GENERATION OF NEW APPAREL DESIGNS USING StyleGAN2 ADA

A. Pawar[1], N. Kannan[2], R. Ganesh[3] and L. Ladge[4]
[1,2,3,4] Department of Information Technology SIES Graduate School of Technology, Nerul, MS, India
[1]avantika.pawar17@siesgst.ac.in, [2]nithya.kannan17@siesgst.ac.in, [3]rahul.marathervar17@siesgst.ac.in, [4]ladge.leena@siesgst.ac.in

ABSTRACT

The Apparel industry is a rapidly growing industry. Currently in industry most of the time designing process is done manually and it takes more time to complete. And the pattern making process is one of the task where the problem arises. The pattern creation process starting from the basic pattern block is also performed manually using CAD software. There are few automated solutions available but still there is no suitable solution to the problem of time constraints that pattern maker face. Recent developments in deep generative models have opened up new avenues for designers to tackle cognitive barriers by automating the generation of design concepts. The capabilities of generative adversarial networks (GAN) of generating novel designs from existing design are explored in this paper. In particular, StyleGAN2 ADA, a generative model that lets you train a neural network to produce high-resolution pictures from a group of training images. StyleGAN2 is a classic example of creating made-up faces, which has been utilized for automated generation of new apparels, with a massive fashion dataset as a test bed. Also the performance of the model is evaluated using Frechet Inception Distance score. The experiments back up StyleGAN2 ADA's ability generating new apparel designs from existing designs. They do, however, highlight a few primary flaws and study issues that need to be addressed in future studies.

Keywords: *Apparel Designs, StyleGAN2 ADA*

Introduction

The apparel industry is known to be one of the largest indus- try having a revenue of over 1.46 trillion U.S. dollars globally and is said to increase to roughly 2.25 trillion U.S. dollars by 2025. Fashion trends are ever-changing; the market needs to keep up with them. The need for bringing in automation and improving efficiency, right from designing to manufacturing is inevitable.

Currently, there are no provisions or systems that automat- ically produce or generate new apparel designs. The design- ing process is usually assigned to people who have a vast knowledge of ongoing trends along with the proper skillset required for the job. Almost all of the designing process is done manually. This is the main reason why the overall completion of this task takes a lot of time, further resulting in the incompletion of required targets of the company.

The automated solutions available in the market are mostly used in the manufacturing process rather than the designing process. So the need for better productivity in the designing process to cope up with fast fashion trends is inexorable. These are the reasons why we decided to leverage the capability of Generative Adversarial Networks which can generate new images from an existing set of images.

Related Work

The resolution of the input image is increased using GAN in this paper [1]. The resolution is augmented using two trained sub-pixel convolution layers. Here both the generator and discriminator are trained. The discriminator is basically trained to distinguish between the real image and the super-resolved image. This paper proposes a super-resolution GAN (SRGAN) for which utilization of a deep residual network (ResNet) with skip-connection is done. This approach was implemented by Christian L et al.

Brian Dolhansky, Cristian Canton Ferrer [2] brings a new approach to in-painting images, where the identity of the object is preserved which has to be removed or changed and accounted for reasoning time. It is a system where extra information can be included at more than one point to obtain detailed images. In this manner, here Exemplar GANs are utilized. ExGANs are a kind of conditional GAN that uses model data to create the superior grade, customized in-painting results. It shows that ExGANs can create photographs with reasonable personalized in-painting results that are perceptu- ally and semantically

conceivable by applying them to the assignment of shut to-open eye in-painting in normal images. This methodology was presented by Chih-Chung H et al. GAN can be used to tamper videos which might affect a individual and may even prove to be harmful for his/her own safety. A deep forgery discriminator (DeepFD) is used to detect these fake/tampered images. We cannot use a binary classifier directly because it might produce wrong results. So DeepFD accurately does this job. It has two learning phases,first, it collects lots of fake images to learn the features of fake GAN-generated images. Afterward, the discriminator will be trained accordingly to identify the real and fake images[3].

Kularatne et al. [4], Developed a system that uses apparel images from the dataset, which in result generates new appar- els. It uses GANs and RCNNs to spot the pattern blocks of generated apparels. LookBook dataset is used which has 77546 apparel images. Main goal is to develop a system which will be similar to the process of apparel development in fashion industry. Instance segementation is used to distinguish the pattern blocks in the generated apparel images.

This approach by Karras T et al. uses style transfer literature to redesign GAN architecture. In this, it automatically sepa- rates high-level features and produces results that are much better than the traditional models. It is possible as it works at each convolution layer. The discriminator or the loss function is not modified [5].

Features of DCGAN and CGAN is compared using a Hand- written digits dataset in this paper [6]. Viswakarma et al. focus on comparative study of the DCGAN and CGAN. As we know GAN framework has recently surfaced as an up-and-coming generative modelling approach. DCGAN works on model dis- tribution and performs on data distribution. CGAN generates or discriminates data on the basis of given parameters. In DCGAN, pixels are clearer than CGAN. Features like GPU requirement for both GANs and clarity of the generated output are compared in this paper.

Methodology

We are creating a Generative Adversarial Network to im- plement a system that generates new apparel designs from existing designs. The model we have chosen for this system is StyleGAN2 ADA. The reason we have chosen this model is that it requires fewer amount of images for training as compared to other types of GAN, which proves to be a better choice because we have limited computational power. Even with fewer amount of images as an input, StyleGAN2 ADA does not compromise with the quality of the generated output.

A. Overview of Generative Adversarial Networks

A Generative Adversarial Network(GAN)[7] is sort of a neural network architecture for generative modelling. Gener- ative modelling uses a model to create new examples which come from an existing samples, like producing new photos that are similar, however not exactly the same (not identical) as a dataset of existing photos. A GAN is a generative model that is trained utilizing two neural network models.

- The first model is known as the ”generator” or ”generative network” model that figures out how to produce new probable examples.
- The second model is known as the ”discriminator” or ”discriminative network” and learns to separate produced examples from genuine examples[8].

Figure 1 represents the basic architecture of GAN.

Different types of GANs include Cycle-Consistent Gener- ative Adversarial Network (CycleGAN), Deep Convolutional .

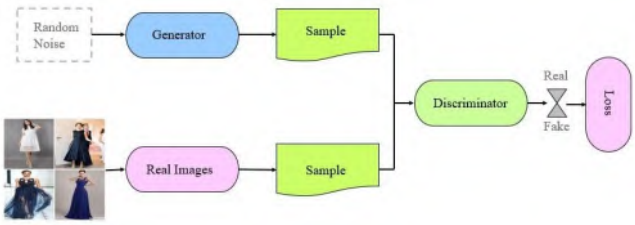

Fig. 1: Basic architecture of GAN

Generative Adversarial Network (DCGAN), Super-resolution Generative Adversarial Network (SRGAN) and Adversarial Generation of Extreme Samples (ExGAN). These have their own advantages which are explained in the previous section. A Style-

Based Generator Architecture for GANs (Style- GAN)[5] is a paper by NVIDIA which introduces a new model for generating new images. StyleGAN generates fake images continuously starting from low resolution to high (1024×1024) resolution. It alters the details at each level independently, that is, from coarse highlights to fine details without affecting any other levels. StyleGAN delivers high resolution state-of-the-artresults.

