of 577 sub centers, 104 PHCs and some community health centers. As per 2011 census data, near about 37.5 percent PHCs are located in the tribal part of the study area. In Nashik tahsil, numbers of PHCs are very less (03) due to its maximum population is concentrated in urban region of the Nashik city, which is served by urban health centers and hospitals.
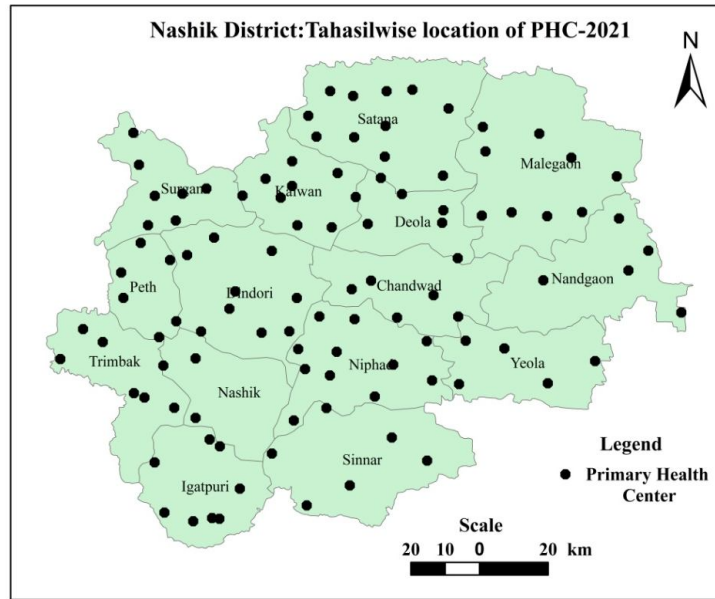
Fig. 2: Spatial distribution of PHC in Nashik District
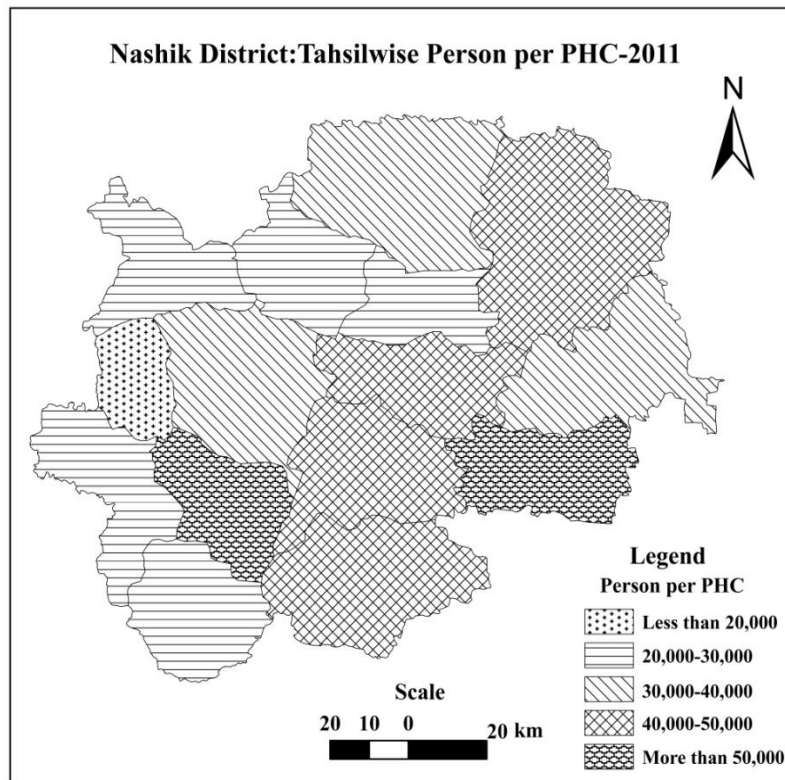
Fig. 3: PHC-Population Ratio in Nashik District

Population Projection: Table No.2 indicates projected population for the year 2021 and 2031 for tribal and rural part of the Nashik district. The projected population for the year 2021 is 3963388 and for the year 2031 is 4416962. Taking into consideration the projected population for the decennial years 2021, and 2031 the expected number of PHC is also estimated 151 and 169 respectively, which are shown in Table No.2.

Table No.2: Nashik District: Tahasilwise Population-2001 to 2031

Sr. No.	Name of Tahsil	Rural Population (2001)	Rural Population (2011)	Rural Population (2021)	Rural Population (2031)
Tribal Tahsils					
1	Surgana	138988	169553	200118	230683
2	Kalwan	165609	208362	251115	293868
3	Dindori	264727	315709	366691	417673
4	Peth	96774	119838	142902	165966
5	Trambak	126613	156367	186121	215875
Non-Tribal (Rural)					
6	Deola	129988	144522	159056	173590
7	Satana	278834	336734	394634	452534
8	Malegaon	333176	368137	403098	438059
9	Nandgaon	140723	185186	229649	274112
10	Chandwad	205189	210508	215827	221146
11	Nashik	165041	175948	186855	197762
12	Igatpuri	176463	197686	218909	240132
13	Sinnar	260445	281091	301737	322383
14	Niphad	381356	418853	456350	493847
15	Yeola	192314	221320	250326	279332
	District	3056240	3509814	3963388	4416962

Source: Compiled by the Researcher, 2021

N.B.: 1.Year 2001 & 2011 Population, Census of India
2. For the year 2021 & 2031 population is projected

Planning of Primary Health Centres

Inequality in health service distribution poses a major challenge towards policy makers and people of the country (***Agarwal & others, 2021***). The health planners in India have utilized the primary health centre as the proper infrastructure to provide health services to the tribal and rural population. As per National norms, each primary health centre renders its services to a population of 20,000 in tribal and hilly regions and population of 30,000 in plain region. Application of this norm, about 133 primary health centers were required in 2011.

However in reality there were 104 primary health centers were existed. This shows that there were 29 primary health centers are less than the required demand. Considering the in accessibility of this region the government might have not provided these 29 primary health centers to this region. After 2021, due to higher rate of population growth the numbers of required primary health centre will be increase, from 151 primary health centers in 2021 to 169 primary health centers in 2031 **(Table No.3).** A PHCs should have one or two physicians, a lady Health Midwife, on medical officer or doctor, 14 para-medical staff and 4 to 6 beds (***Devi & Rajeshwari, 2016***).
The projected population makes clear that there is necessity of introducing planning. The study

proposes to establishment of new PHCs for growing population in the study area. The study area witnesses of poor PHC-Population ratio in both tribal and non-tribal areas of the Nashik district. Therefore the Government should be revise their policy and planning time to time about establishment of PHCs by considering population growth of the region. In the study area, Dindori, Niphad, Nashik, Sinnar, Malegaon and Yeola are major tahsils where establishment of new PHCs is badly required as per the Government norms because these tahsils showing deficiency of PHCs as per their required population.

Table No.3: Nashik District: Tahasilwise existing & required number of PHC-2011 to 2031

Sr. No.	Name of Tahsil	Tribal/ Rural	2011			2021	2031
			Existing PHC	Required PHC	New PHC Required	Required PHC	Required PHC
1	Surgana	Tribal	8	8	0	10	12
2	Kalwan	Tribal	8	10	2	13	15
3	Deola	Rural	5	5	0	5	6
4	Satana	Rural	11	11	0	13	15
5	Malegaon	Rural	9	12	3	13	15
6	Nandgaon	Rural	5	6	1	8	9
7	Chandwad	Rural	5	7	2	7	7
8	Dindori	Tribal	10	16	6	18	21
9	Peth	Tribal	7	6	+ 1	7	8
10	Trambak	Tribal	6	8	2	9	11
11	Nashik	Rural	3	6	3	6	7
12	Igatpuri	Rural	8	7	+1	7	8
13	Sinnar	Rural	6	9	3	10	11
14	Niphad	Rural	9	14	5	15	16
15	Yeola	Rural	4	7	3	8	9
	District		104	133	29	151	169

Source: Computed by Researcher, 2021

Conclusion

This study shows that tahasilwise PHC-population ratio is not satisfied and currently numbers of PHCs are also not available as per WHO and the government's norms in the tribal and rural part of the study area. Only one Peth tahsil has good PHC-population ratio, otherwise all remaining tahsils don't have good PHC-population ratio. As per 2011 data, there were 104 primary health centers were existed in the study area. This shows that there is need of more 29 primary health centers as per the number of population. In Dindori, Niphad, Nashik, Sinnar, Malegaon and Yeola are tahsils, the establishment of new PHCs is badly required as per the Government norms because these tahsils showing deficiency of PHCs as per their required population. After 2021, due to higher rate of population growth the numbers of required primary health centre will be increase, from 151 primary health centers in 2021 to 169 primary health centers in 2031.

Suggestion

For this purpose government should revise all health facilities after every 10 years at the time of census year as per norms suggested by WHO and Government of India. The central and state governments have to take necessary action to improve the health facilities. The demographic criteria proposed by the (Bhore Committee or the National Health Plan 1983) for delayed health care services should be enforced. In future, new primary health centers should be starts on the basis of projected population required, especially in tribal and hilly area, government should be established the primary health centers as per population, because in these area most of population is tribal and economically backward. This tribal people do not afford the private medical facilities which are available mostly in urban part of study area.

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EMPLOYING THE INTERACTIVE PERUSALL PLATFORM IN DEVELOPING CRITICAL READING SKILLS IN ARABIC LANGUAGE AMONG THE SECONDARY SCHOOL STUDENTS

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ABSTRACT

Critical reading skills is an important element in particular among the students in secondary school. In Qatar for example, it has been a major concern for the government to tackle this issue. At the same time, there has been electronic interactive platform that could assist the students. Therefore, the current study aimed to assess the role of the electronic interactive platform known as PERUSALL in developing critical reading skills in t Arabic language among the seventh grade students in the State of Qatar. To accomplish the goal of the study, the researchers used a critical reading test. The researchers adopted a mixed approach, i.e., a design based on collecting and analyzing quantitative and qualitative data to find an answer to the research questions, to investigate the research problem that lies in the weak critical reading skills of seventh grade students. The findings of the study have shown that there were statistically significant differences in the critical reading skills test between the experimental group and the control group in favor of the experimental group that adopted the Perusall platform during teaching. From their findings, the researchers recommended that similar studies be conducted on a larger sample than the current study sample. They also recommended using the Perusall platform to develop critical writing skills .

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Keywords: *Interactive Platforms - Critical Reading - Arabic Language – High School Stage - Perusall Platform.*

Introduction

Critical reading is one of the most important language skills that should be developed, especially among young people. Through critical reading, the reader can understand and judge what has been read. More importantly, the reader evaluates the text and reaches beyond the reading itself. Critical reading contributes to the development of various thinking skills, including critical thinking skills .

Critical reading is to judge the validity of different sources, and determine their value based on clear criteria. Critical reading requires the use of four techniques: raising questions, drawing conclusions, linking, and evaluating through raising questions. (Razaghi et al, 2011, 1173).

The ability to read critically is essential in the twenty-first century because people now live in a world full of digital texts. Students must be empowered to evaluate what they read. In addition, students must be made aware that information published online is not always accurate, and therefore students must be trained to deal with all the text critically. (Varaporn & Sitthitikul, 2019, 81).

Critical reading plays an important role in students' academic life, and to develop critical reading, we must adopt strategies for teaching critical reading to these students. (Suacillo, 2016, 611). It is important for teachers to develop teaching methods and techniques, strategies, and utilize electronic applications in developing students' critical reading skills. Critical reading plays an important role in all subjects; it helps students to evaluate the reading text, distinguish between facts and opinions, draw generalizations from partial ideas, identify contradictory ideas in the read text, determine the writer's purpose, and make judgments about some of the ideas contained in the text (Zin et al, 2014; Akin, 2015; Thuy, 2015 Femilia, 2018).

Despite its importance, critical reading has not been given sufficient attention in schools; it is not directly focused on in the curriculum, or in the teaching practices that teachers use in the classroom.

Based on the abovementioned background, the current study aims to assess the critical reading skills among the Arabic language students in seventh grade students in the State of Qatar. The study employed qualitative research

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approach and utilise the PERUSALL electronic platform as a tools for developing critical reading skills among the students. It also endeavours to investigate how the electronic platform assist the critical reading skills.

Literarature Review

Many previous studies have focused on critical reading because it is very important for students to understand and criticize the ideas in the reading text well. The importance of interaction between readers and written sources is indispensable during reading because critical reading allows readers to interpret, analyze, and evaluate the arguments made by the author in written sources (Alem, 2018) .

Critical reading is a dynamic process, and you cannot avoid being influenced by your own prejudices and past experiences, and it is also essential to realize that authors have their own biases and beliefs. All these elements affect your understanding of the text being read, so the most important critical reading skill is defining the author's goals so that the reader can take them into account while evaluating the read text. (Wallace & Wray, 2016, 34). Previous experiences play an important role in understanding the text; it helps readers to interpret the ideas in the text, and readers try to connect the new experiences in the reading text with the previous experiences that they went through.

The critical reading skill gives students self-confidence that paves the way to explore new sources of information, such as reading books, and learning about topics that were not taught before. Critical reading allows students to use past experiences to help themselves understand the text well. (Rosdiana, 2016, 24). Students should realize the importance of communicating with the text in a meaningful way because developing the critical ability of the students' mind leads to an increase in students' awareness of mental processes. This allows them to evaluate their views, and rethink about them. (Kohzadi, 2014, 63).

Munawaroh's study (2013) emphasized the importance of critical reading among eleventh grade students since reading not only develops the cognitive side of students, which is the understanding of the text, but also develops the emotional side, which is the students' reading behavior. The study also mentioned that a set of measures must be taken to overcome the difficulty of understanding the reading text, and that students spend a long time understanding the text well .

Albeckay's study (2014) investigated students' poor level of critical reading skills at the undergraduate level. It also suggested a program to develop critical reading skills among these students. The study emphasized that critical reading is of great importance to students during the study of language. Critical reading is also closely related to students' competence in reading comprehension. The study recommended preparing training courses for teachers to help them teach critical reading skills to students .

Mulumba's study (2016) focused on the factors that impede students' ability to deal with the read text critically and initiated concern to employ modern technologies to help students understand the text better. The study confirmed that the use of modern technologies led to the development of students' understanding of the text read, and thus the development of students' knowledge in language learning .

Aghajani & Gholamrezapour's study (2019) also focused on the relationship between critical thinking and critical reading among undergraduate students. The findings of the study emphasized the close relationship between critical thinking and critical reading. The study stated that critical thinking is crucial in the education process and effective information search. Students can also use critical thinking skills to understand, interpret, and evaluate what they hear or read while they are studying. The study recommended that students be given more opportunities to develop their critical thinking in the process of learning a language.

Critical reading involves several sub-skills. Students need these skills to be critical readers and they are: distinguishing fact from opinion, interpreting semantics, discovering the author's point of view, recognizing misleading thinking, detecting the means of propaganda in the text, identifying statistical tricks, preparing conclusions, and in addition to other factors present in the text, such as: identifying the author's goal, knowing the time and policies of publication, and knowing the type of readers

targeted. (Parded, 2007, pp: 28:33). There is also a set of sub-skills within critical reading arranged from easiest to most difficult. These are: the ability to identify similarities and differences, evaluate inferences, identify facts and opinions, evaluate generalizations, evaluate the strength of arguments, identify biased statements, identify material relevant to the text, determine the author's motives, and recognize hidden assumptions within the text. (Abdullah, 1998, 34).

Critical reading skills involve many sub-skills as follows: distinguishing between opinion and truth, ability to comprehend what is read, selecting, and evaluating what is read, organizing what is read, ability to summarize what is read, identifying relationships between paragraphs of a reading text, inferring ideas in the text, and detecting author bias .

Students should read the text critically, try to anticipate what the author is saying, and look at the text's title and introduction to find out what is on the mind of the author. They should also see the maps, graphs, and charts in the reading text. (PATEŞAN, 2014, 64). Students should also try to understand beyond the lines, i.e., they can interpret the ideas in the reading text from their previous experiences .

The questions that measure critical reading skills are varied. For example, the SAT measures students' levels of critical reading skills through three types of questions:

1. Vocabulary questions: it focuses on identifying the meanings of vocabulary through context.
2. Literal comprehension questions: it concerns determining the information directly contained in the reading text.
3. Expanded Reasoning Questions: it requires analysis, evaluation, and compilation of information from the reading text. These types of questions involve finding reasons, making inferences, and analyzing, although most critical reading questions involve extensive thought. (Hammond, 2005,119).

Teaching critical reading is an important aspect of language education programs. It aims to develop comprehension and expression skills, and it is important that teachers know how to teach critical reading to students. Critical reading practices (reading education, teaching methods) must be incorporated into teacher

training courses for them to teach to the students (Maltepe, 2016, PP: 170,180). Critical reading questions require a higher level of thinking, as well as a higher level of language. It focuses on the skills of deduction, discrimination, analysis, criticism, and evaluation .

Teachers must employ modern technologies, teaching methods and modern methods in teaching critical reading skills (Mohammed, 2020, 17).

Critical Reading Aids – Using Perusall Platform

As a result of the rapid technological development that has invaded the whole world, the researchers aimed to measure the impact of the Perusall electronic platform on developing critical reading skills, where the weakness of these skills are most noticeable among the seventh-grade students.

The Perusall platform is one of the online social learning platforms designed to promote a commitment to high reading, engagement, and theoretical understanding. The instructor creates a course or module online through Perusall, approves electronic version of textbooks from publishers or uploads articles or documents and creates reading assignments. Students then write appropriate comments asynchronously by posting (or replying to) comments or questions in a chat-like manner. (Miller, Lukoff, King, 2018) .

Some of the studies and research on the Perusall platform have been published on the platform's website, including the study of Liberatore (2017), which aimed to integrate a textbook with modern web tools to increase students' interaction using a web-based platform called Perusall (perusall.com). Graduate students in fluid mechanics followed a traditional textbook and paper journal and a portion of the material's score was awarded to students' questions and comments on the readings they made. The researcher discussed strategies used to engage students in textbook readings, as well as responses, discussions among students, and faculty comments. In the classroom, the quantity and quality of comments were rated using machine learning algorithms built into the platform. Each comment is automatically rated on a 0-, 1- or

2-point scale. The score of the device corresponds very well with the teacher's professional judgment. The researcher noticed that the reading rate increased among students who used the Perusall platform for more than (30%), compared to students who used paper books .

In a study on the use of collaborative reading via the open-source internet, McFarlin (2020) used the Perusall platform as a model to achieve the purpose. He monitored the teaching of reading in a law school using the Perusall platform, which benefitted the students immensely, most important of which are: the use of the Perusall platform helps in the development of collaborative critical reading online; this feature has advantages over individual reading, and it helps students to read actively; it also develops critical thinking, through its commenting function. The researcher adds that the platform also allows teachers to comment, monitor students and interact with them through the same job that was shared with them. The researcher then conducted a survey about the use of Perusall platform, and it showed that nearly 77% of the students in the Faculty of Law classes had recommended the use of this platform in teaching. However, 23% of students expressed concerns about the platform .

Research Methodlogy

The researcher has taken into consideration the nature of the research and the objectives it is trying to achieve. The researcher relied on the mixed approach, a design that relies on collecting and analyzing quantitative and qualitative data to provide convincing logical explanations and answers to research questions. Qualitative research methods include personal interviews, observation of study sample participants, and taking notes. Quantitative research methods also include pre and post tests and questionnaires. The researcher adopted both the descriptive approach and the quantitative approach.

Population and Sampling Design

The study community is the high school students from Qatar Foundation for Education, Science, and Community Development in the State of Qatar, which is a semi-governmental

educational institution. It includes several schools that are interested in teaching international curricula, in particular the International Baccalaureate IB curriculum. Seventh grade students from Qatar Academy Sidra School were selected. It has nearly 700 male and female students comprising of Qatari and foreign students. This study is concentrated on students who study Arabic as a first language .

Both the experimental and control sample contained 18 students. The experimental group was taught using the interactive platform (perusall) while the control group was taught using the traditional method used in schools .

The critical reading skills pre-test was applied to both groups to find out the significant differences between them. The researcher concluded that there were no statistically significant differences at the level ($\alpha \geq 0.05$) between the average scores of both groups.

The researcher used the Independent Samples T-Test to test the validity of this hypothesis, and to determine the significance of the differences between the mean scores of the students of the control group and students of the experimental group in the pre-test of critical reading skills .

By analyzing the findings, the researcher concluded that there is a convergence between the average scores of the students in the experimental and control groups. The average scores of the experimental group in the pre-test were (3.39) while the average score of the control group was (3.61), and the value of (T) was (- 0.396), which is a non-significant value at the significance level (0.05). This indicates that there are no statistically significant differences between the mean scores of students of both group and the average scores of students from the experimental group in the pre-test of critical reading skills. Accordingly, the null hypothesis was accepted: there are no statistically significant differences at the level ($\alpha \geq 0.05$) between the average scores.

The researcher applied teaching using the Perusall platform to the students of the experimental group, while the students of the control group used the traditional method, starting from the first week of October 2020, and the experiment lasted until the first week

of December 2020.The experiment took two full months.

Findings and Discussion

What is the role of the Perusall interactive digital platform in developing critical reading skills in the Arabic language among the experimental sample students ?

The researcher concluded that there are statistically significant differences at the level ($\alpha \geq 0.05$) between the average scores of the students of the control group and the average scores of the experimental group students in the post test of critical reading skills in favor of the students of the experimental group.

The researcher used the Independent Samples T-Test to test the validity of this hypothesis and to determine the significance of the differences between the mean scores of the students of the control group and students of the experimental group in the post test of critical reading skills, the findings came as in the following table :

The value of "t" and the levels of significance of the differences between the scores of the students of the control group and students of the experimental group in the post test of critical reading skills (n = 36).

Skills	Experimental (group (n = 18		The control (group (n = 18		Value of ""t	Indication		The direction of the differences
	M	p	M	p				
Discrimination skill	2.33	0.594	1.28	0.575	5.419	function	0.000	For the experimental group
The skill of linking causes to effects	2.28	0.461	1.22	0.428	7.122	function	0.000	
deduction skill	2.39	0.502	1.28	0.752	5.215	function	0.000	
Author's bias detection skill	2.33	0.686	0.89	0.583	6.807	function	0.000	
Reading assessment skill	2.39	0.608	1.11	0.583	6.438	function	0.000	
The total score of the post-test	11.72	1.904	5.78	1.927	9.311	function	0.000	

Dh = 34 2.04 D at the 0.05 level of significance 2.75 D at the 0.01 significance level, 3.65 D at the 0.001 significance level

The table shows the difference between the average scores of students in the experimental and control groups in the post test; the average scores of the experimental group in the post test were (11.72), while the average scores of the control group were (5.78), and the value of (T) was (9.311), which is a significant value at a level of significance (0.05) and also a function up to a level of significance (0.001). This indicates that there are significant differences between the mean scores of the students of the control group and the experimental group, and the average scores of the experimental group students in the post test of critical reading skills. Accordingly, the null hypothesis is rejected, and the alternative hypothesis accepted is that: there are statistically significant differences at the level ($\alpha \geq 0.05$) between the mean scores of the

students of the control group and the mean scores of the experimental group students in the post-test of critical reading skills in favor of the experimental group students .

These differences can be attributed to the improvement that appeared on the experimental group, as a result of using the Perusall website, which led to the superiority of the experimental group in critical reading skills, which combined the new tool in addition to the collaborative work provided by the site or platform used, where the platform gives students the chance to exchange experiences and reciprocal cooperation among themselves, which led to an increase in understanding and assimilation, and a higher percentage of mastery of the targeted skills .

The researcher used the eta square η2 to clarify the size of the effect resulting from the use of the platform on the students' scores in the post- test, and the following table shows the values of the eta square η2 and the size of the effect.

Skills	The average score of the experimental group	The average score of the control group	Value of ""t	η2	Effect size
Discrimination skill	2.33	1.28	5.419	0.68	Big
The skill of linking causes to results	2.28	1.22	7.122	0.77	Big
Deduction skill	2.39	1.28	5.215	0.67	Big
Author's bias detection skill	2.33	.89	6.807	0.76	Big
Reading assessment skill	2.39	1.11	6.438	0.74	Big
Total score of the post-test	11.72	5.78	9.311	0.85	Big

Eta square values η2 and the size of the effect resulting from the use of the platform on the students' scores in the post-test (n = 36) dh = 34

The table shows the size of the significant impact of using the platform on the difference in the scores of students in the experimental group from their peers in the control group, where the ETA value in all skills is greater than 0.14, but its value in the total test score is 0.85, which indicates a very large effect of using the platform. It is noted from the table that despite the very large impact of using the platform, which is shown by the values of the ETA index, there is a difference between the skills in the size of the effect, as the inference skill is the lowest skill in terms of the ETA value, which amounted to 0.67, while the skill of linking causes to results is the highest, which It had an Eta value of 0.77 .

The researcher also found that there are statistically significant differences at the level ($\alpha \geq 0.05$) between the average scores of the experimental group students in the pre- and post- tests of critical reading skills in favor of the post test .

The researcher adopted the Paired Samples T-Test to test the validity of this hypothesis, and to determine the significance of the differences between the mean scores of the experimental group students in the pre and post-tests of critical reading skills, and the results came as in the following table:

The value of "t" and the levels of significance of the differences between the scores of the experimental group students in the pre and post-tests of critical reading skills (n = 18), the values of the Cohen index and the effect size.

Skills	Post-test		Pre-test		Value "of "t	Indication		The direction of the differences	Cohen's Index (Cohen's d)	Effect size
	M	p	M	p						
Discrimination skill	2.33	0.594	0.72	0.57	8.04	0.000	function		1.90	Big
The skill of linking causes to effects	2.28	0.461	0.56	0.62	12.72	0.000	function	In favor of the post-test	3.00	Big
Deduction skill	2.39	0.502	0.94	0.73	8.69	0.000	function		2.05	Big
Author's bias	2.33	0.686	0.67	0.49	9.22	0.000	function		2.17	Big

detection skill										
Reading assessment skill	2.39	0.608	0.5	0.51	11.85	0.000	function		2.79	Big
Total marks	11.72	1.904	3.39	1.79	19.14	0.000	function		4.51	Big

Dh = 17 2.11 D at the significance level of 0.05 2.90 D at the 0.01 significance level, 3.97 D at the 0.001 significance level

The table shows the difference between the average scores of the students in the experimental group in the pre and post-tests, where the average total score in the pre-test was (3.39), while it was (11.72) in the post test, and the value of (T) was (19.141), which is a function value when significance level (0.05) and a function up to a significance level (0.001). This indicates that there are significant differences between the average scores of students in the experimental group in the pre and post-tests of critical reading skills. Accordingly, the null hypothesis is rejected, and the alternative hypothesis accepted is that: there are statistically significant differences at the level (α ≥ 0.05) between the average scores of the experimental group students in the pre and post-tests of critical reading skills in favor of the post test .

Evident as well through these differences is the extent of the clear impact and the wide gap between the traditional teaching method and the proposed teaching method, which was a clear reason for increasing the impact on students' performance, the extent of the change caused by the platform, and the emergence of differences indicative of the validity of the hypothesis .

The researcher adopted the Cohen's d indicator to clarify the size of the impact resulting from using the platform on the scores of the experimental group students in the post test. It is clear from the table the significant impact of using the platform on the difference in the scores of the experimental group students in the post test from their scores in the pre-test. The value of the Cohen index in all skills is greater than 0.8, and its value in the overall test score is 4.51, which indicates a very large effect of using the platform. It is noticeable from the table that despite the very large impact of using the platform shown by the values of the Cohen index, there is a difference

between the skills in the size of the impact of the platform, as the skill of discrimination is the lowest skill in terms of the value of the Cohen index, which reached 1.9, while the skill of linking causes with results is the highest, which reached the value of the Cohen index 3.0 .

The researcher believes that this improvement in the performance of the experimental group in the post-test compared to the pre-test of critical reading skills is due to the impact of the Perusall platform. This is because the platform helped students analyze words in a modern and easy way, and the platform divides students into equal groups, gives them collaborative group work, and allows them to work remotely, making them communicate with each other more outside the classroom compared to the traditional teaching process which restricts communication to only inside the classroom within a specific period besides being confined by special circumstances and conditions and not forgetting interruptions by the students leaving the classroom. As for the used platform, it allows students to communicate before and after class, and have collective pre-reading, as well as collective dimensional reading, which led to the growth and improvement of various skills among the students of the experimental group

CONCLUSION AND RECOMMENDATION

This research attempts to open the door for researchers wishing to find solutions to many problems facing the Arabic language and develop its various skills, including the skill of readers to criticize. They can do research on the use of technology in teaching Arabic language skills. The researchers believe that it is necessary for Arabic language textbooks to focus on critical reading skills because it helps students to better understand the texts and

develops higher thinking skills. The researchers recommend that teachers are rendered assistance to improve their proficiency in employing modern technologies in teaching critical reading skills. The collaboration between the Arabic language teacher and the educational technology department should also be strengthened especially in the areas of knowledge about all the latest educational technology available.

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REMOTE WORKING: PROS AND CONS ON EMPLOYEES

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ABSTRACT

The purpose of the current study was to examine the relationship between pros and cons of remote working on employees and incidents associated with it. The variables considered were freedom, flexibility, increased care on health, work life balance, commutation cost and time, productivity etc. A total of 100 employees participated in the study using google form as the medium. Results shows that majority of employees were more comfortable with remote working rather than work from office. Remote working has positively impacted their productivity. Many distracting factors like noise, space, and other infrastructural issues, connectivity issues were considered among which extended working hours turned out to be the highest challenge. Out of many advantages considered like freedom, flexibility, better healthcare etc, freedom and flexibility turned out to be most exciting factor in continuing remote working even after pandemic. However, majority of the employees were highly self-disciplined in completing their deadlines.

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Introduction

Remote working means working in a place far away from where employer is located. The employer does not travel or commute to a central workplace. They work virtually or they have virtual teams. Many organisations adopted remote working during the pandemic times.

An employee under remote working requires different sets of capabilities and skills. Remote working requires the employees to have high level of initiative, time management skills and excellent communication within the team . Since the employees are working in virtual teams, they should have a good sense to foresee things and understand what is going on in each member of the team and then act accordingly.

If the employees are provided with the right tools and space, remote working van be a successful way of working in the forthcoming era.

The advantages and disadvantages of remote working are listed below

Advantages

1. The employees can work irrespective of the geographic location. They can operate from anywhere in the world irrespective of the central workplace.
2. The employees can save a lot of time which is required for transportation otherwise.

This enables the employee to start and complete the work earlier and faster.
3. The employees can adopt a more flexible schedule which helps them to attain a greater work life balance.
4. Employees can take better care of their health as they get more time t do physical exercise. Remote working enables them to have less exposure to sick colleagues. This also increases their productivity.
5. Since the employees are working from their homes, they work very happily which enables the company to reduce employee turnover.

Disadvantages

1. If the employees are not highly self-disciplined to achieve their deadlines at office, remote working can delay the work.
2. Lack of socialisation at workplace can lead to increased stress levels.
3. Employees will not be able to compare their performance with others in remote working. So this can lead to over expectation for promotions which leads to a lack of loyalty among the staff.
4. Employees should have latest updates on the emerging trends in technology and should update themselves.
5. Communication with team members can be difficult.

Literature Review

1. With all the challenges that has arouse due to COVID 19 crisis: remote work has become necessary and heading towards it is no longer an action. However ,despite this remarkable development and significant trend towards remote working in the private sector is still moving slowly to adapt to this situation and is still facing many challenges in developing countries says Jihad Fraij , Nemer Aburumman in their article titled "How does telework ac as a solution to the public sector in the time of pandemic.

2. Regarding the organization of remote work, the similar themes observed were "worse interactions "in workflow and collaborations; questions of "infrastructure" a home equipment was not up to par; "better quality of life" with time and safety gains; and the importance of work experience and training as a facilitator to adapt teamwork to a remote scenario. Also the idea that isolation is natural or even beneficial for the illustrator came up as it allows for the immersion and higher focus

on job says Vinicius Mitchell and Dr. Luiza Novaes in their article titled "The pros and cons of working from home: Newspapers illustrators' views on remote work during the pandemic of Covid-19 in Brazil"

Objectives

1. To understand the concept of remote working.
2. To analyse the pros and cons of remote working on employees.
3. To identify the impact of remote working on productivity.
4. To analyse the impact of remote working on working hours of an employee.

Research Methodology

The present study is based on both qualitative and quantitative methods of research and analysis. A self-designed questionnaire was prepared in google forms and circulated among employees of different companies. Responses were then analysed and then conclusions were drawn.

Data Analysis and Interpretations

Did you have remote working options before pandemic?
100 responses

- Yes
- No
- Flexible working policy
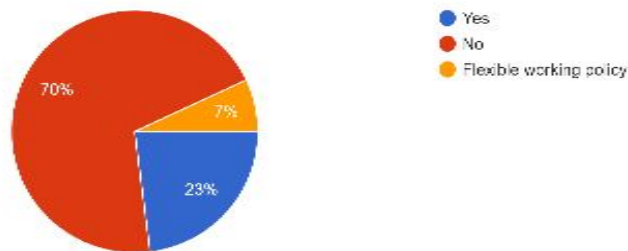
You are more comfortable with:
100 responses

- Work from home
- Work from office
- No difference
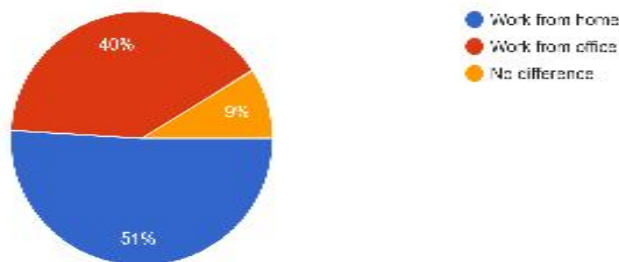
According to you,has remote working impacted your productivity?
100 responses

- Positively impacted
- Negatively impacted
- No change

19% | 28% | 53%
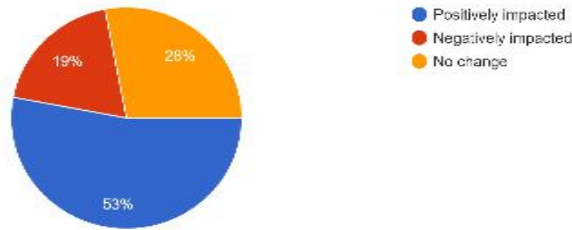
Will you be comfortable if you are asked to work from office within few weeks?
100 responses

- Yes
- No
- Maybe

26% | 21% | 53%
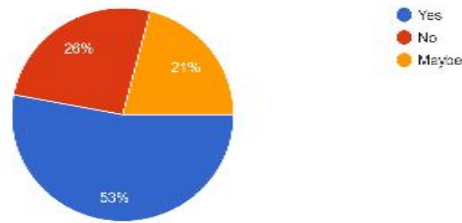
What are the three biggest challenges you are facing while work from home?
100 responses

- Noise/space/network issues at home — 44 (44%)
- Infra/Connectivity issue in office systems — 37 (37%)
- Extended work hours — 64 (64%)
- Unable to communicate with my teammates effectively — 49 (49%)
- Lack of space at home to keep tools — 1 (1%)
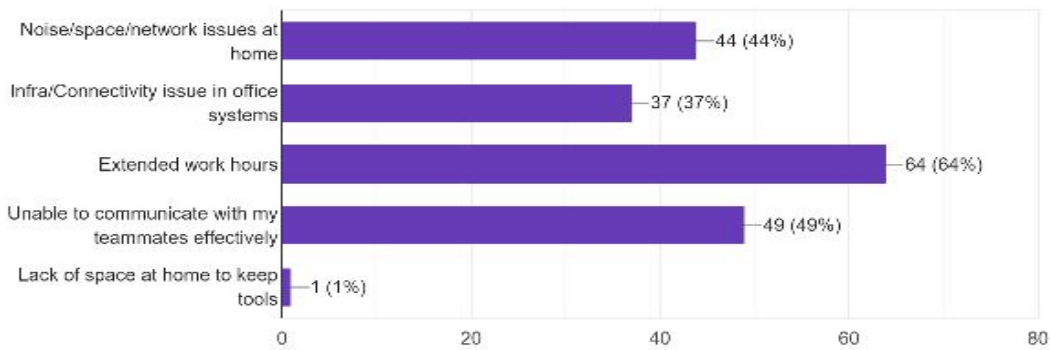
What is the greatest advantage of remote working according to you?Rate from a 1 to 5 point scale;1 being the most important and 5 being the least)

Freedom | Flexibility | Increased productivity | Work life balance | Better healthcare | No commutation cost
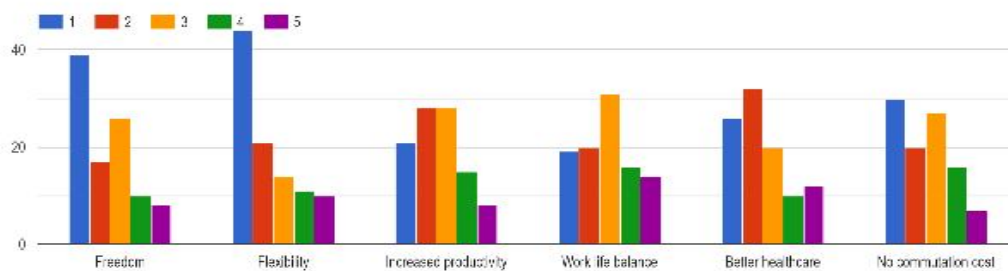
Has remote working affected your working hours?
100 responses

- Yes,there is no fixed working hours
- No,there is no change in my working hours

18%

82%
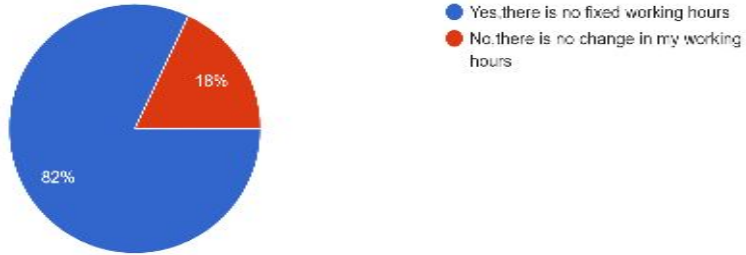
Do you think lack of socialisation at your workplace has affected your stress level?
100 responses

- Yes
- No
- Maybe

22%

17%

Maybe
17 (17%)

61%
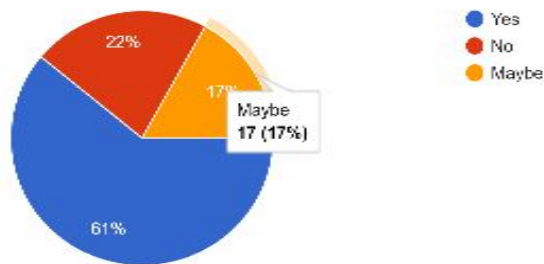
Do you think you are highly self-disciplined in completing your deadlines while remote working?
100 responses

- Yes
- No
- Maybe
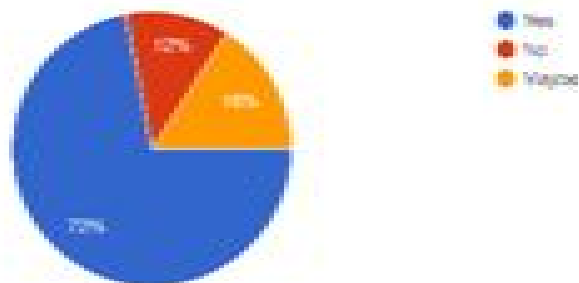
Are you able to take proper breaks during remote working?
100 responses

- Yes
- No

37%

63%
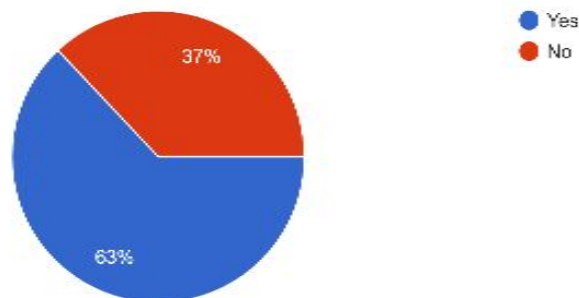
What is the greatest fear you are having when you think of returning to office?Rate from a 1 to 5 point scale;1 being the most important and 5 being the least)
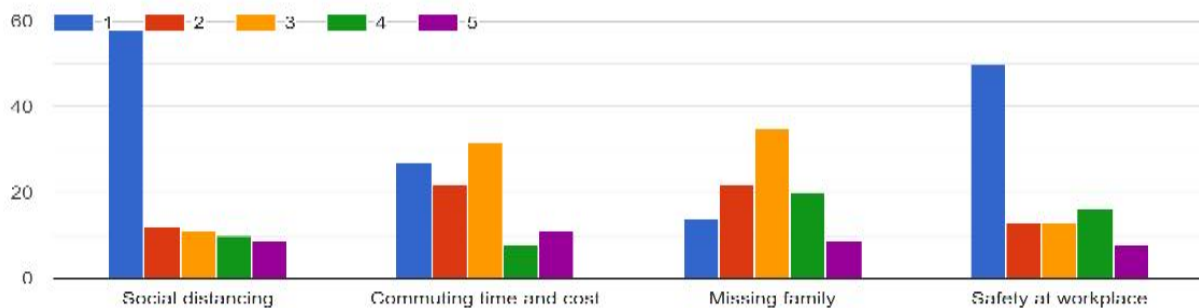
Findings and Conclusions

Out of 100 responses received,45 were females and 55 were males. Majority of the people responded were employed in private firms.70% of the respondents did not have the option of remote working pre-pandemic. The findings and conclusions of the study are as follows:

1. 51% of the people were comfortable with remote working facility as compared to work from office. They feel that this has improved their productivity to a great extent in a positive way. Employees find more peace and work dedicatedly while they work from home.

2. There are many challenges associated with remote working. The topmost among them being extended working hours. Under remote working there is no fixed time for completing the work for employees. Even if the employees are connected virtually, they are unable to communicate effectively to the teammates. There is a gap in transmitting information regarding the job as compared to offline working. Many employees are facing infrastructural and network connectivity issues. Either the companies don't have a common platform to share the data or FTP for data transfer they face poor connectivity issues.

3. Employees feel more freedom and flexible when they work remotely. Since they are at a comfortable environment, they tend to be more productive and enjoy their work more. Work life balance is more and the care towards their health tends to improve.

4. Majority of people feel that lack of socialisation has caused to increase their stress levels.

5. 72% of the employees work with utmost discipline to complete their tasks. These employees wok sincerely and are self-driven regarding their work.

6. The greatest fear that the employees are facing while returning to office is social distancing and safety at workplace.

7. Most companies nowadays cut down the seats as a part of remote working and cut down the cost. They surrender their total office set up and allow employees to work remotely permanently.

8. Many companies have reduced the salary to a particular percentage for those employees who wish to work remotely. These companies have segregated their roles into permanent work from home or vice-versa based on the criticality. But this in turn has created a dilemma among the employees as to the security of their jobs.

9. Most employees responded that they take proper breaks during their work. Since in remote working there is no fixed time limit, taking proper breaks makes them energetic and smart.

10. In nutshell, majority of the employees work very comfortably and flexibly under remote working conditions despite facing infrastructure and network connectivity issues.

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DIGITISATION OF MORTGAGE CREATION PROCESS ON AGRI LAND FOR AVAILING A BANK LOAN BY FARMERS-AN EYE VIEW ON THE PRACTICES FOLLOWED ACROSS DIFFERENT STATES IN INDIA

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ABSTRACT

Lending towards agriculture is an important function of any bank in India. When the banks grant loans to farmers for agricultural activities, the concerned land is normally mortgaged as collateral security towards the loan. The central and state governments have made many regulations to simplify the formalities of mortgage, and to reduce the cost and time of farmers in the process The Digitization of land records drive from central government started since the year 1991. However, the progress on the front has remained slow across many states due to various implementation issues. Few states have progressed well in this regard, whereas few states are lagging behind.This research paper aims to give a brief idea on the various mortgage processes followed at different states in a nut shell , keeping in view the vide disparities in land records maintenance system in the country and also the progress of digitization in various states. This article is based on the personal visits and observations of the author across various states- Maharashtra, MP &Chhattisgarh, Gujarat, Karnataka, AP& Telangana, Tamil Nadu, Rajasthan, Punjab & Haryana UP & Uttaranchal, Orissa, Bihar &Jharkhand and West Bengal. This research paper highlights the processes of digitized charge creation done at Banks itself at few states and highlights the savings on cost and time to farmers and risk reduction to bank

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Keywords : Digitization, mortgage, charge creation, farmer, agri land, agri loans

1. Introduction

Lending towards agriculture is an important function of any bank in India. Agriculture is needed in the economy for producing food for consumption and supplying raw materials to many industries. The farmers require funds on a regular basis to keep this activity going, say for land leveling, irrigation, purchase of seeds and fertilizers, tractors, cattle etc. When the banks grant loans to farmers for agricultural activities, the concerned land is normally mortgaged as collateral security towards the loan. The central and state governments have made many regulations to simplify the formalities of mortgage, and to reduce the cost incurred by the

This research paper aims to give a brief idea on the various mortgage processes followed at different states in a nut shell , keeping in view the vide disparities in land records maintenance system in the country

Maintenance of agri land records by the government dates back to the Mughals, who were the first ones to measure land holdings of individuals, fertility of land, corps grown on the land and accordingly levy tax on the land

owners. Later during the British period land measuring instruments were used to survey the lands and maintenance of land records at government offices commenced in a scientific manner.