For our system, we have used StyleGAN2 ADA, which is a modified version of StyleGAN. The detailed explanation is given further.

B. Dataset

We have used 2 datasets. The T-shirt and dresses dataset is created using images from 'Apparel images dataset', Kaggle. The source of images contains 11.4k images of different categories like dresses, pants, shorts etc. consisting of different colours. We restricted our scope of research to dresses and t- shirts. Thus we used only t-shirt and dress images for our dataset collected from Kaggle. The second dataset used for dresses is the FEIDEGGER (fashion images and descriptions in German)[9] containing 8732 high-resolution images with white background. The most images in Kaggle dataset contains human models but the FEIDEGGER dataset images does not contain any images having human models.

C. StyleGAN2 ADA

Some minor imperfections would particularly show up in StyleGAN. StyleGAN was not that good at teeth and there existed an issue of appearance of blob-like artifacts[10] (which resembled water droplets) in the generated images. This issue occured at 64x64 resolution and worsened in higher resolution. But still, they looked very realistic then. StyleGAN needed a large number of images to be trained, more than 30,000 to 100,000 images were required. If less images were used for training, it would lead to generator overfitting which would diverge the training.

Figure 2 shows that input data is given to the StyleGAN2 ADA model and it generates Fake images as the output.

After that, StyleGAN2 ADA was created[11]. They added what was called adaptive discriminator augmentation(ADA).

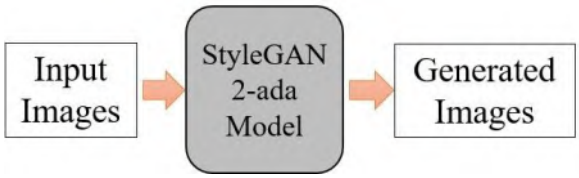

Fig. 2: Generation of new apparel design using StyleGAN2 ADA

1) *Generator:* This Generator architecture consist of 8 Dense layer which is deeply connected neural layer followed by 8 convolution layers which has final layer of 1024*1024 size. After each batch, upsampling is done to avoid overfitting.
2) *Discriminator:* This Discriminator architecture consist of 8 fully convolution layers followed by one dense layer. MinibatchStddev is used for improved quality, stability, and variation of GAN.

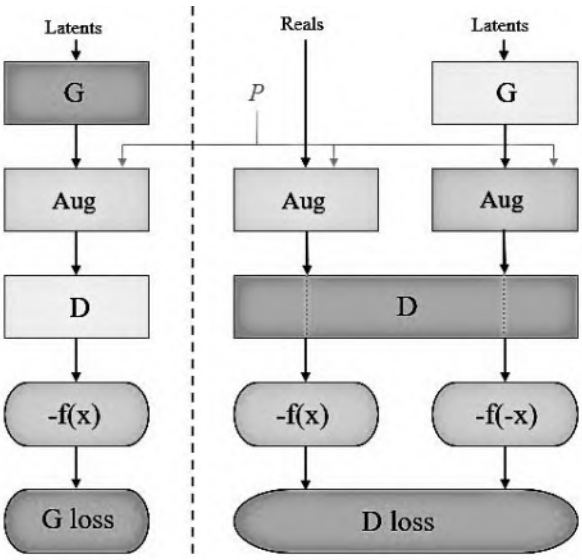

Fig. 3: Latent vector

Augmentation has been used in images for a long time. We could flip images, rotate images and distort them so that we produce the effect of having additional training data. Now, this is being applied to StyleGAN, meaning you need vastly fewer images to train it. As P (probability) increases, the amount of augmentation increases. The reals are being fed into the augmentation which goes to the discriminator to be evaluated [12].

Figure 3 represents a Latent vector. A latent vector is a value that you feed to the

StyleGAN, and that is what actually generates the image. As you make small changes to that latent vector, you make small changes to the image.

D. System Implementation

GAN was implemented using Google Colaboratory and it is run in Tensorflow 1.x. The latest Tensorflow version is 2.4but NVIDIA does not update this to every little upgrade to the various releases that tensorflow and the others go through.

We implemented our GAN based model using StyleGAN2- ADA. We kept most of the details unchanged, including network architectures, weight demodulation, Adam optimizer etc. We used TensorFlow 1.14.0 and Google Colaboratory to execute StyleGAN2-ADA which consist of Tesla K80 GPU of about 12GB and number of GPUs used is 1. We pre-processed and stored the dataset in google drive and accessed the drive using inbuilt colab function. The resolution of the images are 1024*1024 so we used ffhq1024 transfer learning source networks to resume our training from network pickle. Before giving images to the model first it should be converted in tensorflow records format. Tfrecords is formed by shuffling the images in dataset and stores the data as a sequence of binary strings. This tfrecords are given as input to GAN model. In StyleGAN2-ADA we are changing some of the param- eters not changing the layers of the model, some of the parameters which we have used like ”–outdir” where we want to save our generated images and pickel files(something like../results), ”–data” directory where all .tfrecords are stored, ”–snap” (snapshot count) at what interval generated images and pickel files should be saved in our case –snap = 2, ”– seed” it is an abbreviation of the standard term ’random seed’ with a seed we make sure that we can reproduce our results when using random generators, ”–mirror” means flipping the images left-to-right during training which is TRUE for our model, ”mirrory” means flipping the images top-to-bottom during training which is FALSE for our model, ”–augpipe” this sets the augmentation types to be used in augmentation process for our model we use ’bg’ augmentation.

Figure 4 depicts the working of StyleGAN2 ADA.

Evaluation Plan

A. Manual assessment

Manual assessment is the most common and intuitive way to evaluate the performance of GAN. Even though this is the simplest method, it has some limitations like the evaluation might be biased knowing that the views are subjective, or the fact that the manual process of evaluation might be cumbersome. Also, the person evaluating it should have the knowledge of what is realistic and what is not.

B. Quantitative assessment

Quantitative GAN generator assessment alludes to the es- timation of specific numerical scores used to sum up the quality of the produced pictures. There are a lot of quantitative evaluation techniques available such as Inception score, Kernel Inception Distance (KID), Modified Inception Score (m-IS), etc. For our system, we are using Frechet Inception Distance (FID) as it is the most commonly adopted metric. Along with quality, FID also focuses on the diversity of the images, so it proves to be a better evaluation metric overall.

”The Frechet Inception Distance score(FID) is a metric used to find the distance between feature vectors calculated for real and generated images.”

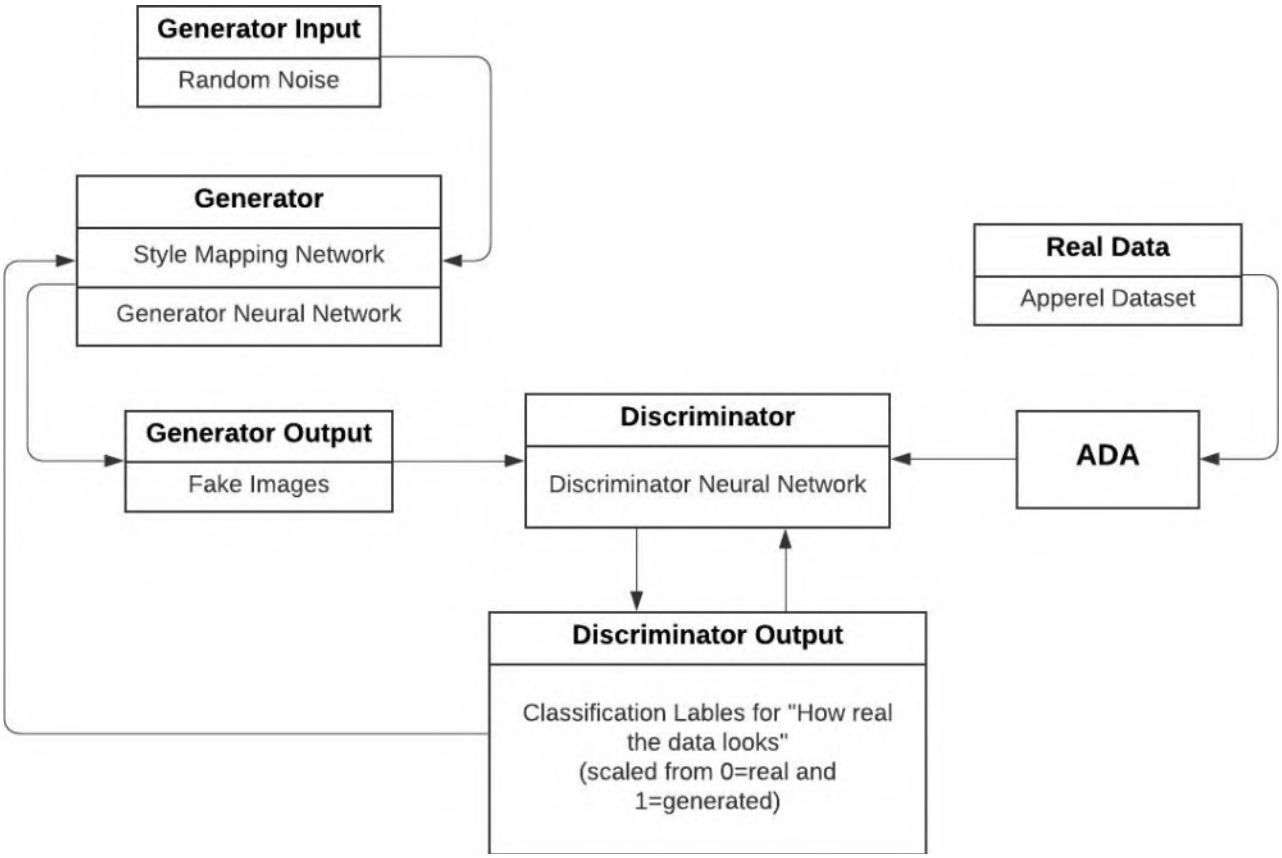

Fig. 4: Working of StyleGAN2 ADA

Lower the score, more similar the images are; and the ideal score is 0.0 which indicates that the two images are identi- cal[13].

The FID score is then calculated using the following equa- tion[14]:

$$d^2 = ||mu_1 – mu_2||2 + Tr(C_1 + C_2 – 2 * \sqrt{(C_1 * C_2)}) \quad (1)$$

d^2 : referred as Score (squared Distance)

mu_1 and mu_2 : means of the real and generated images

C_1 and C_2: Covariance matrix for the real and generated feature vector i.e Sigma

Tr: trace linear algebra operation

Although FID is used to evaluate the network, it may not be a proper method. It can go up or down for each snapshot. So basically, it acts as a guide to check if the score decreases over time. If the FID score decreases over time with increase in training time, the output is considered to be good. For example, for our T-shirt dataset, the FID score at the beginning of the training was 123.622, but it gradually decreased to 83.451 at the end of training. Similarly, the score decreases for other datasets as well.

Results

Figure 5 and 7, snippets which depict images that are real, that is, the images present in the dataset(the one which containshuman models).

Figure 6 and 8 shows the images generated by the network. We can see that the generated (fake) images are different from the images that are present in the dataset.

Figure 9 depicts the real images of the dresses dataset which does not contain any human models(FEIDEGGER).

Figure 10 depicts the generated images.

Conclusions and Future Dimensions

This paper presents StyleGAN2 ADA, a generative model that lets you train a neural network to produce high-resolution pictures from a group of training images. On a wide fashion dataset, the generative model's output is experimented with and checked. We used StyleGAN2 ADA as it had better result along with the fact that it needs a smaller number of images for training[15]. Thus, we have successfully generated new apparel designs using StyleGAN2 ADA.

The results generated by the network are limited by the current dataset we used. Our

training set contains mixed images including humans wearing apparel in some pictures and the others are just plain apparel images which affects the quality of the generated images, thus, in future, we will focus on further improving the resolution of images produced and thereby expanding the reach of the proposed methodology.

Acknowledgment

We thank the entire Information Technology department at SIES Graduate School of Technology for their support and supervision and also for their valuable inputs which helped us to enhance our paper. We would also like to thank the families of all the authors for their tremendous support throughout.