With the increase in population and the fragmentation of land, the land holding per person has decreased during the last 40 years. During 1960-61, the percentage of farmers holding land holding of 5 acres and below was 19 % of the total cultivated land. This has increased to 43 % in 2002-03 as per RBI data. The increase of number of farmers due to sale, partitions etc, has resulted in increase in land records maintained at government offices. This has created a challenge in maintenance, updation and retrieval of land records as and when required and the government went towards computerization of land records

The Digitisation of land records drive from central government started since the year 1991. However, the progress on the front has remained slow across many states due to various implementation issues. The land records are already outdated to a great extent making it defeated to read. Computerization of the huge land records across various taluk and

revenue offices has remained a challenge in all the states. Few states have progressed well in this regard, whereas few states are lagging behind.

2. Research Objective

Analysis of the benefits and challenges of Digitized mortgage creation by banks for granting an agri loan to a farmer.

3. Research Methodology

The study involved personal visit and discussion with Sub Register offices and Tehsil/MRO offices across different states covering nearly 12 states of Western, Southern and North-eastern states across the country and personal discussions with bank branch managers of different banks and interview with farmers

4. Background of the Study

4.1:Agri Land Records Maintenance System

The Agriculture Land records are maintained at two levels at all the states :

1. Records maintained at the Sub Registrar office (SRO): Land records which gets registered are maintained at sub registrar office. Sale deeds, partition deeds, Mortgages get noted in sub registrar offices, showing the ownership

2. Records maintained at Tehsil Office (Revenue Records) Land ownership records obtained through succession and also partitions are shown here. This record shows land acreage, cropping details, tax paid details etc. Both SRO& Tehsil records mentioned before are needed for creation of mortgage as both these records are interdependent. The Entry made in one record does not naturally flow from one set of record too other as a process. It depends on the type of transaction and manual intervention by officials and differs between state to state, which we shall examine below

4.2. Mortgage Processes at different states

There are mainly 3 common methods of creating charge on an agriculture land for obtaining a farm loan, which are practiced at different states, which are elaborated below

1. Registered Mortgage or Simple Mortgage

2. Equitable mortgage or Mortgage by Deposit of Title deeds

3. Mortgage by Declaration by Farmer

5. Research Findings

The study is carried across Western states, Southern states and North-Easterm states and observation are as below

A. Western States

1. Maharashtra State

In Maharashtra state for taking an agri loan by a farmer with a bank, there is an option to mortgage the Agri Land, either by Mortgage by Declaration at the Tehsil office on its key revenue documents – 'SaathBarah' –(7/12) or Mortgage at the sub registrar office through Registered Mortgage (registration of mortgage deed executed) on the SRO Land records or even Equitable mortgage by way of deposit of title deeds . Any one of these can be done independent of the other.

Mortgage through declaration facility is commonly practiced in the state, wherein the farmer gives a declaration as per format (Form V) giving details of the land holding, name of the bank and the loan amount and stating his intent to mortgage the land towards the mentioned loan. This form is handed over to SRO office for filing purpose and to the Tehsil office for making entries into the SaathBarah (7/12) document. This document carries a stamp duty of 0,5% of the loan amount. This document is handed over to the respective area officer known as ' Talati" who is authorized to act upon the mortgage document . Revenue Land records are computerized in almost all the areas of Maharashtra and hence the Mortgage Declaration is routed through the Online website of Maharashtra state government. The form is entered by the 'Talati' for charge creation through his login. After a short waiting period , it gets regularized by the Tehsil office and the charge gets finalized and appears in the land record (7/12). In case of removal of this charge, a No Objection certificate for loan closure to be given by the bank and the same shall be done at the Tehsil office based on this certificate and a letter by the farmer.

Registered mortgage has a fees & stamp duty which adds up to 1.5% of the loan amount. The mortgage deed gets registered and it appears immediately in the SRO records. The cost is slightly higher than mortgage by declaration and hence, registered mortgage for agri lands is insisted upon by banks only when the amount of loan is slightly on the higher side. It depends on the policy of the lending banks and this is an accepted method of charge creation Equitable mortgage by deposit of title deeds is another method followed. But to do this type of mortgage a original title deed (like sale deed, gift deed) registered at the SRO in the name of the farmer is required. It cannot be done only based on the details with the SRO or Tehsil office. So this mortgage is not much prevalent in Maharashtra in agri lending, as compared to the other two types of mortgages.

2. Madhya Pradesh & Chattisgarh

MP and Chattisgarh states follow the process of mortgage by way of Declaration (Form- V). for all agriculture loans,. The Revenue Land document which contains the details of Land holding, cropping pattern and Loan details is known as 'Khasara' (Equivalent of 7/12 in Maharashtra). The Declaration form is filled up in full with details of the land and bank loan and signed by the farmer and authenticated by the bankers. This document is handed over to both the SRO office and the Tehsil Office. The Tehsil office makes a note of the charge of the bank in Khasara records, as per process . Computerisation of land records online in partially done in these states. Wherever the documents are not computerized manully records are updated. The only change in these states is that the SRO office also make a proper note of the charge registered vide the declaration mortgage in the land records. In case the charge need to be removed, the farmer needs to get this removed both at the SRO office and at the Tehsil office, by way of NOC and release deeds

3. Gujarat State

Gujarat is a state which has gone much ahead in digitization in Agri Land mortgage. The state has made it mandatory that all the agri loan related mortgage shall be done only at the Tehsil office , which they refer as Mamlatdar Office in Gujarat. The charge creation is free of cost to the farmer,

A Mortgage by Declaration form has to be executed by the farmer (Form- V) and the same shall be submitted to the Mamlatdar office by the farmer through the banker. The process is completely online after that. Once it is initiated in appears on the land record (7/12 as well in Gujarat state) as mortgage is initiated. Similarly the further steps of – notice sent to farmer, confirmation etc, depict as and when it is done and finally the mortgage gets confirmed on the 7/12 record.

Gujarat state also has gone ahead and given login facility to the banks, where they can initiate the charge creation online in the government website as the initial step. The farmer need not go to any government office at all. The banker can obtain the documents initiate the mortgage and submit the document to govt office, when gets confirmed as a process. There is huge saving on cost and time to the farmer and banker in Gujarat. SRO office does not involve in this activity in any way and no charge noting happens in any of the SRO records

B. Southern States

4. Karnataka

The land records at SRO and Tehsil office are maintained separately. The Agri Land documents at Tehsil office are – Pahani (equivalent of 7/12) and Patta (Total Land holding record). At the SRO office the land ownership documents are maintained.

Karnataka state is one of the pioneer in digitization of land records – through its Portal – ' Bhoomi'. It has enabled online charge creation on agri land in Pahani, which can be routed through the bank itself. The borrower need to fill up the prescribed charge creation form and hand over to the Banks. The Banks are given specific logins wherein they can enter the charge details and upload the scanned copy of borrower declaration. The concerned government office (Bhoomi Centre) while download these and check the authenticity of attached documents and confirm charge creation on the Land . It is visible in Pahani of this charge creation

The charge creation so done on Pahani do not reflect in the SRO records and hence does not appear in the EC (encumbrance certificate) taken at the SRO office . Hence the bankers have not accepted this charge creation as fully compliant and have limited this to the value of the loans. Hence many agri land cases are done through equitable mortgage of land documents or registered mortgage at SRO office. Karnataka state has waivee the stamp duty and registration fees in full, for mortgage of agri land for taking loans from banks for agriculture purpose. This is another reason why banks are mostly sticking to Mortgage at SRO office, and not routing all the charge creation through the online revenue portal – Bhoomi

5. Andhra Pradesh & Telangana

At Telangana and AP states the mortgage related activities are done only at the sub registrar office. There is no process of making any loan related entry into the revenue records. The revenue record ' Pahani' gives all the details of the land and crops grown only. Registered mortgage of land at sub registrar office is the common practice, where the mortgage deed is executed and registered at the SRO office. Also AP state (before partition to AP & TL) had instituted a 'OringalPatta Book ' concept during early 2000. The government issued a Patta Book to every agri land holder giving details of his land holding in acres. This book was treated equivalent to a original title deed for equitable mortgage (mortgage by deposit of title deeds). Hence the practice of equitable mortgage is also prevalent in AP & TL , wherein this original patta book is deposited with the bank as a security for taking loans. In AP state (present) an addition features also has started wherin an online recording in Pahani of mortgages executed is done, to give transparency in Pahani as well

6. Tamil Nadu

In the state of Tamil Nadu, the widely accepted process of creation of mortgage on agri lands is by deposit of title deeds. The title deeds are deposited with banks and a MOTD (Memorandum of Deposit of Title Deeds) is executed by the farmer. This MOTD is registered at the sub registrar office, which reflects in the land records online

There is no role of the revenue offices in mortgage creation in TN state. Revenue documents called as ' Adangal' (manual revenue land record) and ' PattaChitta ' (computerized revenue land record) give details of the land holding, names of the owners and cropping pattern. However there is no process of direct making mortgage entries in this documents.

C. Northern & Eastern States

7. Rajasthan

In the state of Rajasthan, the key revenue document is called as 'Jamabandhi'. This document is issued based on a Khasara Number (land record number) which states the total area of land of that Khasara and the names of the owners who own this piece of land. .Land under one Khasara will be owned by more than one person and the ownership of each of the person is given as a percentage of the land called ' Hissa'.

Unlike the land documents in southern states, Jamabandhi does not mention the actual land holding of any individuals in hectares or acres. One need to calculate the land holding by multiplying the percentage share mentioned and the total area of the Khasara, to get one's individual land holding in acres.

Along with Jamabandhi – a trace map (which shows the area of this Khasara demarcation) and a Girdawri certificate (which gives the details of crops grown) are normally attached. In few locations a certificate is given by Tehsildar, which confirms the land area owned by any individual in hectares confirms percentage calculation), which confirms the land holding in hectares

The widely accepted process of agri land mortgage for bank loans in Rajasthan is ' Mortgage by Declaration'. The land owner declares in a specified format for mortgage (Form 6 (1)) the name of lending institution, loan amount and the land area mortgaged with Khasara details and his intention to mortgage the land . This document is submitted to SRO office and also the Tehsil Office. While the sub registrar office files a copy of such declaration in its records, the Patwari is the government revenue official makes the initial mortgage entries in Jamabandi. He checkes whether the

land is free from mortgage and on confirmation, he makes the mortgage entry in Jamabandi, with the given details. This later gets authenticated by Girdawar and other revenue officials. The final mortgage entry appears after it is confirmed by Tehsil officer, which normally takes around 30 to 60 days time.

Digitisation of land records has commenced in many parts of Rajasthan at present. In digitized locations, mortgage details are entered online to Jamabandi records, as and when it is received. This is giving better transparency in records and is visible to bankers / public online within a short time.

8. Punjab & Haryana

In the states of Punjab & Haryana also, the Key land Document is ' Jamabandhi ' similar to Rajasthan. In these states also, the same calculation methods for assessing the land holding of a person as done in Rajasthan to be followed (calculate based on the percentage mentioned in Jambandhi)

The best part of these two states is that, they are much advanced on digitization as compared to Rajasthan and while digitization, they have merged the two set of documents maintained at SRO office and at Tehsil Office. In these states, whether it is a mortgage or a sale transaction or a partition transaction, all these get entered into the same data base- Jamabandhi, which is accessed by both the SRO and Revenue authorities

Mortgage is done through Declaration of Farmer . Here the stipulated Form 4(1) is executed by the farmer and is witnessed by a senior village person appointed by the government for this purpose known as ' Lambratdar' . He is responsible to identify the farmer and put his witness. Once the Declaration of Mortgage is submitted at the Tehsil office , the same gets updated in Jamabandhi after due diligence. In few locations there is a process of registration of this declaration , similar to a registered mortgage & some other locations, they Tehsil offices update the same basing on the declaration and witness

9. Uttar Pradesh & Uttaranchal

UP and Uttaranchal states follow the process of mortgage by way of Declaration (Form- 6 (1) for all agriculture loans,. The Revenue Land document which contains the details of Land holding, cropping pattern and Loan details is known as 'Khatauni ' (Equivalent of 7/12 in Maharashtra). The Declaration form is filled up in full with details of the land and bank loan and signed by the farmer and authenticated by the bankers. This document is handed over to both the SRO office and the Tehsil Office. The Tehsil office makes a note of the charge of the bank in Khatauni records, as per process . The SRO office role is to accept the charge creation form, given and index number and file these declaration for future records. Computerisation of land records online in partially done in these states. Wherever the documents are not computerized manully records are updated. UP state also has started taking steps similar to Gujarat for mortgage process digitization very recently.

10. Orissa

In the state of Orissa, the mortgage is created through Declaration through Form – 4 (1). But here the change is that the charge is registered at the SRO office only . There is no role of the Tehsil office in security creation. Charge does not appear in revenue records. Normally banks also take the original land documents of the farmers into their custody and create a deposit of title deeds and then send the declaration to the SRO for registration

11. Bihar & Jharkhand

At Bihar and Jharkhand states, registered mortgage of land is the process in vogue, through a simple registered mortgage deed. There is no role of the Tehsil office or revenue records in creation of mortgage and it is a straight process

12. West Bengal

In the state of West Bengal, equitable mortgage by deposit of title deeds with the bank is the method followed for charge creation. There is Memorandum of Deposit of Title deeds with is executed and stamped as per state act. This completes the process. There is no charge registration either with SRO or with Tehsil office. Mortgage entry does not appear

in any records or in the encumbrance certificate. The farmer need to posess the original title deeds. Without the title deeds mortgage is not possible.

6. Conclusion

On comparison of all the states mentioned above, following conclusions are drawn

1. Maharashtra, MP, Chattisgarh, Gujarat, Karnataka, UP & Uttaranchal and Rajasthan are the states where mortgage on agri land is created at Tehsil/MRO office on revenue land records

- Gujarat state has gone far ahead in digitisation of land records, and simplifying the mortgage creation process for taking an agri loan to the benefit of farmers. The mortgage creation happens at the bank branches itself & the farmer need not have to go to any government office to create mortgage. This saves substantial time and money to the farmer & speeds up the loan disbursal process. For the banker it is easier that mortgage creation process happens at the bank branch itself. Right from the day mortgage creation is initiated by the banker, the online revenue land record is updated step by step and it is very transparent. For taking farm loan, the government has stopped all other types of mortgage creations like deposit of title deeds etc . 100% of the mortgages happen through updation of online record at MRO office, either done by banks itself through their logins or even at MRO offices online. This record serves as the ultimate proof of mortgage, which can be referred by any other banker to whom the farmer may approach for a loan.

- Karnataka state also has the same facility available as in Gujarat to create online mortgage and banks also can create mortage through their logins. The difference here is that the other types of mortgages (equitable mortgage, registered mortgage) are also prevalent at this state . Hence various banks have restricted the first type of mortgage only to a certain extent of loan amount say upto Rs.1 lakh to Rs.3 lakhs only. The digital initiative though available has not picked up as desired in Karnataka

- Rest of the states, the process of charge creation happens online and also manually in some locations where the land records are not fully computerized. The respective governments have gone ahead in the process – at all these states as well, and it may take some more time to completed

2. AP & Telangana, Tamil Nadu, Orissa, Bihar, Jarkhand and West Bengal are the states where mortgage is created only on sub registrar records. There is no process of charge creation on revenue land records . These states follow the equitable mortgage or registered mortgage processes . State governments have waived or reduced the stamp duty payable on such mortgages to some extent to farmers. This process takes considerably more time and expense as compared to the earlier mentioned states

3. Punjab & Haryana , while digitisation of land records which happened few years before have merged the sub registrar records and revenue records together. So these are the only states in India where we find a single set of land records maintained. Mortgage creation process for taking bank loans is simplified by way of one entry made by way of a declaration. This is a very cost effective and time saving method and a replica to be followed by many other states The digitisation has overall benefitted the farmers in terms of cost saved on charge creation and lesser time consumed in the process. As the mortgage records are online and transparent it reduces fraud risks faced by banks to a large extent.Various state governments and banks have take different steps on digitisation of land records to the benefit of farmers. The systThis is still in progress at different states at different levels, due to the different challenges faced in implementation. These challenges include availability of land records, budgets, network connectivity at smaller locations, non-cooperation by government employees in implementation etc, With the development of Robotics and Artificial intelligence at Banks and government offices, this is going to be further streamlined in next few years.

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FINANCIAL LITERACY AMONG UNORGANISED WORKERS IN MALNAD REGION- A WAY FOR ECONOMIC GROWTH

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ABSTRACT

The study directed to examine the status of financial literacy amongst unorganised workers in Malnad Region. Financial literacy is vital in ensuring financial stability and heath of individual, institutional and national economy. Lack of financial literacy leads to deprived financial decisions ultimately damage the economic growth of individual and nation at large. To promote economic growth financial literacy is crucial and the workers in unorganised sectors are much unmapped segment, knowing their financial literacy extent and association of demographic factors with financial literacy components and the relationship between financial literacy and economic growth is much needed. Primary required for the study was collected distributing structured questionnaire to the sample and secondary data collected by referring journals, publications, books, and reports. The sample for the study are unorganised workers in Malnad Region of Karnataka State and a total of 570 samples drawn by using multi stage simple random sampling technique, some statistical tests with the help of SPSS software applied such as one way ANOVA, one sample t test applied and found that the extent of financial literacy among unorganised workers in Malnad region is high.
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Keywords: Financial Literacy, Unorganised Workers, Economic Growth, etc.

Introduction

Financial literacy become the main concern for many of the nations. It is more critical in Indian economy due to its reach beyond comprehension. It aims at inculcating financial knowledge, understanding of financial products and services, budgeting, savings and investment habits. It is the capability to make informed decision regarding money management. To achieve financial well-being and to take sound financial decision, set of financial knowledge, awareness, attitude, skill, behaviour is prudent. OECD (2018) defines financial education as "the process by which investors improve their understanding of financial products and concepts, through information develop skills and confidence to become more aware of financial risks and opportunities, to make informed choices to improve their financial well-being". Unorganised sector being the most vulnerable class having limited wealth need to generate returns to achieve financial self- reliance. Financial literacy have plethora of relevance in the financial decision making of unorganised workers. Unorganised workers are the self-employed workers, wage workers, home based workers, who are not governed by any of the employment act. As per NSSO 94% of workforce engaged in unorganised sector. Financial literacy is vital in ensuring financial stability and heath of individual, institutional and national economy. Lack of financial literacy leads to deprived financial decisions ultimately damage the economic growth of individual and nation at large. Financial literacy guides in improving the quality of financial products and services and there by contribute to the economic growth and development of the nation.

Rationale for the Study

Across the globe strengthening the financial system is a matter of concern, unorganised workers being the deprived vulnerable of the society occupy a large part in the employability of the economy. Financial literacy contribute to sustainable economic growth and development, it is an important element for financial health and stability which is inherently allied to the quality of decision making, poor financial verdict and conjecture have wide consequence of system devastating for the entire economic growth. To promote economic growth financial literacy is crucial and the workers in unorganised sectors are much unmapped segment, knowing their financial literacy extent and association of demographic factors

with financial literacy components and the impact of financial literacy on economic growth is much needed.

Objectives of the Study

1. To evaluate the extent of financial literacy among unorganised workers in Malnad Region.
2. To examine association among demographic factors and financial literacy components.
3. To offer recommendations based on the findings of the study.

Study Hypothesis

1. H0: The extent of financial literacy among unorganised workers in Malnad Region is low.
2. H0: There is no significant association among demographic factors with regard to financial literacy components.

Research Methodology

The research was conducted among unorganised workers, it is descriptive cum analytical in nature as it monitors fact-finding investigation along with testing framed research hypotheses. Primary required for the study was collected distributing structured questionnaire to the sample and secondary data collected by referring journals, publications, books, and reports. The sample for the study are unorganised workers in Malnad Region of Karnataka State and a total of 570 samples drawn by using multi stage simple random sampling technique, some statistical tests with the help of SPSS software applied such as

Results and Discussion

The data collected from primary source through a structured questionnaire consisting of various parameters reported in the form of tabulation and the results and discussions are presented below

Hypothesis Testing

Hypothesis 1

H0: The extent of financial literacy among unorganised workers in Malnad Region is low.
H1: The extent of financial literacy among unorganised workers in Malnad Region is high.

Table No.1: One Sample t test for Statements on Financial Literacy Components of Workers

Financial Literacy Components	Test value	N	Mean	SD	t value	P value
Financial Knowledge	12	570	14.3228	3.06823	18.074	<0.001**
Financial Planning	12	570	14.4035	3.30553	17.360	<0.001**
Financial Attitude	12	570	13.8561	3.03066	14.622	<0.001**
Financial Control	12	570	14.1895	2.92962	17.843	<0.001**
Total Financial Literacy	48	570	56.7719	10.83251	19.333	<0.001**

Source: Survey Data SPSS Output

Note: 1. ** denotes significant @1% level

The above table describes the status of financial literacy among unorganised workers in Malnad Region. Based on the mean score it can be concluded that among various components of financial literacy, the unorganised workers have high financial literacy which is above the test value of 12. For financial knowledge the mean score is 14.3228, for financial planning 14.4035, for financial attitude 13.8561 and for financial control 14.1895. These mean score denotes the high financial literacy. One sample t test applied to test the extent of financial literacy, since P value is less than 0.0, null hypothesis rejected for all the components of financial literacy and concluded that, the extent of financial literacy among unorganised workers in Malnad region is high.

Hypothesis 2

H0: There is no significant association among demographic factors with regard to financial literacy.
H1: There is a significant association among demographic factors with regard to financial literacy.

Table No.2: One way ANOVA to test association among demographic factors and financial literacy

Demographic Profile		N	Mean	SD	F value	P value
Gender	Male	410	56.8927	10.65292	0.181	0.670
	Female	160	56.4625	11.30809		
Age	Upto 20	8	67.5000	5.92814	7.371	<0.001**
	21-30	148	57.8649	10.82644		
	31-40	206	57.9135	10.18993		
	Above 40	208	56.7719	11.16682		
Locality	Urban	96	55.9583	14.70547	2.477	0.085
	Semi-Urban	198	58.1515	8.81550		
	Rural	276	56.0652	10.50313		

Source: SPSS Output

Note: 1. ** denotes significant @1% level

One way ANOVA applied to test the association among demographic factors and financial literacy. Since P value is more than 0.05, null hypothesis is accepted at 5% level of significance and concluded that there is no association among gender group with regard to financial literacy. For age factor since P value is less than 0.001, null hypothesis is rejected at 1% level of significance and concluded that there is an association among age group with regard to financial literacy. Concerning locality, since P value is more than 0.05, null hypothesis accepted and concluded that there is no association among locality with respect to financial literacy.

Conclusion

Financial literacy is vital in attaining economic growth through individual welfare. Emergence of new financial instruments in the market demand financial literacy which in turn contribute to sustainable economic growth and development, it is an important element for financial health and stability which is inherently allied to the quality of decision making, poor financial verdict and conjecture have wide consequence of system devastating for the entire economic growth. Unorganised sector being the most vulnerable class having limited wealth need to generate returns to achieve financial self- reliance. Financial literacy have plethora of relevance in the financial decision making of unorganised workers. Financial literacy vitally significant for the unorganised workers it enables to save money, avoid unnecessary expenses, management of debt and credit, wise financial decisions all these results in economic growth.

Recommendations

- The capabilities of intermediaries should be developed who can groom financial literacy among unorganised workers.
- For disseminating financial education community led approaches should be designed to reach the rural masses.
- Financial literacy messages should be disseminated among the unorganised workers by conducting workshops and campaign in the areas of large gathering.
- It is very much important to boost unorganised sector workers to take active participation in financial markets hence encouragement should be made to promote saving behaviour.

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EXECUTION PRIORITIES ANALYSIS OF MULTI EVAPORATOR TYPE COMPRESSOR FOR REFRIGERATION PLANT

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ABSTRACT

This paper aims to obtain the execution priorities of a multi evaporator type compressor, which is generally used in refrigeration plants. For large complex systems, the uncertainty of each parameter enhances the uncertainty of the system's reliability. The proposed model incorporates failures that stop production and deals with partial failures where the system operates at reduced performance rates. Difference-differential equations for all the transient states have been obtained. Laplace-transformation has been used to solve these mathematical equations. Numerical computation and its graphical illustration using Mathematica have been appended in last to highlight significant study results. To find the execution priorities of the sub-systems, the mean time between failure (MTBF) has been calculated using Simpson's 1/3rd rule.

Introduction

A refrigeration plant consists of a single Compressor with multi-evaporators for analysis of its ability forecast. These single-compressor type refrigeration plants can be categorized into the following:
(a) Multi-evaporator type at the same temperature
(b) Two evaporator types at a dual temperature
(c) Multi-evaporator type at multi-temperature
The work of the evaporator, together with the expansion value, is to give the constant temperature corresponding to the required state. Thus, the different evaporators can be fixed either for the same or different temperatures. In this model, the author's investigations are based on "multi-evaporator type at the same temperature." We have divided the whole refrigeration plant into four sub-systems, namely A, B, C, and D, connected in series. System configuration has been shown in fig-1(a). Sub-system A is a compressor, and sub-system B has two evaporators connected in parallel. Sub-system C is an expansion valve, and sub-system D is a condenser. The whole system can fail due to the failure of either sub-system. Also, the system works in reduced efficiency on failure of anyone evaporator. All failures follow exponential time distribution, whereas all repairs follow general time distribution. Since the system under consideration is non-Markovian, the author has used the supplementary variables technique to formulate a mathematical system model. This mathematical model has been solved with the help of Laplace-transform. Reliability function, availability, and M.T.T.F. of the System have been computed to its ability forecast. Long-run behavior of the system and a particular case, when repairs follow exponential time distribution, have also been obtained for the practical utility of the model. A numerical illustration with its graphical presentation has been appended in the end to highlight actual results.
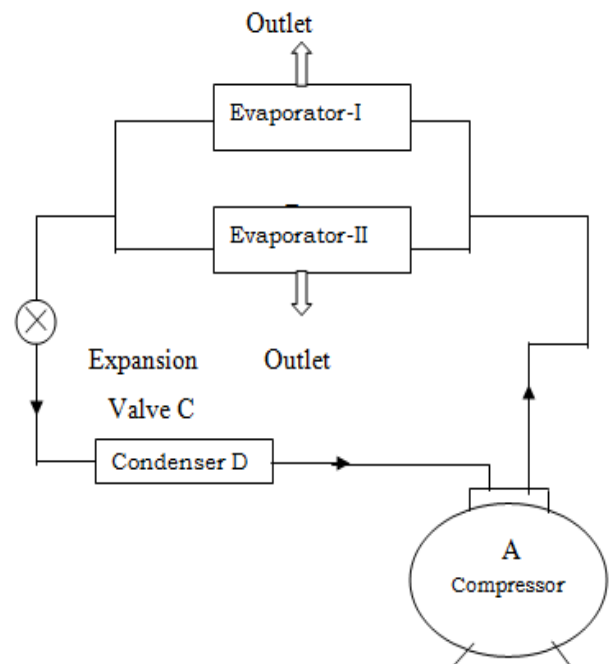
Fig-1(a): System configuration

Assumptions

The following assumptions have been associated with this model:

(i) Initially, all the components of the considered system are excellent and operable.

(ii) All failures follow exponential time distribution.

(iii) Lead time between a failure and the start of its repair is zero.

(iv) Failures are S-independent.

(v) For repairs, follow general time distribution and are perfect.

(vi) The system works in a reduced efficiency state on failure of anyone's evaporator.

(vii) Nothing can fail from a failed state.

List of Notations: The list of notations used is as follows:

a/b/c/d	:	The failure rate of sub-system A/B/C/D.
$\beta_i(j)\Delta$	:	The first-order probability that i^{th} failure can be repaired in the time interval (j, j+Δ), conditioned that it was not repaired up to time *j*.
$P_0(t)$	:	Pr {system is new and all operable at time t}.
$P_i(j,t)\Delta$	:	Pr {at time t, the system is failed due to i^{th} failure}. Elapsed repair time lies in the interval (j, j+Δ).
$P_{B_1}(y,t)\Delta$	:	Pr {at time t, the system is degraded due to failure of anyone evaporator}. Elapsed repair time lies in the interval (y, y+Δ).
$P_{B_1 i}(j,t)\Delta$	:	Pr {at time t, the system is failed due to i^{th} failure while one evaporator has already failed}. Elapsed repair time for ith failure lies within (j, j+Δ).
$P_{B_2}(n,t)\Delta$	:	Pr {at time t, the system is failed due to failure of both units of sub-system B}. Elapsed repair time lies within (n, n+Δ).
$\overline{P}(s)$	:	Laplace transform (L. T.) of function P(t).
$\overline{S}_i(k)$	=	$\beta_i(k)\,exp\{-\int \beta_i(k)dk\},\ \forall$ i and k
$D_i(k)$	=	$1 - \overline{S}_i(k)/k,\ \forall$ i and k
M.T.T.F.	=	Meantime to repair.
M.T.B.F.	=	Meantime between failure
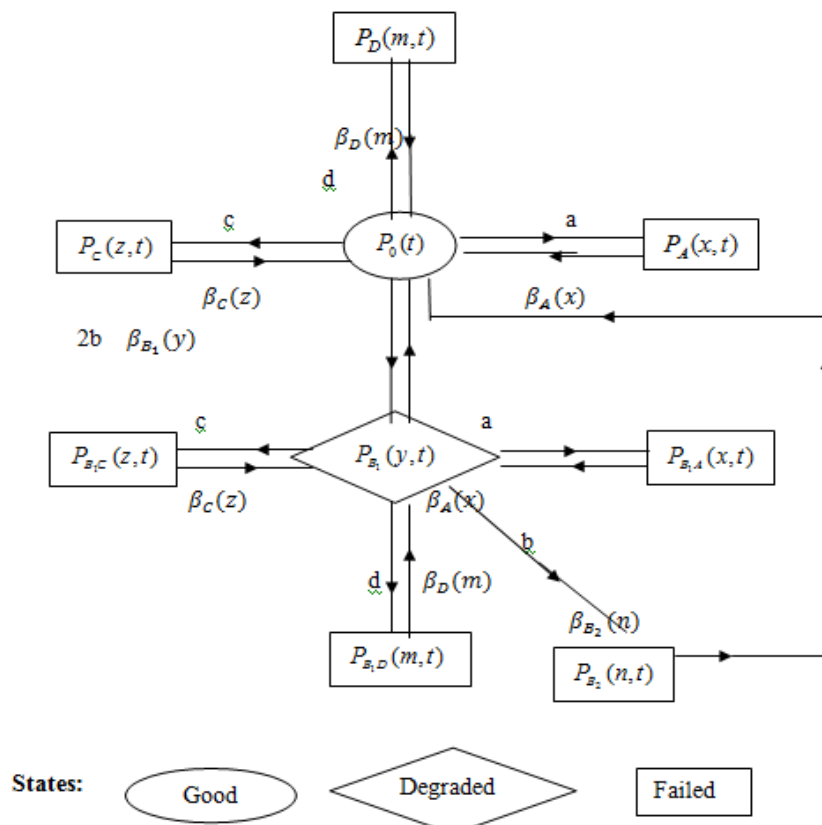
Fig-1(b): State-transition diagram

Formulation of Mathematical Model

By using elementary probability considerations and continuity arguments, one can obtain the following set of difference–differential equations governing the nature of considered system:

$$\left[\frac{d}{dt} + a + 2b + c + d\right]P_0(t) = \int_0^\infty P_A(x,t)\beta_A(x)dx + \int_0^\infty P_{B_1}(y,t)\beta_{B_1}(y)dy$$ $$+ \int_0^\infty P_C(z,t)\beta_C(z)dz + \int_0^\infty P_D(m,t)\beta_D(m)dm$$ $$+ \int_0^\infty P_{B_2}(n,t)\beta_{B_2}(n)dn$$	…(1)
$$\left[\frac{\partial}{\partial j} + \frac{\partial}{\partial t} + \beta_i(j)\right]P_i(j,t) = 0$$ where $i = A, C, D$ and $j = x, z, m$ respectively.	…(2)
$$\left[\frac{\partial}{\partial y} + \frac{\partial}{\partial t} + a + b + c + d + \beta_{B_1}(y)\right]P_{B_1}(y,t) = 0$$	…(3)
$$\left[\frac{\partial}{\partial j} + \frac{\partial}{\partial t} + \beta_i(j)\right]P_{B_1 i}(j,t) = 0$$ where $i = A, C, D$ and $j = x, z, m$ respectively.	…(4)
$$\left[\frac{\partial}{\partial n} + \frac{\partial}{\partial t} + \beta_{B_2}(n)\right]P_{B_2}(n,t) = 0$$	…(5)
Boundary conditions are:	
$$P_A(0,t) = aP_0(t)$$	…(6)
$$P_{B_1}(0,t) = 2bP_0(t) + \int_0^\infty P_{B_1 A}(x,t)\beta_A(x)dx + \int_0^\infty P_{B_1 C}(z,t)\beta_C(z)dz$$ $$+ \int_0^\infty P_{B_1 D}(m,t)\beta_D(m)dm$$	…(7)
$$P_C(0,t) = cP_0(t)$$	…(8)
$$P_D(0,t) = dP_0(t)$$	…(9)
$$P_{B_1 A}(0,t) = aP_{B_1}(t)$$	…(10)
$$P_{B_1 C}(0,t) = cP_{B_1}(t)$$	…(11)
$$P_{B_1 D}(0,t) = dP_{B_1}(t)$$	…(12)
$$P_{B_2}(0,t) = bP_{B_1}(t)$$	…(13)
Initial conditions are:	
$P_0(0) = 1,$ otherwise, all state probabilities are zero at $t = 0$.	…(14)

Taking L.T. of equations (1) through (13) by using initial conditions (14), we obtain:

Solution of the Model

$$[s + a + 2b + c + d]\overline{P}_0(s) = 1 + \int_0^\infty \overline{P}_A(x,s)\beta_A(x)dx + \int_0^\infty \overline{P}_{B_1}(y,s)\beta_{B_1}(y)dy$$ $$+ \int_0^\infty \overline{P}_C(z,s)\beta_C(z)dz + \int_0^\infty \overline{P}_D(m,s)\beta_D(m)dm$$ $$+ \int_0^\infty \overline{P}_{B_2}(n,s)\beta_{B_2}(n)dn$$	…(15)
$$\left[\frac{\partial}{\partial j} + s + \beta_i(j)\right]\overline{P}_i(j,s) = 0$$ where $i = A, C, D$ and $j = x, z, m$ respectively.	…(16)
$$\left[\frac{\partial}{\partial y} + s + a + b + c + d + \beta_{B_1}(y)\right]\overline{P}_{B_1}(y,s) = 0$$	…(17)
$$\left[\frac{\partial}{\partial j} + s + \beta_i(j)\right]\overline{P}_{B_1 i}(j,s) = 0$$ where $i = A, C, D$ and $j = x, z, m$ respectively.	…(18)
$$\left[\frac{\partial}{\partial n} + s + \beta_{B_2}(n)\right]\overline{P}_{B_2}(n,s) = 0$$	…(19)
$$\overline{P}_A(0,s) = a\overline{P}_0(s)$$	…(20)
$$\overline{P}_C(0,s) = c\overline{P}_0(s)$$	…(21)
$$\overline{P}_D(0,s) = d\overline{P}_0(s)$$	…(22)
$$\overline{P}_{B_1}(0,s) = 2b\overline{P}_0(s) + \int_0^\infty \overline{P}_{B_1 A}(x,s)\beta_A(x)\,dx + \int_0^\infty \overline{P}_{B_1 C}(z,s)\beta_C(z)dz$$ $$+ \int_0^\infty \overline{P}_{B_1 D}(m,s)\beta_D(m)dm$$	…(23)

$$\overline{P}_{B_1A}(0,s) = a\overline{P}_{B_1}(s)$$	…(24)
$$\overline{P}_{B_1C}(0,s) = c\overline{P}_{B_1}(s)$$	…(25)
$$\overline{P}_{B_1D}(0,s) = dP_{B_1}(s)$$	…(26)
$$\overline{P}_{B_2}(0,t) = b\overline{P}_{B_1}(s)$$	…(27)
Now integrating equation (16) with the help of boundary conditions (20), (21), and (22), we have	
$$\overline{P}_i(j,s) = \overline{P}_i(0,s)\ exp\left\{-sj - \int \beta_i(j)dj\right\}$$	
integrating this again w.r.t. *j* from 0 to ∞, we get	
$$\overline{P}_i(s) = \overline{P}_i(0,s)\frac{1-\overline{S}_i(s)}{s}$$	
or $\overline{P}_i(s) = \overline{P}_i(0,s)\,D_i(s)$　　　where i = A, C and D	…(28)
Similarly, integrating (18) with the help of (24), (25), and (26), we have	
$$\overline{P}_{B_2i}(j,s) = \overline{P}_{B_1i}(0,s)\ exp\left\{-sj - \int \beta_i(j)dj\right\}$$	
$\Rightarrow \overline{P}_{B_1i}(s) = \overline{P}_{B_1i}(0,s)\,D_i(s)$　where i = A, C and D	…(29)
Integrate equation (19) subjected to (27), we obtain	
$$\overline{P}_{B_2}(n,s) = b\overline{P}_{B_1}(s)\ exp\left\{-sn - \int \beta_{B_2}(n)dn\right\}$$	
$$\therefore \overline{P}_{B_2}(s) = b\overline{P}_{B_1}(s)\frac{1-\overline{S}_{B_2}(s)}{s}$$	
or, $\overline{P}_{B_2}(s) = b\overline{P}_{B_1}(s)D_{B_2}(s)$	…(30)
Equation (23) can be rewritten as, by using relevant relations.	
$$\overline{P}_{B_1}(0,s) = 2b\overline{P}_0(s) + a\overline{P}_{B_1}(s)\overline{S}_A(s) + c\overline{P}_{B_1}(s)\overline{S}_C(s) + d\overline{P}_{B_1}(s)\overline{S}_D(s)$$	…(31)
Now, integrate (17) subjected to (31), we have	
$$\overline{P}_{B_1}(y,s) = \overline{P}_{B_1}(0,s)\ exp\left\{-(s+a+b+c+d)y - \int \beta_{B_1}(y)dy\right\}$$	
$$\therefore \overline{P}_{B_1}(s) = \overline{P}_{B_1}(0,s)D_{B_1}(s+a+b+c+d)$$	
or, $\overline{P}_{B_1}(s) = \dfrac{2b\overline{P}_0(s)D_{B_1}(s+a+b+c+d)}{1-[a\overline{S}_A(s)+c\overline{S}_C(s)+d\overline{S}_D(s)]D_{B_1}(s+a+b+c+d)}$	
or, $\overline{P}_{B_1}(s) = A(s)\overline{P}_0(s)$	…(32)
In last, simplifying (15) by making use of relevant expressions, we get	
$$\overline{P}_0(s) = \frac{1}{B(s)}$$	
Thus finally, we obtain the following L.T. of probabilities of transition-states of fig-1(b), in terms of B(s):	
$$\overline{P}_0(s) = \frac{1}{B(s)}$$	…(33)
$\overline{P}_i(s) = \dfrac{k\,D_i(s)}{B(s)}$　　　where $i = A,C,D$ and $k = a,c,d$ respectively	…(34)
$$\overline{P}_{B_1}(s) = \frac{A(s)}{B(s)}$$	…(35)
$$\overline{P}_{B_ii}(s) = \frac{k\,A(s)D_i(s)}{B(s)}$$ where $i = A,C,D$ and $k = a,c,d$ respectively.	…(36)
$$\overline{P}_{B_2}(s) = \frac{b\,A(s)D_{B_2}(s)}{B(s)}$$	…(37)
where, $A(s) = \dfrac{2bD_{B_1}(s+a+b+c+d)}{1-[a\overline{S}_A(s)+c\overline{S}_C(s)+d\overline{S}_D(s)]D_{B_1}(s+a+b+c+d)}$	…(38)
and $B(s) = s + a + 2b + c + d - a\overline{S}_A(s) - c\overline{S}_C(s) - d\overline{S}_D(s) - bA(s)\overline{S}_{B_2}(s)$ $-\{2b + A(s)[a\overline{S}_A(s) + c\overline{S}_C(s) + d\overline{S}_D(s)]\}\overline{S}_{B_1}(s+a+b+c+d)$	
$= s[1 + aD_A(s) + cD_C(s) + dD_D(s)] + 2b - bA(s)\overline{S}_{B_2}(s)$ $-\{2b + A(s)[a\overline{S}_A(s) + c\overline{S}_C(s) + d\overline{S}_D(s)]\}\overline{S}_{B_1}(s+a+b+c+d)$	…(39)
It is worth noticing that	
Sum of equations (33) through (37) $= \frac{1}{s}$	

i.e., Sum of all transition state probabilities = 1	…(40)

2.6 Long-Run Behaviour Of The System

Using Abel's lemma, viz; $\lim\limits_{t\to\infty} P(t) = \lim\limits_{s\to\infty} s\,\overline{P}(s) = P$ (say), provided the limit on left side exists, in equations (33) through (37), we obtain the following long-run behavior of considered system:

$$P_0 = \dfrac{1}{B'(0)}$$	…(41)
$P_i = \dfrac{k\,M_i}{B'(0)}$ $\qquad \forall\ i = A, C, D$ and $k = a, c, d$ respectively.	…(42)
$$P_{B_1} = \dfrac{A(0)}{B'(0)}$$	…(43)
$P_{B_i i} = \dfrac{k\,A(0)M_i}{B'(0)}$ $\qquad \forall\ i = A, C, D$ and $k = a, c, d$ respectively.	…(44)
$$P_{B_2} = \dfrac{b\,A(0)M_{B_2}}{B'(0)}$$	…(45)
where, $A(s) = \dfrac{2b\left[1 - \overline{S}_{B_1}(a+b+c+d)\right]}{b + (a+c+d)\left[1 - \overline{S}_{B_1}(a+b+c+d)\right]}$	
$M_i = -\overline{S}'_i(0)$ = Mean time to repair i^{th} failure.	
and $B'(0) = \left[\dfrac{d}{ds}B(s)\right]_{s=0}$	

Particular Case

When repairs follow exponential time distribution

In this case, setting $\overline{S}_i(j) = \dfrac{\beta_i}{(j+\beta_i)}, \forall\ i$ and j, in equations (33) through (37), we obtain the following Laplace transformation of different state probabilities of fig-1(b):

$$\overline{P}_0(s) = \dfrac{1}{E(s)}$$	…(46)
$\overline{P}_i(s) = \dfrac{k}{E(s)(s+\beta_i)}$ where, $i = A, C, D$ and $k = a, c, d$ respectively.	…(47)
$$\overline{P}_{B_1}(s) = \dfrac{A_1(s)}{E(s)}$$	…(48)
$\overline{P}_{B_1 i}(s) = \dfrac{kA_1(s)}{E(s)(s+\beta_i)}$ where, $i = A, C, D$ and $k = a, c, d$ respectively.	…(49)
and $\overline{P}_{B_2}(s) = \dfrac{bA_1(s)}{E(s)(s+\beta_{B_2})}$	…(50)
where, $A_1(s) = \dfrac{2b}{s\left[1 + \frac{a}{s+\beta_A} + \frac{c}{s+\beta_C} + \frac{d}{s+\beta_D}\right] + b + \beta_{B_1}}$	…(51)
and $E(s) = s\left[1 + \dfrac{a}{s+\beta_A} + \dfrac{c}{s+\beta_C} + \dfrac{d}{s+\beta_D}\right] + 2b - \dfrac{bA_1(s)\beta_{B_2}}{s+\beta_{B_2}}$ $\qquad - \left\{2b + A_1(s)\left[1 + \dfrac{a\beta_A}{s+\beta_A} + \dfrac{c\beta_C}{s+\beta_C} + \dfrac{d\beta_D}{s+\beta_D}\right]\right\}\dfrac{\beta_{B_1}}{s+a+b+c+d+\beta_{B_1}}$	…(52)

2.8 Reliability and M.T.T.F. of the System

From equation (33), we have

$$\overline{R}(s) = \dfrac{1}{s+a+2b+c+d}$$

$$\therefore R(t) = L^{-1}\{\overline{R}(s)\} = exp\{-(a + 2b + c + d)t\} \quad …(53)$$

Also, $M.T.T.F. = \int_0^\infty R(t)\,dt$

$$= \dfrac{1}{a+2b+c+d} \qquad …(54)$$

Availibility of Considered System:

From equations (33) and (35), we obtain

$$\overline{P}_{up}(s) = \dfrac{1}{s + a + 2b + c + d}\left[1 + \dfrac{2b}{s + a + b + c + d}\right]$$

$$\therefore P_{up}(t) = L^{-1}\{\overline{P}_{up}(s)\}$$
$$= e^{-(a+b+c+d)t}\left[(1-b)e^{-bt} + b\right] \quad …(55)$$

Numerical Illustration

Laplace transforms method has been applied to solve the governing differential equations of the system as given in the equation. The reliability of the serial process in the refrigeration plant has been computed about six

months by taking value-combinations of the repair and failure rates of the sub-systems. These value-combinations have been taken from Chemico Cooling Tower, Yashoda Nagar, Kanpur. It may be mentioned here that these combinations are not exhaustive, and we have only considered the main sub-systems in the numerical study. The reliability of the system based on different value-combinations of failure rates is presented in Tables I-IV. The last row tables give the MTBF in days for sub-systems' respective failure and repair rates. MTBF has been computed with the help of numerical methods by using Simpson's $1/3^{rd}$ rule:

- **Effect of the failure rate of Compressor on the reliability of the system.** The impact of the sub-system compressor's failure rate on the system's reliability is studied by varying its value as: $a = 0.006, 0.007, 0.008, 0.009,$ and 0.010. The failure rates of other sub-systems have been taken as: $b = 0.0058$, $c = 0.0020$, and $d = 0.0010$. The system's reliability is calculated using this data, and the results are shown in Table I. This table shows the effect of the failure rate of the Compressor on the reliability of the system. The values of a have been considered with the interval of days. The average reliability of the system decreases by approximately 0.020 percent with the increase of time. However, it reduces by roughly 0.21 percent with the rise in the rate of failure of Compressor from 0.006 to 0.010, and MTBF decreases by approximately 0.71 percent.

- **Effect of the failure rate of the evaporator on the reliability of the system**. The impact of the sub-system evaporator's failure rate on the system's reliability is studied by varying its values as $b = 0.0052, 0.0054, 0.0056, 0.0058,$ and 0.0060. The failure rates of other sub-systems have been taken as: $a = 0.006, c = 0.0020,$ and $d = 0.0010$. The system's reliability is calculated using this data, and the results are shown in Table II. This table shows the effect of the failure rate of the evaporator on the reliability of the system. The values of b have been considered with

the interval of days. The system's reliability decreases 0.018 percent with the increase in time from 30 to 360 days. Still, reliability reduces by approximately 0.08 percent with the rise in the failure rate of evaporator from 0.0052 to 0.0060, and MTBF also decreases by about 0.28 percent.

- **Effect of the failure rate of expansion valve on the reliability of the system.** The impact of the failure rate of sub-system expansion on the system's reliability is studied by varying its values as: $c = 0.0022, 0.0024, 0.0026, 0.0028,$ and 0.0030. The failure rates of other sub-systems have been taken as: $a = 0.006, b = 0.0058,$ and $d = 0.0040$. The system's reliability is calculated using this data, and the results are shown in Table III. This table shows the effect of the failure rate of the expansion valve on the system's reliability. The values of c have been considered with the interval of days. From Table III, one can note that the average reliability of the system decreases by 0.021 percent with the increasing of time. Average reliability and MTBF fell by approximately 0.04 and 0.14 respectively percent with the increase in the failure rate of expansion valve from 0.0022 to 0.0030.

- **Effect of repair rate of the condenser on the reliability of the system.** Development of the repair rate of sub-system condenser on the system's reliability is studied by varying its values as: $d = 0.0032, 0.0034, 0.0036, 0.0038,$ and 0.0040. The failure rates of other sub-systems have been taken as: $a = 0.006, b = 0.0058,$ and $c = 0.0020$. The system's reliability is calculated using this data, and the results are shown in Table IV. One can note from the table that the system's reliability increases by 0.04 percent by increasing the failure rate of the condenser from 0.0032 to 0.0040. Also, reliability decreases by approximately 0.020 percent with the increase in time from 30 to 360 days. MTBF of condenser decreases by around 0.14 percent with the rise in repair from 0.0032 to 0.0040

	Days (t)	a				
		0.006	0.007	0.008	0.009	0.010
Table I. Effect of the failure rate of Compressor *a* n on reliability of the system	30	0.998288	0.998204	0.998121	0.998038	0.997955
	60	0.996578	0.996412	0.996246	0.996080	0.995914
	90	0.994872	0.994623	0.994374	0.994126	0.993877
	120	0.993168	0.992837	0.992506	0.992175	0.991845
	150	0.991467	0.910054	0.990641	0.990229	0.989816
	180	0.989770	0.989275	0.988780	0.988286	0.987792
	210	0.988075	0.987498	0.986923	0.986347	0.985772
	240	0.986383	0.985725	0.985068	0.984412	0.983756
	270	0.984694	0.983955	0.983218	0.982481	0.981744
	300	0.983007	0.982189	0.981370	0.980553	0.979736
	330	0.981324	0.980425	0.979527	0.987629	0.977733
	360	0.979644	0.978665	0.977686	0.976709	0.975733
	MTBF	356.323	356.146	355.968	355.791	355.614

	Days (t)	b				
		0.0052	0.0054	0.0056	0.0058	0.0060
Table II. Effect of the failure rate of evaporator *b* on the reliability of the system	30	0.998387	0.998354	0.998331	0.998288	0.998225
	60	0.996776	0.996710	0.996644	0.996578	0.996512
	90	0.995168	0.995069	0.994971	0.994872	0.994773
	120	0.993563	0.993431	0.993306	0.993168	0.993036
	150	0.991960	0.991796	0.991632	0.991467	0.991303
	180	0.990360	0.990163	0.989966	0.989770	0.989573
	210	0.988763	0.988533	0.988304	0.988075	0.987846
	240	0.987168	0.986906	0.986644	0.986383	0.986121
	270	0.985575	0.985281	0.984987	0.984694	0.984400
	300	0.983986	0.983659	0.983333	0.983007	0.982682
	330	0.982398	0.982040	0.981682	0.981324	0.980967
	360	0.980814	0.980423	0.980033	0.979644	0.979254
	MTBF	356.535	356.465	356.394	356.323	356.253

	Days (t)	c				
		0.0022	0.0024	0.0026	0.0028	0.0030
Table III. Effect of the failure rate of evaporator *b* on the reliability of the system	30	0.998021	0.998005	0.997988	0.997972	0.997955
	60	0.996047	0.996014	0.995980	0.995947	0.995914
	90	0.994076	0.994026	0.993977	0.993927	0.993877
	120	0.992109	0.992043	0.991977	0.991911	0.991845
	150	0.990146	0.990064	0.989981	0.989899	0.989816
	180	0.988187	0.988088	0.987990	0.987891	0.987792
	210	0.986232	0.986117	0.986002	0.985887	0.985772
	240	0.984281	0.984149	0.984018	0.983887	0.983756

270	0.982333	0.982186	0.982039	0.981891	0.981744
300	0.980390	0.980226	0.980063	0.979900	0.979736
330	0.978450	0.978270	0.978091	0.977912	0.977733
360	0.976514	0.976319	0.976123	0.975928	0.975733
MTBF	355.756	355.72	355.685	355.649	355.614

	Days (t)	d				
		0.0032	0.0034	0.0036	0.0038	0.0040
	30	0.998105	0.998088	0.998071	0.998055	0.998038
	60	0.996213	0.996180	0.996146	0.996113	0.996080
	90	0.994325	0.994275	0.994225	0.994175	0.994126
Table IV. Effect of the failure rate of evaporator b on the reliability of the system	120	0.992440	0.992374	0.992308	0.992241	0.992175
	150	0.990559	0.990476	0.990394	0.990311	0.990229
	180	0.988681	0.988583	0.988484	0.988385	0.988286
	210	0.986807	0.986692	0.986577	0.986462	0.986347
	240	0.984937	0.984806	0.984674	0.984543	0.984412
	270	0.983070	0.982923	0.982775	0.982628	0.982481
	300	0.981207	0.981043	0.980880	0.980716	0.980553
	330	0.979347	0.979168	0.978988	0.978809	0.978629
	360	0.977491	0.977295	0.977100	0.976905	0.976709
	MTBF	355.933	355.898	355.862	355.827	355.791

Analysis of Result

Table V. Comparisons of reliabilities		Changes in reliability with time	Changes in reliability with the failure rate	Changes in MTBF
	Compressor "a"	0.020	0.21	0.71
	Evaporator "b"	0.018	0.08	0.28
	Expansion Valve "c."	0.022	0.04	0.14
	Condenser "d"	0.021	0.04	0.14

Analysis of reliability, long-run availability, and mean time before failure of evaporator type compressor can help increase the production and quality of refrigeration plant. The proposed method can be applied to complex systems that an extensive system of differential equations may govern. Using this method, we can efficiently study the effects of failure and repair rates of different sub-systems on the reliability of the complete system. Detailed study of Tables I-IV and comparison table reveals that sub-system A, namely, Compressor has maximum effect on the long-run availability and reliability of the complete system. Other sub-systems are almost equally effective. Hence, it is suggested that management take utmost care of this sub-system to increase the overall performance of the evaporator-type Compressor.
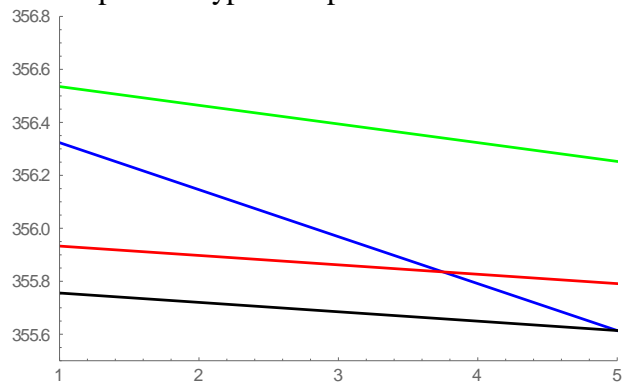
Fig-2: Graph of MTBF's

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STUDY ON SOCIAL MEDIA'S INFLUENCE ON GREEN PURCHASE INTENTIONS

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ABSTRACT

Globalization and financial development have made generous movements for utilization practices, creation and innovation unrest in the wake of unexpected spray of web-based media use among Millennial. The web-based media stages have become a dependable wellspring of correspondence with buyers and are molding customers' buying goals. So, a structure was created to clarify and exactly confirm the components molding green buying intentions. Total 147 respondents were examined to gather the information. The effect of social media use was discovered to be generally compelling on purchasing goals. The discoveries of the examination will help future researchers to more readily see how online media assumes a significant part in molding buyers' buy expectations and how web-based media can be utilized in a superior manner to support green utilization.

Introduction

Green consumerism has become a global trend owing to the increased environmental consciousness among consumers especially millennials post covid-19. This increased environmental and ethical consciousness is pushing consumers to seek out and purchase eco-friendly products. The pandemic caused by covid -19 virus has resulted in increased use of social media networking sites. Social Media platforms are playing a significant role in this paradigm shift in consumer behaviour. According to the global web index (Base 44733 Eco consumers aged:16-64), 41 % of the consumers are actively searching for sustainable/eco-friendly products on social networking sites like Facebook, Instagram, YouTube etc. Social media platforms are increasingly used as a medium for sharing knowledge and experiences by companies and consumers alike. (Muninger, Hammedi, & Mahr, 2019). Eco-consumers are embracing new technologies which include various social networking sites, blogs, (Alvino et al, 2011).

There has been an increase in awareness as well as demand for green products but the actual sale of such products has increased only marginally (Bockman, Razzouk, & Sirotnik, 2009).This positive attitude and intentions are not getting converted to the actual purchase of eco-friendly products. Many previous studies were done by authors like Vermeir & Verbeke, 2009; Chen & Chai, 2010; Johnstone, Yang, & Tan, 2014) have identified a gap between consumer intention to purchase green products and their actual purchase, named as ATTITUDE-INTENTION-BEHAVIOR GAP. Studies over the years have concluded that there is an inconsistency between intentions and behaviours of Eco-consumers that their concerns towards the environment do not get translated into actions. Many factors are found to be responsible for such inconsistencies like affordability, availability… Social Influence is one of them. Social influence is positively related to purchase intention in the case of eco-friendly products (Chen, Chen, & Tung, 2018). According to Lee, peer influence is the topmost predictor of green adoption in both male and female consumers. Consumers these days search social media for product reviews, recommendations and suggestions before making a purchase. Many social media influencers are using different platforms to raise their concerns and sensitising people regarding environmental issues (Clements, 2019). Sustainability influencers like Greta Thunberg, Elizabeth Farell, Swati Dixit and many more are informing and inspiring people all over the world to make sustainable decisions. This study aims to analyse how social media is influencing the green purchase intentions of consumers.

Literature Review & Hypotheses Development

The creativity of the research remains in the investigating what the social media means for the buying aim through inspirations, disposition, and attitude. According to, Vermeir and Verbeke, found a positive relationship between social pressure and

attitude towards buying sustainable products, as supported by similar studies. Gupta and Ogden found that the majority of green consumers have a high level of trust in others and expect others to participate in green behaviour as well.

H1: Subjective norms emphatically influence buyers buying goal towards green products.

H2: Green Motivations emphatically impact buyers' attitude towards green products.

Altruism can be characterized as a caring conduct by a person that benefits others. Past considers tracked down a positive connection between buyers' ecological concerns and mentalities towards purchasing natural food. Buyers express their favorable to ecological conduct and worry for nature through buying natural food and green items. The positive effect of natural worry on disposition has been concentrated in a few settings, e.g., natural food and green items. Prior charitable qualities influence disposition than proud qualities toward eco-accommodating bundled items.

Eze and Ndubisi, in their past investigations have tracked down a positive connection between ecologically cognizant perspectives and green purchasing conduct.EWOM implies any certain or contrary assertion of real, potential, or previous clients about an organization or item accessible to a few foundations or individuals on the Internet.(Hennig-Thurau et al., 2004; Cheung and Lee, 2012, Yan et al. 2016) expressed that the components of eWOM correspondence are not quite the same as customary WOM, like one of a kind versatility, dispersion speed, while ordinary WOM alludes to dividing data between known people inside private discussions way. EWOM correspondence is more open, determined, quantifiable contrasted with conventional WOM, and includes multi-way data trades simultaneously

H3 Green attitude is positively affected by the EWOM of social media influencers.

H4: Perceived Information From the social media marketing has a positive relationship with green attitude.

According to (Yadav and Pathak, 2017) characterize aim as the availability of an individual to direct a particular conduct. As it gets the inspiration to act, including

preparation to take an interest and elevated exertion, an individual will work out. According to (Sharma and Joshi, 2017: Jain and Chamola, 2019) Consumers who are highly involved have to make a deliberate purchase without condition. According to (Ajzen 1991), an individual is bound to act with a specific goal in mind on the off chance that the person in question has an uplifting perspective towards that specific conduct.

H5: Attitudes toward green products positively affect consumers' intentions to purchase green products.
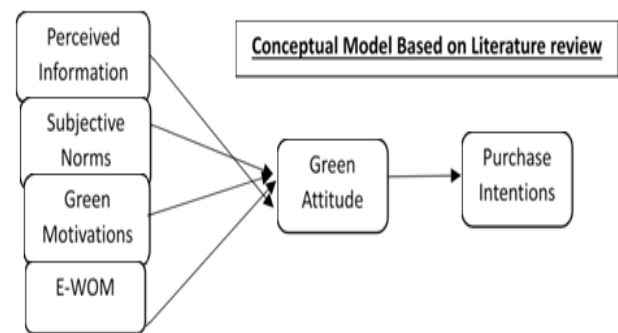
Research Methodology

The current research study has embraced quantitative analysis for the purpose of gathering information. Structured questionnaire was created utilizing existing research studies for the variables and existing scales of constructs had been acquired. The sample was selected using simple random sampling and in total 147 responses were received. The survey was created to test the propounded hypothesis.

Measurement Instruments

To study the variables of the present research, pre-existing measures were utilised. A five-point Likert scale method was used to measure responses against each variable. Perceived Information was measured using the adapted scale from the study by Matthes and Wonneberger (2014). Green Motivations were measured using five items adapted scale from the study by Săplăcan, Annetta alt, & Anna Pop, 2020. Subjective Norms were measured using five items scale from Tarkiainen and Sundqvist (2005). Adapted Scales from the study by Iravani-2012 and do paco et al 2010 were used to measure Green Attitude. To measure the purchase intentions scales were

adapted from the study by Wei and Wang (2018) and Sun et al. (2018).

Data Analysis And Results

The given table shows the demographic and social media usage details of the respondents which were collected with the help of a questionnaire.

Table-1 Demographic Profile of the Respondents(N=147)

S.NO	DEMOGRAPHICS	FREQUENCY	PERCENTAGE
1.	GENDER		
	Male	71	44.7%
	Female	86	55.3%
2.	AGE		
	Less than 18	1	0.7%
	18-25	82	52%
	25-33	56	36.2%
	33 and above	18	11.2%
3.	EDUCATION QUALIFICATION		
	Under Graduate	44	27.6%
	Graduate	46	29.6%
	Post-Graduate	45	28.9%
	Others	22	13.8%
4.	ANNUAL FAMILY INCOME		
	Less than 5 lakhs	50	31.9%
	5 lakhs-10 lakhs	58	36.9%
	More than 10 lakhs	49	31.2%
5.	SOCIAL MEDIA USAGE		
	No of hours spent daily		
	Less than 1 hour	22	13.8%
	1-2 hours	52	32.9%
	2-3 hours	53	33.6%
	More than 3 hours	30	19.7%
6.	Social Media platforms accessed daily		
	Facebook	26	16.8%
	Twitter	16	10.5%
	Instagram	35	22.5%
	You tube	41	26.4%
	Pinterest	18	11.6%
	Snapchat	19	12.2%

To check the relationship between latent construct and variables CFA was carried out. Table 2 shows the factor loadings of all the latent constructs. It can be seen that all the latent constructs load satisfactorily as their values are more than .7 well above the minimum level. The model fit indices are as follows, indicating that the proposed model has satisfactory properties.

GOODNESS OF FIT CRITERIA	CMIN/DF CHI-SQUARE	GFI	TLI	CFI	RMSEA
DEFAULT MODEL	2.12	.761	.873	.887	.08
RESULT	ACCEPTABLE	ACCEPTABLE	GOOD	GOOD	ACCEPTABLE

The reliability of the construct was checked using Cronbach alpha value and CR (composite reliability) value. The result obtained shows that constructs are highly reliable and internally consistent as the values of Cronbach alpha range from.88 to .93 in all the cases and CR value is more than 0.7, all being above the threshold value.

The measurement model also had good convergent validity as the value of AVE (Average Variance extracted) were above the threshold value of .5 in all the cases.

Discriminant Validity was measured by comparing the square root of AVE and correlations between the pairs of variables. Table 3 shows that values in diagonals are more than the values below it, which indicate good discriminant validity as per the Fornell-Larcker criterion.

Table-2 Factor Loadings and Reliability analysis

CONSTRUCT	ITEMS	STANDARD LOADINGS	CRONBACH ALPHA	COMPOSITE RELIABILITY(CR)	AVE
GREEN MOTIVATIONS	GM1 GM2 GM3 GM4	.77 .87 .80 .78	.88	0.69	.64
PERCEIVED INFORMATION	Info1 Info2 Info3 Info4 Info5	.65 .80 .81 .86 .79	.88	.66	.61
SUBJECTIVE NORMS	Norms1 Norms2 Norms3 Norms4 Norms5	.73 .82 .82 .77 .81	.89	.67	.62
E-WOM	E_WOM1 E_WOM2 E_WOM3 E_WOM4 E_WOM5	.79 .78 .84 .82 .83	.90	.70	.65
GREEN ATTITUDE	GA1 GA2 GA3 GA4	.86 .92 .72 .80	.89	.72	.68
PURCHASE INTENTIONS	PI1 PI2 PI3	.90 .89 .92	.93	.83	.80

Constructs	1	2	3	4	5	6
Green Motivations	.805					
Information	.568	.783				
Subjective Norms	.560	.762	.788			
EWOM	.457	.435	.402	.812		
Green Attitude	.456	.288	.548	.629	.829	
Purchase Intentions	.404	.312	.451	.415	.768	.904

Table 3 -Discriminant   Validity

Note: Values in diagonals represent sqrt of AVE and values below shows correlations

The Structure Model And Hypothesis Testing:

After the construct was found to be reliable and valid, the hypotheses were tested by performing a Structural equation modelling technique using SPSS-Amos software. The relationship between the independent variables and dependent variable were identified. All the hypotheses were accepted as the p-value was less than .001. all the independent variables, Green Motivations, Information, Subjective norms and E-WOM had a significant positive relationship with green attitude. Green Attitude had a positive relationship with Purchase Intentions.

PATH	β-COEFFICIENT	T-VALUE	P-VALUE	RESULT
Green Motivation⯈ green attitude	.456	4.918	<.001	HYPOTHESIS ACCEPTED
Information⯈ green attitude	.288	3.521	<.001	ACCEPTED
Subjective Norms⯈Green attitude	.548	5.565	<.001	ACCEPTED
E-WOM⯈ Green Attitude	.629	5.541	<.001	ACCEPTED
GreenAttitude⯈Purchase Intentions	.768	7.095	<.001	ACCEPTED

Discussion and Conclusion

Social Media has emerged as an effective platform to promote green consumption among consumers. Consumers are greatly pursued by sustainable behaviour shown by social media influencers and celebrities across various social media platforms. This study contributes to the current domain of knowledge by examining the impact of variables like green motivations, perceived information, subjective norms and E-WOM on green attitudes and purchase Intentions of the consumers.

Empirical findings of the study indicate a significant positive relationship between green motivations and consumer's green attitudes. Social media platforms inform and influence people regarding environmental issues (altruistic motivations) and health concerns(egotistic motivations). Results also demonstrate that perceived information from social media marketing activities of the firms leads to a positive green attitude among consumers. This is in with a study done by Luo, Sun, Shen, & Xia, 2020. Subjective Norms and E-WOM generated from social media had a high impact on consumers green attitudes. The current study implies that green attitude is the key determinant of the green purchase intentions of the consumers. This is per the earlier studies done by Lee, 2008; Chen, Chen, & Tung, 2018; Chen & Chai, 2010.

Overall, this study contributes towards a better understanding of how social media is affecting consumers preferences and choices these days.

Limitations and Future Scope

At last, there are a few impediments to the examination, which should be considered. As the sample size was moderately low (n = 147), the current examination can be viewed as exploratory, and needing further testing and affirmation.

In addition, the current examination did not differentiate the effect of different online media stages, content sort, and sources (peers, influencers, organizations, and so forth). All things being equal, it handles online media as a homogenous spot where shoppers look for different data.

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A STUDY ON CONSUMER AWARENESS AND ATTITUDE TOWARDS SUSTAINABLE PACKAGING

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ABSTRACT

Sustainable packaging concepts have been developed with the increase in sustainable development with respect to environment, economy, and the society. Packaging will always have an impact on the environment and due to increase in population there has been increase in consumption of resources, hence resulting in the increase in waste. Companies should play a major role in packaging their products using a sustainable material, which will also make consumers aware about the sustainable packaging and its positive impacts on the environment. Consumers' reaction regarding the worth of the sustainably packaged products is sensitive. Hence consumers need to be made more aware of sustainable packaging and its beneficial impacts of reducing the carbon footprint on the planet. The current scenario appeals for the efforts taken in the concern of environment and the society. The objective of this work is to measure the level of consumer awareness and attitude towards sustainable packaging in tier-1 and tier-2 cities of India. The data for this study was collected from 152 respondents by an online survey using a questionnaire and online websites & journals and stratified random sampling method has been used. It has been found out that consumer awareness towards sustainable packaging is dependent on age and gender. Consumers show interests towards products which have been marketed as sustainably packaged product and are also willing to pay a little extra for the sustainable packaging of the product they purchase. Recommendations for companies to package their products sustainably and minimizing the energy content and mass and volume of packaging materials while packaging a product are provided.

Introduction

Sustainability refers to the utilization of natural products and energy in a way that does not harm the environment. It also means meeting our own needs without compromising the facility of future generations to satisfy their own needs, additionally to natural resources, we also need social and economic resources.

Sustainable packaging of products refers to packaging of products using sustainable materials like paper, wood, glass, etc. In addition to this it also states that there should be minimum usage of packaging materials, be beneficial for the society, should meet marketing criteria for performance and price, should be sourced and manufactured using renewable energy and be easily recyclable or reusable. Sustainable packaging should perform the main functions of packaging i.e., barrier protection, physical protection, and information transmission.

Due to increase economic development and increase in population, there has been increase in demand of products, hence resulting into more generation of waste of packaging materials. It's high time to make changes in the packaging of products. Some products can't be

manufactured sustainably, but at least packaging for the same can be done sustainably. There are consumers who think sustainable packaging is unimportant and makes no difference. But companies should bring changes in their packaging patterns and educate consumers about it. This will in turn help consumers to make wise choices and purchase products with sustainable packaging. Companies should either make packaging which can be easily recycled or can be reused by the consumers. Both these forms of packaging are considered to be sustainable.

Over the years there have been development in packaging industry. There are various sustainable alternatives for packaging like corrugated air bubble pillow, cornstarch packaging, mushroom packaging, seaweed packaging etc. Companies should try to switch to such types of sustainable packaging and bring about a change for the environment and the society. Thus, sustainable packaging of products can help reduce carbon footprint on the planet.

Literature Review

G Prakash, S Choudhary, A Kumar (2019) - This research provides relevant findings about

young consumers and their response to products with ecological packaging. These findings will assist marketers in reducing the environmental footprint caused by packaging materials, helping them to retain customers as a result. From the Asian perspective, the present research is among the early efforts towards understanding the significance of values pertaining to ecological packaging.

S Boesen, N Bey, M Niero (2019) - In this study, it is investigated how well-educated young consumers living in Denmark understand the environmental sustainability of five different kinds of packaging for liquid food (milk, beer, soft drink, olive oil and skinned tomatoes) based on an on-line survey and qualitative interviews. The results of the consumer research show that consumers assess the environmental sustainability of the tested types of packaging primarily based on the material type and on what they can personally do at the disposal stage. The consumers covered in this study do, in general, not consider the impacts of production and of transport. Amongst the investigated packaging types, bio-based types and glass are perceived as the most environmentally sustainable ones, and plastic in general is perceived least favourable. Laminated cartons receive a mixed perception.

G Prakash, P Pathak (2017) - The aim of this paper is to look at how eco designed packaging affects customer responses. the idea of rational action was accustomed assess the relative value of major antecedents of eco designed packaging actions. the info of 204 young Indian consumers was analysed using structural equation modelling, and therefore the proposed conceptual modality was evaluated. The study's results indicated that private norms, mindset, environmental interest, and willingness to pay all influence purchasing intention for eco-friendly packaging. The paper also gives some fascinating insights into the perceptions of young consumers toward environmentally friendly packaging. Marketers will enjoy these important experiences as they build tailored campaigns for young consumers.

P Mishra, T Jain, M Motiani (2017) – In this paper a survey was conducted among prospective customers in major cities of eastern and western India in June 2012. As predicted by the TRA, positive relationships exist between beliefs, consequences and attitudes toward paying more for green packaging. Overall concern levels, knowledge levels and beliefs were quite high for consumers within the sample. it's suggested that knowledge plays a crucial role in developing positive beliefs about green packaging. Results of the study also indicate that buyers can pay premium for green packaging conditioned to the beliefs, though paying a premium supported knowledge and concern doesn't show sufficient support within the study.

G Martinho, A Pires, G Portela, M Fonseca (2015) - In this paper data from a 215-person online survey in Portugal was to test multiple hypotheses by contrasting two groups of consumers: one who emphasises environmentally friendly packaging and another who finds it unimportant in product buying decisions. Sex, environmental awareness, concerns about public views, a positive attitude toward green buying, and consumer action perception are factors that separate the 2 groups of consumers, consistent with the findings. Public decision-makers, packaging suppliers, and advertisers should find the results useful. However, features like price are still needed to change the behaviour of consumers with reference to encouraging the utilization of sustainable packaging.

Objectives of the Research

The primary objective of the study is to measure the level of consumer awareness and attitude towards sustainable packaging of products.

The effectiveness will be examined by testing the following which forms the secondary objectives that included the following:

- To find the relationship between consumer awareness towards sustainable packaging and age.
- To assess the relationship between consumer awareness towards sustainable packaging and gender.
- To analyse whether marketing a product as sustainably packaged changes consumers' purchase decision.

- To analyse whether consumers prefer paying a little extra for sustainably packaged product.

Research Methodology

The research was quantitative in nature and primary data was gathered with a sample size of 152, whose responses were recorded using a questionnaire. Random sampling method has been used to collect the data. The respondents were from tier-1 and tier-2 cities of India. Out of 152 respondents 63.2% were female respondents and 36.8% were male respondents. Secondary data was collected from websites and online journals.

Each response collected using a questionnaire was then fed into an electronic spreadsheet in order to collate all the responses which resulted into a raw database for the research. To understand the trend and pattern of the collected information histograms and pie charts were constructed.

After collecting the sample data and producing sample statistics, the obtained information was then tested with hypothesis using Chi-square test to assess the independent/dependent relationship between the two attributes by determining and comparing observed frequencies and expected frequencies.

Key Findings

H01: Consumer Awareness towards sustainable packaging is independent from Age.

H1   : Consumer Awareness towards sustainable packaging is dependent on Age.

Age

Value	Observed N	Expected N	Residual
18 or less	1	30.40	-29.40
19-30	130	30.40	99.60
31-40	8	30.40	-22.40
41-50	3	30.40	-27.40
50 and above	10	30.40	-20.40
Total	152		

Awareness of Sustainable Packaging

Value	Observed N	Expected N	Residual
Yes	148	76.00	72.00
No	4	76.00	-72.00
Total	152		

Test Statistics

	Chi-square	df	Asymp. Sig.
Age	409.64	4	.000
Awareness Of Sustainable Packaging	136.42	1	.000

Result – For Chi-square test to have a significant relation between two variables, the p-value should be less than or equal to 0.05. From the above test, it can be seen that the p-value is less than 0.05, i.e., 0.000. This indicates that the null hypothesis H01 is rejected and the alternative hypothesis H1 is accepted for the above chi-square test. These results show that Consumer Awareness towards sustainable packaging is dependent on Age.

H02: Consumer Awareness towards sustainable packaging is independent from Gender.

H2   : Consumer Awareness towards sustainable packaging is dependent on Gender.

Gender

Value	Observed N	Expected N	Residual
Female	96	76.00	20.00
Male	56	76.00	-20.00
Total	152		

Awareness of Sustainable Packaging

Value	Observed N	Expected N	Residual
Yes	148	76.00	72.00
No	4	76.00	-72.00
Total	152		

Test Statistics

	Chi-square	df	Asymp. Sig.
Gender	10.53	1	.001
Awareness of Sustainable Packaging	136.42	1	.000

Result – For Chi-square test to have a significant relation between two variables, the p-value should be less than or equal to 0.05. From the above test, it can be seen that the p-value is less than 0.05, i.e., 0.001. This indicates that the null hypothesis H02 is rejected and the alternative hypothesis H2 is

accepted for the above chi-square test. These results show that Consumer Awareness towards sustainable packaging is dependent on Gender.

Awareness of sustainable or recyclable packaging-

Out of 152 respondents, 148 respondents, i.e., 97.4% are aware of sustainable or recyclable packaging and 4 respondents, i.e., 2.6% are not aware of sustainable or recyclable packaging. Change in consumer decision while marketing a product as sustainably packaged-
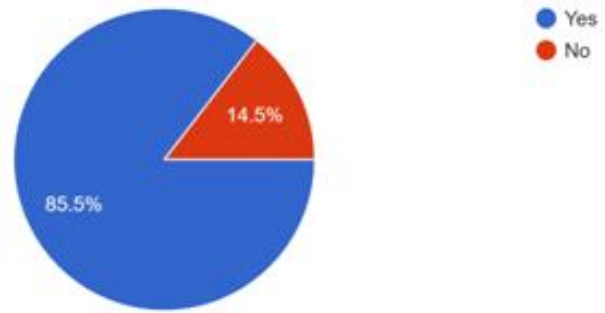
From the above figure it is seen that 130 out of 152 respondents have bought a product which has been marketed as sustainable or recycled packaged product and only 22 respondents out of 152 have not bought a product which has been marketed as sustainable or recycled packaged product.

Willingness to pay a little extra for the products with sustainable or recyclable packaging-
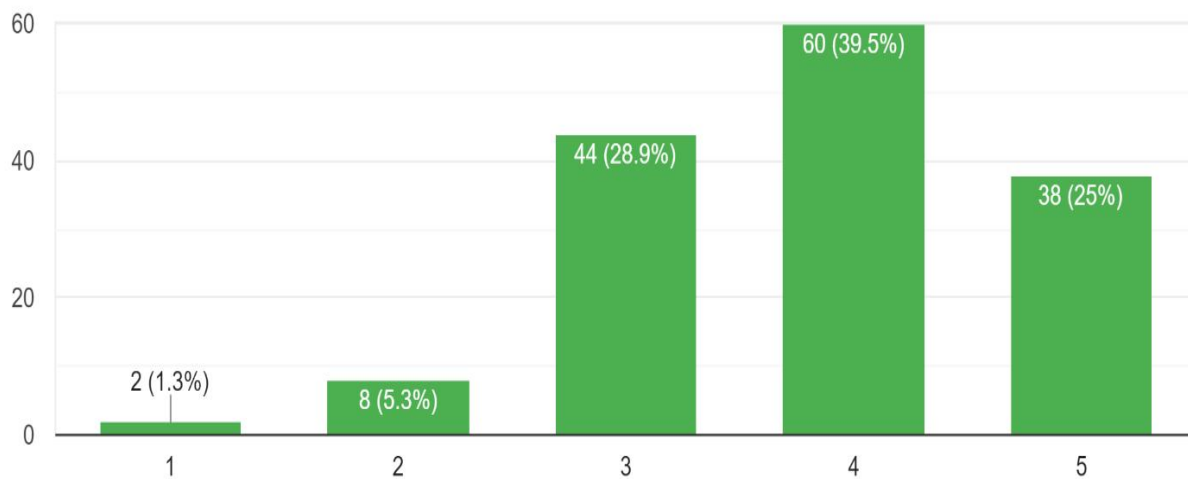
From the above figure, it can be seen that maximum respondents i.e., 60 out of 152 agree to the fact that paying a little extra for products with sustainable packaging is worth and only 2 out of 152 respondents strongly disagree to this statement.

Other Findings

Can sustainable or recyclable packaging can change consumers' purchase decision-
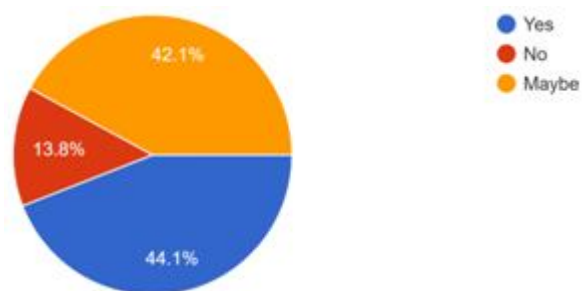
From the above figure it can be seen that maximum respondents i.e., 67 out of 152 say yes that sustainable packaging can change their purchase decision, 64 respondents out of 152 say maybe and only 21 respondents say no it cannot change their purchase decision.

Consumer behaviour while making repetitive purchase of the products-
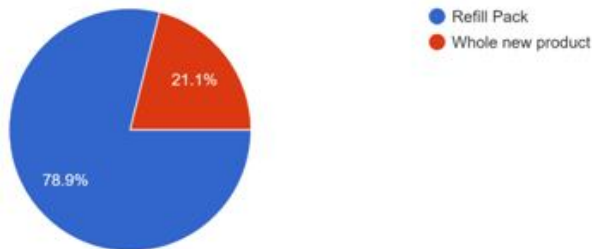
From the above figure it can be seen that maximum respondents i.e., 120 out of 152 respondents prefer buying a refill pack while making repetitive purchase of products and only 32 out of 152 respondents buy the whole new product.

Limitations

The sample size for this study was very small.

For chi-square test only two variables have been used to find the significant relationship with consumer awareness towards sustainable packaging, more variables can be used for the same.

Conclusion & Suggestions

The companies should consider that customers agree to pay a little extra for the sustainable packaging, so they should focus on cost incurred for the sustainable packaging.

The companies should consider the factors age and gender of consumers while designing the recycled or sustainably packaged product.

The companies can market their brand or product as a sustainably packaged product. This may attract customers towards your brand.

The companies should sell more of its refill packs of the products, as people prefer purchasing the refill pack rather than buying the whole new product. This helps the customers to saving money also.

The companies should spread awareness regarding sustainable or recyclable packaging in the market. This will help consumers learn more about sustainable packaging, and also brands can attract the customers to buy their sustainably packaged products.

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PERCEPTION OF STUDENTS RELATED TO JOB MARKET IN THE POST COVID-19 PANDEMIC PERIOD

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ABSTRACT

Almost a year and half, COVID-19 pandemic has affected the world drastically. Tremendous effect has been witnessed on global economy as well as other service sectors. Education sector is worst affected during the pandemic situation, especially in the developing country like India, which fails to install right infrastructure required. But then overcoming the lacunas, somehow the students and teachers have prepared themselves for online education. This system marks few errors, especially in the examination pattern. It has been witnessed that almost three semesters have been examined in online mode where knowledge of students have been assessed purely in objective manner. The reasoning and analytical skills are rarely evaluated. Cheating and lack of transparency are other core lacunas of the online examination system. Students are adopting unfair means. In the prevailing situation, many intelligent youngsters face a big problem about the future job market due to unfair competition they would face. The present paper evaluates the perception of the students related to the job market in the post COVID-19 period.

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1. Introduction

The COVID-19 pandemic has seen the downturn in the economic activities and so as in education. The closure and lockdown at every place has brought the education from offline mode to online mode that is from real classroom to virtual classroom. The education pattern and teaching pattern has been changed in the COVID-19 pandemic. But the current education pattern has few advantages and many disadvantages. The advantages were, students have learnt use of internet and technology, and the online education facilitated the non-stoppage of education even after lockdown. But there are various disadvantages of online education. The exam pattern which is taken online is not adequate as only multiple choice questions are being asked. Hence, student's practical knowledge cannot be tested. As the exams are conducted online, this gives the students chance to cheat. Many times student skips the online lecture. Further, this kind of exams and marks would bring difficulties to the student while securing the job.

For online classes a student and the teacher need a device with good quality of internet. In the process, the teacher will send the link of the mobile application, and students should also have the similar application in their device. The students join the online lectures by entering identification number and password by clicking on the link provided. But for all this there is a need of good device and strong internet connectivity which might be available in urban areas but not in rural areas.

2. Objectives Of The Study

The main objectives of the study are:

2.1. To find out the advantages and disadvantages of the present day online education system.

2.2. To find out the impact of online education on the skills and knowledge of the students.

2.3. To study the perception of the students about the job market in the post pandemic situation.

3. Hypothesis Of The Study

Hypothesis 1

Ho-The advantages of online education system are lesser than disadvantages.

H1-The advantages of online education system is at par with the disadvantages and thus there is no need of any modification in the present system.

Hypothesis 2

Ho-Online education has proved to be inadequate in imparting quality education among the students of Higher Education courses in India.

H1-Online education has reached immense success in providing quality education among the students of Higher Education courses in India.

Hypothesis 3

Ho-The students feel that the present education system would not hamper the future job market in India.

H1-The students feel that the present education system would hamper the future job market in India negatively.

4. Materials and Methods

For the purpose of the study and to fulfil objectives, the researcher has surveyed the responses to know about perception of students. Total 143 students of various streams such as arts, commerce, science and engineering were chosen for the study. They were provided with Google link to mark their responses. These students were selected on the basis of their year of passing. Those students who have cleared their final exam in the year 2020 as well as 2021; and those students who are pursuing their final year in 2021-22 were chosen for the study. This was particularly meant to study the impact of COVID on their perception about the job market. The data was analysed using graphical and tabular format and interpretation was drawn to reach the conclusion

5. Advantages of Online Education

5.1 **Parent's Attention -** This pandemic brought education online that is study from home. Students for this need to have a device with proper internet connection to attend the online lecture. As lecture is attended from home, the parents can keep an attention on their child and his studies, which was not possible for parents during offline lecture.

5.2 **Extra courses-** The online studies have saved the time of the students so they can engage their balance time in some other online courses which are available. This lockdown has brought many courses online which student can join. Student has also joined and learned from that, which is beneficial to them.

5.3 **Able to attend the lectures-** Many students who were working and simultaneously also studying they won't able to attend the lectures by visiting the college due to their job. But online lectures it just has to attend at anywhere. This student got a lot of opportunity to attend the lectures and get the knowledge while working and conducting other activities. Many students who were having school and colleges far away from their home are benefited. Many students feel comfortable to attend the online lecture then visiting the college every day.

6. Disadvantages of Online Education

5.4 **No face to face interaction-** In online lecture, teachers cannot have face to face interaction with the students. Many a times teachers are not knowing that whether the students are attending or listening the lectures or not. Students might have on the online meeting lecture and keep the mobile phone aside and play games or other activities. Teachers are unable to see the reaction of the student from which the teachers were used to judge whether the student has understood the point or not.

5.5 **Reduction in attendance-** It has been noticed that the percentage of attendance during the online lectures is reduced as compared to the offline college lectures. Students many times feel lazy to wake up early in the morning and seat on the online lecture, many time it is being seen that student sit in first 1 or 2 lecture and then subsequent lectures are being skipped. During the starting phase of online education the attendance was good but it became worse month by month. It is also observed that many students keep their online lecture on and play games, watch TV etc.

5.6 **Improper exam pattern-** The lockdown due to pandemic began from March 2020 when the academic year 2019-20 was at the end and only examination of the various schools and colleges where pending. Many institutions have taken the decision to give average marks to students as per their past performance. Further in new academic year 2020-21, the exam was conducted online by asking the multiple choice questions to

the students. Various students as well as their parents and teachers stated that this is improper way to judge the student knowledge as practical knowledge is not being tested. Students all over are cheating during the exam as they are giving it online. They use another phone to search the answers of the questions; even many students use the books during the exams. It is noted that students with low percentage and average students are also scoring the high percentage in this online exams. Many students commented that this exam pattern is not good.

5.7 **Will affect while getting the job -** Due to improper practical knowledge, the students would not be able to crack the competitive exams and job interviews.

5.8 **Non-availability of devices and technology-** To attend the online lectures as well as to appear for online exam, it is very much needed to have a proper device with the good quality of internet connection. It is been seen that various students and parents don't have good quality of devices or mobile phones. Many students are not having the proper internet connection. If one doesn't have money to eat the food, then how can he pay for the internet? This problem was one of the biggest problems mainly in rural areas where maturity of students was remaining aside from the education. Sometimes it is seen that even those students who have internet connection and devices, fail to attend the lectures because of poor connectivity. While sometimes teachers also don't even have the proper connectivity. All this forced the parents for buying the mobile phones and internet connectivity every month. This added additional cost in their monthly budget.

5.9 **The results were not proper-** The results declared during the online exam process was from the MCQs marks which won't be an actual performance of the students. While in some places it was calculated as per the average performance. Many places it has been seen that students during this pandemic situation are not being failed and being promoted by giving a Grace Mark that would be unfair means for them. Such

kind of result will also affect the students in taking admission for next academic because lot of students are getting higher percentages. Also, their job future is not safe.

5.10 **Not suitable for some subjects-** The online education and class is not suitable for practical subjects like mathematics, accountancy, information technology, chemistry, etc. For these subjects, it is very important of presence front to front. How one can show the full final account and tally the balance sheet online, also how student can make full final account in online exam. This is not an impossible but it is not too easy for each and every student to understand. For this the actual presence of student in the classroom is necessary to understand in a better way.

5.11 **Migration Affected Education-** As the lockdown was announced in the March 2020, various families especially wage earners were unable to survive in the City places. They started to migrate back to their hometown and villages. This left their student education in half. Many of them skipped the education while some still continue from villages but weren't able to attend the lectures due to poor internet connectivity at rural area. Also due to lack of income, the parents of those migrated students won't able to pay school and colleges fees, they are not being able to buy the devices and pay for internet connectivity.

7. Negative Effect of Covid-19 Pandemic on Education Sector

It has been seen that covid-19 affected everything negatively and also the education. The exam pattern and the learning pattern have changed. It is observed that the problem of migration has brought down the number of admissions in schools and colleges. Also various colleges have to reduce their fees. In turn, many institutions have fired the teachers and now they are being jobless. The pandemic has affected the income of the people. They are unable to pay for the coaching classes and some extracurricular activities fees. This affected to those sector working in coaching

classes and some extracurricular activities teaching.

The importance of years like standard 10, standard 12, graduation final year and post-graduation final years has got vanished since last two academic years of lockdown. The students are studying for the year and it has been announced that the result would be on the average marks or exam is been conducted by multiple choice questions. This has reduced the interest of the students in the studies as they know they are going to pass with the good marks even if they have not studied proper. Study of standard 11th and 12th is an important base for the college life. If any of the students fail or ignore this year studies, surely will get affected in the further studies because his base would not be clear.

Due to delay in results the admission process was also delayed and the academic year got reduced. Many universities and institutions have reduced their portion which has affected student as they didn't get the knowledge of that deleted portion. Since last two years the students are not getting the practical knowledge properly and also the practical knowledge is not being tested which is very much essential.

Not only college students but small school children also affected. How we can expect that a small kid of class 1 to class 8, will seat 4 to 5 hours continuously in online lecture and he was able to understand everything. And how teacher would keep an attention on all the children at a one time in online classroom, where she can see only limited students on the screen at a time. Therefore, the education sector has been affected very badly due to this covid-19 lockdown.