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Fig. 5: The real images present in shirt dataset

Fig. 6: Generated fake images after 20 hours of training

Fig. 7: The real images present in dress dataset(The one which contains human models)

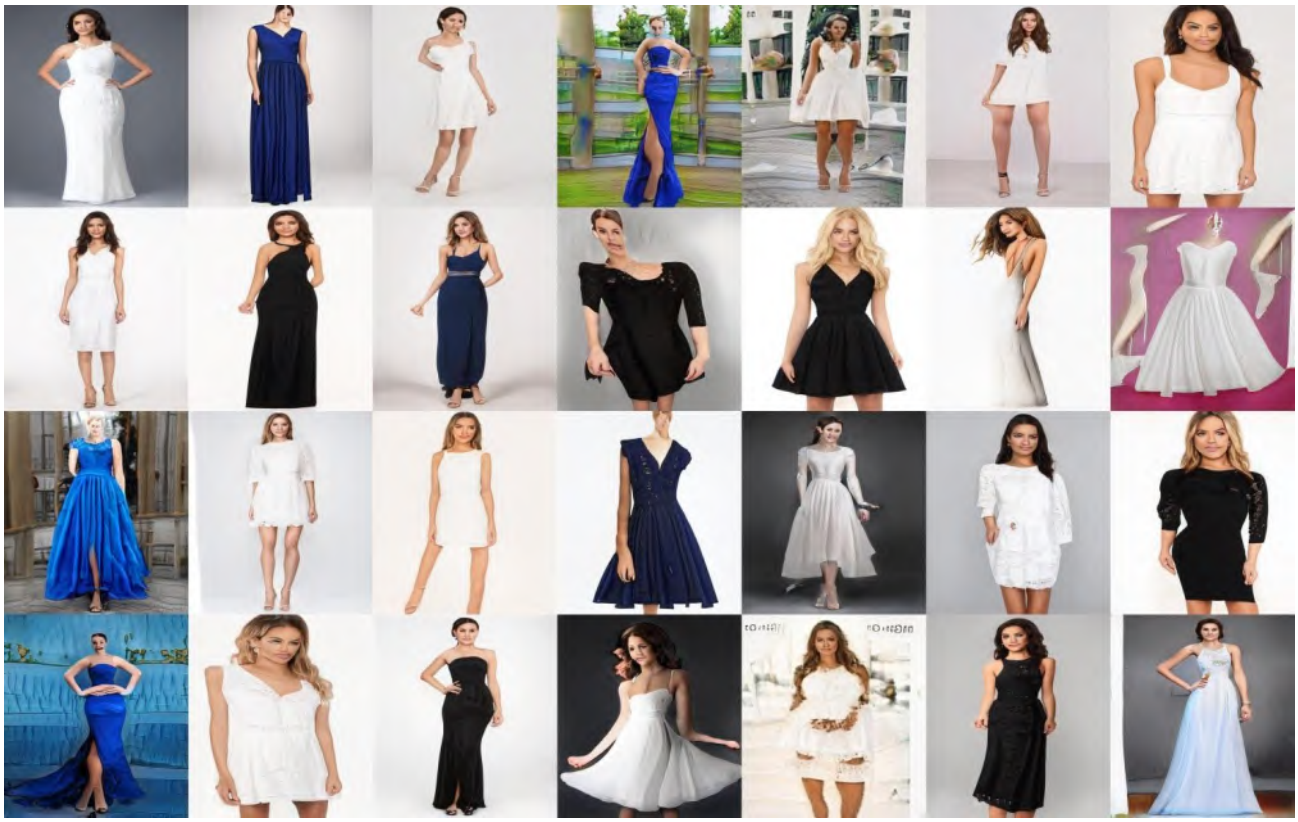

Fig. 8: Generated fake images after 20 hours of training

Fig. 9: The real images present in dress dataset (The one without human models)

Fig. 10: Generated fake images after 20 hours of training

DETECTION OF RETINAL DISEASE- BRVO

J. Fernandes[1], A. Antony[2], D. Sharma[3] and M.Ojha[4]

[1,2,3,4] Fr. C. Rodrigues Institute of Technology, Navi Mumbai, India
[1]jferns2022@gmail.com, [2]anshalantony10@gmail.com, [3]sdevansh1710@gmail.com,
[4]mritunjay.ojha@fcrit.ac.in

ABSTRACT

The Retinal Vein Occlusion is a vascular disorder of retina which cause blockage of the blood. This blockage takes place at the veins that push the blood out from the retina. The retina is the part of an eye where light is focused. This light is then converted into electrical signals that are sent to the brain. Retina has one major vein, referred to as Central Retinal Vein. A blockage caused in this vein is referred to as a central retinal vein occlusion (CRVO), while a blockage in a branch vein is called a branch retinal vein occlusion (BRVO). This paper deals with an automated detection system of the disease BRVO using deep learning approach. In this paper, BRVO infected retinas are recognized using Convolutional Neural Network (CNN). The system is trained to learn features from the BRVO infected images and classify them into two categories viz. BRVO or normal image.

Keywords:*Occlusion, BRVO, Neural networks, Automated disease detection, fundus camera*

Introduction

The light-sensitive tissue that covers the inside surface of the eye is known as the human retina. Light rays are focused on the retina by the cornea and lens. The retina then converts the light into electrical impulses, which it sends to the brain via the optic nerve. The brain interprets these impulses as visuals as a result. The retina borders the back of the eye and is around 0.5 mm thick. The optic nerve comprises of axons from ganglion cells that travel to the brain, as well as incoming blood vessels that vascularize the retinal layers and neurons. The macula, also known as the macula lutea, is an oval-shaped pigmented region in the retina's centre.

Theodor von Leber, a German ophthalmologist, initially described Branch Retinal Vein Occlusion (BRVO) in 1877. Researchers have since discovered that BRVO can be caused by a variety of factors, including age, hypertension, diabetic retinopathy, or hypercoagulability. Major BRVO (retinal vein occlusion) and macular BRVO (branch retinal vein occlusion) are two types of branch retinal vein occlusion (macular vein occlusion) [10]

Figure 2 was captured with a fundus camera. The introduc- tion of fundus photography has had a significant impact on retinal imaging and screening programmes. Traditional fundus

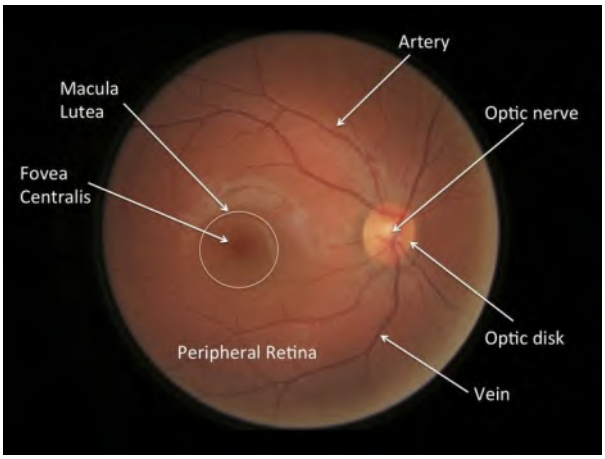

Fig. 1. Anatomy - Ocular Manifestations Of Systemic Disease (weebly.com)

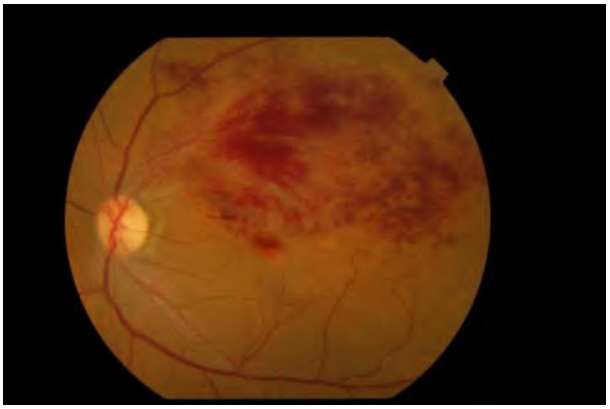

Fig. 2. Fundus Image of BRVO infected eye

cameras produce high-quality images but are bulky, office- based, non-portable, technician-dependent, and expensive, as illustrated in Fig 3. Aside from access to the retinal imaging device, affordability is critical in screening

programmes, espe- cially in the most remote locations. Significant technological advancements have recently radicalised retinal photography. We hope to use advancements in LED and smartphone tech- nology to make ophthalmic screening in remote areas a reality.

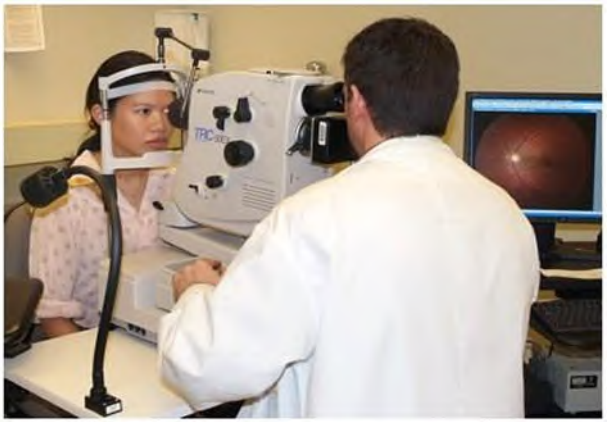

Fig. 3. Current fundus camera systems

Related Work

To detect and determine the extent of Branch retinal vein occlusion, eye care professionals use two tests:

- There are two tests that eye care professionals use to detect and identify the extent of Branch retinal vein occlusion:
- Optical coherence tomography (OCT): The Inner layer hyper-reflectivity in the areas of retinal hemorrhage is shown by OCT. Hence it is considered as a useful tool. [9]

The images received from both of these machines are RGB images. They form the dataset for the Neural Network as shown in Fig 4.

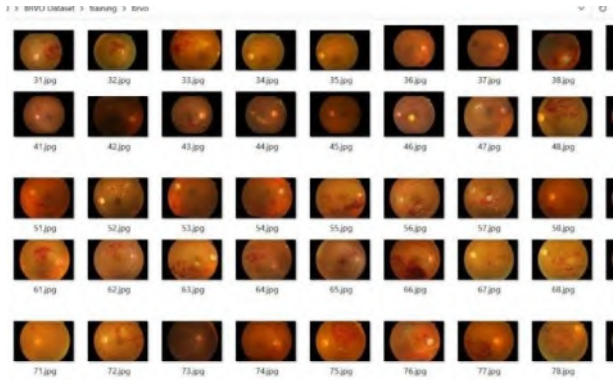

Fig. 4. Dataset (RGB) used for building of CNN model

Methodology

In the present project, an attempt was made to develop a deep neural network for the automatic classification of branch retinal vein occluded images, as well as for the segmentation of features from these images. More specifically, the project's scope can be stated as follows:Methods used such as augmentation and preprocessing, in order to handle class imbalance and image artifacts.

- A deep convolutional neural network is created to automatically classify retinal images into the two classes

A. Preprocessing of Input:

The Neural Network receives the complete retinal image directly. Brightness, breadth and height shifts, and rotation augmentations are all part of the data augmentation process.

B. Convolutional Neural Network:

A Convolutional Neural Network (CNN) is made up of one or more convolutional layers followed by one or more fully connected layers. These layers consist primarily of an input layer, an output layer, and hidden layers. Multiple convolutional layers, pooling layers, and fully connected layers can be used as hidden layers. Figure 5 depicts a traditional convolutional neural network model. The model is made up of hierarchical convolution layers as well as pooling layers. The image is fed into the CNN as an input for image recognition. The input image is then subjected to operations such as multilayered convolution, pooling, and so on. A full connection layer connects the previous convolution layer at the final layer. The CNN output is the result of this fully connected layer. The total number of output nodes equals the total number of image classes. In this paper, for example, there are two image classes: normal and BRVO. The CNN then has two output nodes. [7]

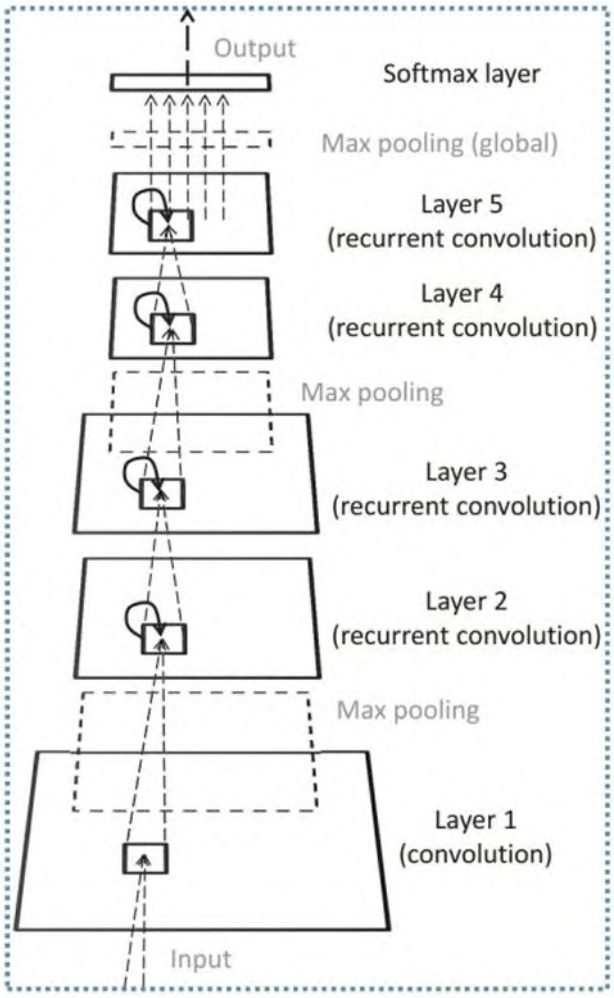

Fig. 5. Classic convolutional neural network model

C. Transfer Learning with CNNs

In addition to CNNs, we used the concept of transfer learning to improve the model's performance despite the limited amount of dataset obtained. We used transfer learning to take the MobileNet v2 model (Fig. 6) that had been trained on a large dataset and apply it to the smaller fundus images dataset. To make a prediction, we freeze the network's initial convolutional layers and only train the last few layers. The idea is that the convolutional layers extract vague, low-level features like edges, patterns, and gradients that are applicable across images, while the later layers identify specific features within the image.