8. Perception about Job Market with Regards to Covid Pandemic

The covid-19 pandemic has affected the business organisation and trade. The bad effect of this pandemic is seen on the employment. Even qualified persons lost their job during this pandemic. Organisations are unable to pay this wages and salary to their employees and workers due to lockdown and losses in the pandemic period. This was a situation of covid-19 pandemic but before the pandemic also, getting job was one of the biggest tasks. Even a person having good qualification and practical knowledge were facing harder to get a good job with good salary. Many graduates and postgraduates were jobless. Various engineering students were also not having the job even before this pandemic and in the pandemic the situation became worst.

The education is considered as important factor to get the job. Not only degree but it is essential to have good practical knowledge. For instance if a person has the M.com degree, might be unable to tally the balance sheet and degree obtain in this lockdown exam phase is just for name sake. Even if degree gives the job, then to secure that job for long term one should have the good amount of practical knowledge.

This pandemic has brought the education online, where students are not getting the practical knowledge. The theoretical concept is only being taught in the online classroom. It is very difficult to teach the subject like accounts and mathematics on video call classrooms. Even though institutions and faculties are teaching the practical subject but students are finding harder to understand those and their doubts are not getting solved. But still the students are not making complaint about this kind of study just because the exam is also online where there would be no practical question answers, only multiple choice questions where they have to tick the answer, which they can get easily available on open book or internet. Students are scoring the high marks by copying in the online exam.

By studying this way, one can obtain the good result, high percentage, but what about practical knowledge that is essential in employment. Even students and parents also worried as they both knew that they will find harder to get the job. The high percentage marks in covid-19 pandemic has no valid acceptance in the employment market. The future of students who have pass out and study in the covid-19 pandemic is in danger.

Various students have accepted that the result has not been considered during the interview as, the interviewer states that this is lockdown exam result we are not considering this as a valid. Another problem is the students who are actually scoring the good percentage and the students who were average for having low

percentage are also scoring the similar percentage with the intelligent student. So there is no differentiation this would affect the further admission process and also for the getting the job.

9. Data Analysis

From the data collected, the following data have been noted:

Sl. No.	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
1	Covid-19 pandemic has affected education sector negatively Percentage of Total	82	48	9	4	0	143
		57.34%	33.57%	6.29%	2.80%	0.00%	100.00%
2	Covid-19 pandemic has brought new trends to the Education sector Percentage of Total	48	83	6	5	1	143
		33.57%	58.04%	4.20%	3.50%	0.70%	100.00%
3	Covid-19 pandemic has created huge openings in the job market. Percentage of Total	22	46	19	45	11	143
		15.38%	32.17%	13.29%	31.47%	7.69%	100.00%
4	Online examination was relevant option during the Covid-19 period Percentage of Total	41	57	25	18	2	143
		28.67%	39.86%	17.48%	12.59%	1.40%	100.00%
5	The results of online examination genuinely depicted the skills/talents of the students Percentage of Total	29	70	35	6	3	143
		20.28%	48.95%	24.48%	4.20%	2.10%	100.00%
6	I am more comfortable in online education pattern than attaining the college every day. Percentage of Total	14	55	32	24	18	143
		9.79%	38.46%	22.38%	16.78%	12.59%	100.00%
7	I am able to focus on my studies in a better way rather than offline mode of education. Percentage of Total	18	57	34	21	13	143
		12.59%	39.86%	23.78%	14.69%	9.09%	100.00%
8	I am sure that job market will recruit potential candidates in the future course. Percentage of Total	33	58	32	17	3	143
		23.08%	40.56%	22.38%	11.89%	2.10%	100.00%
9	Covid-19 pandemic has increased the competition present in the job market. Percentage of Total	53	61	11	9	9	143
		37.06%	42.66%	7.69%	6.29%	6.29%	100.00%
10	The future of job market is not safe due to the degrees provided during the pandemic period Percentage of Total	46	70	17	8	2	143
		32.17%	48.95%	11.89%	5.59%	1.40%	100.00%

11	I am able to take up additional/vocational courses during the Covid-19 Pandemic period.	39	52	16	28	8	143
	Percentage of Total	27.27%	36.36%	11.19%	19.58%	5.59%	100.00%

Source: From the primary data collected with the help of google forms

This research aims to find out perception of the students towards the online education and online exam. For this the primary data was collected of 143 students from 3 streams i.e. science, commerce and arts.

➢ 57.34% students strongly agreed and 33.57% agreed that covid-19 pandemic has affected the education system.
➢ More than 90% students said the covid-19 pandemic has brought new trend in the education sector.
➢ More than 47% students accept that pandemic has brought huge opening in the market, while more than 39% were against this and remaining were neutral.
➢ When students were asked about was online exam was a relevant option during this pandemic, 28.67% strongly disagreed, 39.86% disagreed, while 14% agreed to it, others were neutral.
➢ Around 70% students knew that the result obtained by such exams are not genuinely showing their skills and talents and 24.48% were neutral about it.
➢ Around 48% said they are not comfortable in online lecture and would prefer to attain the offline college, while around 32% said they would prefer online education rather than attaining the offline college and 22.38% were neutral.
➢ More than 52% students said they were able to focus on studies more during offline time and unable to focus in online studies, while around 25% said they are able to focus more during online studies, while 23.78% were neutral.
➢ Majority i.e. 48.95% agreed and 32.17% strongly agreed that, future job market is not safe for them, only 7% disagreed to this.
➢ Around 63.50% students agreed that they were able to take some additional and vocational courses during the covid-19 pandemic, while 25% disagree about it, and remaining where neutral.

Research clearly shows that this online studies and examination pattern is not beneficial for the students and their future. Majority of students also agreed with this. All talent and skill cannot be developed online. This online education will create a tough competition and big challenge for the students to get the job in the market.

Hypothesis Statement

Hypothesis	Remark
The advantages of online education system are lesser than disadvantages.	Accepted
Online education has proved to be inadequate in imparting quality education among the students of Higher Education courses in India.	Accepted
The students feel that the present education system would not hamper the future job market in India.	Rejected

10. Conclusion

From the above empirical evidence, it can be concluded, that the young graduates are really afraid of the present situation and their future in job market. They feel that the present education pattern has created an unfair competition for them not only in job market but also in higher education. It becomes the responsibility of the State Government to check with the alternative assessment pattern wherein the actual skills and knowledge of the students can be evaluated. One probable solution, especially during the pandemic times is going for face-off Vivas, where the educator can interrogate the learner on his academic knowledge and based on this performance, he/she will be scored. Many such type of options should be introduced, wherein the talent and knowledge can be given due credit.

The job market will then check only with the deserving candidates.

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SUSTAINABILITY THROUGH INNOVATION – THE FINAL STRAW!

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ABSTRACT

This paper addresses the disaster created by fostering a linear material economy on a finite planet leading us to the Sixth Mass Extinction that is already underway as human activities have pushed the planet past the last tipping point of ecological sustainability. In view of the Climate Crisis as a substantial environmental influence on businesses operating today, it would not just be wise for managements to overhaul their ventures to focus on ecologically and socially sustainable innovations as an adaptation to the ecological crisis, but probably the only option available, the window for which is open for a really short time. To do this across the economy, the inherent 'spirituality' will have to be awakened, not just in businesses but also among the consumers. This shall lead to higher values including 'minimalism'. Sustainability will have to be 'promoted and sold' through the battling of 'desires'. Desires that have led us to plunder the planet beyond our rights. Innovation will have to build ecologically sound products in the new normal.
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Introduction

As we watch the sun go down, evening after evening, through the smog across the poisoned waters of our native earth, we must ask ourselves seriously whether we really wish some future universal historian on another planet to say about us: 'With all their genius and with all their skill, they ran out of foresight and air and food and water and ideas,' or, 'They went on playing politics until their world collapsed around them.'

U. Thant, United Nations Secretary General [3]

1. Current ecological crisis & its economic cost.

Climate Change[1] is witnessed all around us from the subtle impacts of melting Arctic Permafrost to more obvious events like the glacial breach in UttaraKhand or the massive flash floods in Germany and Belgium to the Heat Dome that pumped up temperatures to a killing 50 degrees Celsius in Canada and America. Millions of dollars' worth of property was damaged and human lives lost in the recent past. It is no rocket science to grasp that ecological health and that of the economy are interconnected. It has been a sadly myopic approach of the world political leaders and the industry captains to have ignored this vital relationship. Sustainability is not an option anymore, it's our only way to survival.

2. Concept of 'sustainability' – ecological & otherwise.

To begin with sustainability [2] assumes 'non-permanency'. With the premise that most resources will be not be around forever, we need to exploit or alter them only to the extent it does not jeopardise the existence of those who come after us and depend on the same elements as us.

A business that looks forward to living happily ever after needs to worry about sustainability. It will be only as healthy as its resource base a hundred years from now.

If we look at the economic health aspect in the long-term too, it will be easy to prove that sustainability does indeed translate in to monetary savings directly. A business adopting sustainability enjoys better credibility and trust of the general public that help it to survive a crisis. In happy times, the "we care" image helps to attract more buyers, investors, business partners and even the cream of the workforce.

A hundred years ago we would not think of 'sustainability' as an issue as the planet was healthy and we lived a 'backward' life close to the jungles. Ironically, that 'backward' seems to be the only way 'forward' today! Scientist-Physicist Dr Vanadana Shiva exhorts us to 'get our hands dirty', to go back to natural ways of life, to grow our own food forests from native seeds. Engineer-Innovator Sonam Wangchuk, also appeals all of us to "live simply"! As the

planet has crossed all the tipping points [8] to the ecological sustainability, businesses have no option but to reinvent themselves right from the core.

Main Body

3. Ethical rationale of sustainability.

"The ethical element is part and parcel of the integral process of decision making on a business management problem."[3]

It is easy to understand and fair to state that the rights and dignity of every entity on this planet must be respected. Take the logic a little further across generations and we can understand Greta Thunberg's rage at all people from the previous generations who caused the planet to start dying a pitiable death from massive environmental degradation[4] causing global warming, wild fires, floods and draughts, which we are witnessing globally today. While we go about extracting resources, processing and consuming them to make our lives comfortable and the businesses richer, we are ripping off the 'life support system' of the future generations.

All along human history, we have chosen to play God and altered the natural environment around us to suit our whims and fancies calling it 'development' or 'progress'. We walked out of the jungle and the natural food chain. We created an artificial world of our own entirely based on the greed for 'money', which too was an invention of the human brain. But in the myopic view we failed to see that 'infinite economic growth on a finite planet was in itself a myth!'

In Mahatma Gandhi's view businesses are 'Trustees' of the resources of the planet and while they serve consumers with a pure motive they must take utmost care of all the stakeholders involved, including the natural ecosystem. In simpler words, "There is enough on this planet for everyone's need but not for everyone's greed."

4. Innovation

4.1 Concept of innovation & its relevance.

Innovation [5] refers to anything 'new'. Business managements need to realign their vision & missions to the new reality of climate collapse and then derive their organisational goals. 'Sustainability' and 'Equity' are bound to feature in as the bedrock on which the premise of a business plan is based. This implies that every decision a business takes needs to evolve to be creative enough to satisfy the new sustainability parameter.

A sea change will be needed. In the way a business is started, land acquired to minimise degradation & displacement, inputs gathered to minimise depletion to ensure long-term procurement, clean power to designing eco-friendly final products that biodegrade on disposal. To minimise on transport and warehousing expenses as these are inversely related to sustainability, businesses need to go local and seasonal.

Scrapping percentage profits as a measure of success and adopting carbon footprint and quality of life of consumers as the new parameters, is essential. Their promotional and marketing communications too will need to tap in to the 'higher aspirations' [6] of the consumers that will create a ready market for the new sustainable products.

A lot of generic demand will need to be created for the 'intangible' as the society realigns its collective goals to a higher philosophy-of-life, based on ideas of spirituality [5] and resultant sustainability. These are partly being promoted by the businesses and partly getting drilled in to the society's psyche as nature unleashes its wrath in the form of climate disasters with greater intensity and frequency [8].

4.2 Social Entrepreneurship

Innovation when used to make a big impact among the masses can be called as Social Entrepreneurship. Just like David Ogilvy believes that the real power of advertising is in its ability to induce reforms, it would not be as overstatement to say that the real power of innovation lies in its ability to uplift the masses out of a recurring social, ecological or economic problem. It is a known fact that it's not just money that drives innovation. Entrepreneurs are attracted by an array of motives from ability to provide decent livelihoods to ensuring power and affordable healthcare to the marginalised. From Nano that was conceptualised to provide safe transport to the lower income group families to the Ultrasonic Solar-powered snake repellent stick

used by the Indian farmer or the Mitticool refrigerators that run without power for the hot Indian interiors to drones that plant seeds; are all examples of innovation that rode on the wave of deprivation.

This concept is relevant here as today's times demand that businesses look away from the economic motive of 'self-aggrandisement' which has led us to 'self-annihilation' as a race.

5. Findings

The cause of the fall.

Simply put, the cause of ecological and resultant, eventual economic collapse is our myopic definition of progress. The idea of infinite growth of the material economy measured in GDP and per capita income & expenditure on a planet with finite resources is clearly illogical to begin with.

To validate your status in society, one has to spend. The higher the spending, higher is the investment in to plundering some more of the virgin planet making life impossible for the indigenous people who depend on the natural resources. This displaced population now needs to be given jobs in factories so investments must expand further and displace some more independent indigenous people. The viscous circle continues. But everything we demand and gets produced has a cost which we neither see nor pay for in money. It's the ecological [7] and human cost. Had we incorporated that early on most of the products we buy would be at least twenty times more expensive and hence probably would not be demanded in the massive quantities as it is today. At every stage from sourcing of raw materials, it's processing and distribution, all cause depletion, degradation and pollution. At disposal too the trash ends up in a land fill or an incinerator.

Big corporations have bigger blame to take as a lot of them simply dump their unsold stock in landfills instead of giving it off to charities or orphanages as they want to protect their brand value. That's a sheer waste of resources which are now sitting in a landfill leeching toxins contaminating our underground source of water causing cancers and tumours we haven't started talking openly about.

6. The cure.

6.1 Paradigm shift from GDP based definitions to holistic well-being based growth.

Societies ravaged by ecological disasters may want to look at life differently. The business world that was once the centre of their desires is now the unnecessary evil that brought on the Sixth Mass Extinction. These findings and resultant warnings about global climate collapse [8] leading to collapse of farming, acute water shortages etc. had been kept under wraps by the nexus between selfish capitalists, greedy Governments and the irresponsible media.

With fresh awareness of this unsettling development people who have been jolted out of their sweet 'consumerist slumber' are going to demand less of some products and none of a lot of them. This poses a new challenge for businesses that want to remain invested in the new economy. Not to mention the shortage of most of the vital inputs that traditionally go in to a business like power, water, metals & minerals and the raw materials that all come from nature.

Powerful nations of the European Union have decided to disown the capitalist's scale to measure progress and explore more holistic parameters to judge the health of a nation. The European Union's declaration of Climate Emergency brings sustainability on the table for all

involved. So does the four plus decades of work on Ecocide Act by all including late Ms Polly Higgins, the Earth Lawyer.

A society that has evolved beyond the superficial gratification of desires to deeper spiritual aspirations of the consumer [6]. Every product that the consumer pays for may require validation on several levels from the economic viability, social acceptance to ecological sustainability and ethical soundness. All of these are developments leaning in favour of those businesses that are open to committing and redirecting resources to sustainable alternatives. We need to unlearn the obsession with 'standard of living' and learn to be aware of 'quality of life'.

7.2 Circular Economy – Essentially Local. `

It's not the first time this concept of a circular economy has been proposed. But it's the most suitable alternative at the moment. A linear economy on a finite planet is a no-brainer. Mahatma Gandhi mentioned something similar in his article 'India of my dreams' where he promoted a self-sufficient village economy. Everything that is needed by the people of a village is produced within it with local resources.

This needs immense amounts of innovative skills to reorient every function of business right from how we source our inputs to how we process them with local and traditional know-how and also how the same is distributed among a local consumer base at a much more affordable price as most of the costs of transport, warehousing and promotion are eliminated to a large extent.

Sustainability is the foundation on which such circular economies are to be built. Everything comes from nature and goes back there in the same harmless way as it came. Research & Development have only done half-baked jobs so far. The intelligent and far-sighted know that creating new materials from nature is good but if we cannot put it back there in the same form at disposal stage then we as scientists have failed. If we had learnt to 'reverse engineer' all our complex products and machines we would not be needing to eject solid waste in to space, dump toxic chemical waste in to the oceans, secretly export lead laced e-waste to third world countries and press plastic and PVC waste in to our landfills.

7.3 Innovations will sweep us off our foundations …to lay newer & stronger ones!

New ideas have a tremendous scope to take us closer to the forced wisdom to live closer to nature and blend in rather than compete and stand out. Happiness quotient and well-being will be more a measure of progress of a nation and its organisations than ever before. This means innovations will have to pass through the rigorous tests of ecological sustainability, social relevance as well as economic gain.

Even ideas can be sold. Provided they fit the bill. A new world order where 'Minimalism' is not a hermit's philosophy but the way the masses live and shop. For a business to make its place in a minimalist society / economy, a substantial amount of creativity will need to be pulled in to use. For a minimalist, sustainability is one of the core values. Everything a business does will be watched through the lens of its sustainability quotient.

A technological society has two choices. First it can wait until catastrophic failures expose systemic deficiencies, distortion and self-deceptions…Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures.

M. K. Gandhi [3].

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THOUGHT FUSION AND CONTROL STRATEGIES OF OCD, DEPRESSION AND HEALTHY POPULATION

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ABSTRACT

Obsessive-compulsive disorder is a chronic disabling condition, and the lifetime prevalence is reported to be up to 3 %forgeneral population. Patients with OCD experience sudden intrusion of unwanted thoughts or unpleasant images into consciousness which result into obsessions thatare often accompanied by a profound sense of dire and the urge to perform specific compulsions. While depression is characterized by a loss of interest in everything. This study is an attempt to provide novel information about thought fusion and thought control strategies of patients with obsessive compulsive disorder and depression. The findings of the present study indicated that in patients with OCD increased thought fusion tends to decrease the use of distraction, self- control and reappraisal as thought control strategies and that patients with OCD involve more in thought fusion than patients with depression and the healthy controls. Patients with depression were observed to use worry in thought control strategy more than their counterparts. From the clinical perspective, thought fusion and thought controlare considered to bethe major aspects of OCD. An important viewpoint of treatment is the understanding of OCD with respect to cognitive fusion and thought control which will ultimately lead to a better outcome of metacognitive therapy and acceptance and commitment therapy.

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Keywords: OCD, Depression, Thought Control, Thought Fusion

Introduction

Obsessive-compulsive disorder is a chronic disabling condition, and the lifetime prevalence is reported to be up to 3 %for general population. Patients with OCD experience sudden intrusion of unwanted thoughts or unpleasant images into consciousness which result into obsessions thatare often accompanied by a profound sense of dire and the urge to perform specific compulsions. Compulsions refer to the actions performed repetitively, in a typical manner,which are performed a specific number of times or according to specific private rules, that the individual isfeels an urge to complete, even after the acts are perceived to be excessive.[1]

In the model and treatment of OCD, two domains of metacognitive beliefs are implicated:

(a) the significance of thoughts and feelings,and

(b) the need to perform rituals.

A range of different themes may be identified within the first domain. For example, beliefs about intrusions can involve following themes:

(i) thought-action fusion (TAF); "if I think about stabbing him, I probably will stab him",

(ii) thought-event fusion (TEF); "If I think of the Devil, the Devil will appear or if I think I've abused her, I probably have done so", and

(iii) thought object fusion (TOF)

an example is the belief that "feelings of unrest" can be transferred into books, thus contaminating them such that the feeling can never be escaped when the infected books are used.[2]

Thought control strategies mean a method for controlling unwanted and undesirable thoughts. Strategies people use to cope with disturbing thoughts are divided into five classes: punishment, reassessment, social control, anxiety and inattentiveness.[3]According to the psychodynamic approach OCD was initially termed as "obsessional neurosis". Freud considered the disorder as a conflict between the ego and super ego. As a result of

this people with the disorder end up using defense mechanisms such as isolation, undoing and reaction formation etc. As stated by him an individual having OCD exhibits repressed aggressive impulses that is shown as uncontrollable maladaptive behaviors.[4]

As per the behavioral theory, OCD was based on learning theory especially the two-factor model of fear and avoidance presented by Mowrer. According to this model normal intrusive thought, images, or impulses come to be associated with anxiety through classical conditioning so that whenever an intrusive thought occurs, anxiety increases. The person then learns, through operant conditioning, to reduce obsessional anxiety by escaping or avoiding stimuli that evoke obsessional thoughts. So, a person performs the compulsive behaviors to escape from obsessional anxiety and is negatively reinforced by the reduction in anxiety that it contains.[5]

Material & Methods

Objective: To study thought fusion and thought control strategies in patients with obsessive compulsivedisorder and depression.

Sample: A total sample of 60 caseswas collected from Government Medical College & Hospital (GMCH), Chandigarh OPD-Psychiatry, out of which 20 cases were obsessive compulsive disorder, 20 cases were major depressive disorder as per Diagnostic and Statistical Manual of Mental Disorders (DSM V) and another 20 sample were healthy control population.

Inclusion Criteria for study group

1. Those with the diagnosis of OCD and depression as per DSM V
2. Those who give consent for the participation
3. Both the genders male and female
4. Age range 18-45 years.

Exclusion Criteria for study group

1. Those having suicidal risk or psychotic symptoms.
2. Those having any co-morbid psychiatric disorder.

3. Those having any organicity like epilepsy, head injury and other neurological disorders.
4. Those having any chronic or terminal illness.
5. Those having substance dependence.
6. Those practicing yoga and meditation.
7. Those undergoing electroconvulsive therapy (ECT).

Inclusion Criteria for healthy controls

1. Those who give consent for the participation.
2. Those who fall between 18-45 years of age.

Exclusion criteria for healthy controls

1. Those having any neurological illness like epilepsy, head injury and other neurological disorders.
2. Those having any terminal illness.
3. Those practicing yoga and meditation.
4. Those having substance dependence.

Study design: An exploratory, cross sectional & co relational design were applied. The research design used was multi group, control group and quasi experimental.

Tools

1. Yale- Brown OCD scale [6]

This scale has been developed by Goodman et. al in 1989. It is a 10-item scale designed to measure the severity and type of symptoms in people with obsessive-compulsive disorder (OCD) over the past seven days. The symptoms assessed are obsessions and compulsions. This scale is useful in tracking OCD symptoms at intake and during/after treatment. The measureYale- Brown OCD scale reports to have satisfactory psychometric properties and good standard measure of obsessive–compulsive symptom severity.

2. Mini International Neuropsychiatry Interview (MINI 7.0) [7]

It is a brief diagnostic structured interview, designed to diagnose DSM-IV and ICD-10 psychiatric disorders developed by Sheehan, et al., 1998. It is fully structured to allow administration by non-specialized interviewers. MINI is divided into modules corresponding to diagnostic categories such as

major depressive episodes, dysthymia, mania/hypomania, panic disorder, psychosis, social phobia, obsessive compulsive disorder, post-traumatic stress disorder, anorexia nervosa, bulimia nervosa and generalized anxiety disorder etc. The MINI Plus employs different time frames for various disorders: current, past, or lifetime. Psychometric examination of the MINI shows acceptable test-retest and inter-rater reliability.

3. Beck Depression Inventory (BDI-21)[8]

The BDI is a 21-item inventoryassesses the severity of depression in an adult population. It was initially based upon clinical observation and description of symptoms frequently experienced by depressed psychiatric patients. Clinical interpretation of scores is as follows: 0-9 is considered to be within the normal range; 10-18 indicates mild to moderate depression, 19-29 indicates moderate to severe depression and a score of 30 or more indicates extremely severe depression. Alpha reliability coefficients range from.76 to.95 in psychiatric samples and from .73 to .92 in non-psychiatric samples indicates that BDI has good internal consistency.

4. Thought Fusion Instrument(TFI)[9]

TFI is 14 item self-report instrument measuring metacognitive beliefsregarding the meaning and power of thoughts. It was designed to assess the three types of thought fusion implicated in the metacognitive model: Thought Action Fusion (TAF),Thought Event Fusion(TEF) and Thought Object Fusion(TOF). It reported good internal consistency with a Cronbach's alpha 0.89 for the scale. Test-retest reliability was acceptable with a coefficient of 0.69.

5. Thought control questionnaire (TCQ)[10]

TCQ measures the frequency of using different strategies to control negative unwanted thoughts. The 30- item self-report instrumentassesses thought control in five empirically derived subscales: distraction, punishment, reappraisal, social control, and worry. The responses are scored on a 4-point Likert scale from 1 = "never" to 4 = "almost always". The internal consistency was reported

α = .8. Test-retest reliability was .83 indicating that it is a stable measure.

Procedure

Subjects were inducted from the outpatient services of the Department of Psychiatry, Government Medical College Chandigarh. Three types of population were included in the study. A consecutive total sample of 60 who fulfilled inclusion and exclusion criteriawere collected from OPD- Psychiatry. Out of which 20 samples were diagnosed with OCD, 20 samples were diagnosed with Depressive disorder and remaining 20 were healthy control population. The patients were explained the purpose of study properly in their vernacular language. It was emphasized that participants in the study should be voluntary and that they can withdraw anytime if they wish to. The OCD population wasadministered Socio-demographic data sheet, Yale- Brown OCD scale, Thought Control Questionnaire (TCQ) and Thought Fusion Instrument (TFI) to assess their socio-demographic details, to rule out severity of OCD, thought control strategies and thought fusion for them. Similarly, the population with Depressive disorder was administered Socio-demographic data sheet, Beck Depression Inventory (BDI), Thought Control Questionnaire (TCQ) and Thought Fusion Instrument (TFI) to assess their socio-demographic details, to rule out severity of depression, thought control strategies and thought fusion for them. The healthy control population was administered Socio-demographic data sheet, MINI (7.0), Thought Control Questionnaire (TCQ) and Thought Fusion Instrument (TFI) to assess their socio-demographic details, to rule out psychiatric morbidities, thought control strategies and thought fusion for them. The subjects were thanked at the end of the study. The data of both study and healthy control groups was entered and analyzed using statistical package for the social sciences (SPSS). The assessment proceduretook about 60-90 minutes with each participant in both groups each.

Statistical Analysis

The statistical analysis was carried out using the software statistical package for the social

sciences (SPSS -16) . The whole sample was subjected to descriptive statistics such as mean, standard deviation, frequencies and percentages to identify the sample characteristics. Categorical data was compared using Chi square test, ANOVA and post hoc was used to find out the significant differences between three groups. Correlation was used to identify the relation among the variables.

Group	N	Mean	SD
OCD patients	20	29.00	8.651
Depression patients	20	35.00	8.329
Healthy control	20	27.00	8.727

Table 1 shows mean age for various groups of patients, i.e. patients with OCD, depression and healthy control group. The mean age of patients with OCD is 29.00 ± 8.651, depression is 35.00 ± 8.329 and healthy control is 27.00 ± 8.727.

Results

Table 1: Mean age and SD of OCD and Depression patients and healthy controls

Table 2:Comparison of thought control strategies of OCD and Depression patients and healthy controls

Variables		N	Mean	SD	F	P value
Worry	OCD	20	12.70	4.473	5.884	.005*
	Depression	20	16	4.267		
	Normal	20	11.80	3.412		
Distraction	OCD	20	8.15	2.412	137.581	.000**
	Depression	20	7.40	1.273		
	Normal	20	22.35	4.848		
Self- control	OCD	20	9.45	2.625	49.409	.000**
	Depression	20	10.55	3.000		
	Normal	20	20.45	5.356		
Punishment	OCD	20	11.15	3.200	.093	.912
	Depression	20	10.75	3.567		
	Normal	20	11.05	2.259		
Reappraisal	OCD	20	8.80	2.628	67.078	.000**
	Depression	20	8.65	1.182		
	Normal	20	19.80	5.317		

*Significant at 0.05 level

**Significant at 0.01 level

Table 2shows ANOVA test applied on domains of thought control questionnaire for all the three populations namely OCD, depression and healthy controls. The result indicates that there is significant difference among the three groups on all the subscales except punishment. It was further observed thatthe patients with depression use worry in thought control strategy more than their counterparts. On the contrary healthy controls were seen to use distraction, self-control and reappraisal more than OCD and depression groups.

Table 3:Comparison of Thought fusion in OCD and Depression patients and healthy controls

Variables		N	Mean	SD	F	P value
Thought fusion instrument	OCD	20	41.50	161.548	119.913	.000**
	Depression	20	25.00	17.622		
	Healthy control	20	6.00	7.539		

*Significant at 0.05 level

**Significant at 0.01 level

Table 3 shows ANOVA test applied on thought fusion instrument (TFI) in all the three groups which are OCD, depression and healthy controls. The results show that the three groups differ significantly on the scores of thought fusion instrument. It further indicated OCD patients were more involved in thought fusion

then rest of the two groups which are

depression as well as healthy controls.

Table 4: Relationships among various subscales of thought control and thought fusion

Variables	Distraction	Self-control	Worry	Punishment	Reappraisal	TFI
Distraction	1	.889**	-.300*	.122	.908**	-.407**
Self-control	.889**	1	.-274*	.058	.849**	-.481**
Worry	-.300*	-.274*	1	.134	-.301*	.012
Punishment	.122	.058	.134	1	.061	.177
Reappraisal	.908**	.849**	-.301*	.061	1	-.376**
TFI	-.407**	-.481**	.012	.177	-.376**	1

*Significant at 0.05 level

**Significant at 0.01 level

Table 4shows inter-correlation among all the domains of thought control questionnaire, and the thought fusion instrument. It is found that there is a positive correlation between distraction and self- control, distraction and reappraisal, self-control and reappraisal which means the use of distraction technique improves self- control as well as reappraisal. Likewise, when self-control improves, distraction and reappraisal alsoimprove and vice-versa.

Negative correlation is observed for the relationship between distraction and worry, distraction and TFI, self-control and worry, self-control and TFI, worry and reappraisal, reappraisal and TFI and TFI and self-control which indicateswhen worry is applied as a thought control strategy the use of distraction, reappraisal and self- control decreases. Likewise, with the increase in thought fusion a decrease in the use of distraction, self-control and reappraisal is observed.

Discussion

The present study was conducted to study the patterns of thought fusion and thought control strategies in patients with obsessive compulsive disorder and depression.

The study was comparative in nature regarding how these variables differ in OCD, depression and healthy controls. The diagnosis of OCD and depression was made by experienced consultant psychiatrists using as per DSM V. After rapport building and consent from all the participants was taken. Thought control questionnaire and thought fusion instruments were used to find out thought fusion and thought control strategies of the participants.

The result also shows that patients with depression use thought control strategy of worry more than patients of OCD and healthy controls. Based on systematic review it was found that there was a significant positive association between worry and rumination in depression.[11] Similarly the use of worry to control unwanted thoughts is associated with proneness to emotional problems.[12]

When considered for distraction it was found that healthy controls are more often able to use distraction as a thought control strategy whereas patients with OCD and depression are not able to use it as effectively as healthy controls. It is also evident from previous researches that patients with OCD are less likely to use the adaptive strategy of distraction than non-anxious or healthy controls.[13, 14]

In the reappraisal subscale of thought control questionnaire, the results found a significant statistical difference among the three groups which indicates that healthy controls are more able to use thought control strategy of reappraisal than patients with OCD and depression. This may be attributed to use of adaptive thought control strategies by healthy controls. It is seen in previous researchesthat reappraisal successfully reduced the late positive potential in healthy controls whereas patients with OCD failed to do so.[15, 16, 17]

With respect to self-control as a thought control strategy, the result of the current study found that healthy controls were able to use it more than OCD group and depression group. Previous researches also found that when people with OCD negatively interpret the consequences of not being able to exert self-control over their thoughts, it gives a way to the pathogenesis of obsessional problems which gives rise to the increased awareness of the intrusive thoughts that needs to be controlled[18]. Similarly, in another study, it

was found that when patients with OCD deliberately try to suppress the thoughts, it was associated with its increased frequency during and after the process of suppression. The contradicting effects of thought suppression resulting in failure in controlling thoughts and because of some more reasons like previous unsuccessful attempts at thought control result in decline in mood state. Adding to it the failed attempts in controlling unwanted thoughts, this may result in increased sense of responsibility and personal importance related to such thoughts. [19]

The result also found that the three groups differ significantly on the scores of thought fusion instrument which means the subjects in OCD group were more involved in thought fusion then rest of the subjects in other two groups. Consistent with our results, previous research also found that certain thought fusion beliefs evolve toward more complex metacognitive beliefs, which ultimately lead to the development of OCD symptoms.[20]

The results also showed correlation between all the domains of thought control questionnaire, and the thought fusion instrument. A positive correlation has been found between distraction and self- control, distraction and reappraisal, self-control and reappraisal which means when the use of distraction technique improves; use of self-control as well as reappraisal also improve. Similar results are seen in previous research, that severity of OCD symptoms is statistically significant and positively related with distraction and worry thought control strategies[21].

A negative correlation is found between distraction and worry, distraction and TFI, self-control and worry, self-control and TFI, worry and reappraisal, reappraisal and TFI and TFI and self-control. This means that the use of worry as a thought control strategy decreases the use of distraction, reappraisal and self-control. Likewise, when thought fusion increases, use of distraction, self-control and reappraisal decreases. These findings indicate that use of thought fusion does not let patients employ adaptive thought control strategies. An earlier study found that thought fusion beliefs and thought control strategies can be maintaining factors of OCD which also supports the meta cognitive model of OCD.[22]

The results of the current study indicate that increased thought fusion tends to decrease the use of distraction, self- control and reappraisal as thought control strategies and that patients with OCD involve more in thought fusion than patients with depression and the healthy controls. The use of thought control questionnaire shows differences in use of different thought control strategies by all the three groups.

Our study results contribute substantially to the understanding of OCD and depression with respect to the cognitive fusion and thought control which will ultimately lead to a better outcome of metacognitive therapy and acceptance and commitment therapy.

Conclusion

This study provides novel information about thought fusion and thought control strategies of patients with obsessive compulsive disorder. The findings of the present study indicated that in patients with OCD increased thought fusion tends to decrease the use of distraction, self-control and reappraisal as thought control strategies and that patients with OCD involve more in thought fusion than patients with depression and the healthy controls. The analysis of thought control questionnaire showed differences in use of different thought control strategies by all the three groups.

From the clinical perspective thought fusion and thought control are considered to be the major aspects of OCD. An important aspect of treatment is the understanding of OCD with respect to cognitive fusion and thought control which will ultimately lead to a better outcome of metacognitive therapy and acceptance and commitment therapy.

Limitations

1. The study had a small sample size.
2. Specific regional characteristics of the population under study may lead to restriction in generalization.
3. Medication use was not controlled in the present study and the patients were taking a wide variety of medications at the time of testing, therefore, difficult to know how

pharmacological management might impact the present findings.

Strengths

1. The study had been conducted using well-defined homogeneous groups.

2. To maintain the homogeneity between group, they had been matched by gender, age and education.
3. Standardized tools have been used.
4. This study also helps in understanding OCD in the light of thought fusion and thought control, which can lead to a better outcome in metacognitive therapy.

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A STUDY ON EFFICIENCY OF WORKING CAPITAL MANAGEMENT AND FINANCIAL PERFORMANCE WITH REFERENCE TO INDIAN MANUFACTURING COMPANY (BRITANNIA LTD)

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ABSTRACT

The current study analyzes the efficiency of working capital management and monetary execution of Britannia Ltd. for the time of year 2011-2020. The examination depends on secondary information and it has been extracted from Capitaline Database for the financial year 2011 to financial year 2020. Quick ratio (QR), current ratio (CR), debtors' turnover ratio (DTR) and fixed assets turnover ratio (FATR) are selected as an independent variables on return on net worth (RONW) as a dependent variables. The efficiency of WCM and firm performance examined by figuring Pearson's Correlation Coefficient, and Multiple Regression Analysis. The consequence of the connection revealed tight negative relationship between QR, CR, FATR and RONW while DTR having positive impact on RONW.

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Keywords: Working capital administration, working capital factors, return on total assets or return on net worth (RONW), Britannia Ltd., Multiple regression analysis.

1. Introduction

Working capital administration is a significant component of monetary administration and considered as a lifeblood for most association. Working capital is the contrast between current resources and current liabilities and the principle point of this is to deals with the short-term obligations. It requires to be observed timely and managed in a complete, real-time and proactive manner. For smooth business operation, all the departments of the organization should manage their working capital efficiently and also keep going the activities to support the strategic goals and growth with a view to achieving their business objectives. In finance management, working capital management and optimization deals as an important keys which guarantee that a firm can deal its monetary commitments, cover its expense of wages and supplies as well as improve its liquidity.

James S. Sagner (2001) believed that in todays' scenario the role of working capital management play in a growing field, involving marketing managers, financial managers, account receivables and account payables managers, order-entry, invoicing supervisors and other staffs.

As per Gitmen (2009), working capital administration is fundamentally about how to deal with the short-term obligations and teach to balance between each components of working capital at optimum level as it includes the process of WCM decisions about different aspects of inventories, cash investment, managing of receivables and payables. Croci & Petmezas (2015), clarified that WCM includes a compromise among benefit and liquidity hazards and is similarly significant in worldwide cutthroat business. Further said that an efficient working capital management helps in avoiding liquidity risk and it has important role in financial crisis.

Fess, P. E. (1966), provided two types of analysis; firstly talked about the specific amount of working capital management for a specific time that will represent the rough idea of profit margin or buffer which will be reserved to meet the current maturing obligations. Secondly, the author discussed about the flow of working capital in which tried to balance the past flows with the future flows of working capital. Mueller, F. W. (1953), pointed out the three problems in the definition of working capital administration; which means of corporate working capital, term of liquidity and the sources of liquidity. Many creators characterized that functioning capital management is the current resources over the current liabilities yet in his examination he explained two aspects of the

problems; one is related to the function and other related to the proprietorship.

Sundar, N. (1980), said that an efficient working capital management has always been organized by well-managed enterprises as wide for their growth. Furthermore said that an efficient management of working capital can help in smooth operations of business at optimum level, finance it and have control over it.

Company Profile – Britannia Ltd

Britannia Industries Ltd. is an Indian food and refreshment organization. It is one of India's most seasoned leaving organizations, established in 1892 and settled in Kolkata. It is presently a piece of Wadia group headed by Nusil group. The organization was set up by a gathering of British money managers with a venture of Rs.295. Afterword, the undertaking was procured by the Gupta Siblings, for the most part Nalin Chandra Gupta, a lawyer and worked under the names V.S. Brothers in 1918. Holmes, an English financial specialist situated in Kolkata, was taken on as an accomplice and The Britannia Biscuit Company Ltd. was dispatched. Presently, the name of organization changed "Britannia Industries Limited" in 1979.

2. Literature Review

Paul, P. and Mitra, P., 2018, analyzed the impacts of working capital administration on productivity of the firm regarding the Indian Steel Industry. The study considered about four free factors; current proportion, quick proportion, account holders' proportion and finished production turnover ratio which is set apart as the sign of the functioning capital while return on resources addressed the profitability of the business and proceeded as a reliant variable. The study was directed for the time of 17 years from the financial year 2000 t0 2016. Researchers developed factual model with a view to maintaining the connection between working capital administration and productivity of the Indian Steel Industry and investigated information by utilizing board information relapse or panel data regression. The examination uncovered that the beneficial outcome between quick proportion and debtor's ratio on return on assets.

Sharma, A. K., & Kumar, S. (2011), checked the impact of working capital on firms' productivity of Indian firms. For this, specialists taken a sample of 263 non-monetary firms which depends on BSE 500 firms. The information has been gathered from the *Capitaline database* and *CMIE-prowess database* for the monetary year 2000 to monetary year 2008 and addressed by applying OLS multiple regression analysis. The outcome coordinated that there was a negative connection between inventories of number of days and number of record payables though, account receivables and cash conversion period corresponded decidedly. In conclusion, the investigation contributed the leaving writings by exploring the impact of working capital administration on profitability regarding developing business sector like India.

Ukaegbu, B. (2014), led an examination on meaning of working capital administration and corporate profitability with the reason to examine its relationship across the countries with deferential industrial levels. Based on quantitative approach, the data has been gathered from the financial statement of the selected manufacturing firm such as; Egypt, Kenya, Nigeria and South Africa. The investigation thought about data from Orbis Database for the period of 2005-2009 and represented through Pearson's Correlation and Multiple Regression Analysis. The study uncovered a negative association between the money change cycle and net working benefit. It proposed that a firm manager can make a positive incentive for investors by overseeing days customers settle their accounts, sell off the inventories, settled the payments to supplies as much as possible.

Adekola, A., Samy, M., & Knight, D. (2017), tried to distinguish the job of working capital administration with the intent to enhance the profitability and liquidity level of the organization. The study considered 50 Nigerian- based non- monetary companies for the financial year 200-2011 and interpreted data by applying ANOVA. The components of working capital management were; ARP, APP, ITD, CCC, CR, FS, SG, DR whereas, GOP and NOP compiled as profitability level which is known as dependent variables of the firm.

The investigation uncovered negative connection between cash transformation cycle (CTC) and gross just as net operating profit (GOP & NOP) and on other hand, it also existed positive relationship between current ratio (CR) and (GOP & NOP). Ultimately, the examination presumed that the connection among productivity and liquidity was neither inward nor straight and was influenced by the sector within a firm operated.

Padachi, K. (2006), coordinated an investigation on 'patterns in working capital administration and its effects on firms' presentation' and through this paper the study attempted to analyze the foundations for a particular contrasts between the businesses. The study took an example of 58 little assembling firms so as to check the association among working capital management and firms' exhibition. Independent factors were utilized; inventories days, accounts receivables days, accounts payables days, cash formation cycle while the reliant factors were utilized as return on assets. The data has been applied for the period of year 1998-2003 and represented via panel data regression. The result of the study showed a high venture proportion towards inventories and receivables related with lower benefits. The last, study tracked down the accepted procedures in the paper industries and an expanding pattern in the monetary segment of WC financing.

Dong, H. P., & Su, J. T. (2010), conducted a case study on working capital administration with the intention to analyze the connection between working capital management and benefits. The specialists believed that the functioning capital administration assumes a critical part towards firms' prosperity or disappointment because of its direct effects on profitability and benefits. For the investigation, a sample of 130 firms thought which depended on Vietnam Stock Market for the time of financial year 2006-2008 and interpreted by utilizing multiple regression analysis. The number of days accounts receivables (AR), the number of days accounts payables (AP), stock turnover days (STD), cash transformation cycle (CTC), debt ratio (DR), fixed resources for all-out turnover proportion used as an autonomous factors and gross operating profit (GOP) used as a reliant variable. There were solid negative relationship exited between (CCC) and (GOP) which denoted the decline in productivity of the firm. Therefore, the investigation recommended that a manager can improve the worth of shareholders by overseeing adequate money change cycle as and by maintaining different components of WCM at optimum level.

Ponsian, N., Chrispina, K., Tago, G., & Mkiibi, H. (2014), zeroed in on the reason to examine the measurable connection among working capital management and productivity. An example of 3 listed manufacturing firms selected which was based on Dar es Salaam Stock Exchange for the period 2002-2012 and attempted to not really set in the stone the goal of the examination by adopting quantitative approaches and tested a series of research hypothesis. Information has been breaking down through Pearson's Correlation and Regression Analysis and the outcome indicated a positive association between working capital management and benefit of the firm. Then again, examination revealed negative connection between productivity and liquidity because of the reduction in liquidity and strengthen in profitability. Lastly, researchers suggested that there will be a huge scope for further research in future on the generalization of the present findings, more on working capital variables and profitability measures' such as cash, market securities, ROA, ROE and by acquiring number of years.

3. Research Methodology

The present study analyzed the financial data of Britannia Industries Limited based on NSE. The required data has been extracted from the financial statement of the Britannia Industries Limited from the *Capitaline Database* for the period of year 2011-2020. The market capitalization of the Britannia Industries Ltd. as on March, 2020 was stood at (Rs.64, 677.56) Crores. In the study, return on net worth (RONW) is considered as dependent variable while quick ratio (QR), current ratio (CR), debtors' turnover ratio (DTR) and fixed asset turnover ratio (FATR) are selected as an independent variables.

Summary of hypothesis

Hypothesis	Significant level (P value)	Result	Effect (on P value)
H1: There is positive relationship between QR and RONW.	.014	Accepted	The P-value is 0.014 which is less than 0.05. The result shows that significant impact between the QR and RONW (0.014<0.05)
H2: There is positive relationship between CR and RONW.	.028	Accepted	The study found a significant result between CR and RONW. Where, P-value (0.028<0.05).
H3: There is positive relationship between DTR and RONW.	.027	Accepted	The result shows significant impact of DTR on RONW. Where, (0.027<0.05).
H4: There is positive relationship between FATR and RONW.	.948	Rejected	The P-value is 0.948 which is more than 0.05. So, the result does not shows significant impact between the QR and RONW (0.948>0.05).

4. Data Analysis

In this study, statistical tools were applied for descriptive/quantitative analysis. With the help of descriptive statistics we computed the mean value of each set of dependent and independent variables and also measured its standard deviation separately. Then after, the study discussed about multiple correlation analysis with the view to knowing the internal relationship among the variables. The reason behind adopting this multiple regression analysis was that for more & better understanding and check the correct relationship between the two and tried to examine the efficiency of working capital management on firms' performance.