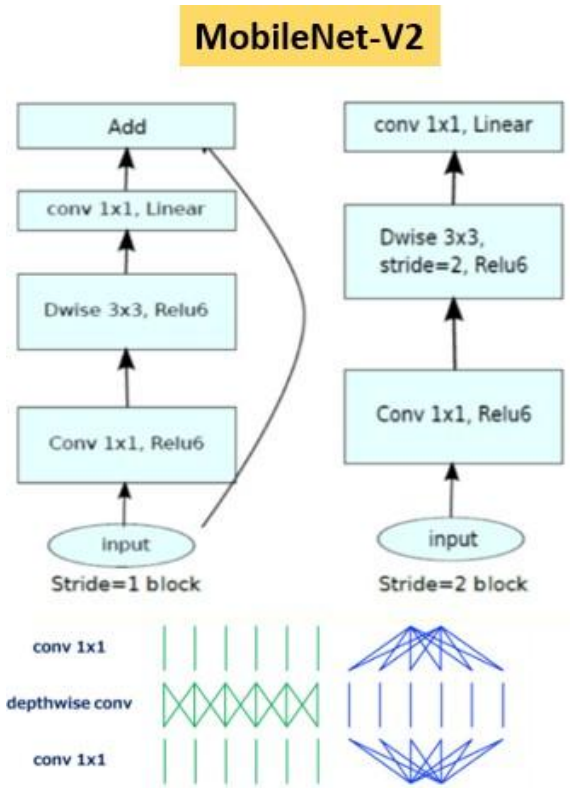

Fig. 6. Overview of the MobileNet Model

After the base layers of the mobileNet are frozen we go on to add more layers resulting in the layers present in the final model as shown in Fig 7.

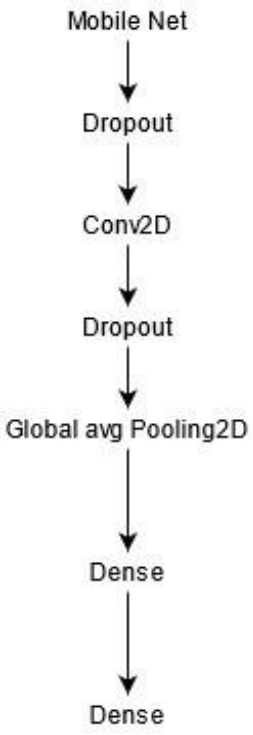

Fig. 7. Layers used to create the deep learning mode

Camera Module, which is a version of the Camera Module not having an infrared filter i.e. it is sensitive to IR light. We used a smartphone as a display device, and a power bank to make the power supply portable as well (A lithium battery could be used instead as well), holding the ensemble together with tape and rubber bands. We also connected a button and infrared and white light LEDs stuck co-axially to each other with the GPIO pins of the Raspberry Pi. A 20D condensing lens is also used to focus the retina in front of the patient's eye. This lens is not connected to the camera in anyway but is essential for the focusing of the retina.

Fig 8.shows the handheld build of the fundus camera.

D. Hardware:

We'll need to build a good ocular fundus camera to capture the patient's retina. However, the camera cannot capture a useful image unless the eye is brightly lit, and when the pupil constricts in response to light, the camera's view of the retina is obstructed. Pupil-dilating eye drops are commonly used by ophthalmologists to prevent constriction of the pupil, but they can cause blurred vision for several hours.

Thus, our aim is to build a Raspberry Pi-based fundus camera that can take photos of the retina without the need for eye drops. In order to make the device handheld and portable the entire processing is done on the Raspberry Pi 3B. This makes it not only portable but also inexpensive. We made our camera with a Raspberry Pi 3B and a Pi NoIR

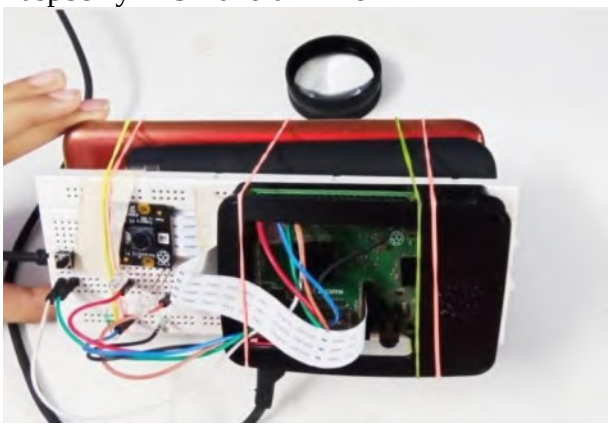

Fig. 8. Handheld build of the fundus camera

E. Integration of Model with Hardware

Django is used in the backend to create a website. The Python script activates the IR LED and displays the camera preview on the screen when the user clicks the 'capture image' button on the website. Because the iris does not respond to infrared light, it is simple to position the camera and the separate condensing lens in a dark room where the patient's pupil does not dilate due to the light. The button is pressed when the user is satisfied with the image. This turns off the IR LED and activates the white light LED, allowing a colour image of the fundus to be captured before the eye responds and constricts the pupil. This dual IR and white light LED combination has been used before in order to prevent the usage of eye drops however it is less bulky and cheaper than existing equipment. The captured image can then be sent for analysis and the presence or absence of BRVO is detected.

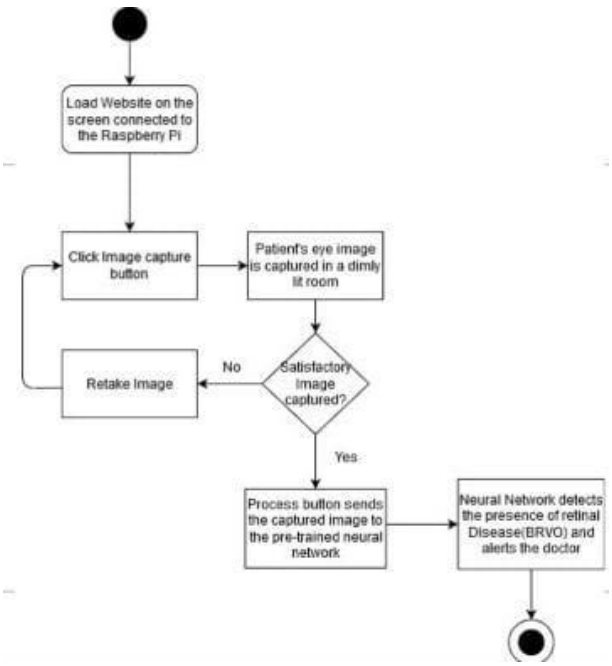

Fig. 9. Flowchart representation of the working of the project

Results and Discussion

A. Dataset and Configuration

The dataset contains 410 BRVO fundus images and 408 NOT BRVO fundus images. All the images are resized to 64*64. and every pixel value was transformed from range [0,255] - [0,1]. Additional augmentations such as zooming, brightness, rotations, etc. were used

to help increase the size and create variations in the dataset.

B. Neural Network

Base layers of the MobileNet v2 increased the accuracy of the model and additional convolution and pooling layers were added as well. The model was tested for 40 images and the accuracy was 78% .

C. Hardware

The hardware is handheld and portable. By simply clicking on the shutter button the hardware automatically switches of the IR light and triggers the LED light to capture the image.

However, there is a learning curve to focusing the retina using the condensing lens. Thus, it is preferably more suited for people working in the Ophthalmology field. Though this is not the first fundus build having IR and white light LEDs together, this build is in expensive and combined with neural networks gives a ready to use device.

Conclusion and Future Scope

The primary goal of this paper is to propose a low-cost au- tomated system for detecting Branch Retinal Vein Occlusion. This is accomplished by utilising off-the-shelf components costing less than INR 10k, i.e.$ 130. It is not only inexpensive, but it is also highly portable and produces results in a matter of seconds. As a result, medical and scientific research is becoming more affordable and accessible. Because of recent advances in camera and LED technology, our prototype cam- era proves that fundus cameras do not have to be bulky or expensive. The advantages of fundus imaging may be made available to a wider range of medical professionals with further refinement and safety testing of our prototype camera, or a camera based on our prototype.

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CYBERBULLYING DETECTION IN SOCIAL MEDIA TEXT

A. Jadhav[1], R. Punekar[2], T. Sayyed[3] and D.Vora[4]
[1,2,3]Department of IT Vidyalankar Institute of Technology,Mumbai, India
[4]Department of IT, Symbiosis Institute ofTechnology, Pune, India
[1]ashwini.jadhav1@vit.edu.in, [2]ruchika.punekar@vit.edu.in, [3]tanvi.sayyed@vit.edu.in,
[4]deepali.vora11@gmail.com

ABSTRACT

Cyberbullying is when someone is bullied using technology as an intermediary. Despite the fact that it has been a problem for many years, the impact on young people has just recently become more widely recognized. Bullies thrive on social media platforms, and teens and children who use them are vulnerable to attacks. A copious amount of user-generated communication data is generated by the widespread usage of social platforms netwroks by individuals.. Because of the prevalence of social public network, online bullying has become a severe issue in online web communication, and cyberbullying is getting aggrandized attention. Cyberbullying has the potential to have a wide range of negative effects on an individual's life, including teen suicide. Twitter has provided a set of unique characteristics that have been included into the existing system, including activity, network, user, and tweet content. Machine learning techniques recognize cyberbullying phrases existing in tweet content using these criteria. The identification of cyberbully words on Twitter is combined into one application in this proposed study, and cyberbully contents within tweet comments will be detected using Linear SVM. This project comprises of a web-based application written in Django (a Python programming language), as well as a dashboard for users to track cyberbullying. An email is also sent to the recipients of this alert.

Keywords: *Cyberbully, Bully, social media, Twitter, metadata, classification, extraction, Linear SVM, TF-IDF*

Introduction

The ascend of social media has profoundly influenced our lives. Social media which is also called as Social Networking Services (SNS) has the character of free and anonymous and it allows user to interact with each other without boundary. However, this puts adolescents at the prospect of becoming victims of online misbehaviour, especially cyberbullying. [1] Cyberbullying refers to an aggressive, intentional act conducted by either a group or an individual in cyberspace using information and communication technologies (e.g.email, against victims who cannot easily defend themselves [2].

Cyberbullying is one of the most frequently happen Internet abuse and also a very serious social problem especially for teenager. According to a 2015 report from the Cyberbullying Research Center, about one-third of the high school students from random samples have experienced cyberbullying [2]. The identification of cyberbullying on social media networks is becoming increasingly important. Because there is so much data that people can't keep track of, automatic detection that can distinguish harmful content and frightening circumstances is required. This allows for large-scale social media monitoring. [3] Machine learning is one of the most successful ways for learning from data and creating a model that automatically classifies appropriate actions. Machine learning can be used to identify bullies' linguistic patterns and so construct a model for detecting cyberbullying. So, the main objective of our project is concentrating on the development of cyberbullying detection approach. In the approach, we will detect cyberbullying text. The text, or conversations will be extracted from social network sites (i.e., twitter). The training data will be dataset of Twitter (labelled dataset from Twitter stream API) [4] and from ChatCoder [5] consisting of labelled dataset from Formspring.com and kaggle.com. The methodologies which will be used are Data Collection,DataPre-processing,DataExtraction, Classification and Evaluation.

Literature Survey

Through this section, summarization of some of the existing research work is done to detect the cyberbully and bully traces in texts to build a model according to the prevaling applications.

The set of solitary properties emanated from Twitter in the existing system, such as activity, network, user and tweet contents. Machine learning techniques are used to detect cyberbullying phrases that are present in tweet content using thesefeatures.[10]. Tools used for detection, classification and verifying are classification and natural language processing, the prime aspects to be checked are: Provenance, Source, Date and location [12]. Corroborating the sureness of the data is complex. Another detection models have used syntactic and semantic feature which gives effective result, the accuracy is above 90% [3]. A capacious literature review has been made on above existing techniques. Amazon mechanical turk is used for data labelling which is a costly approach in the existing system [8]. Hence to bridle the limitations of existing techniques, intelligent text mining techniques will be proposed by incorporating cyberbully detection from the twitter with the aim of providing accurate results and less error rate.

Table 1: Literature Survey

Sr. No	Author	Findings	Algorithms/ Approaches	Evaluation Parameter
1	Cynthia V.H, Gilles J, Chris E, Bart D[1]	Data annotation guidelines given, Replication dataset available	Fleiss Kappa, cost sensitive SVM, Linear SVM implemented in LIBLINEAR,LeTs PreProcess Toolkit, BootCat corpus toolkit, Classifiers (Table 10), deep representation learning, deep learning techniques	Kappa Scoresk=0.59 (English)
2	Kelly R, April K[8]	Rules for detecting, TP% increases, Sentiment and contextual features, SUM and TOTALfeatures	J48:C4.5, JRIP, IBK, k-nearest, SMO, cross validation	TP success rate, language based
3	Jennifer Bayzick [4]	Rule based system, cyberbullying in chat transcripts, voting method, classdiagram, codeword,appendix A	ChatCoder, BullyTracer uses Rule-based algorithm	FP, FN, countof correctly identified windows
4	A.Saravanaraj, J. I. Sheeba, S.Pradeep Devaneyan [10]	Syntactic and semantic techniques, Data pre-processing, cyberbully andRumour detection	Naïve Bayes, Random Forest Classifier, specific classification, twitter speach-act classifier, text mining techniques, regression, classification	tweets, comments
5	Monirah A.A, Mourad Y [1]	Cyberbullying detection in Twitter based on deep learning (OCDD).	binary classification experiments using support vector machine (SVM) with linear kernel , (Glo Ve)technique, CNN.	F1 scores

Problem Statement

To build a system that consists of data set of any social media sites, to recognize the pattern based on the posts, comments, stories etc. of an individual and to recognize bullying instances using various Machine learning techniques and algorithms.