4.1 Descriptive Statistics

YEAR	RONW	QR	CR	DTR	FATR
Mar-11	30.61	0.7	1.05	87.97	7.46
Mar-12	34.56	0.4	0.78	92.01	7.92
Mar-13	40.2	0.4	0.66	88.21	7.8
Mar-14	49.27	0.5	0.71	98.21	7.45
Mar-15	48.11	0.9	0.82	117.83	7.57
Mar-16	46.9	1.0	0.96	89.52	9.24
Mar-17	36.7	1.2	1.39	74.45	9.96
Mar-18	32.59	1.5	1.59	52.59	7.97
Mar-19	30.85	1.5	1.51	36.07	6.79
Mar-20	35.71	1.1	1.25	37.04	5.79
Minimum	30.61	0.4	0.66	36.07	5.79
Maximum	49.27	1.5	1.59	117.83	9.96
Mean	38.55	0.92	1.072	77.39	7.795
Standard Deviation	6.811904	0.394462	0.324894	25.72529	1.101519

Source: Capitaline Database

RONW = β0 + β1 (QR) + β2 (CR) + β3 (DTR) + β4 (FATR) + ε

Where,

RONW = Return on net worth

QR = Quick ratio

CR = Current ratio

DTR = Debtors' turnover ratio

FATR = Fixed assets turnover ratio

ε = the error term

4.2 Multiple correlation analysis

4.2.1 Correlation Matrix

Correlations		RONW	QR	CR	DTR	FATR
Pearson Correlation	RONW	1	-0.373	-0.638	0.669	0.224
	QR	-0.373	1	0.932	-0.695	0.008
	CR	-0.638	0.932	1	-0.803	-0.008
	DTR	0.669	-0.695	-0.803	1	0.393
	FATR	0.224	0.008	-0.008	0.393	1

Source: Researchers' Computation
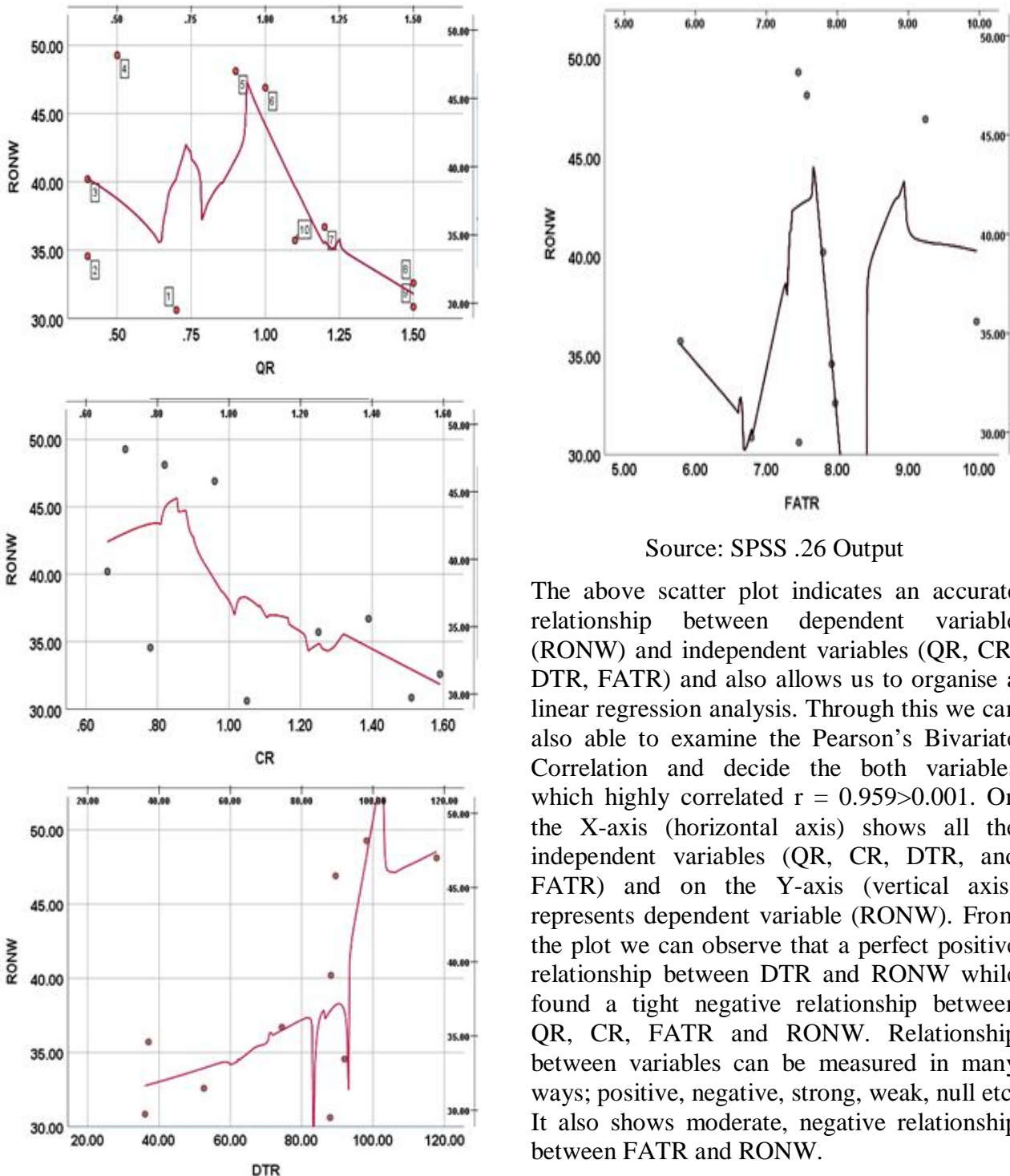
Source: SPSS .26 Output

The above scatter plot indicates an accurate relationship between dependent variable (RONW) and independent variables (QR, CR, DTR, FATR) and also allows us to organise a linear regression analysis. Through this we can also able to examine the Pearson's Bivariate Correlation and decide the both variables which highly correlated r = 0.959>0.001. On the X-axis (horizontal axis) shows all the independent variables (QR, CR, DTR, and FATR) and on the Y-axis (vertical axis) represents dependent variable (RONW). From the plot we can observe that a perfect positive relationship between DTR and RONW while found a tight negative relationship between QR, CR, FATR and RONW. Relationship between variables can be measured in many ways; positive, negative, strong, weak, null etc. It also shows moderate, negative relationship between FATR and RONW.

4.2.2 Correlation coefficients

Coefficients[a]							
Model		Unstandardized Co-efficient		Standardized Co-efficient	t	Sign.	95.0% Confidence Interval for B	
		B	Standard Error	Beta			Lower level	Upper level
1	(Constant)	52.702	14.329		3.678	.014	15.869	89.536
	QR	29.017	9.458	1.680	3.068	.028	4.705	53.330
	CR	-46.681	15.123	-2.226	-3.087	.027	-85.555	-7.806
	DTR	-.008	.116	-.030	-.068	.948	-.305	.289
	FATR	1.258	1.561	.203	.806	.457	-2.755	5.270
a. Dependent variable : RONW								

Source: Researchers' Computation

The above table-4.2.2 breaks down that the various relapse model or multiple regression model to check the productivity of a dependent variable and independent variables and examined the regression coefficient with the help of well-liked method that is t-test. It combines the two things; correlation and determination of coefficient. The above matrix table 4.2.1 shows highest correlation between DTR and RONW (0.669).

4.2.3 Autocorrelation test (Durbin Watson)

Model Summary[b]										
Model	R	R^2	Adjusted R^2	Standard Error of the Estimate	Change Statistics					Durbin-Watson
					R^2 Change	F Change	df 1	df 2	Sign. F Change	
1	.905[a]	.820	.675	4.09078	.820	5.682	4	5	.042	2.375
a. Predictors: (Constant), FATR, QR, DTR, CR										
b. Dependent Variable: RONW										

Source: Researchers' Computation

The above table clarifies that the relationship between working capital administration and monetary execution of Britannia Industries Ltd. The worth of connection between them (R =0.905), addresses close to 1 means perfect correlation. R^2 estimates the extent of the variety in the reliant variable (RONW) which is clarified by autonomous factors (QR, CR, DTR, FATR) for a linear regression model. Changed/Adjusted R^2 attempted to change the measurement based on the quantity of autonomous factors in the model. It shows the craving property of a goodness-of-fit measurement.

The Durbin Watson (DW) measurement used to test the autocorrelation in the residuals from a factual relapse investigation. The worth of Durbin Watson consistency lies somewhere in the range of 0 and 4. On the off chance that the worth of DW from 0 to under 2 demonstrates positive autocorrelation and worth from 2 to 4 indicates negative autocorrelation. The worth of DW is 2.375, which addresses the underlying phase of negative autocorrelation.

4.2.4 ANOVA Analysis

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	380.348	4	95.087	5.682	.042[b]
	Residual	83.672	5	16.734		
	Total	464.020	9			
a. Predictors: (Constant), FATR, QR, DTR, CR						
b. Dependent Variable: RONW						

Source: Researchers' Computation

ANOVA Table shows that the statistics which used to test the hypothesis about the population means. Here mean square can be formed by partitioning sum of squares by the provided levels of opportunity/ degrees of freedom (df). In the table, F-esteem used to check whether the test is measurably critical or not. At 5% degree of significance the F-esteem (F_{cal} =5.682 > F_{tab} = 3.89) is larger than basic worth. In the event that, we reject the null hypothesis and we can reason that there is a (genuinely) huge distinction among the population means.

5. Conclusion

The investigation was led with the end goal of analyzing the proficiency of the functioning working capital management and firm execution concerning to Food and Beverage Company; Britannia Industries Ltd. In the light, quantitative nature, the examination determined descriptive statistics, correlation, connection coefficient and different relapse analysis. The investigation tracked down a positive connection between Debtors' turnover ratio (DTR) and return on net worth (RONW) while, QR, CR, FATR uncovered a tight adverse consequence on return on net worth (RONW). It recommended that the organization may pay their attention towards financial expenses by reducing the amount of inventories and related costs.

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A REVIEW ON MODIFIED CONCRETE WITH PVC POWDER ,QUARRY DUST AND FLY ASH AS A PARTIAL REPLACEMENT OF FINE AGGREGATE AND CEMENT

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ABSTRACT

To meet the requirements of globalization, Right now India has taken a significant activity on building up the road works, buildings constructions, power projects, seaports etc, in the development of structures and different structures. Concrete will be the key job and a huge amount of cement is being used in each development activity. Sand is one of the constituents utilized in the generation of regular concrete, has gotten over the top expensive and furthermore getting rare because of high consumption. PVC powder can be used as a replacement for sand in the present examination. This paper reports the trial study which researched the impact of fractional supplanting of sand with PVC powder. At first concrete mortar solid cube was considered with different rates of substitution of PVC powder (5, 10, 15 and 20%). The test results indicated that the expansion of PVC powder for a fine to coarse aggregates proportion was found to improve the compressive properties just as elastic modulus.

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Keywords: Concrete, elastic modulus, compressive strength.

I.　Introduction

In the progressing past admirable undertakings have been made for the productive use of various mechanical side effects, (for instance, flyash, silica rage, rice husk ash and foundry waste) to save regular tainting. Furthermore, an elective hotspot for the possible replacement of normal aggregates in concrete has expanded extraordinary thought. Subsequently reasonable examinations have been coordinated to find the suitability of rock quarry dust in customary concrete. Regardless, reused strong aggregate, fly ash have been considered by various researchers, Zain et al. (2000); Neville (2002); Gambhir (1995). Quarry dust, a symptom from the overwhelming strategy during quarrying practices is one of those materials that have starting late got contemplations to be used as establishing sums, especially as fine sums. Quarry dust have been used for different activities in the advancement business, for instance, road improvement, and creation of building materials, for instance, lightweight sums, squares, tiles and autoclave squares. Asks about have been driven in different bits of the world, to examine the effects of combination of quarry dust into concrete. Galetakis and Raka (2004) considered the effect of fluctuating displacing degree of sand with quarry dust (20, 30 and 40%) on the properties of concrete in both new

and hardened state (Nevillie, 2002). Saifuddin et al. (2001) investigated the effect of midway displacing of sand with quarry buildup and bond with mineral admixtures on the compressive nature of concrete (Gambhir, 1995), while Celik and Marar investigated the effect of deficient overriding of fine absolute with crushed stone buildup at various percenttages in the properties of new and set concrete (Safiuddin et al., 2001; Celik and Marar, 1996). The current assessment is wanted to consider the effects of quarry dust extension in customary concrete and to overview the pace of compressive strength improvement for different quarry buildup to coarse absolute extent, (Goble (1999); De Larrard and Belloc, 1997).

II. Literature Review

Khilesh Sarwe. [1]this study presents the results of addition of waste PVC along with steel fibers with an objective to seek maximum use of waste PVC in concrete.Two different categories of mix were casted in cubes(150mmx150mmx150mm),one with varying percentages of PVC wastes (0.2percentage, 0.4percentage, 0.6percentage, 0.8percentage and 1percentage weight of cement) and another mix of PVC waste/steel fibers (0.2/0.1, 0.4/0.2, 0.6/0.3, 0.8/0.4 and 1/0.5 percentage by weight of cement) to study the compressive strength at 7 and 28 days

strength. The combine mix of PVC waste and steel fibers has shown more strength as compare to concrete mix prep only with PVC waste. Praveen Mathew et al. [2]they have explored the appropriateness of reused plastic as fractional substitution to coarse aggregates in solid blend to contemplate impact on compressive strength, modulus of elasticity, split elasticity and flexural strength properties of cement. Raghatate Atul M[3]The paper is based on experimental results of concrete sample casted with use of plastic bags pieces to study the compressive and split tensile strength. Compressive strength of concrete specimen is affected by the addition of plastic bags and with increasing percentage of plastic bag pieces compressive strength goes on decreasing (20percentage decrease in compressive strength with 1percentage of addition of plastic bag pieces). On other hand increase in tensile strength of concrete was observed by adding up to 0.8percentage of plastic bag pieces in the concrete mix afterward it start decreasing when adding more than 0.8percentage of plastic bags pieces. R L Ramesh et al.[4] They have utilized waste plastic of low thickness poly ethylene as substitution to coarse aggregates to decide its practical application in development industry and to consider the conduct of new and solidify solid properties.Youcef Ghernouti et al.[5] The study present the partial replacement of fine aggregate in concrete by using plastic fine aggregate obtained from the crushing of waste PVC pipes. it was observed from the results of slump test that with increase of waste content workability of concrete increases which is favorable for concrete because plastic cannot absorb water therefore excessive water is available. Bulk density decreases with increase of PVC waste. In harden state, flexural and compressive strength were tested at 28 days and reductions in both strengths with increasing percentage of plastic bag waste sand in concrete mix. PVC waste increases the volume of voids in concrete which on other hand reduce the compactness of concrete simultaneously speed of sound in concrete is also decreased. A.M. Mustafa Al Bakri1 et al. [7] They have explored the quality of cement with ceramic waste as substitution of coarse total in concrete. The wellsprings of clay waste

are obtained from the industrial in Malaysia.Presently, in ceramics industries the production goes as waste, which is not undergoing the recycle process yet. The potential of reused ceramic waste as a substitute for coarse totals in concrete has been explored. .Amitkumar D. Raval et al.[6] They have concentrated about the (OPC) concrete has been supplanted by clay squander powder in like manner in the scope of 0%, 10%, 20%, 30% 40%, and half by weight for M25 grade concrete. C Freeda Christy and D Tensing[8]The have explored about the after effects of the concrete mortar of blend extent 1:3, 1:4.5 and 1:6 concrete mortar in which concrete is mostly supplanted with Class-F fly debris as 0%, 10%, 20%, 25% and 30% by weight of concrete. More extravagant the blend, higher the compressive quality has been gotten even with partial replacement of fly ash with cement. Patel et al[9]The paper manages the impacts of expansion of different extents of polypropylene strands on the properties of High quality cement. A test program was completed to investigate its consequences for compressive, ductile, flexural, shear quality and plastic shrinkage breaking. An eminent increment in flexural, tractable and shear quality was found. Various combinations of polypropylene fiber and granite powder can be studied together better results for compressive strength and split elasticity of concrete.

III. Materials

Binding Materials

cement or limes are utilized as the binding material. They bind the individual units of fine total and coarse total by virtue of its properties of setting or hardening in blend with water. The binding material assists with filling voids and imparts thickness to concrete.

Aggregates

Fine aggregates generally consist of natural sand or crushed stone with most particles passing through a 4.75mm sieve. Coarse aggregates are any particles greater than 4.75mm, but generally range between 3/8 and 1.5 inches in diameter

PVC Powder

Polyvinyl Chloride (PVC) that is a widely used thermoplastic polymer. Polyvinyl Chloride (PVC) finds application in diverse construction applications. We procure superior strength Polyvinyl Chloride (PVC) from reliable manufacturers across the country.

IV. Methodology

Partial replacement of quarry dust, polypropylene fibers and PVC powder to cement and with addition of fine aggregates and coarse aggregates to bind together. Firstly we have to study the journals regarding to the topic. Then we have to follow design and mix proportions. In this project we have used dust, polypropylene fibers, PVC powder, cement, fine and coarse aggregates. A proper mix design is used and proper proportion would be used.

❖ Collection and study of data.

❖ Materials used.

❖ Mix design.

❖ Casting of specimens.

❖ Curing of specimens.

❖ Testing of specimens.

❖ Results and conclusions.

The methodology which is given above is to be followed. This is the approach for the undertaking. In the arrangement of PCC we have utilized M20 grade extent, i.e., (1:1.5:3). The proportioning is done dependent on the necessity or given determination. The estimation of material should be possible by weight grouping or volume bunching. Sand will be estimated based on its dry volume. While estimating the total ,firing, smashing or pounding will not be finished. PCC is permitted to be finished by hand blending just for little scope works. The base on which the solid is blended must be spotless, water leggings work steel stage. Sand, concrete residue, polypropylene strands and PVC powder blended altogether followed with the expansion of coarse total. Finally water is included and the blend is blended appropriately to increase an even shading and consistency. Blended cement is put in the solid shapes and right off the bat apply oil to the molds, at that point pour concrete. We need to pour 3 layers and for each layer we need to give blows with alter bar. At that point set aside for one day. After that evacuate the shape and spot the 3D shapes in water for restoring. Compaction will be done before beginning setting begins with in a short time of expansion of water to the dry blend

V. Material Testing and Results

Cement

Portland Pozzolana cement of 53 grade is taken for the test and the test results are follows;

Table 1: Cement Tests and Results:

S.No	Brand Name	Test	Results
1	PPC	Fineness	4%
2	PPC	Initial Setting Time	30 min
3	PPC	Final Setting Time	480min/8Hrs
4	PPC	Normal Consistency	32%

Sand, Coarse Aggregate and PVC Powder

Pycnometer apparatus is used to measure specific gravity and bulk density, fineness modulus of aggregate is found by using set of sieves.

Table 2: Test Results of Sand, Coarse and Fine aggregate

Properties	Sand	Coarse	PVC Powder
Specific Gravity	1.67	2.53	1.18
Bulk Density	2.56	1.05	0.28
Fineness Modulus	2.67	6.75	2.8

Fineness modulus of sand is found by using the set if sieves of 4.75mm, 2.36 mm, and 1.18 mm, 600 and 300 micron.

VI. Results and Discussion

The compressive strength of concrete for 7 days,14 days & 28 days has been shown below

by using PVC .

Compressive Strength of 7 Days Curing

Table 3: results of Compression Tests on Concrete Cubes (7days)

S. No	concrete Cubes	Compressive Strength (N/mm2)
1	Normal concrete	13.14
2	5% Of PVC Concrete	9.80
3	10% Of PVC Concrete	10.83
4	15% Of PVC Concrete	12.76
5	20% Of PVC Concrete	14.39

Compressive Strength of 14 Days Curing

S No.	Concrete cubes	Compressive strength [N/mm2]
1	Normal concrete	17.48
2	5% of PVC Concrete	13.41
3	10% of PVC Concrete	15.6
4	15% of PVC Concrete	16.85
5	20% of PVC Concrete	18.1

Compressive Strength of 28 Days Curing

Table 4: results of Compression Tests on Concrete Cubes (28days)

S.No	Concrete cubes	Compressive Strength (N/mm^2)
1	Normal concrete	22.49
2	5% Of PVC Concrete	17.67
3	10% Of PVC Concrete	18.40
4	15% Of PVC Concrete	19.79
5	20% Of PVC Concrete	21.73

VII. Conclusion

The Detailed literature review indicated that the expansion of the quarry dust improved the strength properties of concrete which was par comparable to that of traditional cement. From above testing results, it is induced that the quarry dust might be utilized as a successful substitution material for regular sand. The expansion of bond content in the mortar stage shows an increment in the strength. The fine quarry dust ,flyash and pvc will in general increment the measure of super plasticizers required for the quarry blends so as to accomplish the rheological properties. At the

point when the quarry dust has high fineness, its utilization in the ordinary cement is constrained in light of the fact that it expands the water request.

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BRAND: FACTOR OF CONSIDERATION WHILE PURCHASING

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ABSTRACT

With the wider choice, always a consumer gets confused what to purchase and what not. Then the consumer start making comparison among the different brands. As consumer wants the product with maximum benefits, he makes comparison. Most probably consumer make comparison of brands based on product attributes and features. In this paper there will be scope of understanding what different characteristics of a product are being consider by the consumer while purchasing a brand. This paper will also be able to know what most satisfactory attribute of any brand for the consumers is. The study will also include about the satisfaction level of consumers from branded products and how much they are loyal for a brand. Other than this it will also cover the area of types of brands a consumer prefer.

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Keywords: Brand, satisfaction, product, attributes, consumer.

Introduction

Branding is a part of marketing. Branding comes after the production of goods and plays a vital role in achieving the company's goal. Before understanding about branding, it is necessary to understand marketing also. Basically, marketing is not just selling of goods and services, but it also includes activities like developing product features, setting price of goods, packaging, branding, and labelling etc. If we talk about branding, it is also a wider concept and includes many activities like brand name fixation, brand logo, creating good brand image, brand packaging, labelling etc.

According to American Marketing Association, "Brand is a name, term, sign, symbol, or design, or a combination of them which is intended to identify the goods or services of one seller or a group of sellers and to differentiate them from those of competitors".

According to Mellerowicz, "Brand is defined as branded product as a ubiquitous finished product of consistent or increasing quality for private consumption with an identification mark, standardised amount and appearance, acceptance in the market and existing consumer advertising".

Essence of branding

The significance of brand building is to make loyal customer grounds. From customer's perspective, the brand must provide value and from the comprehensive view, the brand should develop some uniqueness. Successful branding is all regarding creating customer's indifference to rival brands and creating difference for the marketed brand. In a competitive situation, broadly, the strategy operates at two tiers:

First, the firm must achieve some minimum parity with other competitors in the field to be clubbed as a valid competitor in a category. This involves parity making. Second, this involves breaking away from the parity by creating effective differentiation in the product or service from other participants in the category.

The essence of branding is to get the customer out of decision-making process by building a trusting relationship. The following issues are important in this context:

Brand Awareness

Brand awareness is the starting point for brand creation. The consumer must first of all be aware of a brand to begin with. No brand can exist in consumer's mind in the absence of its awareness. The brand awareness is made up to two memory elements:

a) Brand recognition (ability to confirm prior exposure/ having seen earlier)

b) Brand review (it can be unaided or aided recall).

Literature Review

Brand has its own advantages and disadvantages over consumer mind. While purchasing a consumer spends his income and takes the decision wisely. Many researchers worked on this that how much a brand matters for a consumer and have got different

outcomes. Chovanova, et al., (2015) stated that brand has a great impact on the minds of consumers. As per the survey, more than half of the respondents select the commodities by a brand. Survey also represents that main focus during purchasing a brand is quality. Ultimately, it is necessary that offered brand must meet the customer needs and desires.

Mishra, Shukla (2013) mentioned in their study that a relationship based on trust is being created between brand and customer just because of brand consciousness. When a consumer makes a search for a brand or consume a brand then brand consciousness began. The study also reveals that concept of brand consciousness is subjected to the characteristics associated with the product of that brand. Ahmed, et al., (2013) concluded that youngsters are conscious about the brand. And as per the gender comparison, girls are more conscious about brands. Brand name and quality are being focussed by youngsters. Mostly brands are covering the young generation with different segments in Pakistan. Riaz, et al., (2013) stated that creating awareness about the brand and increasing loyalty of a customer for a brand will take a lot of time. For increasing brand awareness and loyalty managers should actively promote and improve the awareness programs of brand, so that there will be enhancement in purchase intentions of the customers. These practices if accompanied by strong communication about the brand, then the result will be very fruitful. Noorlitaria A, et al., (2020) concluded that several conclusions came out of this study The study is related to a restaurant namely – Samarinda City Fast Food Restaurant. The study shows that there is a direct relationship between brand awareness and purchase intention of the consumer. If there is maximum awareness of Samarinda City Fast Food then there is a possibility of increase in purchase intention of consumers from this restaurant.

Katole (2015) stated that out of 100 percentage responses, 62 percentage respondents are those who are loyal towards a brand and few are conscious about the price. Instead of gender consciousness, consumers are more focused for their health while buying the commodities like soap, here age does not matter during purchasing. Ahsan, et al., (2017) concluded

that there are certain factors such as quality, comfort and status due to which priority for branded apparel is changing very fast. Hypothesis one and two of this study shows that consumer satisfaction purchasing behaviour and brand loyalty are positively and significantly correlated with the sub variables of brand consciousness.

Farhat, Khan (2011) concluded that loyalty can be foster by consistent brand personality. According to this study brand personality plays an important role for increasing the brand loyalty of a consumer. This practice should be followed by industrial marketing practitioners. It is also mention that for supporting the customer loyalty programs, there is need to develop the quality and brand trust.

Narasimham (2018) stated that now a days consumers are much conscious about the brand while purchasing the commodity. Through social norms consumers get influenced and consumers move towards similarity avoidance. The dependent variable- brand consciousness does not have positive relationship with independent factors at the same time. As per the product, consumer attitude gets influenced positively as well as negatively through a normative factor. Ardestani, et al., (2012) reveals that between performance and brand awareness there is a highly positive relationship. There are many services which can attract the customers like providing maintenance systems for preventing system failures, increased security and more cash dispensers. More of the promotion with the help of mass media, posters and catalogues will lead to more awareness of the bank among the customers. Thus, every effort will lead to improvement in the performance of banks. Sharma, et al., (2013) concluded in their study that mostly female buyers prefer the brands which are their favourite. So, their pattern of buying is similar mostly in beauty care products. Whereas respondents of this research like to try the new brands. Consumers do not bother about the brand ambassadors while purchasing the beauty care products. Two factors which are majorly concerned or have the affects in selection are price and brand image. Quality is also a main concern of females while purchasing the beauty care products.

Ahuja (2015), mentioned that brand plays a role of securer which gives the surety about the standardized quality of the product. Brand competes by making a space in the minds of consumers and do not compete in the product area. Business organizations should use branding as it is an effective and powerful tool for the success. If the activities related to the brands are not managed properly then it may lead to damage. Quality, income, rates etc., are some of the key factors of brands which have an effect on the consumer mind. Ashraf, et al., (2017) stated that advertisement plays an important role in creating a brand image. Through advertisement the preference for a product may increase. Similarly, there are some other factors like brand image, brand loyalty and brand association which also have a great influence on consumer buying behaviour. In the study, Narowal and Punjab region are being covered and in both the region impact of advertisement is different i.e., lower effect in Narowal and higher effect in Punjab. Lin, Chang (2013) stated that customer satisfaction may lead to the loyalty for a brand. Customer satisfaction may lead to a good brand image or quality products. In case of mobile phones, product brand image is highly correlated with brand loyalty. So, improvements should be made as to increase the satisfaction level.

Objectives of the study

1) Objective of this paper is to identify that brand provides satisfaction to the consumers or not.

2) Another objective is to determine what product attributes consumers, prefer in a brand.

3) Through this paper the loyalty of consumers towards a brand can be measured.

4) The study also aims at knowing how much a branded product add on to the consumer's status in the society.

Research Methodology

Primary data collection is used which is the first-hand data.

1) Survey is being conducted for data collection and questionnaire tool is used.

2) Data is collected in Delhi NCR region and 154 respondents of different age groups ranging from 15-25, 25-35, 35-45, 45-55, and 55-65 are included.

3) Both male and female respondents are there with their status of working, non-working, studying and self-employed.

4) Questionnaire consist of 15 questions which are related to the research topic of branding and being framed to fulfil the research objective.

Data Interpretation

The questions included in this questionnaire are mentioned below along with the result received from respondents.

1. While purchasing a product what first comes in your mind?
154 responses

- Price of product
- Quality of product
- Variety of product
- Quantity of product
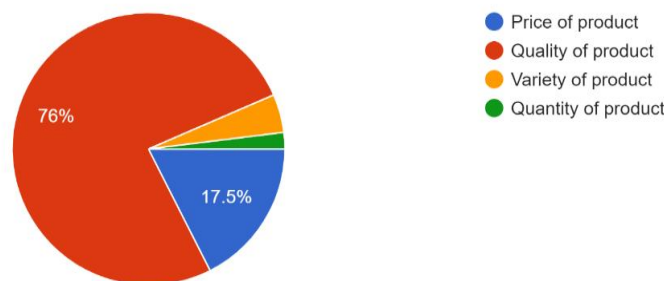
From the above pie chart, it is very clear that while purchasing a product consumer mostly thinks of brand quality. 76% of respondents focus on quality of a branded items.

2. On what basis you compare the products of two or more different brands?
154 responses

- Durability & benefits from the product
- Guarantee & Warranty
- Quality
- Price
- Quantity
- All of the above
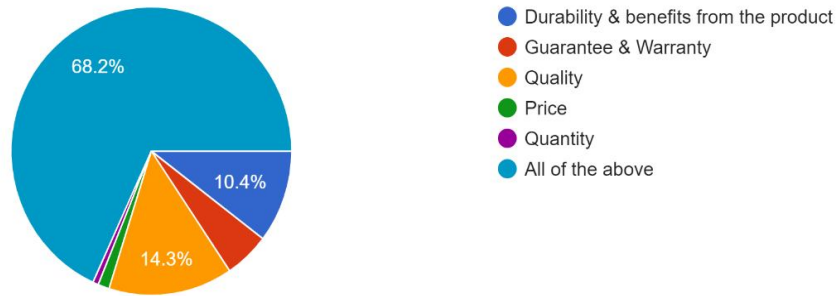
Here the responses given by the consumer shows that while comparing the products of two or more different brands, maximum number of consumers considers the all above factors like durability, benefits, guarantee, warranty, quality, price and quantity.

3. Which of the following products require more time in selection of brands?
154 responses

- Daily basis products
- Occasional products
- Luxurious products
- Seasonal products
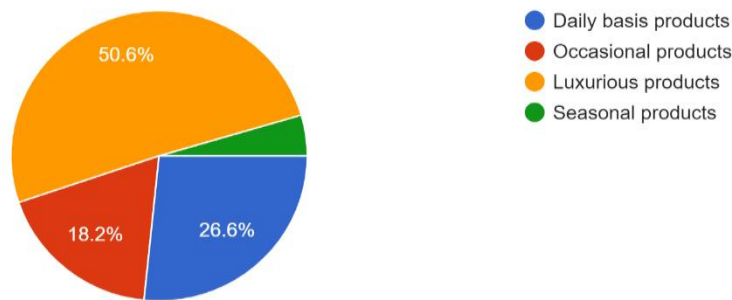
It has been observed that luxurious products take more time in selection of brands. 50.6% respondents take more time in selecting a brand for luxurious items.

4. If you find a brand suitable after experiencing many times, will you remain loyal to that brand?
154 responses

- Yes
- No
- May be
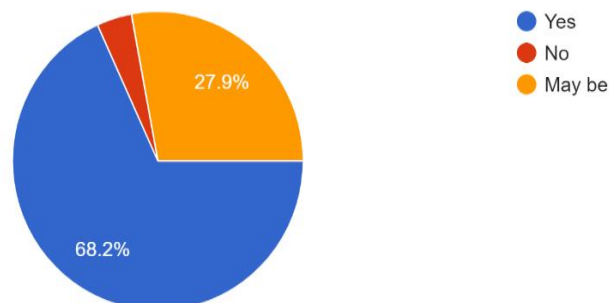
From the above responses it can be seen that if a consumer has a good experience of a brand, then consumer may remain loyal to that brand. 68.2% of responses show loyalty of consumers towards the brand from which they are satisfied.

5. Branded products enhance the consumer's status in the society.
154 responses
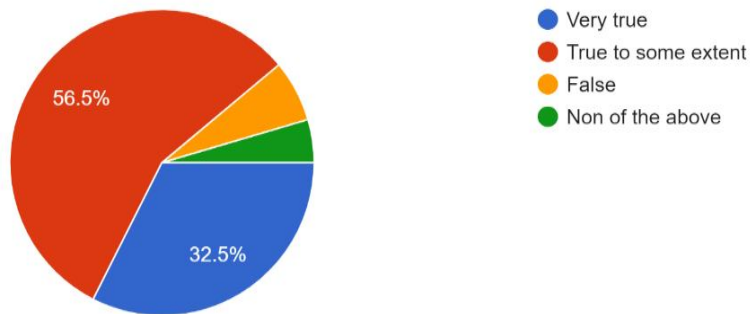
The above pie chart shows that brand is significant for the consumers, as 56.5% of the respondent gives their response that branded product enhances their status in the society.

6. Do you compromise with a brand for price?
154 responses
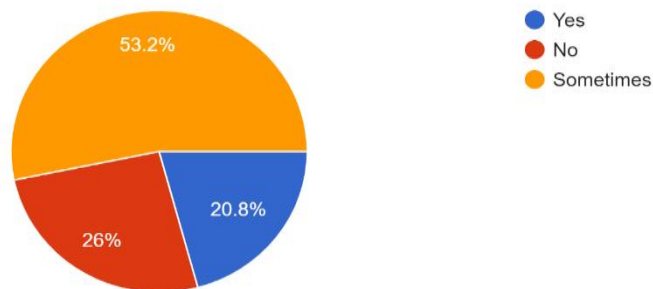
From the above responses it can be seen that consumers are price conscious also and mostly respondents had shown that sometimes they compromise brand for price.

7. Are you more conscious about the additional services like free home delivery, guarantee, replacement, refund, etc. rather than the brand?
154 responses
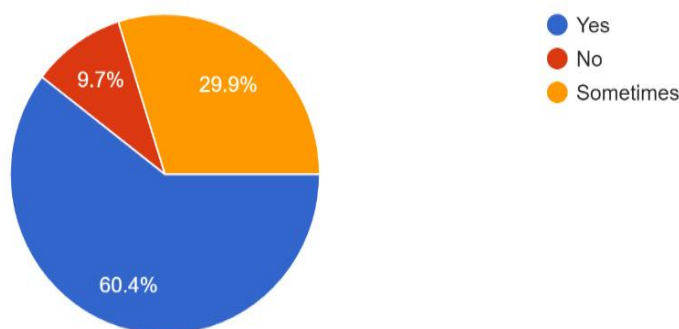
In this question, 60.4% of respondents gives their response in the favour of additional services like free home delivery, guarantee, replacement, refund, etc. rather than the brand.

8. Among the following which brand you mostly prefer

154 responses

- ● National brand
- ● Local brand
- ● Manufacturers brand
- ● International brand

18.8%   22.1%

51.9%
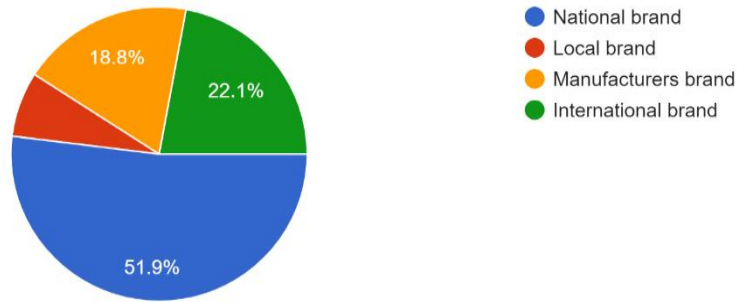
Among the different brands, maximum number of consumers go for a nationalized brand. 51.9% of respondents purchase national brand and 22.1% of respondents purchase international brand, 18.8% purchase manufacturers brand. Remaining respondents go for local brand.

9. A high price brand gives you assurance of quality.

154 responses

- ● Strongly agree
- ● Agree
- ● Neutral
- ● Disagree
- ● Strongly disagree

20.1%   18.2%

44.8%   13.6%
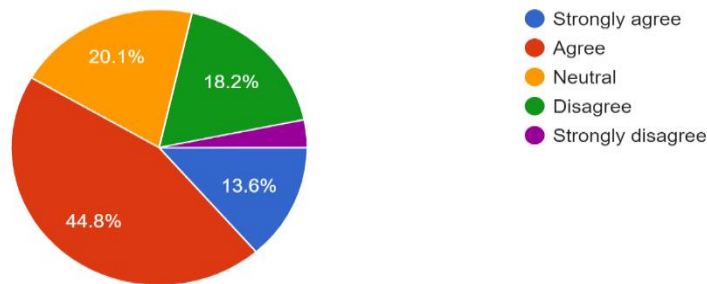
According to the responses received 44.8% of respondents are agree that brand gives assurance of quality. 20.1% of respondents remains neutral for this statement.

10. If you find a brand suitable for one product, will it also be suitable for other products of the same brand.

154 responses

- ● Strongly agree
- ● Agree
- ● Neutral
- ● Strongly Disagree
- ● Disagree

39.6%   23.4%

27.9%
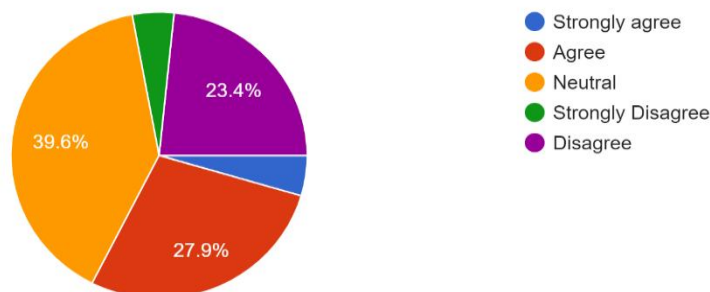
The results of the above question are being in dilemma as 39.6% of the respondent marked neutral. 27.9% respondents are in favour that if they find a brand suitable for one product, it will also be suitable for other products of the same brand.

11. How much will you rate a branded product out of 5?
154 responses
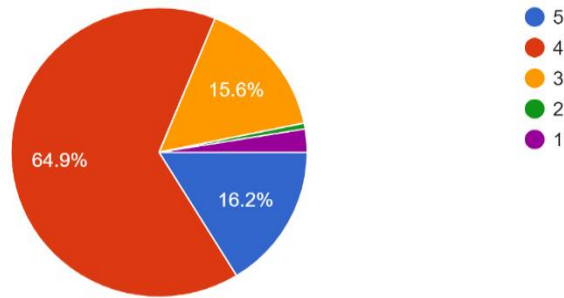
From the above results it is clear that maximum number of respondents has given their rating 4 out of 5 to the branded products.

Whereas 16.2% of respondents gives full rating to the branded products.

12. Satisfaction level is maximum from a branded product.
154 responses
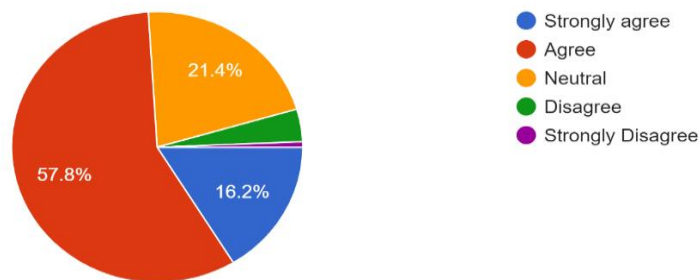
According to the result of survey 57.8% of respondents are agree to the statement that satisfaction level is maximum form a branded product. Whereas 21.4% of respondents remain neutral on this statement and 16.2% of respondents are strongly agree on this statement.

13. How was your experience whenever you purchased a branded product?
154 responses
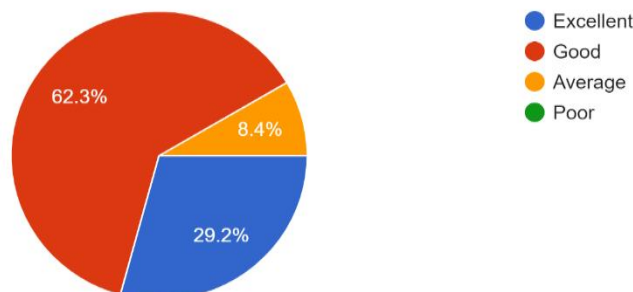
From the above pie chart, it has been observed that 62.3% of respondents have a good experience whenever they purchased a branded product. 29.2% of respondents have an excellent experience of a branded product. 8.4% of respondents have an average experience of a branded product.

14. Do you find the product what you have expected in case of a branded product?
154 responses
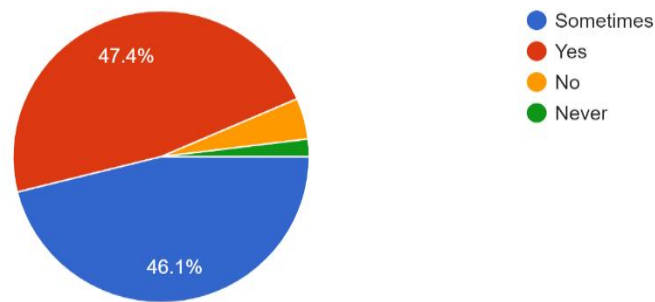
From the above result it can be seen that maximum number of respondents gets the branded products as they expect. 47.4% of respondents answer yes that they find the product as they expect and 46.1% of respondents answer sometimes only, they get the branded product as per their expectations.

15. Have you ever find a defaulted product of a brand after purchasing?
154 responses
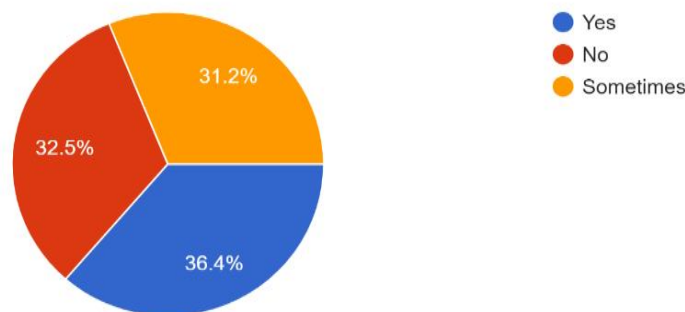
Here the responses do not have much variation in percentage. 36.4% of respondents answer yes that they have got a defaulted product of a brand after purchasing and 32.5% of respondents answer no. 31.2% of respondents answer that sometimes they have got a defaulted product of a brand after purchasing.

Conclusion

The objective of this research study is fulfilled to a great extent. Giving any particular statement may not be possible regarding the brand consciousness of consumers. From the study it can be concluded that maximum number of consumers get satisfaction from the branded product. And while comparing the brands most of the consumers makes difference on basis of product attributes like quality, durability, quantity and price etc. Loyalty level of consumers is higher for a brand if they had a good previous experience. Most of the results are in the favour that brand adds a value to the consumers status in the society. Thus, it can be said that brand has a good value in consumers mind and there is need to make awareness of the brands among the consumers by the brand owners which may be possible through education, promotional programs. Consumers activeness during purchasing is also important so that they do not get exploited by any defective or defaulted product of a brand. Mostly a good brand image does not provide such products but sometimes it may happen. Lastly, it can be stated that brand is an important factor of consideration while purchasing along with other factors as per the situation.

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OROFACIAL MANIFESTATIONS OF MIXED CONNECTIVE TISSUE DISEASE: A RARE CASE REPORT

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ABSTRACT

Connective tissue diseases (auto immune rheumatic diseases) are a group of disorders of unknown etiology. MCTD has overlapping features of more than one autoimmune disease and evolved as a separate disease entity due to presence of high titres of Anti U1-RNP antibodies. We report a case of mixed connective tissue disorder with emphasis on orofacial manifestations which is to the best of our knowledge is very rare presentation.

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Keywords: MCTD; Malar Rash; Anti U1-RNP; Autoimmune

Introduction

Autoimmune connective tissue diseases possess difficulty in diagnosis and treatment due to uncertainty in etiology, a wide array of clinical presentation, and unpredictable disease course. Mixed connective tissue disease (MCTD) is an autoimmune disease which was first described in 1972 by Sharp et al. [1] It has overlapping features of juvenile idiopathic arthritis (JIA), systemic lupus erythematosus (SLE), systemic sclerosis, dermatomyositis (DM), and polymyositis. [2] It is also known as referred disease. This disease demonstrates the autoantibodies to a Ribonuclease - sensitive component of extractable nuclear antigen (ENA) now known as RNP2. [3] We report a case of a 37 year old female patient corresponding to the oral manifestation mixed connective tissue disease.

Case Report

A 37 year old female patient reported with chief complaint of bleeding from gums during brushing since one year. She also gave history of metallic taste; foul odour from mouth; burning sensation on having hot and spicy food and frequent ulceration in her mouth. She gave history of rashes on the back, legs, face and also joint pain from three years. Her medical history revealed that she had gangrene of tip of little finger secondary to small vessel vasculitis for which she had undergone left cervical sympathectomy two years back. She was diagnosed as a patient of rheumatoid arthritis,

mixed connective tissue disease and vasculitis since two years for which she is taking medication such as: Tab ACITROM 10mg once a day; Tab HCQs 200mg once a day; Tab wysolone 5mg once a day; Cap shelcal once a day; Tab Rabivin 20mg once a day; Tab methotrexate 10 mg once a week. On general physical examination patient is poorly built and poorly nourished with pallor present irt to lower palpebral conjunctiva. The loss of hair, dry and rough skin was also present. The tenderness on palpation present irt to temporomandibular joint. On extraoral examination, a butterfly shape rash was present on the nose and malar area (Fig 1). The intraoral examination revealed that a generalised linear erythematous marginal gingiva which was soft in consistency with loss of scalloping and stippling (Fig 2). There was generalised gingival recession and bleeding on probing was also present. There was pallor present on both right and left buccal mucosa, labial mucosa, hard palate and tongue. An ulcer was also present on left buccal mucosa measuring of about 5X6mm in size roughly oval in shape with floor covered by necrotic slough and surrounded by an erythematous halo. On palpation it was tender and has no tendency to bleed (Fig 3). The relevant laboratory investigations were done and results are as follows:

Test	Observed value	Reference value
Hb	8.3gm%	11.5-16.5gms%
RBC count:	3.11millions/cumm	4.2-5.4 million/Cumm
Total WBC count:	4100 cells/cumm	4000-11000 cells/Cumm
ESR	60mm/hr	0-20 mm/hr
BT(Ivy method)	4min 55 secs	2-7min
CT(Lee and White method)	5 min 45 sec	6-16min
PT time	28sec	14 sec
Haematocrit	23%	42-52%
RA factor	2.34IU/ml	0-14IU/ml
S.Sodium	136meq/L	135-155meq/L
S.Potassium	5.3meq/L	3.5-5.5meq/L
S.Chlorine	109meq/L	98-105meq/L
Random Blood Sugar	89mgs%	70-130mgs%
Blood Urea	29mgs%	15to45mgs%
S.Creatinine	14.6mgs%	08 to 18mgs%
S. Cholestrol	0.9mgs%	0.8 to 1.4mgs%

The peripheral blood smear shows that the RBC's are anisopoikilocytosis. microcytes, macrocytes and elliptocytes with moderate to severe hypochromia seen. No obvious features of haemolysis. The WBC's are normal in number with polymorph predominance and the platelets are adequate in number and no haemoparasites are found suggestive of dimorphic blood picture. On the basis of history and clinical examination the diagnosis of mixed connective tissue disease with drug induced leucopenia and anemic stomatitis was given. The patient was referred to general physician where tab methotrexate was discontinued after which the symptom of linear gingival erythema was subsided. The patient was also given cap haem up for the period of one month following which her haemoglobin level was within normal limits. The patient had been followed after one month.

Discussion

MCTD is now recognized to occur throughout the world. It is predominantly a disease of females, with female to male ratio of 16:1.[4] The disease is seen among all age groups range from 4 - 80 years; the mean age of onset in adult is 35 years. There is both T-cell & B cell response with less immune complex formation. The characteristic lesions in the involved organs are intensive obliterative, proliferative vascular lesions in large, medium and small vessels with less inflammatory infiltrates.[5] In the early phases of the MCTD many patients complain of easy fatiguability, poorly defined myalgias, arthralgias and Raynaud's phenomenon. The fever of unknown origin may be the presenting feature of MCTD . The gastrointestinal symptoms may range from heartburn, dysphagia, diarrhea and symptoms of malabsorption Neurological manifestations are seen in 20-30% patients presenting as aseptic meningitis, trigeminal neuralgia, demyelination, transverse myelitis and peripheral neuropathy.[6] Our patient presented with generalized arthritis and gastrointestinal symptoms.

Pericarditis is the commonest clinical manifestation of cardiac involvement being reported in 10 to 30 percent of patients.[7] The pulmonary problems may include pleural effusions, pleuritic pain and pulmonary hypertension.[8] The absence of severe renal disease is a hallmark of MCTD; it is possible that high titers of anti-RNP antibodies, which are characteristic of MCTD, may protect against the development of diffuse proliferative glomerulonephritis.[9]

SLE features can be found in a 3rd of patients with MCTD, and include serositis, malar rash, hypo-pigmentation, and hyper-pigmentation, photosensitivity and discoid skin lesions.[10] Our patient presented with a discoid rash, a generalized macular skin rash, and an oral ulcer.

The laboratory findings are anemia, leucopenia, elevated erythrocyte sedimentation rate, hypergammaglobulinemia (100%), positive combs test, and Rheumatoid factor positive in 50 to 70% of patients.[11] Antinuclear

antibody positivity is seen in 100% of patients in high titre with coarse speckled pattern. Anti U1RNP antibodies by haemagglutination test is highly characteristic feature of MCTD. [6] Our patient had evidence of leukopenia and anemia. Anemia and leukopenia usually come with disease activity and improve with treatment.

In MCTD, mucous membranes can be involved, including nasal septal perforation, orogenital ulcerations, and buccal ulcerations. Oral manifestations associated with MCTD include difficulty in chewing and swallowing, changes in taste, the presence of a fissured tongue and lips, increased dental decay, and oral candidiasis. [12] Our patient also presented with metallic taste; foul odour from mouth; burning sensation on having hot and spicy food and frequent ulceration in her mouth.

To the best of our knowledge very few cases have been reported in which there was direct relationship between any oral/dental manifestations and MCTD, but in this case, presence of orofacial manifestations in MCTD

patients emphasize the importance of early oral/dental manifestation and MCTD. It has been recognized that in many diseases that oral manifestations precede the systemic signs and symptoms as in the case of Pemphigus Vulgaris, Crohn's Disease, pemhigoid, lichen planus and many more.

Conclusion

As it is rightly said that the mouth is the mirror of the oral cavity or inother words oral diagnosticians are general physicians therefore The oral cavity must be examined by a dentist as an vital component of the human body, which provides critical information regarding some systemic diseases. As it was documented in this case that the MCTD patient present with certain orofacial manifestations. Such information should be considered and appreciated to assist in reaching the proper diagnosis and delivering effective management to the patient.

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Figures

Fig 1: Malar Rash

Fig 2: Intraoral picture showing linear marginal erythematous gingiva

Fig 3: intraoral picture showing ulcer on left buccal mucosa

EUROZONE - PROS & CONS

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ABSTRACT

This paper studies an important phenomenon that how is common currency impacting the economies of members in the Eurozone. The member states participated in the EMU to increase the volume of bilateral trade among them and to improve their economic condition. The main reason put forth was reduction in cost by eliminating transaction cost of different currencies. The study concludes that the expected impact of euro did not turn out to be the actual impact. Exploring the data of GDP from 2000-2011 of two groups of member states in the Eurozone, the study could not find a direct relation between the common currency and improvement in the macroeconomic variable.

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Keywords: Eurozone, European Union, Euro, GDP

1. Introduction

The emergence of Economic Monetary Union in the Eurozone is an offshoot of a long-drawn process spanned over six decades. The starting point for six founding members was to collaborate for Coal and Steel, required for rebuilding the Europe devastated by the Second World War. Gradually, the idea of collaboration and cooperation gathered steam and spread on to other economic and civic parameters. Custom union was formed which ultimately led to Single European Act. Finally, the process culminated into EMU and hence, a common currency, Euro in 1999. When other European nations sensed the benefits of EMU, there was a huge rush to apply for membership and join Eurozone (Rani, 2017). Eurozone started facing a major turbulence starting 2008. Due to some unwarranted developments in the economies of a number of EU members, political and academic debates started on the future of EU. The present study has been undertaken to understand the causes of the problem using a macroeconomic variable Gross Domestic Product (GDP) from 2000 to 2011, and comparing the data of two groups of member states.

2. Review of Related Literature

While working on this paper, the researcher has studied a number of prior studies. Some more relevant studies have been mentioned here. "A complete EMU is not an end in itself. It is a means to create a better and fairer life for all citizens, to prepare the Union for future global challenges and to enable each of its members to prosper. Europe is emerging from the worst financial and economic crisis in seven decades. The challenges have forced the governments and EU institutions to stabilize their economies and to protect what is achieved through the gradual and tough process of European integration" (Juncker, Tusk, Dijsselbloem, & Draghi, 2015). Monetary integration is one of the most far-reaching areas of European integration; EMU stands as one of the EU's flagship achievements. But, the second decade of the single currency gave rise to an asymmetry between 'core' and 'periphery' member states (Howarth & Verdun, 2020). Studies have examined how the euro periphery has dealt with these challenges by studying the case of Italy (Notermans & Piattoni, 2020), how EMU contributed to the Greek crisis and what the EU's rescue of Greece has meant for EMU governance (Pagoulatos, 2020). The crisis of the last decade has, in fact, shaken the EU to its roots. Solely the 'bad' behaviour of some members is not responsible for the economic problems which have threatened the existence of the euro, rather the 'design faults' in the construction of the euro project is equally to be blamed. The faults such as the convergence criteria which focuses on nominal not real variables; disregards the exchange rates at which countries enter the EMU, or ignores the current account deficits and surpluses; and the differences in inflation mechanisms between countries (Arestis & Sawyer, 2011). "Inflation

differentials across the euro zone have been persistent, and real exchange rate movements across the euro area have been substantial. The adoption of the euro has resulted in economic integration; however, economic linkages with the rest of the world are also growing strongly and hence, the relative importance of trade within the European monetary union has not dramatically increased. In future, a severe economic downturn or financial crisis in a member country will decide the future political viability of the euro" (Lane, 2006). Twenty years of euro history confirms the euro's stability and position as the second global currency. Euro also enjoys the support of majority of the euro zone population. The European Central Bank is successfully keeping inflation at a low level. However, the European debt and financial crisis in the 2010s marked a need for deep institutional reform (Dabrowski, 2019).

3. Significance of the Study

The first decade of EMU was very eventful but the next decade witnessed the turbulence and sent a warning signal to the Eurozone to introspect and mend ways.

To study the impact of introduction of common currency in the Eurozone, by comparing the pre-euro and post-euro status of macroeconomic indicators of two different sets of member-states – core and periphery, is significant for the entire world because the European Union is the world's largest trading block and the second largest economy.

4. Objectives of the Study

In the light of history of Eurozone and the present global status of EU, the specific objectives of the present study are as follows.

1) To identify the defects in the design of EMU.
2) To analyse the differential impact of Euro on Eurozone by comparing pre-euro and post-euro status of problem states with that of core states.

3) To compare the economic status of economically weak states with stronger ones.

5. Scope of the Study

The proposed study focuses on:

(i) Two groups of member states, namely, Germany, Austria, France, Finland and Belgium, grouped as More Prosperous European Economies, MPEE; and Italy, Spain, Greece, Portugal and Ireland, grouped as Less Prosperous European Economies, LPEE.
(ii) Economic variable- GDP.
(iii)Available data for the period from 2000 to 2011.

6. Research Methodology

For an empirical and comparative study of the data, the appropriate statistical tools are used, such as, Levene's Test and t-Test. Where the observed differences are found to be significant, further analysis is done to gain a better understanding of why variation exists. Correlation Analysis is used to explain why there are differences or variations in GDP.

7. Analysis

To understand the nuances of macroeconomic variable and the impact of EMU, the descriptive analysis is done.

7.1. GDP Growth Rate

Average annual GDP growth rate, maximum GDP, minimum GDP, standard deviation (S.D.) and coefficient of variation (C.V.) in GDP of each country for an overall period from 2000 to 2011, has been shown in Table 1, for pre-Euro period from 2000 to 2002 in Table 2 and for post-Euro period from 2003 to 2011 in Table 3, and efforts have been made to measure the impact of EMU on the annual GDP growth rate of each selected member-state.

Table 1: GDP Growth Rate, Overall Period (2000-2011)

Country	Mean (in %)	Maximum (in %)	Minimum (in %)	Standard Deviation (S.D.)	Coefficient of Variation (C.V.)
Austria	1.81	3.71	-3.82	2.05	1.13
Belgium	1.63	3.67	-2.80	1.69	1.04
Finland	2.17	5.34	-8.54	3.69	1.70
France	1.42	3.68	-3.15	1.72	1.22
Germany	1.36	4.01	-5.15	2.54	1.87
Greece	1.53	5.94	-7.11	4.36	2.85
Ireland	3.18	10.65	-6.38	4.49	1.41
Italy	0.67	3.65	-5.49	2.29	3.44
Portugal	0.81	3.92	-2.91	1.84	2.29
Spain	2.15	5.05	-3.83	2.49	1.15
MPEE	1.68	3.88	-4.69	2.26	1.35
LPEE	1.67	5.55	-4.35	2.74	1.64

Table 2: GDP Growth Rate, Pre-Euro Period (2000-2002)

Country	Mean (in %)	Maximum (in %)	Minimum (in %)	Standard Deviation (S.D.)	Coefficient of Variation (C.V.)
Austria	2.07	3.67	0.86	1.44	0.70
Belgium	1.95	3.67	0.81	1.52	0.78
Finland	3.14	5.32	1.83	1.90	0.60
France	2.15	3.68	0.93	1.40	0.65
Germany	1.53	3.06	0.01	1.53	1.00
Greece	4.04	4.48	3.44	0.54	0.13
Ireland	7.02	10.65	4.99	3.15	0.45
Italy	1.99	3.65	0.45	1.60	0.81
Portugal	2.22	3.92	0.76	1.59	0.72
Spain	3.81	5.05	2.71	1.18	0.31
MPEE	2.17	3.88	1.16	1.49	0.69
LPEE	3.81	5.55	2.56	1.55	0.41

Table 3: GDP Growth Rate, Post-Euro Period (2003-2011)

Country	Mean (in %)	Maximum (in %)	Minimum (in %)	Standard Deviation (S.D.)	Coefficient of Variation (C.V.)
Austria	1.72	3.71	-3.82	2.28	1.33
Belgium	1.52	3.27	-2.80	1.82	1.20
Finland	1.85	5.34	-8.54	4.16	2.25
France	1.17	2.54	-3.15	1.82	1.56
Germany	1.30	4.01	-5.15	2.87	2.21
Greece	0.69	5.94	-7.11	4.78	6.91
Ireland	1.90	6.08	-6.38	4.22	2.23
Italy	0.23	2.20	-5.49	2.39	10.55
Portugal	0.34	2.37	-2.91	1.75	5.20
Spain	1.60	4.08	-3.83	2.60	1.63
MPEE	1.51	3.50	-4.69	2.52	1.67
LPEE	0.95	3.75	-4.35	2.72	2.86

(i) Analysing GDP for Austria, S.D, suggests that the dispersion in the value of GDP growth rate over the entire period (2000-2011) is quite less at 2.05, especially in pre-Euro period (2000-2002) at 1.44. C.V. also substantiates the same argument as its values 1.13 (2000-2011), 0.70 (pre-Euro) and 1.33 (post-Euro) indicate that the fluctuations in GDP is negligible.

(ii) GDP growth rate of Belgium also shows consistency over the period with 1.63 per cent overall, 1.95 per cent pre-Euro and 1.52 per cent post-Euro. Just like Austria, Belgium also shows that post-Euro, the

minimum GDP fell as much as by 2.0 per cent. S.D. results show that the fluctuation in GDP growth is not only consistent over the entire observed period (1.69) but also in the pre-Euro period (1.52) and the post-Euro period (1.82), emphasising that differential impact of EMU on Belgium's economy is negligible. Although the C.V. in the pre-Euro and post-Euro periods tends to show otherwise. The pre-Euro fluctuations in GDP growth were at 0.78, thus showing an increase of 0.42 in post-Euro period.

(iii)   Looking at the rate of Finland, the overall GDP growth is impressive at 2.17 per cent; it was much higher at 3.14 per cent in the pre-Euro period and was bogged down to 1.85 per cent in the post-Euro period. It is the highest fall in the minimum GDP growth among all the ten select member-states and both the groups. S.D. at 3.69 for the entire period (2000- 2011) is the third highest in the panel and shows that there were great swings in the average GDP growth.

(iv) Now, for one of the large economies of EU, namely France, the GDP growth rate for the total period is 1.42 per cent. It was much higher at 2.15 per cent in the pre-Euro period that fell to 1.17 per cent in the post-Euro period. The minimum GDP growth stood at 0.93 per cent in the pre-Euro period that decreased to -3.15 per cent, surely not a desirable impact of EMU. C.V. data of 1.22 for the entire period, 0.65 in the pre-Euro period and 1.56 in the post-Euro period indicate a small movement in GDP.

(v) GDP growth rate of Germany has shown almost identical percentage in all the three periods, in total (2000-2011), in pre-Euro (2000-2002) and in post-Euro (2003-2011). It can be said that in Germany, the growth rate of GDP remained static irrespective of the introduction of Euro. C.V. of German GDP for the entire period was 1.87, which was only 1.0 during the pre-Euro period and rose up to 2.21 in the post-Euro period.

(vi) Greece emerged to be the laboratory to test the success of EMU. As far as GDP is concerned, Greece had the second highest GDP growth at 4.04 per cent before the introduction of Euro. The overall GDP growth was also higher at 1.53 per cent than the two big economies of the EU, namely, France (1.42 per cent) and Germany (1.36 per cent). But, in post-Euro, a gigantic fall brought down its GDP to 0.69 per cent, the third lowest among all the selected member-states.

(vii)   For GDP growth rate of Ireland, much shocking results are found. Ireland had not only the highest GDP growth at 3.18 per cent for the entire study period, but also the phenomenally highest at 7.02 per cent in the pre-Euro period. No member-state in our selected group could come closer to this performance of the Irish economy. But the impact of EMU has been so severely negative on Ireland that GDP turned out to be only 1.9 per cent post-Euro. Although the fissure was huge in maximum and minimum GDP even in the pre-Euro ranging from 10.65 per cent to 4.99 per cent (more than 5.0 per cent), it aggravated further in the post-Euro from 6.08 to -6.38 per cent (almost 12 per cent). This shows the precarious condition of the Irish economy.

(viii)   Italy seems to be a poor cousin of the selected member-states having the least GDP growth rate of 0.67 per cent. During pre-Euro, its growth rate was almost 2.0 per cent which fell to 0.23 per cent in the post-Euro. This variation was less in the pre-Euro and measured only 0.81. On the contrary, in the post-Euro, the instability in the Italian economy increased sharply and C.V. reached up to 10.55, the highest among all the selected member-states.

(ix) The overall GDP growth of Portugal was sufficiently high at 2.22 per cent in pre-Euro, but became dismal at 0.34 per cent in post-Euro. This signifies that the EMU had an adverse impact on the Portuguese economy. C.V. was 2.29, showing large fluctuations. Pre-Euro C.V. was very less at 0.72; while, it was massive at 5.20 in post-Euro period.

(x) GDP growth rate of Spain was reasonably high at 3.81 per cent in the pre-Euro, while it fell to 1.6 per cent in the post-Euro. Overall GDP growth was the third highest at 2.15 per cent. The maximum GDP was

highest in the pre-Euro and the minimum GDP was the lowest in the post-Euro. Even the C.V. suggests that the Spanish economy became more volatile in post-Euro at 1.63 which was only 0.31 prior.

(xi) Comparing GDP growth rate of MPEE and LPEE, the difference was non-existent in the average growth during the entire period, as the rate was 1.68 per cent for MPEE and 1.67 per cent for LPEE.

7.2. Correlation Analysis

The results of Bi-Variate Correlation Analysis & post- and pre-Euro Correlation Index between MPEE and LPEE for GDP are provided in Table 4. This correlation index reflects the change in correlation in the post-Euro relative to the pre-Euro period

Table 4: Bi-Variate Correlation Coefficients & Post- and Pre-Euro Correlation Index between MPEE and LPEE Countries

Variables	Pearson Correlation	Study Periods			Post- and Pre-Euro Correlation Index
		Total	Pre	Post	
GDP Growth Rate	Coefficient	0.75	0.99	0.77	0.78

Correlation between LPEE and MPEE has been positive for GDP in both the periods. We find high positive correlation in overall period and post-Euro, along with very high positive correlation in the pre-Euro. This implies that, the correlation between GDP growth of LPEE and MPEE has reduced post-Euro. This is further affirmed by the less than one (0.78) value of the post- and pre-Euro correlation index.

7.3. Inferential Analysis

The study now puts the data to more rigorous testing and then, further analyses the results to draw a meaningful conclusion. To test the equality of Variances and equality of Means of GDP, Levene's Test and t-Test are applied respectively.

First considering the data in Table 5, we take a Null Hypothesis (H_o) as follows.

H_o: Average GDP Growth Rate is same in the pre-Euro and post-Euro periods.

Now, we focus on the 3S, that is, Significance, Size and Sign.

Table 5: GDP Growth Rate, Select Member-States

Country	Levene's Test for Equality of Variances		t-test for Equality of Means		
	F	Sig.	t	Sig. (2-tailed)	Mean Difference
Austria	0.17	0.69	0.25	0.81	0.36
Belgium	0.01	0.91	0.37	0.72	0.43
Finland	0.43	0.53	0.51	0.62	1.29
France	0.14	0.71	0.84	0.42	0.98
Germany	0.74	0.41	0.13	0.90	0.23
Greece	8.22**	0.02	2.06*	0.07	3.35
Ireland	0.53	0.49	1.91*	0.09	5.12
Italy	0.28	0.61	1.17	0.27	1.76
Portugal	0.26	0.62	1.64	0.13	1.88
Spain	2.48	0.15	1.39	0.20	2.21
MPEE	0.27	0.61	0.42	0.68	0.66
LPEE	2.31	0.16	1.70	0.12	2.86

Levene's Test: Applying Levene's Test for equality of variances, it is found that it is rejected in case of Greece. Hence, in case of Greece, the unequal variance t-Test has been used. For all other countries, the equal variance t-Test is used.

t-Test: The t-Test result is significant in the case of Greece and Ireland and hence, the null hypothesis that the GDP growth rate has equal means in pre-Euro and post-Euro periods is rejected in the case of both the member-states.

In Table 5, mean difference of all the member-states and both the groups is positive. It signifies that the GDP growth of pre-Euro period is higher than the GDP growth of the post-Euro period. Interestingly, the mean difference of GDP growth rate of Greece and Ireland are significantly high at 3.35 per cent and 5.12 per cent. Their mean difference is among the top two highest followed by the mean difference of the LPEE. The mean difference of GDP growth rate is statistically significant at 10 per cent level while for Greece and Ireland; it is 7 per cent and 9 per cent respectively. The LPEE not only has a positive mean difference, indicating that the pre-Euro average GDP growth rate was higher, but also it is much higher at 2.86 than the mean difference of the MPEE which has a magnitude of 0.66 only.

8. Conclusion

The economy of Austria has been steady during pre- and post-Euro periods. The fluctuations in GDP growth of Belgium increased in the post-Euro. The differential impact of Euro on the Finnish economy has been tremendous. The oscillation increased in the German economy in post-Euro. The EMU had a severe negative impact on the Greek as well as Irish economies. The differential impact of EMU on the Italian economy was not as it was desired and expected. The EMU disturbed the Portuguese economy as well.

We may infer that EMU created unsteadiness among the economies of the LPEE. Despite the volatility, a tendency for lessening the dispersion of GDP growth rates is to be noted. However, due to the global economic crisis, an increase in the dispersion is visibly noticed in the years 2008 and 2009.

The Euro is overall a stable and successful currency. As expected, it has provided transaction cost reduction and price stability, and the shield against external instability. In a short span of time, it has become the second most important global currency as around sixty nations directly or indirectly peg their currency to it. The present crisis is the right time to work on the 'design faults' of convergence criteria to strengthen the Eurozone.

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ECOFEMINISM IN RABINDRANATH TAGORE'S SHORT STORIES

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ABSTRACT

Ecofeminism or ecological feminism is an interdisciplinary movement that signifies the blend of the fundamental movement in ecology and feminism. Ecofeminism is a set of beliefs that finds the oppression of women is interlinked to the oppression of nature with the same masculine-centered practices and attitudes concerning the patriarchal society. Ecofeminism has a source in literature also. This paper will focus on the selected short stories of Rabindranath Tagore (the only Indian to get Nobel Prize for literature in 1913), who has written nearly one hundred short stories though he is very well known as a novelist, poet, painter, philosopher, and essayist. In most of his story, he has presented the position and treatment of women in society. Through his stories, he tells the world that Indian women are highly sacrificing, obedient, loving, kind, and religious. He found that the women of this country dare to fight against all odds, have immense wealth, the power of survival under the worst possible conditions. His novels and short stories are previously analyzed through the vision of feminism but now the objective and aim of this paper is to evaluate them through the essence of ecofeminism which is a new term in literature.

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Introduction

The term ecofeminism was first discovered by Francoise d'Eaubonne in 1974 in her famous book Feminism or death. This theory both questions and rejects the earlier patriarchal model and further carries the notion that the domination of women by men is interconnected to the destruction of the environment. Ecofeminism came first into the discussion in the early 1970s in the United States when several women became depressed with the traditional environmental movement and so they wanted to create more awareness among feminists about the environmental concerns. Ecocriticism allies the relationship between literature and the physical environment, asking how nature is represented in literary works. According to a more recent ecofeminist Maureen Devine (1992) "women is the victim not only of individual men but of powerful patriarchal structure- which treat environment and women as objects and within these power structures both become victims."

Rabindranath Tagore was a versatile writer; therefore, his writings can be analyzed from various perspectives. In literature, there are thousands of research already done on his writings. But still, now there is sufficient scope to study many concepts which have not yet been touched. In Tagore's writing feminism and nature, both are common and well-discussed topics. His short stories are often set in rural villages of Bengal, where one can easily find the impact of nature, men especially the position and treatment of women in society. In many of his short stories nature is shown in the background and Tagore observes himself as a member of natural things. He introduced nature as a source of peace, joy, tranquillity, and the source of suffering for many female characters who are highly loving, sacrificing, meek, obedient, kind, and religious. The connection between the natural environment and the world of women has been central to the thinking and activity of ecofeminists. Some of the works of ecofeminists like Mary Daly (1976), Susan Griffin (1976) Karen Warren (1987, 1990), Val Plumwood (1993), and others emphasize the fact that ecology is a feminist issue.

Karen Warren an American philosopher in 1987 wrote a significant article "Feminism and Ecology: Making Connections" in which she persuades feminists to turn their attention to problems of ecology and to acknowledge the connection between sexism, environmental degradation, and other forms of social oppression. Another recent ecofeminist like Maureen Devine (1992) assumes that "women are victim both of patriarchal power, as well as of individual men… which treat environment

and women as objects and within these power structures both become victims." (p52)

From the last twentieth century onwards, many women writers in India have advocated the concept of ecology in relation to women, some are Mahashweta Devi, Kamala Markandaya, Arundhati Roy, Shashi Deshpande, Kiran Desai. But Rabindranath Tagore a 19th-century writer considered nature as a living entity and realized it as a companion from his very childhood. Therefore, Tagore admits in his work Creative Unity: I remember, when was a child a row of coconut trees by our garden wall, with their swaying branches beckoned the rising sun on the horizon, gave me companionship as living as I was myself (C.U. p8). Tagore has written more than a hundred short stories and in many of his short stories, he reveals the link between nature and human beings. For instance, Subha (The Dumb Girl), Shasti (The Punishment), Streer Patra (The Wife's Letter) all these stories are all important regarding connection with nature. In all these stories Tagore has taken the help of nature to create a certain mood of the central characters specifically the female characters, how they are treated by nature? How is their relationship with nature? What is the effect of nature on them? Although through these stories Tagore presented how nature has changed the whole atmosphere of the setting of the story.

The main aim of this paper is to explore Tagore's few short stories from an ecofeminist point of view. Therefore, this paper will focus on ecofeminism a recent theory in Tagore's short stories which were about hundreds of years back.

Tagore being a premier romantic poet of Bengal, acknowledge women in all their sorrow and joy, despair and hope, their dreams and their desires. In Tagore's days, women were extremely suppressed by primitive society. The cruel, outdated, primitive customs intensified the tortures and miseries of women. Through his stories, Tagore pointed out those abuses. He was never influenced by patriarchal views. In some of his stories we find that somewhere because of nature, women are suffering, somewhere nature is being tortured like women, or somewhere are presenting like nature, both suffering and revolting. Based on these factors about women and nature in

Tagore's stories this paper will discuss three of his famous short stories, where women are closely affected by nature, both positively and negatively.

Rabindranath Tagore's short story "Punishment" or "Shashti" (The sentence) which was published in 1893, depicts the Bengali peasant's hard life. Tagore here showcases the divine richness of women in peasant's family, although they live in acute poverty, and had to face indignity everywhere. This story is about the life of two young brothers Chidam and Dukhiram and their respective wives Chandora and Radha. When the brothers came back home after a day's hard work, the elder brother Dukhiram asked for some food from his wife Radha. But when she answers him cruelly, he lost his temper and killed Radha with his chopper. Then Chidam came to save his brother. He asked his wife Chandora to own the crime and to tell the court that she had killed Radha in self-defense during an argument. Chandora worshipped her husband like a god but due to his wicked suggestion, she understood her worth in the eyes of her husband and decided to kill herself as disapproval against the humiliating proposal. Therefore, she accepted in front of a judge that she had killed her sister-in-law because she did not like her. Chidam realized what kind of mistake he had done, so both Chidam and Dukhiram wanted to save the life of Chandora instead of theirs, but on the other hand, the judge had got convinced that Chandora was a culprit so he sentenced her to be hanged.

The starting of the story is very depressing in nature which is very similar to the depressing aura of the house. The background of nature is very terrible and it is also creating a tense situation in which the murder would take place. William Radice has illustrated this as "There was not a breath of wind. Weeds and scrub around the house have spot up after the rain: the heavy scent of damp vegetation, from these and from the water-logged jute fields, formed a solid wall all around. Frogs crooked from the pond behind the cowshed, and the buzz of crickets filled the leaden sky." (SSS 125)

Therefore, through this style of writing Tagore is formulating the reader for some terrible event that is coming very near to the family.

Two brothers after whole days' hard work when came back home through rough weather by dealing with the village's muddy path, exhausted, hungry, and after asking for food when the answer was harsh elder brother lost his temper and unintentionally killed his wife Radha with a chopper. In this rough weather, neither even at the end of the day, they didn't get proper money for their work, nor they didn't get proper food all through the day. Hence, from the very starting, they were hot-tempered and lost at it in front of their wives. Due to their social status, poverty, environmental situation, they are not able to think properly. Therefore, when the landlord of the house encourages Chidam with the legal ways to save his wife by blaming Dukhiram, Chidam instantly said that "if he lost his wife, he could get another, but if his brother was hanged, he could never replace him." (parabaas -20.11.17) At the end of the story Chandora just said that: "Your honor, I beg you, please make your ruling. Do what you like. I've had enough." (parabaas -20.11.17) These plain words depict the depth of the grief and offense in the mind of a simple but stable and strong-willed woman.

In another story Subha" or "The dumb girl" we see a close resemblance between nature and man. In this story, Bankianath has three daughters and Subha is the youngest of all. Her two sisters Suhashini and Sukeshini had been married with great difficulty and usual cost and now Subha the youngest daughter was sitting like a weight upon the hearts of her parents. As she was dumb from her earliest childhood, so she knew that God has sent her like a curse to her father's house. Therefore, she endeavors to withdraw herself from ordinary people to live separately in the company of nature. Subha, with her parents, lived in a small village called Chandipur. Due to her dumbness, she had no friends except two cows in the household, nature, and a lazy boy of Gosains named Pratap whose main desire is nothing but only fishing. When Subha was growing, her parents were bothered regarding her marriage so they decided to shift to Calcutta. It was traumatic for Subha to leave her friends. Subha's parents fixed her marriage without revealing her defect of dumbness to the bridegroom's family. Although she cried a lot

but her tears and displeasure made no negative effect on either her parents or the proposal. The marriage took on a promised day to bring good luck. The husband was settled in the west due to work, and soon after the marriage, he took her over there.

Therefore, this story wonderfully depicts the close relationship between man and nature. The stream the nature, the cows are the major characters here. Following is the description: "It's river, small for a river of Bengal, kept to its narrow bounds like a daughter of the middle class. This busy streak of water never overflowed its banks, but went about its duties as though it were a member of every family in the village beside it." (Wikisource-20.11.17)

So, a daughter of a middle-class family is compared to a small river, who has her own emotion, passion, and feeling, with all these instincts, she is leading her life without expressing them. Therefore, she kept herself in a slender bound of the patriarchal society. As the river moves without harming anybody, in the same manner, the daughter of a middle-class family also leads her life without saying anything to anybody. In this story, the little dumb girl is trying to find her support for her pain in nature. Nature fulfilled her want of speech and spoke to her. The voice of the village folk, the murmur of the brook, the crying of the birds, the songs of the boatman, the whisper of the trees mingled and were one with the trembling of her heart. According to Dodd "They became one great wave of sound which beat upon her restless soul. They were her real language, in which she talked with nature." (Dodd,35) So this movement and murmur of nature were the dumb girl's language. Therefore, when the whole busy world paused after labor and became silent then there were only a dumb girl and dumb nature, sitting very silently.

Besides this, Subha's two cows were also her friend. Although they knew her footfall but still, they never heard anything from her lips. Whenever someone hurts her, she would come to this dumb friend and would try to find relief with her. Nature was like a mother to Subha because she has nothing to do except giving her moral support. Before leaving the village she bid farewell to Pratap, cows, and also the night when she used to come out from her

room and flung herself on her grassy couch. It was like as if she threw her arms around her strong mother that is nature and made an effort to say: "Do not let me leave you, mother. Put your arms about me, as I have put mine about you, and hold me fast." (Wikisource-20.11.17) Subha is the daughter of nature. But both nature and Subha are dumb like mother daughter s also helpless. It is as similar that Subha has been plucked out from the comfortable lap of mother nature into never-ending suffering.

"The Wife's Letter" is another vital short story by Rabindranath Tagore, illuminating a women's hatred and struggle with the ways of her life unravels. The plot goes around Mrinal, who is married to a patriarchal, upper-middle-class zamindar family. After marriage, Mrinal often has to become the subject of fun due to her rustic nature but at the same time, her in-law's family are well informed of her sharp brains. In this story, we get to know about three women, and all are represented by the signatory explosive letter, Mrinal. In her letter, she has not only presented her own fifteen years of married life but also the position of her young sister Bindu and her elder sister-in-law. Mrinal is reborn as herself by signing her name rather than the descriptive nomenclature allotted to her as a "mejo bou", that is the wife of the second son. But in the concluding line of Mrinal's letter she became Mrinal from Mejo bou thus discovered her own identity- "I too will be saved. I am saved." (ebook-20.11.17)

Apart from Mrinal, another daughter-in-law, i.e., the eldest one (Boro bou), who was neither rich nor beautiful. She came from a blue-blood family. Therefore, she was always aware of her lack of beauty and assets. She falls into a great problem when her unmarried fourteen-year-old sister came to live with her after her father's death. As Mrinal's daughter died soon after birth, therefore her urge for a child was a little bit compensated with the arrival of Bindu. Therefore, Mrinal became Bindu's surrogate mother, although she started fighting with the rest of the family members. Still, Bindu's marriage has been fixed and on the second day of her marriage, she came to know that her husband was violent and mad. Due to patriarchal norms, she can't leave her in-law's

home. Finally, she committed suicide by setting herself on fire.

Although the husbands of all the three women Mrinal, Borobou, and Bindu had provided them security, shelter, and sustenance still they were having a loveless family life. There were no chances of equal partnership in this relationship between powerlessness and power. Mrinal, a small girl from a village, has to leave her village when she was twelve years and that was due to her marriage. But there was no love and care for women in her in-law's house. Even there was not a single space where women can breathe freely. Therefore, Mrinal who was grown up fully in the open air, in the lapse of nature now in a dungeon-like in-law's house.

"But I shall not return to 27 MakhanBaral Lane ever again. I saw what happened to Bindu. I have realized the position women have in this society. I don't want to go through it anymore." (ebook-20.11.17) Therefore, it was through nature that she got her intelligence at an early age and it was again through nature that she got the power of getting off her freedom which she didn't get in her husband's house.

In the first story "Punishment" or "Shasti", Chandora has to be punished, which was because of the effect of nature as she silently protests against her husband's betrayal. In the second story "Subha" or "The Dumb Girl" Subha has been set apart from mother nature and therefore has to suffer a lot because Mother Nature and Subha are dumb. In the third story "The Wife's Letter" or "Streer Patra" Mrinal gets freedom and a new identity in Mother Nature. So, though nature is dumb it has its own principles, language, and effect on every human being. In many of Rabindranath Tagore's books, nature has been depicted as common and its effect on characters is very eminent. In fact, nature is the same as for men and women, it's not that there's any specific relation between women and nature but everywhere women are more affected both negatively and positively by the impact of nature. Ecofeminism as a movement and an ideology find that oppression of women is interlinked to the oppression of nature with the same masculine-centered practices and attitudes concerning the patriarchal society, therefore all the discussed women in this paper

are highly influenced by nature, which presented ecofeminism.

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GST- A VIOLATINO TO BASIC STRUCTURE OF INDIAN CONSTITUTION OR A STEP TOWARDS CO-OPERATIVE FEDERALISM

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ABSTRACT

The present study will analyse the implementation of 101ˢᵗ Amendment Act 2016. The constitutional validity of the bill at question that whether this bill is harming the basic structure doctrine of the Indian Constitution of it should be considered as a step towards the co-operative federalism. The concept of co-operative federalism is always been disguised on the term that India is a quasi-federal nation and provide an opportunity to Centre government to come up with certain legislation which may deceive the core principle of basic structure doctrine.
This paper is tends to understand the balance made between the distribution of power amongst the Centre and the State through this amendment and simultaneously to what extend it has harmed the constitutional provisions.

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Keywords : Co-operative federalism, doctrine of basic structure, Centre & State government, GST, amendment.

Introduction

The Constitution (One Hundred and First Amendment) Act, 2016, popularly known as the GST amendment, marks the beginning of a Constitutional experiment that will put the federal character to test. A few major Legislative heads, which earlier fell within the independent and sovereign realm of individual legislative assemblies, have now been replaced by a legislative power that will ideally have to be exercised in harmony by the States and Centre and the inter States if the integrated system that has been envisaged is to work out.

The drastic effects of these amendments on the revenue and revenue-generating avenues of the Centre and the States meant that discussions surrounding the amendment predominantly concentrated on the sphere of revenue of the federal units, the sharing and distribution of revenue, constitution and decision-making powers of the GST Council, capping of tax rates etc. In this commotion of discussions and debates, questions regarding the effect of this amendment on the design of and power dynamic under the Constitution, failed to find any patrons.

The Constitution, by design, enlists heads of legislations, including taxing heads, in the Seventh Schedule. Post the 101st Amendment, most heads dealing with indirect taxation have been removed from the Seventh Schedule and consolidated into a single tax head titled Goods and Services Tax, leviable on the supply of goods and services by both the Centre and the States by Laws passed by their respective legislatures under a newly added Article 246A. To decide on a unified GST rate and the rate at which taxes would be split between the Centre and the States, a GST council has been constituted to give recommendations to the Centre and the States on these issues. The constitution of the Council and its decision-making mechanism are laid down by the Constitution itself. There are certain devastating effects that the 101st Amendment has on the design of the Constitution and consequently on the Federal balance under the Constitution.

Concept of Co-operative Federalism

Cooperative federalism is a "cherished constitutional goal." It would be wise to begin with the suspicion that cooperative federalism is not, as the term might otherwise suggest about the tiers of the government cooperating with one another, which is, parenthetically, an ethical requirement in all forms of governance. It is a federal structure which solidifies unitary ideas at the same time as also stand for the states to operate independently within some limited outlines. It thus, "involves the sharing of authority between federal and state agencies, often leaving state agencies with discretion to implement broad federal policy goals".

The independence of a political unit is controlled by the degree of authority over its laws. It exists when one government is liberated from the controls of a higher level of government. Accordingly, in a model of cooperative federalism, the states should be genuinely self-governing in their circles for example the states should be enabled to enact regarding the matters appointed to them. This is the 'positive capacity' of self-governance. Self-sufficiency likewise plays out a negative capacity – it avoids the middle from interrupting into the states circle of administrative skill and the other way around.

The Constitution of India, before the 101st Amendment was passed, accommodated a total polarity in tax collection forces of the middle and states, consequently performing both the positive and negative capacity of self-governance. Duty based sections discovered a spot just in List I (Union List) and List II (State List) of the Seventh Schedule. Therefore, customarily, charges collected by a state can't be exacted by the middle and the other way around. In any case, with the inclusion of Article 246-A, the middle and states are simultaneously approved to demand GST. States have now lost the opportunity to pick their assessment rates. A choice to change the tax-rate would mean approaching the **GST Council**, thereby surrendering to the sanction of a special majority of weighted votes. Consequently, the states' freedom of economic and developmental pursuits has also been curtailed to a great extent. This is a grave sacrifice at the altar of autonomy.

Provisions violating Basic Structure

A Constitutional Amendment under Article 368 of the Constitution is a vast power of very wide import that permits the Parliament to effect changes to any portion of the Constitution. There are two checks that're imposed on this power. First is the judicially developed Basic Structure Doctrine. Besides this Article 368 itself contains a procedural check by **entrenching** certain provisions of the Constitution and requiring ratification from half the States in order to amend those provisions. These entrenched provisions deal with matters that have an effect on the federal balance and federal system. The Seventh

Schedule, comprising of heads of legislation, being an important feature of this balance and system, is also entrenched by Article 368.

As the 101st Amendment eliminated and modified certain heads of legislation under Schedule VII, it must be confirmed considerably the States. The heads of legislation that were taken out from the Seventh Schedule have been merged into on head of legislation contained in a different Article, Article 246A. Yet, shockingly, Article 246A has not been remembered for the settled in list under Article 368. The uncommon circumstance that has now emerged because of the change is that, a revision to the ability to impose, gather and suitable the new Goods and Service Tax can be done without requiring sanctions from the States. It's fairly unusual and frustrating that while Article 279A which manages the Constitution, obligations, dynamic instrument and so on of the GST board has been remembered for the settled in arrangements of Article 368 by the 101st Amendment, the charging arrangement Article 246A that enables the Parliament and State Assemblies to force the GST, has not been dug in. There are two worries with this non-entrenchment.

Firstly, it gives allows the Parliament to amend the power to impose, collect and appropriate GST. That means, with a sufficient majority, Parliament can even convert GST into an exclusively Union levied and appropriated Tax, and there would be no Constitutional check on the same. While a particularly outrageous advance possibly opposed through political common society coordinated pressing factors, it stays the case that the State Governments' sovereign ability to exact and gather GST perhaps rejected, dynamically stripped or re-designed, especially by the Parliament without obtaining any confirmation from the States.

Furthermore, whenever let to persevere, such utilization of the ability to Amend under Article 368 would set an extremely risky point of reference. Under our Constitution, the Union and the States practice sovereign forces in their individual fields of force. While the ability to revise the Constitution is given to just to the Parliament, where any such change influences the government character, endorsement of a dominant part of the State Assemblies is

required. This necessity of sanctions itself establishes a fundamental instrument of keeping up the force balance under the government arrangement of our Constitution and is henceforth a significant aspect of the administrative plan of our Constitution. On the off chance that the mutilation of this plan by the 101st Amendment is produced as a point of reference to results other comparative changes, it may happen progressively a re-arrangement of the government character with a wide assortment of heads of enactment being added or moved external the domain of Schedule VII and not being remembered for the rundown of settled in arrangements under Article 368.

Regardless of whether there is no purposeful ulterior rationale and this is simply absolutely an instance of poor and uncreative artist transport, the repercussions are sad. It is an incongruity that from one viewpoint GST is presented, a milestone analyse in co-employable federalism, while on the other, through exactly the same correction through which the GST is being given Constitutional power, it is venturing out towards destroying a significant part of the government structure under the Constitution.

Changes in the 7th Schedule

This amendment has made following changes in 7th schedule of the constitution:

Union List

1. The entry 84 of Union List earlier comprised the duties on tobacco, alcoholic liquors, opium, Indian hemp, narcotic drugs and narcotics, medical and toilet preparations. After this amendment, it will comprise of Petroleum crude, high speed diesel, motor spirit (petrol), natural gas, and aviation turbine fuel, tobacco and tobacco products. Thus, these are now out of ambit of GST and subject to Union jurisdiction.
2. Entry 92 (newspapers and on advertisements published therein) has been deleted thus, they are now under GST.
3. Entry 92-C (Service Tax) has been now deleted from union list.

State List

Under State list,

1. Entry 52 (entry tax for sale in state) has been deleted.
2. In Entry 54, Taxes on the sale or purchase of goods other than newspapers, subject to the provisions of Entry 92-A of List I.; has been now replaced by Taxes on the sale of petroleum crude, high speed diesel, motor spirit (commonly known as petrol), natural gas, aviation turbine fuel and alcoholic liquor for human consumption, but not including sale in the course of inter-State trade or commerce or sale in the course of international trade or commerce of such goods."
3. Entry 55 (advertisement taxes) have been deleted.
4. Entry 62 (Taxes on luxuries, including taxes on entertainments, amusements, betting and gambling) has been replaced by these taxes only to be levied by local governments (panchayats, municipality, regional council or district council.

Other Important amendments in existing articles

1. The residuary power of legislation of Parliament under article 248 is now subject to article 246A.
2. Article 249 has been changed so that if 2/3rd majority resolution is passed by Rajya Sabha, the Parliament will have powers to make necessary laws with respect to GST in national interest.
3. Article 250 has been amended so that parliament will have powers to make laws related to GST during emergency period. Article 250 has been amended so that parliament will have powers to make laws related to GST during emergency period.
4. Article 268 has been amended so that excise duty on medicinal and toilet preparation will be omitted from the state list and will be subsumed in GST.
5. Article 268A has been repealed so now service tax is subsumed in GST.
6. Article 269 would empower the parliament to make GST related laws for inter-state trade and commerce.

After studying the changes made under 7th Schedule it can be said that its not the pure violation of basic structure but can be

interpreted as a step towards the cooperative federalism.

The spirit and soul of federalism is the presence of association and state and the conveyance of force among the association and states The Constitution of India accommodates a league which has dense unifying inclinations. The alliance of India doesn't follow the guideline of "traditional federalism", which is regularly ascribed with the Constitution of US. The Indian federalism has its own tone and characteristic, has been assigned as an essential element of the Indian Constitution.

The 101st Amendment to the constitution has set up the simultaneous burdening in the country interestingly. Another idea has been received and accepted where the association and states will correspondingly demand charge on the two merchandise and Enterprises. The new burdening system has given certain advantages and powers to the middle, yet in supreme compatibility and consonance of protected plan.

GST: Architecture of Cooperative Federalism.

GST has not usurped the taxing powers of the state so as to jeopardise the states. It is only because of our federal structure that the GST is dual, levied and administered by different governments. The union would levy and collect **Central Goods and Services Tax (CGST)**, and States would levy and collect the State Goods and Services Tax (SGST) on all transactions within the boundaries of states. The union government will have the plenary power to levy and collect GST in the course of interstate trade or commerce, or imports known as Integrated GST (IGST) but the amount so collected shall be arrogated and appropriated by both central and state governments.

The determination and fixation of rates for CGST, SGST and IGST will be administered by the GST council which is neither an agent of States nor of the Union. The GST council with have representatives from both union as well as the States, also the council is not a body of the Union but an independent body in itself. Parliament and legislature of every state, have power to make laws with respect to goods and services tax imposed by the union or by such state.

A law made by union legislature in relation to GST will never supersede or overpower a state made GST law. GST is a great specimen of cooperative federalism where the States and Central governments have co-operatively and jointly relinquished their taxing power, in order to adopt and accept the GST. The fact that more than half of the states have also assented to the amendment portrays the development of cooperation between states and centre which is a good update for the Indian democracy.

The contribution of States to the public economy are determined through the gross state domestic products (GSDP). The GSDP of each State is a measure, which is adjusted to amount to the public GDP and doesn't move an excess of away from the time pattern. In the government money setting, some bigger State economies contend that their contribution to the Union assessment income is bigger and subsequently they ought to get a comparable offer in the Union tax revenue.

Given the unified income tax administration, it is difficult to calculate the geographically distributed income tax base. This was valid for extract obligation until the presentation of GST. Presently, fundamental data on the geographical dissemination of creation and utilization designs through GST income figures will be accessible. This new data won't just change the scale of GSDP yet will help evaluate better the territorial contribution to the public exchequer.

With the presentation of GST, the Government of India gave another arrangement of codes for book keeping income from the new taxes.

Conclusion

Cooperative federalism stands for a philosophy in which sovereignty is shared: 'the national and state governments work together in the same areas, sharing functions and therefore power'." - MD Reagen

The essential focal point of the constitution producers was never to devise a government or a non-bureaucratic constitution yet to have an arrangement of administration which would take into account the necessities of individuals and address the difficulties of the evolving scene. It was believed by C. Rangarajan that to meet and handle the powers of globalization and worldwide rivalry, the government system

of our nation will to have support and bear some fundamental changes. The requirement for monetary development and improvement has required the parliament of India to bring the censured change. GST act is on the side of the helpful government structure and along these lines makes ready for comprehensive development. GST law has been brought to accomplish the qualities and standards cherished in the Preamble, part III and part IV of Indian Constitution. The Indian Constitution has been corrected, to meet the current financial and monetary difficulties of the advanced world. The government construction of India will go through a change because of this alteration yet the correction not the slightest bit disregards the administrative casing work of the Indian Constitution, yet rather it reinforces the helpful organization of India.

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LONGINUS' VIEWS ON THE SUBLIME

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ABSTRACT

Longinus' treatise deals with the elements that make the style sublime in literary creations and rhetorical discourses, and as such he singles out five elements (capacity of forming great conceptions, vehement and inspired passion, due formation of figures, noble diction, and dignified and elevated language composition) about which further discussion takes place, providing numerous examples from the literature, which help to reach the necessary conclusions.

Although Longinus is considered the first to deal with the sublime, from the introduction of the work, he informs us that this issue was quite discussed in his time, moreover, there have even been other writings on this, such as Cecil's booklet, or also any other writings which have failed to transcend the barriers of time and enter into dialogue with scholars of later generations.

As much as the lack of natural talent, the sublime is hindered by the lack of inspiration or passion, therefore even the writings with pretended inspiration never achieve the right effect on the readers, an element that is very much favoured by Longinus, because he sees the effectiveness of the work closely linked to the beauty of style, sublime and pleasure.

Among the factors that affect style damage, Longinus mentions lack of inspiration, excessive amplification, but also broken pace of discourse, excessive concentration of phrase, carelessness of language and anything else that goes against those that elevate style.

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Keywords: *Longinus, literature , sublime, theory, among, writings*

Introduction

Theoretical writings on literature originating from the ancient period, with their depth and extent of problem-solving have become the foundations of later theories that have aimed to explain the essence of literature. Created as a result of the rapid development of knowledge, thought and culture, these theories continue to have an impact even nowadays on various writings, treatises, studies and treaties on literature. In addition to the well-known writings of Plato and Aristotle, Longinus' treatise from Greek antiquity has reached our time and *Peri hypsous* (On the Sublime) where for the first time the sublime is mentioned, as an aesthetic category, which Longinus defines as a feature of art that causes not only excitement but also ecstasy to the reader.

Longinus' treatise deals with the elements that make the style sublime in literary creations and rhetorical discourses, and as such he singles out five elements (capacity of forming great conceptions, vehement and inspired passion, due formation of figures, noble diction, and dignified and elevated language composition) about which further discussion takes place, providing numerous examples from the literature, which help to reach the necessary conclusions. Longinus leaves an important place in his work to issues that damage the style and always takes as a point of reference the influence that certain writings have on the reader, thus laying the foundations of the reception theory.

Although, the work of Longinus *On the Sublime*, has exerted tremendous influence in later periods, and in particular in the theory of classicism and philosophical considerations of the sublime as an aesthetic category, this work although claiming to be a systematic study fails to take the place of a precise rhetorical treatise, as for instance *Poetics* of Aristotle does. In addition, numerous dilemmas and discussions about the authorship of this text are known with evidence that Longinus lived in the third century whereas the treatise is of the first century, while Ernst Robert Curtius questions the very title of the book, on the grounds that it does deal with the sublime but with the height of style, respectively high literature. However, in the absence of accurate data, we will continue to treat *On the Sublime* as Longinus' work and as an important theoretical writing, because the issues it deals with and the way it deals with them express a high degree of knowledge that the author had in the field of literature, rhetoric and philosophy, where moreover with a quote from the book of *Genesis* (The Old Testament) it also presents

knowledge from the field of the Jewish religion, which is not common for the scholars of ancient Greece. This fact also served as a pretext for Longinus to sometimes be considered a Hellenized Jew.

The Sublime According to Longinus

Although Longinus is considered the first to deal with the sublime, from the introduction of the work, he informs us that this issue was quite discussed in his time, moreover, there have even been other writings on this, such as Cecil's booklet, or also any other writings which have failed to transcend the barriers of time and enter into dialogue with scholars of later generations. Longinus' work *On the Sublime* is built in the form of conversation with the Roman Postum Terencian, who as mentioned by the author himself gave him the impetus for the collection of his notes on the issue, so that they may be provided to the reader of the time.

At the beginning of his writing, Longinus first gives a definition of sublime by saying that: *Sublime is an eminence or excellence of discourse that arouses our admiration,* - specifying for the reader the object of his interest, which will be the most sublime in the literary work, in prose and poetry and the way it can be achieved. This even makes Longinus' treatise special and opens the possibility of its use in the evaluation of the literary work, especially in relation to the later writings on the sublime, which were dealt with by Schelling, Henry Home, Kant, Hegel and Hartmann who approach it from different perspectives. Definitions such as: *The sublime has a more serious character and includes all human attention, therefore its experience has the character of totality* (Henry Home), *The sublime is anything that not only pleases, but also causes shudder* (Kant), *The sublime in its absoluteness encompasses the beautiful, just as the beautiful that in its absoluteness encompasses the sublime* (Schelling), and many more are the result of the definition of the sublime as a general aesthetic category and the attempt to distinguish it from the beautiful. They can also be applied in determining the aesthetic values of literary creations but do not provide the details that can elevate the style of writing, the factors that influence in this direction and those that damage the high style, as Longinus does in his writing, with which he presents his more literary than philosophical tendencies.

There are two innate factors that influence high style, according to Longinus, *the ability for grand conceptions* and *strong passion*. Saying to others that sublime is innate and cannot be taught, and that the only technique for it is the possession of natural talents, Longinus adds to his opinion that method is also necessary for the determination of order because *talents need a spur or a curb*. In this way he creates a close connection between natural talent and the need to process it, but always supporting the idea that sublime is *one echo of a great soul*. As much as the lack of natural talent, the sublime is hindered by the lack of inspiration or passion, therefore even the writings with pretended inspiration never achieve the right effect on the readers, an element that is very much favoured by Longinus, because he sees the effectiveness of the work closely linked to the beauty of style, sublime and pleasure. When discussing the pure consciousness of the sublime, Longinus mentions that it is especially needed by the creator, while in the soul of the reader it is natural to have the ability to be exalted in the presence of sublime and this happens to all people regardless of profession, age, taste, cultural status etc. Longinus brings numerous examples of the ability for sublime conceptions from Homer, moreover from him derives the well-known opinion that *Iliad* is the work of Homer's youth, where drama dominates while *Odyssey* is the work of old age, therefore it is dominated by narrative. In these two works, Longinus compares Homer to the sun, but in the second he is like *the sun in sunset.*

Among the elements that elevate the style and that can be learned Longinus mentions the ability to use stylistic figures, noble style and the organization or composition of the work. Among the figures used for the elevation of the style are mentioned: amplification, apostrophe, anaphora, asyndeton, polysyndeton, hyperbaton, enumerations, polyptotes, climax, paraphrases, hyperboles, metaphors, similarities, comparisons, and so on, but always insisting and repeating that they should not be used excessively and especially that they

should not look like figures. But what does Longinus mean when he seeks and insists on this fact, and if he lists the use of figures in the elements of style elevation that can be learned, then how can a creator learn what the proper measure of using figures is? Deeply convinced that it is not the use of stylistic figures that in itself makes a high style, Longinus insists on this fact, but the very extent of their use risks to include this element in the group of innate factors that enable high style. The fact that the existence of the sublime literary works of Homer, Dante, Shakespeare, and so on, are examples, among other things, of the use of stylistic figures, does not guarantee young creators an absolute model of writing and a sure support to elevate the style, which makes us believe that even the ability to use figures correctly is an innate gift, rather than learned technique. While the other requirement which has to do with the invisibility of the figures has the meaning of insertion and natural interconnection with the matter of the work, and by no means that they should be placed artificially. Among other things, on the formal side, Longinus introduces the use of singular and plural shifts, person-shifting, and so on as elements that provide the elevation of style.

Among the factors that affect style damage, Longinus mentions lack of inspiration, excessive amplification, but also broken pace of discourse, excessive concentration of phrase, carelessness of language and anything else that goes against those that elevate style.

The many examples with which he illustrates and argues his theses are mainly from the works of the giants of literature and rhetoric, besides Homer, he brings quotations from the works of Sophocles, Aeschylus, Euripides, Plato, Sappho, Alcinous, Demosthenes, Cicero and many others and there are cases when they are even mentioned not in the superlative but also to indicate their mistakes. Longinus is aware that the creations that have managed to become masterpieces are not completely perfect, without any flaws, but the sublime in them appears in the entirety of the work, whereas there are many second-hand works that do not have those flaws that are found in the masterpieces. Like many other scholars, Longinus claims that Homer's work is also flawed but every creator prefers to be Homer,

Plato, or Demosthenes who errs, rather than a lesser but infallible creator, because, *he who does not err avoids criticism, but he who is sublime is also worshiped.* The fairest judges and evaluators of Longinus' works are the descendants, because their judgment is objective and not hindered by the envy and jealousy that often hinder the appreciation of contemporaries.

The issue with which Longinus' treatise ends is the concern for the path in which his compatriots have entered; he is tormented by the lack of inclination to appreciate sublime things and the unnecessary care for anti-values, for wealth, but also the greed that more and more takes the place of the values, and among them also the place of art, literature, sublime. Such a concern of Longinus, manifested since the first century AD, makes us think that a similar situation which exists today, has always followed humanity and all people cannot have the talent to appreciate art but only *elevated spirits* that have innate aesthetic taste.

The influence of Longinus' views on classical theory

Longinus' theory had an impact on later periods and in particular on classical theory in France in the seventeenth century. His work was translated by Nicolas Boileau who with his work *L'Art poétique (On Poetic Art),* written under the influence of Longinus' work, is known as the codifier of this literary direction. It seems that some of the issues on which Boileau relies, not that they do not occupy an important place with Longinus, but their application is not insistently required, in the way the classicists have applied them. Such is for instance the issue of imitation of ancient writers. When requiring for such a thing, Longinus does not think about blind imitation starting from metrics, verse, figure, content and so on but aims at an imitation where only patterns of creation could be exploited, as does Plato who extracts *innumerable streams from Homer's sublime fountain,* but it is known that Plato did not write any epic work, or as Aeschylus himself claims that *Greek tragedies are nothing but crumbs from Homer's feast* in the sense that they have exploited themes posed by Homer, which have further been expanded and enriched by others. In addition,

the classicists also insist on adhering to the rigid rules of creation, which Longinus opposes several times within his treatise.

On the other hand, Longinus' attention to the impact of the work on the reader, as mentioned above, is an anticipation in later reception theory. The impression that a work leaves on the reader is one of the most important factors that determine the presence of the sublime, while the reader of later times, as we mentioned, is considered as a motivator of high style: *If I write this, how will the descendants anticipate it?* In addition, Longinus' treatise has many elements with which he anticipates in the form of an essay, which will later come from Michel de Montaigne.

With all the issues that are intertwined within it, with the philosophical, critical and oratorical approach, the Longinus treatise *On the Sublime* occupies an important and influential place in later periods of human thought.

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SMART PERSONAL PROTECTIVE EQUIPMENT USING RASPBERRY PI

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ABSTRACT

Women in today's world are confronted with a variety of circumstances that cause them to feel terrified. Ladies from varying backgrounds are confronted with events that make them feel endangered in a variety of settings. In such circumstances, the guide of a security gadget that will help females feel more secure, sure and lessen the odds of provocation. However, there are a couple of Smartphone based answers for something very similar, it probably won't be workable for the casualty to go after her telephone in certain circumstances without the information on the culprit. In this work a high-level framework is constructed that can catch the image of the occasion and send the crisis messages of the casualty through GSM to predefined numbers and furthermore gadget can be turned on through the manual switch and just as through a basic voice command. At a similar time, device likewise monitors different parameters like alcohol, smoke, temperature, heart beat whose status are shown on the control centre window.

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Keywords: Raspberry pi, Arduino Uno, Safety device, GSM, GPS, Self-defence, SMS.

Introduction

Recently, showings of a brutality and assault against women are rising. With the speed increase of female agents in adventures and various spaces of the business commercial center, it is at present going to a requirement for women to go at late hours to trip distant and detached regions as a piece of their work. In this day and age, the significant inquiry in each young lady's brain is about her security and security. A report shows that 51% need to encounter lewd behaviour reluctantly. The rate went to 66%, 38% and 35% for general society spots, workplace and at their home exclusively. Regardless, the surprising extension in assault and violence against women in the past couple of years is addressing a threat to the turn of events and improvement of women. Right away, the case dealing with by the police is a significant issue yet there have some botheration resembles not knowing the casualty's definite area, not realizing unquestionably the wrongdoing happened by any means, and afterward need proof, police stop examination. Subsequently, there is a need of an easier security arrangement that can be enacted as just as by pressing a switch and can immediately send alarms to the close to ones of the person in question. This undertaking centres around a security framework that is planned interestingly to effectively provide security and wellbeing to ladies. We are focusing on building an effective pause and reliance system to make the woman of India feel safe and empowered. Our platform will act as 24/7 active help and companion for women so that they don't ever feel that they are alone in the middle of a crisis. This tool will act as eyes and ears for the police and help them in preventing crime against women. This tool has been designed in a manner that it covers the various situation a woman can be stuck in like when she is alone or when she is in crowded place or when she is in public transport etc. We are probably living in the worst time of our modern society has ever seen in terms of women security as strong as ever and strong enough to fight the odds, strong enough to protect themselves against any sexual assault.

We expect to offer capacity to those without whom we stop to exist. Contraption revolves around another IOT based verification gathering device to ensure women prosperity and security. This system involves a Raspberry Pi, Arduino Uno, ringer, switch, GSM module, beat sensor, alcohol sensor and smoke sensor and a Bluetooth for giving a voice request through which the contraption is activated. Right when the woman is in harm's way, the sensors the body limits like heartbeat rate, change in temperature, the improvement of loss by accelerometer sensor. Exactly when the sensor passes quite far the limit identified by the sensor will be displayed on the screen

communicating the characteristics are gone past the cut off regard. The device can similarly be sanctioned through a fundamental voice request. The objective of assessment work is to make a conservative prosperity contraption for ladies, which gives following workplaces: Alarms friends and family by sending emergency message, gets the photos/video of the attacker to save a proof for authentic exercises, makes alert, make second shock in absurd situation. Section II of this paper presents the literature review followed by section III &IV which describes the existing and the proposed system. Section V which describes the methodology, section VI briefs about the results and outcomes and section VII gives conclusion and future scope which enhances the chances of securing the women.

Literature Survey

This is an Arduino-based embedded system that uses a GSM module with GPS to send an emergency message and trigger an alarm. The project's drawback is that if the carrier is in a remote location, delivering messages may be difficult because it is entirely reliant on GSM and GSM signals, and it cannot automatically send messages if the victim's location changes. The switch must be pressed every time it is turned on.[2]

Bluetooth is used to link the hardware and software together. The emergency switch activates the "complete women security (CWS)" app, which communicates the victim's current position in real time. Some of the work's drawbacks include the size of the smart band being significantly larger, and the requirement for a lot of public awareness to urge individuals to volunteer and it is dependent on the phone; when the phone is turned off, it is impossible to seek assistance.[1]

SALVUS is the name of this device. The contribution of this work is to design and develop an Android application that can be used to with just hardware or software. The user is given the coordinates of the nearest safe zone. This device can read RFID card if valid, the women's information is displayed. There is no alternative way to seek help if the victim is unable to press the panic button; RFID transponder can be used up to 2 inches away if

it is far it cannot be used to seek help; there is no system for evidence capture; and the LPC2148 is bulky and large, making it difficult to transport.[4]

It is carried out as a clever ring (SMARISA) that is incredibly portable. It will get the victim's recent location and seize the attacker's picture using the Raspberry Pi photographic camera. The victim's smart phone is used to send the whereabouts and connect of the image shot to pre-determined emergency contact numbers or police.[5]

In this work, a portable gadget is built that may be triggered as needed by the individual and that can find the victim using GPS and send emergency signals to the designated places using GSM. The device includes an electric shock to incapacitate the assailant.[6]

The focus of this literature is on developing a safety system that provides an answer that guarantees both defence coupled with the establishment of a smooth path to starting lawful methodology. It notifies family and law enforcement, as well as providing the woman's GPS coordinates.[7]

Individuals can inform designated acquaintances that they are in harm's way and reveal their position through the click of a button under this system. This software also includes the necessary first-aid actions to be taken in the event of an emergency.[8]

The goal of this endeavour is to create a wearable gadget for women and girls' security and safeguard. The raw accelerometer data is used to estimate body position. It accomplishes data by detecting changes in the monitored signals, and then taking appropriate action by sending notifications/alerts to selected personnel.[9]

The device is based on the global positioning system, Bluetooth, a multi-function microprocessor, and a switch-over approach. Meanwhile, the device can be made to work with any smartphone that has the "ALERT" app, which can be downloaded from the Google Play Store.[12]The proposal component provides voice-activated access to the programme and determines the individual's location in positions of longitude plus scope, which can be followed utilizing Google maps. This framework decreases the pace of wrongdoing against ladies.[14]

Existing System

Understanding all feasible approaches and accessible devices to support women in emergency situations, numerous developers have come up with intense applications based on the aforementioned literature survey. Emergency services and a mobile application that alerts police management are two examples of such programmes that have been introduced to aid women. In an emergency, however, a lady is incapable of picking up the women have trouble getting hold of their phones at critical times. Even if they do, it is difficult and unreliable to convey a message quickly enough before anything heinous occurs. If a device is used to capture an image of a criminal, the photo will be saved on the SD card or locally on the device. One of the biggest issues with this system is locating the gadget after the occurrence and recovering it without damage. Most of the existing hardware solutions are triggered by hitting a button, which can be challenging when she doesn't have enough time to react, thus a simpler and more convenient approach to switch on the gadget is required.

Proposed System

The Raspberry Pi, Arduino Uno and few sensors with camera are used to create the mechanism for women's safety. The tool is designed to function in two ways. If a woman is attacked by an enemy, she must physically press a switch. This switch will activate the controller (Raspberry Pi & Arduino Uno), and an emergency message "Please Help" will be sent through GSM module to the pre-determined mobile phone numbers (usually family and friends). An alarm sound is produced with the use of a buzzer. In extreme circumstances, a nerve simulator is utilised to provide moderate shock for self-defence. The victim is alerted by the message displayed by the Alcohol and Smoke sensor. Another pathway of activating the gadget is through voice command. The device can also be triggered by voice command if the victim is unable to press the button manually. We've also included a feature that will capture the attacker's photograph and send it to the registered email address.

Methodology

The system comprises of Raspberry pi as well as Arduino Uno as two core controllers. The following are the hardware and software that are being used in this system.

1) Hardware components required
- Raspberry Pi
- Arduino UNO
- Power supply
- GSM Module
- ADXL Sensor
- Pulse Rate Sensor
- Alcohol Sensor (MQ3)
- Smoke sensor (MQ2)
- Temperature Sensor
- Buzzer
- Panic Button
- HC-O5 Bluetooth

2) Software required
- Raspbian OS
- VNC server
- Python

The device can be in either of the two ways:
When the device is triggered by the victim manually by pressing the push button, device is turned on, all other modules gets activated. GPS and GSM connected to the Raspberry pi, collects the data of the latitude and longitude, and transmits the emergency message alongside the area to the pre-characterized contacts. Buzzer also turns on throwing out loud noise. The camera attached to the raspberry pi records and stores the data. All other sensors are activated, and the values are displayed on the screen. The device can also be turned on by voice command which triggers the device and allows the GPS and GSM to fetch the present position. The message is delivered to pre-defined connections. In extreme situations, nerve simulator is also used to produce mild shocks. The Block diagram is illustrated in Figure 1
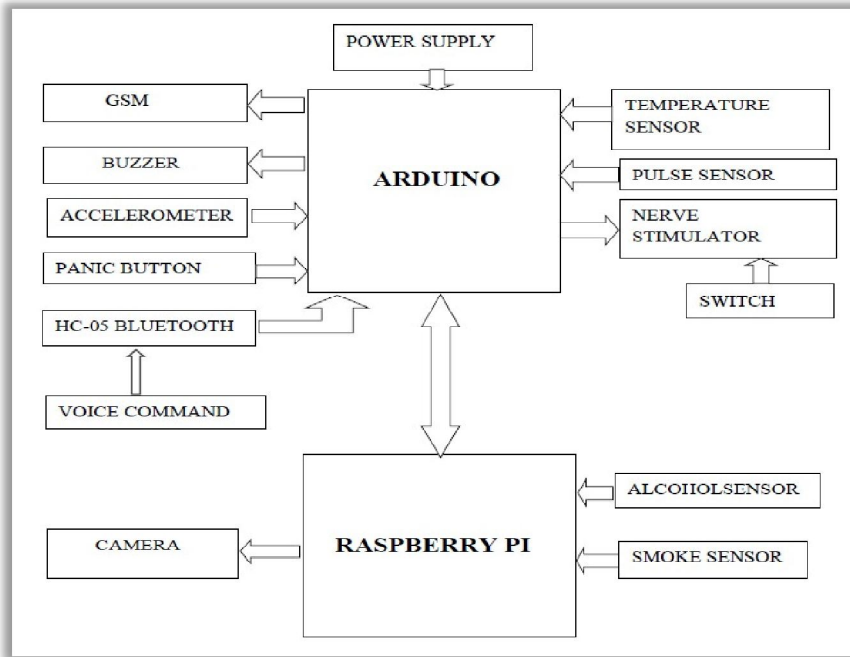
Fig :1 Block Diagram

Results & Discussion

As presented in the Figure 2, hardware entails of press button, Raspberry Pi, Arduino uno, buzzer, pi camera, GSM module, nerve simulator, temperature sensor, alcohol sensor, smoke sensor, pulse sensor. On pressing the button, the device is activated, the buzzer turns on giving a loud sound. Along with it the GSM module sends the emergency message and call to the pre-defined numbers as shown in Figure 3& 4. The pi camera captures the camera and mails the photo captured along with the present location to given mail id which is shown in Figure 5. And along with-it sensor status is displayed on the console window.

Fig:2 Hardware Setup

Figure 2 shows the equipment arrangement of the proposed plan of the security gadget. It is nothing but the hardware set up which clearly shows the connection of the various equipment and the circuit diagram.

Fig:3 Emergency message received

Fig:4 Emergency Call

Fig 5 : Mail with location & image captured

Conclusion

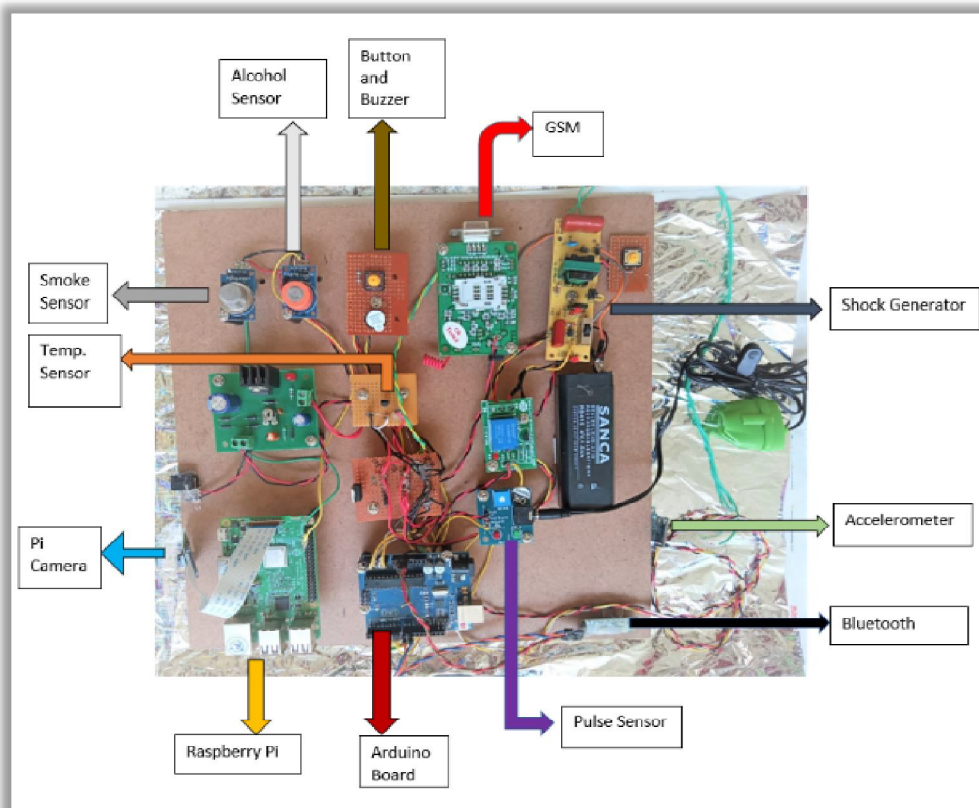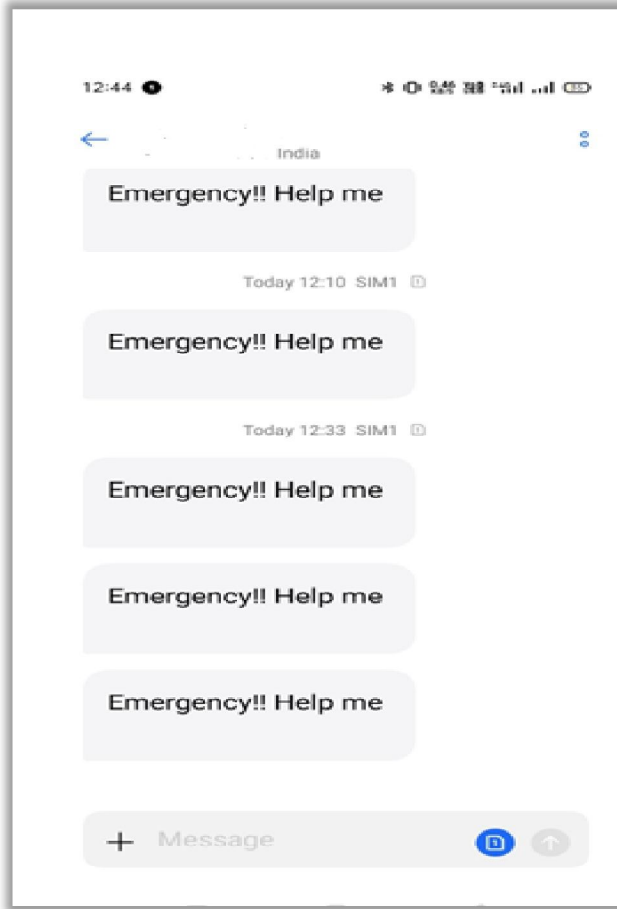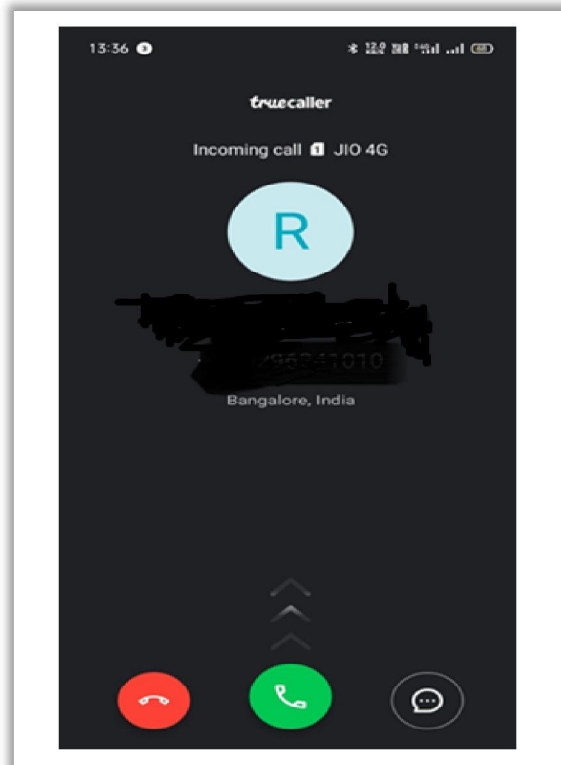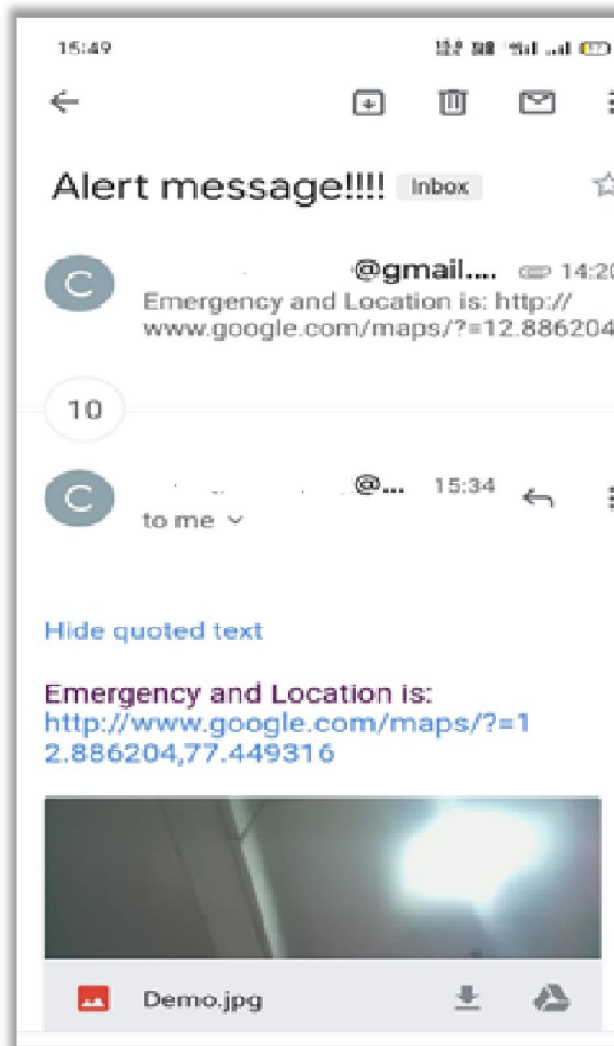This type of thinking contributes significantly to providing the most effective approach of female wellness. The recommended design will address basic concerns that women have faced in the past and will assist in their resolution through the use of security devices. This effort was centred around fostering a shrewd minimal expense gadget to help ladies, cause them to feel more comfortable, and forestall the event of lewd behaviour. This device facilitates by giving a protected climate to ladies in the general public and permits them to work till late evenings. Anybody prior to doing any wrongdoing against the females will be prevented and it assists with lessening the crime percentage against the ladies.

This prototype can be additionally evolved to make a wearable gadget, the plan can be made more minimized and lighter in weight, so it tends to be effectively compact and easy to understand. The design can be constructed using only one microcontroller and can also have its own processor like we have for many Fitbit watches and perform function just like our smart phones. The Android application can be utilized to make the gadget more successful. It can likewise have arrangements to enter various contact subtleties according to the client prerequisite. Additionally, recorded proof can be made available through the application. More safeguard provisions can be added which can be constrained by different checking framework. This this gadget can likewise be intended for the ones who are utilizing public vehicle where the female and driver should give biometric impression while beginning the outing and data of both with the assistance of GPS prove to be useful in the event of deplorable happening regardless of the traveller has cell phone or not.

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A STUDY ON THE PELL –LIKE EQUATION $3x^2 - 8y^2 = -20$

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ABSTRACT

The hyperbola represented by the binary quadratic equation $3x^2 - 8y^2 = -20$ is analyzed for finding its non-zero distinct integer solutions. A few interesting relations among its solutions are presented. Also, knowing an integral solution of the given hyperbola, integer solutions for other choices of hyperbolas and parabolas are presented. The formulation of second order Ramanujan Numbers with base numbers as real integers and Gaussian integers is illustrated and also the sequence of Diophantine 3-tuples are exhibited.

Keywords: Pell like equation, Binary quadratic, Hyperbola, Parabola,2nd order Ramanujan numbers, sequence of Diophantine 3-tuples.

Introduction

The binary quadratic Diophantine equations of the form $ax^2 - by^2 = N, (a, b, N \neq 0)$ are rich in variety and have been analyzed by many mathematicians for their respective integer solutions for particular values of a, b and N. In this context, one may refer [1-11].

This communication concerns with the problem of obtaining non-zero distinct integer solutions to the binary quadratic equation given by $3x^2 - 8y^2 = -20$ representing hyperbola. A few interesting relations among its solutions are presented. Knowing an integral solution of the given hyperbola, integer solutions for other choices of hyperbolas and parabolas are presented. The formulation of second order Ramanujan Numbers with base numbers as real integers and Gaussian integers is illustrated and also the sequence of Diophantine 3-tiples are presented.

Method of Analysis

The hyperbola represented by the non-homogeneous quadratic equation under consideration is $3x^2 - 8y^2 = -20$ (1)

Introduction of the linear transformations

$$x = X + 8T, y = X + 3T \quad (2)$$

in (1)leads to

$$X^2 = 24T^2 + 4 \quad (3)$$

The smallest positive integer solution for (3) is $T_0 = 2, X_0 = 10$

To find the other solutions to (3),consider the corresponding pell equation given by

$$X^2 = 24T^2 + 1 \quad (4)$$

whose general solution $(\widetilde{T_n}, \widetilde{X_n})$ is

$$\widetilde{X_n} = \frac{1}{2} f_n$$

$$\widetilde{T_n} = \frac{1}{2\sqrt{24}} g_n$$

Where

$$f_n = \left(5 + 1\sqrt{24}\right)^{n+1} + \left(5 - 1\sqrt{24}\right)^{n+1}$$

$$g_n = \left(5 + 1\sqrt{24}\right)^{n+1} - \left(5 - 1\sqrt{24}\right)^{n+1}$$

➢ Employing the lemma of Brahmagupta between the solutions (T_0, X_0) & $(\widetilde{T_n}, \widetilde{X_n})$,the general solution (T_{n+1}, X_{n+1}) to (3) is given by

$$T_{n+1} = T_0 \widetilde{X_n} + X_0 \widetilde{T_n}$$

$$= f_n + 5 * \frac{1}{\sqrt{24}} g_n$$

$$X_{n+1} = X_0 \widetilde{X_n} + DT_0 \widetilde{T_n}$$

$$= 5 f_n + 24 * \frac{1}{\sqrt{24}} g_n$$

where n=-1,0,1,……

In view of (2),the general solution (x_{n+1}, y_{n+1}) to (1) is given by

$$x_{n+1} = X_{n+1} + 8T_{n+1}$$

$$= 13f_n + \frac{64}{\sqrt{24}}g_n$$

$$y_{n+1} = X_{n+1} + 3T_{n+1}$$

$$= 8f_n + \frac{39}{\sqrt{24}}g_n$$

A few numerical solutions to (**1**) are presented in table below:

Table: Numerical solutions

n	x_{n+1}	y_{n+1}
-1	26	16
0	258	158
1	2554	1564
2	25282	15482
3	250266	153256
4	2477378	1517078
5	24523514	15017524

Observations

➢ The values of x_n and y_n are even

➢ $x_{n-1} \equiv 0(mod2)$, $y_{2n-2} \equiv 0(mod4)$ where n=1,2,3,……

➢ A few interesting relations among the solutions are given below:

- $x_{n+3} = 10x_{n+2} - x_{n+1}$
- $y_{n+3} = 10y_{n+2} - y_{n+1}$
- $8y_{n+1} = x_{n+2} - 5x_{n+1}$
- $8y_{n+2} = 5x_{n+2} - x_{n+1}$
- $8y_{n+3} = 49x_{n+2} - 5x_{n+1}$
- $8y_{n+1} = 5x_{n+3} - 49x_{n+2}$
- $8y_{n+3} = 5x_{n+3} - x_{n+2}$
- $8y_{n+2} = x_{n+3} - 5x_{n+2}$
- $3x_{n+1} = y_{n+2} - 5y_{n+1}$
- $3x_{n+2} = y_{n+3} - 5y_{n+2}$
- $3x_{n+3} = 5y_{n+3} - y_{n+2}$
- $3x_{n+1} = 5y_{n+3} - 49y_{n+2}$
- $3x_{n+2} = 5y_{n+2} - y_{n+1}$
- $3x_{n+3} = 49y_{n+3} - 5y_{n+1}$
- $6x_{n+2} = y_{n+3} - y_{n+1}$
- $80y_{n+1} = x_{n+3} - 49x_{n+1}$
- $80y_{n+3} = 49x_{n+3} - x_{n+1}$
- $30x_{n+3} = 49y_{n+3} - y_{n+1}$

- $30x_{n+1} = y_{n+3} - 49y_{n+1}$
- $16y_{n+2} = x_{n+3} - x_{n+1}$

➢ Expressions representing square integers:

- $\frac{1}{40}[64x_{2n+3} - 632x_{2n+2} + 80]$
- $\frac{1}{5}[79x_{2n+4} - 782x_{2n+4} + 10]$
- $\frac{1}{245}[6256y_{2n+2} - 39x_{2n+4} + 490]$
- $\frac{1}{15}[387y_{2n+2} - 39y_{2n+3} + 30]$
- $\frac{1}{15}[3831y_{2n+3} - 387y_{2n+4} + 30]$
- $\frac{1}{25}[632y_{2n+2} - 39x_{2n+3} + 50]$
- $\frac{1}{5}[632y_{2n+3} - 387x_{2n+3} + 10]$
- $\frac{1}{25}[632y_{2n+4} - 3831x_{2n+3} + 50]$
- $\frac{1}{25}[6256y_{2n+3} - 387x_{2n+4} + 50]$
- $\frac{1}{5}[6256y_{2n+4} - 3831x_{2n+4} + 10]$
- $\frac{1}{150}[3831y_{2n+2} - 39y_{2n+4} + 300]$
- $\frac{1}{400}[64x_{2n+4} - 6256x_{2n+2} + 800]$
- $\frac{1}{5}[64y_{2n+2} - 39x_{2n+2} + 10]$
- $\frac{1}{25}[64y_{2n+3} - 387x_{2n+2} + 50]$
- $\frac{1}{245}[64y_{2n+4} - 3831x_{2n+2} + 490]$

➢ Expressions representing cubical integers:

- $\frac{1}{40}[64x_{3n+4} - 632x_{3n+3} + 192x_{n+2} - 1896x_{n+1}$
- $\frac{1}{5}[79x_{3n+5} - 782x_{3n+4} + 237x_{n+3} - 2346x_{n+2}$
- $\frac{1}{245}[6256y_{3n+3} - 39x_{3n+5} + 18768y_{n+1} - 117x_{n+3}$
- $\frac{1}{15}[387y_{3n+3} - 39y_{3n+4} + 1161y_{n+1} - 117y_{n+2}$
- $\frac{1}{15}[3831y_{3n+4} - 387y_{3n+5} + 11493y_{n+2}1161y_{n+3}$
- $\frac{1}{25}[632y_{3n+3} - 39x_{3n+4} + 1896y_{n+1} - 117x_{n+2}$

- $\frac{1}{5}[632y_{3n+4} - 387x_{3n+4} + 1896y_{n+2} - 1161xn+2$

- $\frac{1}{25}[632y_{2n+5} - 3831x_{3n+4} + 1896y_{n+3} - 11493xn+2$

- $\frac{1}{25}[6256y_{3n+4} - 387x_{3n+5} + 18768yn+2-1161xn+3$

- $\frac{1}{5}[6256y_{3n+5} - 3831x_{3n+5} + 18768yn+3-11493xn+3$

- $\frac{1}{150}[3831y_{3n+3} - 39y_{3n+5} + 11493yn+1-117yn+3$

- $\frac{1}{400}[64x_{3n+5} - 6256x_{3n+3} + 192x_{n+3} - 1876xn+1$

- $\frac{1}{5}[64y_{3n+3} - 39x_{3n+3} + 192y_{n+1} - 117xn+1$

- $\frac{1}{25}[64y_{3n+4} - 387x_{3n+3} + 192y_{n+2} - 1161xn+1$

- $\frac{1}{245}[64y_{3n+5} - 3831x_{3n+3} + 192y_{n+3} - 11493xn+1$

➢ Expressions representing biquadratic integers:

- $\frac{1}{40}[64x_{4n+5} - 632x_{4n+4}] + 4f_n^2 - 2$

- $\frac{1}{40}[64x_{4n+5} - 632x_{4n+4} + 256x_{2n+3} - 2528x2n+2+240$

- $\frac{1}{5}[79x_{4n+6} - 782x_{4n+5}] + 4f_n^2 - 2$

- $\frac{1}{5}[79x_{4n+6} - 782x_{4n+5} + 316x_{2n+4} - 3128x2n+3+30$

- $\frac{1}{245}[6256y_{4n+4} - 39x_{4n+6}] + 4f_n^2$

- $\frac{1}{245}[6256y_{4n+4} - 39x_{4n+6} + 25024y2n+2-156x2n+4+1470$

- $\frac{1}{15}[387y_{4n+4} - 39y_{4n+5}] + 4f_n^2 - 2$

- $\frac{1}{15}[387y_{4n+4} - 39y_{4n+5} + 1548y_{2n+2} - 156y2n+3+90$

- $\frac{1}{25}[632y_{4n+4} - 39x_{4n+5}] + 4f_n^2 - 2$

- $\frac{1}{25}[632y_{4n+4} - 39x_{4n+5} + 2528y_{2n+2} - 156x_{2n+3} + 150]$

- $\frac{1}{5}[632y_{4n+5} - 387x_{4n+5}] + 4f_n^2 - 2$

- $\frac{1}{5}[632y_{4n+5} - 387x_{4n+5} + 4528y_{2n+3} - 1548x2n+3+30$

- $\frac{1}{25}[632y_{4n+6} - 3831x_{4n+3}] + 4f_n^2 - 2$

- $\frac{1}{25}[632y_{4n+6} - 3831x_{4n+3} + 2528y2n+4-15324x2n+3+150$

- $\frac{1}{25}[6256y_{4n+5} - 387x_{4n+6}] + 4f_n^2 - 2$

- $\frac{1}{25}[6256y_{4n+5} - 387x_{4n+6} + 25024y2n+3-1548x2n+4+150$

- $\frac{1}{5}[6256y_{4n+6} - 3831x_{4n+6}] + 4f_n^2 - 2$

- $\frac{1}{5}[6256y_{4n+6} - 3831x_{4n+6} + 25024y2n+4-15324x2n+4+30$

- $\frac{1}{150}[3831y_{4n+4} - 39y_{4n+6}] + 4f_n^2 - 2$

- $\frac{1}{150}[3831y_{4n+4} - 39y_{4n+6} + 15324y2n+2-156y2n+4+900$

- $\frac{1}{400}[64x_{4n+6} - 6256x_{4n+4}] + 4f_n^2 - 2$

- $\frac{1}{400}[64x_{4n+6} - 6256x_{4n+4} + 256x_{2n+4} - 25024x2n+2+2400$

- $\frac{1}{5}[64y_{4n+4} - 39x_{4n+4}] + 4f_n^2 - 2$

- $\frac{1}{5}[64y_{4n+4} - 39x_{4n+4} + 256y_{2n+2} - 156x2n+2+30$

- $\frac{1}{25}[64y_{4n+5} - 387x_{4n+4}] + 4f_n^2 - 2$

- $\frac{1}{25}[64y_{4n+5} - 387x_{4n+4} + 256y_{2n+3} - 1548x2n+2+150$

- $\frac{1}{245}[64y_{4n+6} - 3831x_{4n+4}] + 4f_n^2 - 2$

- $\frac{1}{245}[64y_{4n+6} - 3831x_{4n+4} + 256y_{2n+4} - 15324x2n+2+1470$

➢ Employing linear combinations among the solutions, one obtains solutions to other choices of hyperbolas

Choice1: Let $X = 64x_{n+2} - 632x_{n+1}, Y = 129x_{n+1} - 13x_{n+2}$

Note that (X, Y) satisfies the hyperbola

$8[800 + 3Y^2] = X^2$

Choice2: Let $X = 79x_{n+3} - 782x_{n+2}, Y = 1277x_{n+2} - 129x_{n+3}$

Note that (X, Y) satisfies the hyperbola

$80[X^2 - 100] = 3Y^2$

Choice3: Let $X = 6256y_{n+1} - 39x_{n+3}, Y = 8x_{n+3} - 1277y_{n+1}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[6Y^2 + 60025]$

Choice4: Let $X = 387y_{n+1} - 39y_{n+2}, Y = 8y_{n+2} - 79y_{n+1}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[225 + 6Y^2]$

Choice5: Let $X = 3831y_{n+2} - 387y_{n+3}, Y = 79y_{n+3} - 782y_{n+2}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[225 + 6Y^2]$

Choice6: Let $X = 632y_{n+1} - 39x_{n+2}, Y = 8x_{n+2} - 129y_{n+1}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[625 + 6Y^2]$

Choice7: Let $X = 632y_{n+2} - 387x_{n+2}, Y = 79x_{n+2} - 129y_{n+2}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[25 + 6Y^2]$

Choice8: Let $X = 632y_{n+3} - 3831x_{n+2}, Y = 782x_{n+2} - 129y_{n+3}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[625 + 6Y^2]$

Choice9: Let $X = 6256y_{n+3} - 3831x_{n+3}, Y = 782x_{n+3} - 1277y_{n+3}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 24[3750 + Y^2]$

Choice10: Let $X = 64x_{n+3} - 6256x_{n+1}, Y = 1277x_{n+1} - 13x_{n+3}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[160000 + 6Y^2]$

Choice11: Let $X = 64y_{n+1} - 39x_{n+1}, Y = 8x_{n+1} - 13y_{n+1}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[25 + 6Y^2]$

Choice12: Let $X = 6256y_{n+2} - 387x_{n+3}, Y = 79x_{n+3} - 1277y_{n+2}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[625 + 6Y^2]$

Choice13: Let $X = 6256y_{n+3} - 3831x_{n+3}, Y = 782x_{n+3} - 1277y_{n+3}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[25 + 6Y^2]$

Choice14: Let $X = 64y_{n+3} - 3831x_{n+1}, Y = 782x_{n+1} - 13y_{n+3}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[60025 + 6Y^2]$

Choice15: Let $X = 64y_{n+2} - 387x_{n+1}, Y = 79x_{n+1} - 13y_{n+2}$

Note that (X, Y) satisfies the hyperbola

$X^2 = 4[625 + 6Y^2]$

➢ Employing linear combinations among the solutions, one obtains solutions to other choices of parabolas

Choice1: Let $X = 64x_{2n+3} - 632x_{2n+2} + 80, Y = 129x_{n+1} - 13x_{n+2}$

Note that (X, Y) satisfies the parabola

$5[X - 160] = 3Y^2$

Choice2: Let $X = 79x_{2n+4} - 782x_{2n+3} + 10, Y = 127x_{n+2} - 129x_{n+3}$

Note that (X, Y) satisfies the parabola

$3Y^2 = 40[X^2 - 20]$

Choice3: Let $X = 625y_{2n+2} - 39x_{2n+4} + 490, Y = 8x_{n+3} - 1277y_{n+1}$

Note that (X, Y) satisfies the parabola

$245X = 4[6Y^2 + 60025]$

Choice4: Let $X = 387y_{2n+2} - 39y_{2n+3} + 30, Y = 8y_{n+2} - 79y_{n+1}$

Note that (X, Y) satisfies the parabola

$15X = 4[225 + 6Y^2]$

Choice5:   Let $X = 3831y_{2n+3} - 387y_{2n+4} + 30, Y = 79y_{n+3} - 782y_{n+2}$

Note that (X, Y) satisfies the parabola

$5[X - 60] = 8Y^2$

Choice6:   Let $X = 632y_{2n+2} - 39x_{2n+3} + 50, Y = 8x_{n+2} - 129y_{n+1}$

Note that (X, Y) satisfies the parabola

$25[X - 100] = 24Y^2$

Choice7:   Let $X = 632y_{2n+3} - 387x_{2n+3} + 10, Y = 79x_{n+2} - 129y_{n+2}$

Note that (X, Y) satisfies the parabola

$5[X - 20] = 24Y^2$

Choice8:   Let $X = 632y_{2n+4} - 3831x_{2n+3} + 50, Y = 782x_{n+2} - 129y_{n+3}$

Note that (X, Y) satisfies the parabola

$25[X - 100] = 24Y^2$

Choice9:   Let $X = 6256y_{2n+3} - 387x_{2n+4}, Y = 79x_{n+3} - 1277y_{n+2}$

Note that (X, Y) satisfies the parabola

$25[X - 100] = 24Y^2$

Choice10:   Let $X = 6256y_{2n+4} - 3831x_{2n+4}, Y = 782x_{n+3} - 1277y_{n+3}$

Note that (X, Y) satisfies the parabola

$25[X - 4] = 24Y^2$

Choice11:   Let $X = 3831y_{2n+2} - 39y_{2n+4} + 300, Y = 8y_{n+3} - 782y_{n+1}$

Note that (X, Y) satisfies the parabola

$75[X - 600] = 12Y^2$

Choice12:   Let $X = 64x_{2n+4} - 6256x_{2n+2} + 800, Y = 1277x_{n+1} - 13x_{n+3}$

Note that (X, Y) satisfies the parabola

$50[X - 1600] = 3Y^2$

Choice13:   Let $X = 64y_{2n+2} - 39x_{2n+2} + 10, Y = 8x_{n+1} - 13y_{n+1}$

Note that (X, Y) satisfies the parabola

$5[X - 20] = 24Y^2$

Choice14:   Let $X = 64y_{2n+3} - 387x_{2n+2} + 50, Y = 79x_{n+1} - 13y_{n+2}$

Note that (X, Y) satisfies the parabola

$25[X - 100] = 24Y^2$

Choice15:   Let $X = 64y_{2n+4} - 3831x_{2n+2} + 490, Y = 782x_{n+1} - 13y_{n+3}$

Note that (X, Y) satisfies the parabola

$245[X - 980] = 24Y^2$

➢ Considering suitable values of $x_n \& y_n$, one generates 2nd order Ramanujan numbers with base integers as real integers

For illustration, consider

$y_2 = 1564 = 1 \times 1564 = 2 \times 782 = 4 \times 391 = 17 \times 92 = 34 \times 46$ (*)

Now, $1 \times 1564 = 2 \times 782$

$\rightarrow (1564 + 1)^2 + (782 - 2)^2$
$\quad\quad\quad = (1564 - 1)^2 + (782 + 2)^2$

$\rightarrow 1565^2 + 780^2 = 1563^2 + 784^2$
$\quad\quad\quad = 30576255$

$1 \times 1564 = 4 \times 391$

$\rightarrow (1564 + 1)^2 + (391 - 4)^2$
$\quad\quad\quad = (1564 - 1)^2 + (391 + 4)^2$
$\quad\quad\quad = 2598994$

$1 \times 1564 = 17 \times 92$

$\rightarrow (1564 + 1)^2 + (92 - 17)^2$
$\quad\quad\quad = (1564 - 1)^2 + (92 + 17)^2$
$\quad\quad\quad = 2454850$

$1 \times 1564 = 23 \times 68$

$\rightarrow (1564 + 1)^2 + (68 - 23)^2$
$\quad\quad\quad = (1564 - 1)^2 + (68 + 23)^2$
$\quad\quad\quad = 2451250$

$1 \times 1564 = 34 \times 46$

$\rightarrow (1564 + 1)^2 + (46 - 34)^2$
$\quad\quad\quad = (1564 - 1)^2 + (46 + 34)^2$
$\quad\quad\quad = 2449369$

$2 \times 782 = 4 \times 391$

$\rightarrow (782 + 2)^2 + (391 - 4)^2$
$\quad\quad\quad = (782 - 2)^2 + (391 + 4)^2$
$\quad\quad\quad = 764425$

$2 \times 782 = 17 \times 92$

$\rightarrow (782 + 2)^2 + (92 - 17)^2$
$$= (782 - 2)^2 + (92 + 17)^2$$
$$= 620281$$

$2 \times 782 = 23 \times 68$

$\rightarrow (782 + 2)^2 + (68 - 23)^2$
$$= (782 - 2)^2 + (68 + 23)^2$$
$$= 616681$$

$2 \times 782 = 34 \times 46$

$\rightarrow (782 + 2)^2 + (46 - 34)^2$
$$= (782 - 2)^2 + (46 + 34)^2$$
$$= 614800$$

$4 \times 391 = 17 \times 92$

$\rightarrow (391 + 4)^2 + (92 - 17)^2$
$$= (391 - 4)^2 + (92 + 17)^2$$
$$= 161650$$

$4 \times 391 = 23 \times 68$

$\rightarrow (391 + 4)^2 + (68 - 23)^2$
$$= (391 - 4)^2 + (68 + 23)^2$$
$$= 158050$$

$4 \times 391 = 34 \times 46$

$\rightarrow (391 + 4)^2 + (46 - 34)^2$
$$= (391 - 4)^2 + (46 + 34)^2$$
$$= 156169$$

$17 \times 92 = 23 \times 68$

$\rightarrow (92 + 17)^2 + (68 - 23)^2$
$$= (92 - 17)^2 + (68 + 23)^2$$
$$= 13906$$

$17 \times 92 = 34 \times 46$

$\rightarrow (92 + 17)^2 + (46 - 34)^2$
$$= (92 - 17)^2 + (46 + 34)^2$$
$$= 12025$$

$23 \times 68 = 34 \times 46$

$\rightarrow (68 + 23)^2 + (46 - 34)^2$
$$= (68 - 23)^2 + (46 + 34)^2$$
$$= 6425$$

Note

$2 \times 782 = 34 \times 46$

$\rightarrow 392^2 - 390^2 = 40^2 - 6^2$

$\rightarrow 392^2 + 6^2 = 40^2 + 390^2 = 153700$

Thus
3057635,2598994,2454850,2451250,2449369,
764425,620281,616681,614800,161650,15805

0, 156169,13906,12025,8425   represent 2nd order Ramanujan numbers

➢ Considering suitable values of x_n & y_n, one generates 2nd order Ramanujan numbers with base integers as Gaussian integers

For illustration, consider again , y_2 represented by (*),

Now,

$1 \times 1564 = 2 \times 782$
$$\rightarrow (1 + i1564)^2 + (782 - i2)^2$$
$$= (1 - i1564)^2 + (782 + i2)^2$$
$$= -1834575$$

Also, $1 \times 1564 = 2 \times 782 \rightarrow (1 + i1564^2 + 782 - i2^2 = 1 - i1564^2 + 782 + i2^2$

$$= 1834575$$

Note that -1834575 & 1834575 represent 2nd order Ramanujan numbers with base integers as Gaussian integers.

In a similar manner, other 2nd order Ramanujan numbers are obtained

Formation of sequence of Diophantine 3-tuples:

Consider the solution to (1) given by

$x_0 = 26, y_0 = 16$

It is observed that

$x_0 y_0 + k^2 + 34k - 127 = (k + 17)^2,$ a perfect square

The pair (x_0, y_0) represents diophantine 2-tuple with property D$(k^2 + 34 - 127)$.

If c is the 3rd tuple, then it satisfies the system of double equations.

$$26c + k^2 + 34k - 127 = p^2$$
(1*)

$$16c + k^2 + 34k - 127 = q^2$$
(2*)

Eliminating c between (1*) and (2*) ,we have

$$-10(k^2 + 34k - 127) = 16p^2 - 26q^2$$
(3*)

Taking,

$p = X + 26T, q = X + 16T$ (4*)

In(3*) and simplying, we get

$$X^2 = k^2 + 34k - 127 + 416T^2$$

which is satisfied by,

$$T = 1, X = k+17$$

In view of (4*) and (1*), it is seen that

$$c = 2k + 76$$

Note that (26,16,2k+76) represents diophantine 3-tuple with property $D(k^2 + 34k - 127)$

The process of obtaining sequences of diophantine 3-tuples with property $D(k^2 + 34k - 127)$ is illustrated below:

Let M be a 3*3 square matrix given by

$$M = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 0 & -1 \\ 0 & 1 & 2 \end{pmatrix}$$

Now, (26,16,2k+76)M=(26,2k+76,4k+188)

Note that

$$26*(2k+76)+k^2 + 34k - 127 = \text{perfect square}$$

$$26*(4k+188)+k^2 + 34k - 127 = \text{perfect square}$$

$$(2k+76)*(4k+188)+k^2 + 34k - 127 = \text{perfect square}$$

Therefore the triple (26,2k+76,4k+188) represents diophantine 3-tuple with property $D(k^2 + 34k - 127)$.The repetition of the above process leads to sequences of

diophantine 3-tuples whose general form $(1, c_{s-1}, c_s)$ is given by

$$(26, 26s^2 + (2k - 18)s - 2k + 8, 26s^2 + 2ks + 34s + 16), \text{s=1,2,3……..}$$

A few numerical illustrations are given in Table below:

Table: Numerical Illustrations

k	$(26, c_0, c_1)$	$(26, c_1, c_2)$	$(26, c_2, c_3)$	$D(k^2 + 34k - 127)$
0	(26,16,76)	(26,76,188)	(26,188,352)	D(-127)
1	(26,16,78)	(26,78,192)	(26,192,358)	D(-92)
2	(26,16,80)	(26,80,196)	(26,196,364)	D(-191)

It is noted that the triple $(c_{s-1}, c_s + 26, c_{s+1})$,s=1,2,3……

forms an arithmetic progression.

In a similar way one may generate sequences of diophantine 3-tuples with suitable property through the other solutions to (1).

References

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IMPACT OF MATERIAL HANDLING OPERATIONS IN CONTROLLING DAMAGES: A STUDY ON SELECTED HUB

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ABSTRACT

In the field of logistics, the theoretical knowledge provides the fundamental stone for the guidance of practices and the study is incomplete without its practical implementation in an efficient manner to make the logistics work constructively. The main focus of the study is to emphasize and analyse the material handling system. The material handling system ensures that each and every material handling equipment (i.e., manual, semi-automated or automated) during a facility works along as a unified, integrated material handling system. Material handling is the art and science involving the movement, handling and storage of materials during different stages of manufacturing. Thus, the function includes every consideration of the product except the actual processing operation. Materials handling is often recognized as an integral part of the process. When performed inferiorly, materials handling can lead to substantial product damage resulting in more losses. The ratio of the time spent in the handling to the total time spent in production can measure the effectiveness of the material handling system. Here, I tried my best to pay attention on the overall scenario of the material handling system which was increasing the level of damages and by identifying the bottlenecks and providing a better solution for improving the quality of the hub. The analysis was done with the help of interviews, observations, and questionnaire (primary data) and monthly reports of damages occurred from Jan-2019 to June-2019 (secondary data).

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1. Introduction

Material handling is the movement, protection, storage, and management of dockets and packages throughout, sorting, distributing, transporting, and stocking. As a method, material handling incorporates a large variety of manual, semi-automated, and automated material handling equipment and systems that support supply and build the provision chain of work. The proper material handling equipment should be hand-picked by analysing the type of material, the route it should take from its origin to its destination, and knowing what kind of vehicle is available.

A material handling system consists of hardware, software, human, and management sub-systems that work together to perform all activities associated with handling. The largest sub-system in an MHS is hardware and consists of various categories of equipment such as transfer, unit loads, storage, identification, communication, packaging, information processing, control, and support equipment. Designing a material handling

system is therefore a complex task and the designers have to consider various types of sub-systems, and select among a large number of categories, classes, and types of equipment. The relevance of materials handling stems from the fundamental relationship that it has with the production flow. When it presents an asymmetry, there is the accumulation of extra stock or a breach in supply. When the flow does not have enough velocity, transit time is long, and the system cannot serve its customers when they need it.

2. Literature Review

The study focused on the fundamental problems of the material handling from the technical factors point of view. Two types of factors that were found in the material handling system are the human factor and the technical factors. The study deals with both the factors in material handling system [1]. The scheduling of material handling equipment, performance of the handlers and movers, packaging, transportation and to explore the different material handling risks [2]. The manual

handling risks and considered the aspect of management of stocks on material handling activities. The study further explored the stock volume, goods movement and storage space and lastly recommended safety measures to improve the material handling efficiency [3]. The case from lean manufacturing point of view. As the lean manufacturing is responsible in reducing waste so it clearly emphasise the lean manufacturing and it further emphasises on the material handling system of lean manufacturer [4].

A study highlighted the production and material handling problems. It further mentioned the constraint as scheduling problem. It also mentioned the operation may be optimized with machine operations. The constraint in the study were machines and vehicles [5]. One of the journals has mentioned the material handling needs for the organizations and further concentrated on simultaneous and concurrent engineering [6]. An in-depth study was carried out to explore the different manual handling risk with special reference to soft drink distribution centre. For collecting data, the semi structural interviews were organized. The study identified the manual handling risk and recommended safety measures [7]. The material handling operations during reverse logistics for food retailers, non-food item and mail order organisations. The study suggested measures to improve material handling efficiency [8]. The issues related to the non-rigid parts for the material handling has been discussed and suggested measures were provided [9]. The material handling practices of highway kerbs and the risks to operatives were discussed in the study [10].

3. Objectives of the Study

- To assess the performance measure of the existing material handling system.
- To assess the actual level of damages due to current material handling system.
- To know the role of operations of material handling system in causing the damages.

4. Hypothesis of the Study

H01: There is no relation between the performance of the Material Handling System (MHS) and the occurrences of damages.

5. Scope of the Study

The present study is focused on finding the operations of the material handling system in the hub operations. The study has analysed the in-depth operations of material handling activities as well as damage issues. The different factors involved in the hub are also taken into consideration in calculating the material handling operations.

6. Limitation of the Study

The study considered the material handling operations only at a hub. Due to time and cost constraint the study only concentrated on the Cachar District of Assam. As the study area is only situated in only one district so the conclusion drawn may be tested with the other districts also for meaningful conclusion.

7. Research Methodology and Data

The present study is of the nature of exploratory. Facts and information have been gathered from the different respondents to gather proper idea. The sampling technique adopted here is the stratified random sampling with the sample size of 50, out of them there were employees, operating staffs, managers etc. Both primary as well as secondary sources of data have been used in the study. Questionnaire and interview technique were adopted to gather primary data. As per the study the variables considered are:

- Independent variable: Performance of the material handling system.
- Dependent variable: Damage levels

8. Analysis of Data

The secondary data collected from the hub are as follows:

Table 1: Damage Issues

Types	January 2019	February 2019	March 2019	April 2019	May 2019	June 2019
Damages Count (including shortages)	75	250	289	320	330	354

It is clear that the number of damages (including shortage) is increasing in the hub. It shows flaws in the system.

8.1 Descriptive Analysis

Following are the representation of the descriptive analysis in SPSS of the data collected with the help of the questionnaire about the performance of the present material handling system:

Table 2: Rating of handling of materials, level of defects, In-transit damages, Improper packaging of goods while unloading, Handling of materials by movers, Service provided by the present MHS and the Present storage system.

Table 2: Descriptive analysis about the performance of the present material handling system

Table 2: Descriptive analysis about the performance of the present material handling system

Rating on	Proper handling of materials		Increase in level of Defects		In-transit damages		Improper packaging of goods while unloading		Handling of materials by movers		Service provided by the present MHS		Present storage system	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Strongly Disagree	3	6	3	6	3	6	0	0	7	14	8	16	14	28
Disagree	14	28	15	30	3	6	1	2	20	40	5	10	13	26
Neither Agree nor Disagree	17	34	26	52	11	22	20	40	21	42	29	58	9	18
Agree	8	16	6	12	13	26	18	36	2	4	7	14	7	14
Strongly Agree	8	16	0	0	20	40	11	22	0	0	1	2	7	14
Total	50	100	50	100	50	100	50	100	50	100	50	100	50	100

Table 2 shows that almost 34% of the respondent disagreed, that the materials are properly handled by the present material handling system. Almost 12 % of the respondent agreed, that there is an increase in the level of defects. Almost 66% of the respondent agreed, that there were more occurrence of in transit damages. Nearly 58% of the respondent agreed, that sometime goods are found to be loosely packed in an inappropriate manner while unloading which increases the level of damages. About 54% of the respondent disagreed, that the goods are carefully handled by the handlers and movers. Almost 26 % of the respondent disagreed, that the present material handling system provides a safe and hassle-free service. About 54 % of the respondent disagreed, to the statement that the goods are carefully stored.

Table 3: Rating of Service provided by the present MHS, Present storage system, Efficiency of the trolley used, Efficiency of the delivery routes, Loading/unloading time, stacking of goods/materials, placing of the MHS in its zone after use, Separate zone for broken MHS and Agility of the present MHS

Table 3: Rating of Service provided by the present MHS

Rating on	Efficiency of the trolley used		Efficiency of the delivery routes		Loading/unloading time		Stacking of goods/materials		Placing the MHS in its zone after use		Separate zone for broken MHS		Agility of the present MHS	
	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
Strongly Disagree		4	5	10	0	0	13	26	11	22	9	1	4	8
Disagree		8	10	20	0	0	12	24	13	26	7	14	16	32
Neither Agree nor Disagree	2	4	9	18	12	24	21	42	11	22	12	24	23	46
Agree	7	4	15	30	21	42	2	4	12	24	13	26	7	14
Strongly Agree	0	0	11	22	17	34	2	4	3	6	9	18	0	0
Total	0	00	50	100	50	100	50	100	50	100	50	10	50	100

Table 3 shows that almost 54% of the respondent agreed that the trolley used can work efficiently. About 52% of the respondent agreed that the routes taken for delivery are efficient. Nearly 76% of the respondent agreed that the loading/unloading of goods depends upon the no. of packages received in a shipment. Nearly 50 % of the respondent disagreed to the statement that the goods are stacked immediately in their respective zone after unloading. Almost 48 % of the respondent disagreed to the statement that the MHE are placed in their respective zone after its use. About 44% of the respondent agreed that there is a separate zone for broken MHE. Almost 40% of the respondents does not agree that the agility of the present MHS is high.

The table 4 shows the descriptive statistics of all the variables that are considered. The range, minimum, maximum, mean, standard deviation and variance of all the variables were also calculated.

Table 4: the descriptive statistics of all the variables

	N	Range	Min	Max	Mean	S. D	Var
Proper handling of materials	50	4.00	1.00	5.00	3.0800	1.157	1.340
Increase in level of Defects	50	3.00	1.00	4.00	2.7000	0.762	0.582
Occurrence of in transit damages is more	50	4.00	1.00	5.00	3.8800	1.189	1.414
Improper packaging of good found while unloading	50	3.00	2.00	5.00	3.7800	0.815	0.665
Handler & movers handle goods carefully	50	3.00	1.00	4.00	2.3600	0.7761	0.602
Present MHS provides safe & hassle-free service	50	4.00	1.00	5.00	2.7600	0.959	0.921
Sufficient storage system	50	4.00	1.00	5.00	2.6000	1.3997	1.959
Trolley used is efficient	50	4.00	1.00	5.00	3.4800	1.1292	1.275
Delivery routes are very efficient	50	4.00	1.00	5.00	3.3400	1.303	1.698
Loading/unloading of goods depends upon no. of packages received	50	2.00	3.00	5.00	4.1000	0.762	0.582
Materials are stacked in their respective zone immediately after unloading	50	4.00	1.00	5.00	2.3600	1.045	1.092
MHE are placed in their respective zone after their use	50	4.00	1.00	5.00	2.6600	1.238	1.535
Separate zone of broken MHE	50	4.00	1.00	5.00	3.1200	1.364	1.863
Agility of MHS is very high	50	3.00	1.00	4.00	2.6600	0.823	0.678

8.2 Correlation Analysis

For correlation analysis, the dimensions of the variables were reduced to two factors i.e. the Occurrence of Defects and the performance of MHS

Table 5: Descriptive Statistics Of The Reduced Dimensional Factors

	Mean	Std. Deviation	N
Occurrence of Damages Extras Pilferages Shortages	3.4533	0.56247	50
Performance of Material Handling System	3.0200	0.41155	50

Table 6: Correlation between the Factors

		Occurrence of Damages	Performance of MHS
Occurrence of Damages	Pearson Correlation	1	0.345[*]
	Sig. (2-tailed)		0.014
	N	50	50
Performance of Material Handling System	Pearson Correlation	0.345[*]	1
	Sig. (2-tailed)	0.014	
	N	50	50
* Significance of Correlation at the 0.05 level (2-tailed).			

According to the Table 6, there is a positive relationship between occurrence of damages and the performance of MHS of magnitude 0.345.

8.3 Regression Analysis

Table 7a: Regression Statistics

Regression Statistics	
Multiple R	0.345065381
R Square	0.119070117
Adjusted R Square	0.100717411
Standard Error	0.533882734
Observations	50

Table 7b: ANOVA

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	1.84924489	1.84924489	6.487878026	0.014121248
Residual	48	13.68147711	0.285030773		
Total	49	15.530722			

Table 7 C: Coefficients

	Coefficients	Standard Error	t Stat	P-value
Intercept	2.028833346	0.564356117	3.594952348	0.000763475
X Variable 1	0.471742054	0.185205234	2.547131333	0.014121248

From the regression it is clear that the p value (0.014) < 0.05. Thus, the null hypothesis (H_{01}) is rejected. Therefore, from the analysis we can understand that is a relation between the performances of the Material

Handling System (MHS) and the occurrences of damages. The relation is also expressed by Y= 2.02 + 0.472 X, where Y= the occurrence of damages and X= the performance of material handling system.

performance is below average. The study also established that the present material handling system has a significant relationship with the occurrence of Damages. The findings concluded that to improve the service provided by the hub must improve its material handling system by providing professional training to the handlers and movers, upgrading its material handling equipment and must focus on the packing.

9. Conclusion

The study established that the existing material handling system is not efficient enough and its

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ON THE HOMOGENEOUS CONE $z^2 = 14x^2 + y^2$

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ABSTRACT

The homogeneous ternary quadratic equation given by $z^2 = 14x^2 + y^2$ is analysed forits non-zero distinct integer solutions through different methods. A few interesting properties between the solutions are presented. Also, formulae for generating sequence of integer solutions based on the given solution are presented.

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Keywords: Ternary quadratic, Integer solutions, Homogeneouscone.

Notation

$$t_{m,n} = n\left[1 + \frac{(n-1)(m-2)}{2}\right]$$

Introduction

It is well known that the quadratic Diophantine equations with three unknowns (homogeneous or non-homogeneous) are richin variety [1, 2]. In particular, the ternary quadratic Diophantine equations of the form $z^2 = Dx^2 + y^2$ are analysed for values of D=29,41,43,47, 53, 55, 61, 63, 67in [3-11]. In this communication, yet another interestinghomogeneousternary quadratic diophantine equation given by $z^2 = 14x^2 + y^2$ is analysed forits non-zero distinct integer solutions through different methods. A few interesting properties between the solutions are presented. Also, formulas for generating sequence of integer solutions based on the given solution are presented.

Methods of Analysis

The ternary quadratic equation to be solved for its integer solutions is

$$z^2 = 14x^2 + y^2 \quad (1)$$

We present below different methods of solving (1):

Method: 1

(1) Is written in the form of ratio as

$$\frac{z+y}{14x} = \frac{x}{z-y} = \frac{\alpha}{\beta}, \beta \neq 0 \ (2)$$

which is equivalent to the system of double equations

$$14\alpha x - \beta y - \beta z = 0$$
$$\beta x + \alpha y - \alpha z = 0$$

Applying the method of cross-multiplication to the above system of equations,

$$x = x(\alpha, \beta) = 2\alpha\beta$$
$$y = y(\alpha, \beta) = 14\alpha^2 - \beta^2$$
$$z = z(\alpha, \beta) = 14\alpha^2 + \beta^2$$

which satisfy (1)

Properties

- $z(\alpha,1) - t_{30,\alpha} \equiv 1 \pmod{13}$

- $z(\alpha,\beta) + y(\alpha,\beta) - 14x(\alpha,1) + \alpha = t_{58,\alpha}$

- $z(\alpha,\beta) + y(\alpha,\beta) - t_{26,\alpha} - t_{34,\alpha} \equiv 0 \pmod{26}$

Note: 1

It is observed that (1) may also be represented in the form of ratio asbelow:

(i) $\dfrac{z+y}{2x} = \dfrac{7x}{z-y} = \dfrac{\alpha}{\beta}, \beta \neq 0$

The corresponding solutions to (1) are given as:

$$x = 2\alpha\beta, \ y = 2\alpha^2 - 7\beta^2, \ z = 2\alpha^2 + 7\beta^2$$

(ii) $\dfrac{z+y}{7x} = \dfrac{2x}{z-y} = \dfrac{\alpha}{\beta}, \beta \neq 0$

The corresponding solutions to (1) are given as:

$$x = 2\alpha\beta, \; y = 7\alpha^2 - 2\beta^2, \; z = 7\alpha^2 + 2\beta^2$$

Table: 1 System of Double Equations

System	I	II	III	IV
$z + y =$	$14x$	x^2	$7x^2$	$7x$
$z - y =$	x	14	2	$2x$

Solving each of the above system of double equations, the value of $x, y \,\&\, z$ satisfying (1) are obtained. For simplicity and brevity, in what follows, the integer solutions thus obtained are exhibited.

Solutions for system: I

$$x = 2k, \; y = 13k, \qquad z = 15k$$

Solutions for system: II

$$x = 2k, \; y = 2k^2 - 7 \; z = 2k^2 + 7$$

Solution for system: III

$$x = 2k, \; y = 14k^2 - 1, \; z = 14k^2 + 1$$

Solution for system: IV

$$x = 2k, \; y = 5k, \; z = 9k$$

Method: 3

Let $z = y + 2k, k \neq 0$

$$\therefore (1) \Rightarrow 4ky = 14x^2 - 4k^2 \;(3)$$

Assume

$$x = 2k \;(4)$$

$$\therefore y = 13k \;(5)$$

In view of (3)

$$z = 15k \;(6)$$

Note that (4), (5), (6) satisfy (1)

Method: 4

(1) Is written as

$$y^2 + 14x^2 = z^2 = z^2 * 1 \;(7)$$

Method: 2

(1) Is written as the system of double equation in Table 1 as follows:

Assume z as

$$z = a^2 + 14b^2 \;(8)$$

Write 1 as

$$1 = \frac{\left(13 + 2i\sqrt{14}\right)\left(13 - 2i\sqrt{14}\right)}{15^2} \;(9)$$

Using (8) & (9) in (7) and employing the method of factorization, consider

$$\left(y + i\sqrt{14}x\right) = \left(a + i\sqrt{14}b\right)^2 \cdot \frac{13 + 2i\sqrt{14}}{15}$$

Equating real & imaginary parts, it is seen that

$$\left.\begin{array}{l} x = \dfrac{1}{15}\left[2a^2 - 28b^2 - 26ab\right] \\[2mm] y = \dfrac{1}{15}\left[13a^2 + 182b^2 - 56ab\right] \end{array}\right\} \;(10)$$

Since our interest is to find the integer solutions, replacing a by $15A$ & b by $15B$ in (8) & (10), the corresponding integer solutions to (1) are given by

$$x = x(A,B) = 15\left[2A^2 - 28B^2 - 26AB\right]$$
$$y = y(A,B) = 15\left[13A^2 + 182B^2 - 56AB\right]$$
$$z = z(A,B) = 15^2\left[A^2 + 14B^2\right]$$

Properties

- $\dfrac{5x(A,1)}{15} - t_{22,A} \equiv -1 \,(\text{mod } 139)$

- $\dfrac{5y(A,1)}{15} - t_{132,A} \equiv 210 \,(\text{mod } 280)$

- $\dfrac{y(A,1)}{15} - t_{28,\alpha} \equiv 6 \,(\text{mod } 44)$

Note :2

It is worth to observe that, one may write 1 in general as

$$1 = \frac{\left[(14r^2 - s^2) + i\sqrt{14} \cdot 2rs\right]\left[(14r^2 - s^2) - i\sqrt{14} \cdot 2rs\right]}{(14r^2 + s^2)^2}$$

  (11)

For the above choice, the corresponding values of x, y, z satisfying (1) are given below:

$$x = 14r^2 + s^2 \left[2rs(A^2 - 14B^2) + 2AB(14r^2 - s^2)\right]$$
$$y = (14r^2 + s^2)\left[(14r^2 - s^2)(A^2 - 14B^2) - 56ABrs\right]$$
$$z = (14r^2 + s^2)^2 (A^2 + 14B^2)$$

The choice $r = 1$, $s = 1$ in (11) leads to (9). However, in this case, there is an another representation for 1 given by

$$1 = \frac{(5 + i2\sqrt{14})(5 - i2\sqrt{14})}{9^2}$$

For the above choice, the corresponding value of x, y, z satisfying (1) are given below:

$$x = 9\left[2A^2 - 28B^2 + 10AB\right]$$
$$y = 9\left[5A^2 - 70B^2 - 56AB\right]$$
$$z = 9^2\left[A^2 + 14B^2\right]$$

The readers of this paper may attempt for finding integer solution to (1) by considering other values of r and s in (11).

Method: 5

(1) Is written as

$$z^2 - 14x^2 = y^2 = y^2 * 1 \quad (12)$$

Assume y as

$$y = a^2 - 14b^2 \quad (13)$$

Write 1 as

$$1 = \frac{(9 + 2\sqrt{14})(9 - 2\sqrt{14})}{5^2} \quad (14)$$

Using (13) & (14) in (12) and employing the method of factorization, consider

$$(z + 14x) = (a + \sqrt{14}b)^2 \cdot \frac{(9 + 2\sqrt{14})}{13}$$

Equating rational and irrational parts, it is seen that,

$$x = \frac{1}{3}(9a^2 + 126b^2 + 56ab)$$
$$z = \frac{1}{3}(2a^2 + 28b^2 + 18ab)$$

  (15)

Since our interest to find the integer solution, replacing a by 3A & b by 3B in (13) & (15), the corresponding integer solutions to (1) are given by

$$x = x(A, B) = 3\left[2A^2 + 28B^2 + 18AB\right]$$
$$y = y(A, B) = 3^2\left[A^2 - 14B^2\right]$$
$$z = z(A, B) = 3\left[9A^2 + 126B^2 + 56AB\right]$$

Note: 3

In addition to (14), 1 can be represented as follows,

(i) $$1 = \frac{(15 + 2\sqrt{14})(15 - 2\sqrt{14})}{13^2}$$

For the above choice, the corresponding values of x, y, z satisfying (1) are given below:

$$x = 13\left[2A^2 + 28B^2 + 30AB\right]$$
$$y = 13^2\left[A^2 - 14B^2\right]$$
$$z = 13\left[15A^2 + 210B^2 + 56AB\right]$$

(ii) $$1 = \frac{(2k^2 + 7 + 2k\sqrt{14})(2k^2 + 7 - 2k\sqrt{14})}{(2k - 7)^2}$$

For the above choice, the corresponding values of x, y, z satisfying (1) are given below:

$$x = (2k - 7)\left[2kA^2 + 28kB^2 + (4\sqrt{14}k^2 + 4\sqrt{14})AB\right]$$
$$y = (2k - 7)^2\left[A^2 - 14B^2\right]$$
$$z = (2k - 7)\left[(2k + 7)A^2 + (28k^2 + 98)B^2 + 56kAB\right]$$

(iii) $$1 = \frac{(14k^2 + 1 + 2k\sqrt{14})(14k^2 + 1 - 2k\sqrt{14})}{(14k^2 - 1)^2}$$

For the above choice, the corresponding values of x, y, z satisfying (1) are given below:

$x = (14k^2 - 1)[2kA^2 + 28kB^2 + (28k^2\sqrt{14} + 2\sqrt{14})AB]$

$y = (14k^2 - 1)^2[A^2 - 14B^2]$

$z = (14k^2 - 1)[(14k^2 + 1)A^2 + (14 + 196k^2)B^2 + 56kAB]$

If α, β are the distinct eigen values of M, then

$\alpha = 1, \beta = 9$

We know that

$$M^n = \frac{a^n}{(\alpha - \beta)}(M - \beta I) + \frac{\beta^n}{(\beta - \alpha)}(M - \alpha I),$$

$I = 2 \times 2$ Identity matrix

(iv)

$$1 = \frac{(14r^2 + s^2 + \sqrt{14}(2rs))(14r^2 + s^2 - \sqrt{14}(2rs))}{(14r^2 - s^2)^2}$$

For the above choice, the corresponding values of x, y, z satisfying (1) are given below:

$x = (14k^2 - s^2)[2rsA^2 + 28rsB^2 + (28r^2 + 2s^2)AB]$

$y = (14r^2 - s)^2[A^2 - 14B^2]$

$z = (14r^2 - s^2)[(14r^2 + s^2)A^2 + (14s^2 + 196r^2)B^2 + 56rsAB]$

Thus, the general formulas for integer solutions to (1) are given by

$x_n = 3^n x_0$

$y_n = \left(\frac{9^n + 1}{2}\right)y_0 + \left(\frac{9^n - 1}{2}\right)z_0$

$z_n = \left(\frac{9^n - 1}{2}\right)y_0 + \left(\frac{9^n + 1}{2}\right)z_0$

Formula: 2

Let (x_1, y_1, z_1) given by

$x_1 = h - 15x_0, \ y_1 = h - 15y_0, \ z_1 = 15z_0 \ (17)$

be the 2nd solution to (1). Using (17) in (1) and simplifying, one obtains

$h = 28x_0 + 2y_0$

In view of (17), the values of y_1 and z_1 are written in the matrix form as

$(x_1, y_1)^t = M(x_0, y_0)^t$

where

$M = \begin{pmatrix} 13 & 2 \\ 28 & -13 \end{pmatrix}$ and t is the transpose

The repetition of the above process leads to the nth solutions x_n, y_n given by

$(x_n, y_n)^t = M^n(x_o, y_0)^t$

If α, β are the distinct eigen values of M, then

$\alpha = 15, \beta = -15$

Thus, the general formulas for integer solutions to (1) are given by

Generation of Solutions

Different formulas for generating sequence of integer solutions based on the given solution are presented below:

Let (x_0, y_0, z_0) be any given solution to (1)

Formula: 1

Let (x_1, y_1, z_1) given by

$x_1 = 3x_0, \ y_1 = 3y_0 + h, \ z_1 = 2h - 3z_0 \ (16)$

Be the 2nd solution to (1). Using (16) in (1) and simplifying, one obtains

$h = 2y_0 + 4z_0$

In view of (16), the values of y_1 and z_1 are written in the matrix form as

$(y_1, z_1)^t = M(y_0, z_0)^t$

where

$M = \begin{pmatrix} 5 & 4 \\ 4 & 5 \end{pmatrix}$ and t is the transpose

The repetition of the above proses leads to the nth solutions y_n, z_n given by

$(y_n, z_n)^t = M^n(y_0, z_0)^t$

$$x_n = \frac{14\alpha^n + \beta^n}{15} x_0 + \frac{\alpha^n - \beta^n}{15} y_0$$

$$y_n = \frac{14}{15}(\alpha^n - \beta^n)x_0 + \frac{\alpha^n + 14\beta^n}{15} y_0$$

$$z_n = 15^n z_o$$

Formula: 3

Let $(x_1, y_1 z_1)$ given by

$$x_1 = x_0 + h, \ y_1 = y_0, \quad z_1 = 4h - z_0 \ (18)$$

be the 2nd <u>solution to</u> (1). Using (18) in (1) and simplifying, one obtains

$$h = 14x_0 + 4z_0$$

In view of (18), the values of x_1 and z_1 are written in the matrix form as

$$(x_1, z_1)^t = M(x_0, z_0)^t$$

where

$$M = \begin{pmatrix} 15 & 4 \\ 56 & 15 \end{pmatrix} \text{ and } t \text{ is the transpose}$$

The repetition of the above process leads to the nth solutions x_n, y_n given by

$$(x_n, y_n)^t = M^n(x_0, z_0)^t$$

If α, β are the distinct eigen values of M, then

$$\alpha = 15 + 4\sqrt{14}, \ \beta = 15 - 4\sqrt{14}$$

Thus, the general formulas for integer solutions to (1) are given by

$$x_n = \left(\frac{\alpha^n + \beta^n}{2}\right)x_0 + \left[\frac{\alpha^n - \beta^n}{2\sqrt{14}}\right]z_0$$

$$y_n = y_0$$

$$z_n = \frac{7}{\sqrt{14}}(\alpha^n - \beta^n)x_0 + \left(\frac{\alpha^n + \beta^n}{2}\right)z_0$$

Formula:4

Let $(x_1, y_1 z_1)$ given by

$$x_1 = x_0 + h, \ y_1 = y_0 + h, \quad z_1 = 4h - z_0 \ (19)$$

be the 2nd <u>solution to</u> (1). Using (19) in (1) and simplifying, one obtains

$$h = 28x_0 + 2y_0 + 8z_0$$

In view of (19), the values of x_1, y_1 and z_1 are written in the matrix form as

$$(x_1, y_1, z_1)^t = M(x_0, y_0, z_0)^t$$

where

$$M = \begin{pmatrix} 29 & 2 & 8 \\ 28 & 3 & 8 \\ 112 & 8 & 31 \end{pmatrix} \text{ and } t \text{ is the transpose}$$

The repetition of the above process leads to the nth solutions x_n, y_n, z_n given by

$$(x_n, y_n, z_n)^t = M^n(x_0, y_{0,} z_0)^t$$

where,

$$M^n = \begin{pmatrix} \dfrac{14Y_{n-1} + 1}{15} & \dfrac{Y_{n-1} - 1}{15} & X_{n-1} \\ \dfrac{14}{15}(Y_{n-1} - 1) & \dfrac{Y_{n-1} + 14}{15} & X_{n-1} \\ 14X_{n-1} & X_{n-1} & Y_{n-1} \end{pmatrix}$$

in which

$$Y_{n-1} = \frac{1}{2}\left[\left(31 + 8\sqrt{15}\right)^n + \left(31 - 8\sqrt{15}\right)^n\right],$$

$$X_{n-1} = \frac{1}{2\sqrt{15}}\left[\left(31 + 8\sqrt{15}\right)^n - \left(31 - 8\sqrt{15}\right)^n\right],$$

$$n = 1,2,3,...$$

Observation

Let x, y, z be any known solution of (1). Let p, q be two distinct non-zero positive integers such that

$$p = x + z, \ q = x$$

Treat p, q as the generators of the Pythagorean triangle (α, β, γ). Consider

$$\alpha = 2pq, \ \beta = p^2 - q^2, \quad \gamma = p^2 + q^2$$

Then it is seen that $7\beta - \alpha - 6\gamma$ is a perfect square.

Conclusion

In this paper, an attempt has been made to obtain non-zero distinct integer solutions to the ternary quadratic Diophantine equation $z^2 = 14x^2 + y^2$ representing homogeneous

cone. As there are varieties of cones, the readers may search for other forms of cones to obtain integer solutions for the corresponding cones.

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