Proposed System

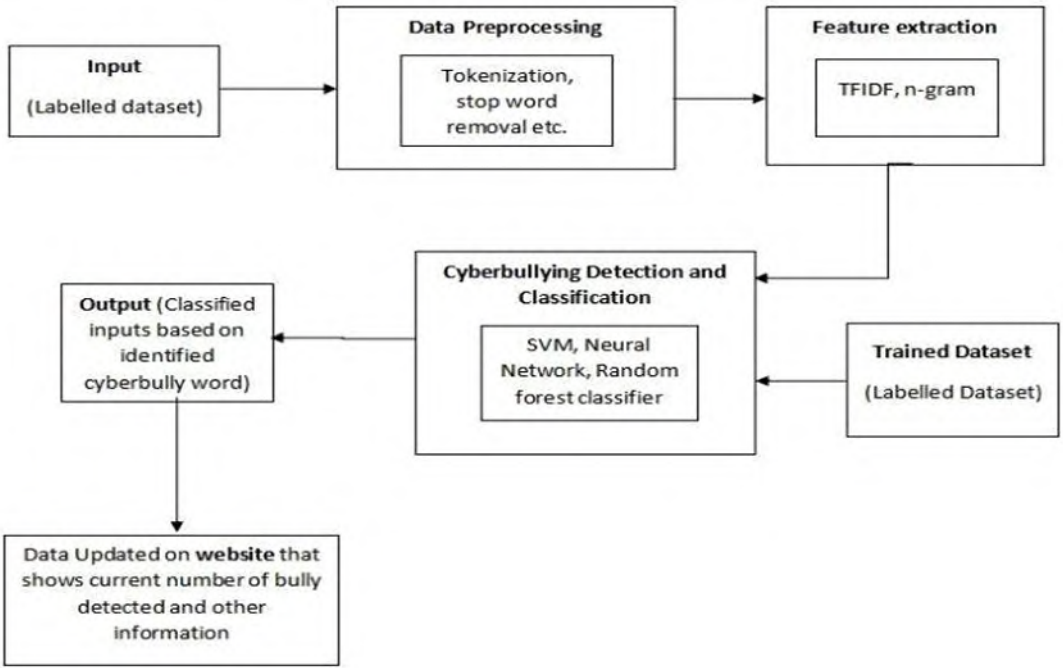


Fig. 1: Block Diagram of Proposed System

4.1 Data Collection.

Data collection is done from formspring.com and kaggle.com. It has two fields: tweets and label (0 - non-bully, 1 - bully).

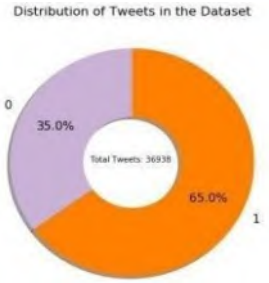


Fig. 2: Distribution of tweets in the dataset

4.2 Data Preprocessing

It is a process to prepare the data in such a way that machine can use it to perform task. In this step, we clean the data by eliminating the noise and text which is not required. The pre-processing step is done in the following**:**

1. Tokenization: It is basically splitting a sentences, phrase, paragraph, or text document into smaller elements, such as individual words or terms.
2. Transform Cases: This method lowers all of the letters in the list of terms that got out of the tokenization.
3. Stop word removal: The words that does not add much information to the sentence like is, or, and, the etc., are filtered out.
4. Normalization: The process of converting a text into a canonical (standard) form is known as text normalization.
5. Noise Removal: Noise removal is the process of deleting characters, numerals, and text fragments that can obstruct your text analysis.
6. Lemmatization: Lemmatization technique is similar to stemming. The result we will get is called ‘lemma’, which is a root word instead of root stem, the output of stemming.
7. Generate n-grams: We will be employing n-grams of 2-4. The procedure of producing n-grams is to build a collection of words from a partible and graph, usually by pushing one word forward.

4.3 Feature Extraction

The third step of the proposed Model is the features extraction step. Here, the data is converted into a suitable format suitable to feed into machine learning algorithms, as machine learning cannot recognize texts. This process is known as Text Vectorization. Initially, we extract the features of the input data using Term Frequency-Inverse Document Frequency (TFIDF) as and put them in a features list.

4.4 Cyberbully Detection

In cyberbully detection, the bullying phrases in the tweet contents and tweet comments are detected with the use of the machine learning algorithms. After getting the output from the preprocessing step, the output report will sent to the classification algorithms. For detection the trained classifier will be used. With the training dataset the preprocessed twitter dataset is examined for bullying instances. Linear SVM is especially used to locate the cyberbully phrases present in the tweet contents and comments.

Dataset was tested with 4 different algorithms :

1. Linear SVM
2. Rbf SVM
3. Random Forest
4. Logistic Regression

Linear SVM and TF-IDF Vectorizer

Linear SVM is a rapid data mining approach that uses an innovative proprietary version of a cutting plane algorithm for creating a linear support vector machine. It is used to solve multiclass classification problems from extremely huge data sets. Linear SVM is a technique that builds an SVM model in a CPU time that scales linearly with the size of the training data set.

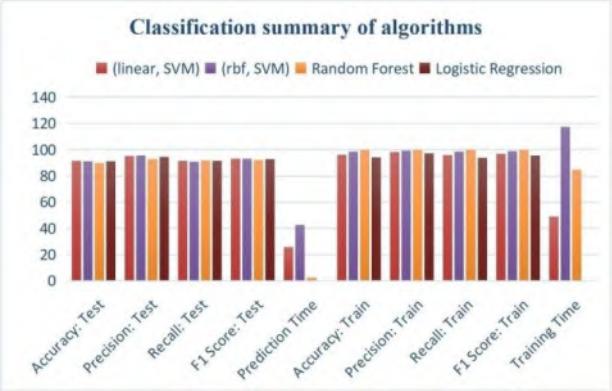
TF-IDF - This is an abbreviation than stands for **"*Term Frequency – Inverse Document*"** Frequency which are the components of the resulting scores assigned to each word. **Term Frequency**: This summarizes how frequently a given word appears within a text.

Result and Discussion

Inverse Document Frequency: This downscales words that appear a lot across documents.

In this project it was tested and tried with different algorithms on different parameters. The evaluation factors clearly gave us the best result and we can see which algorithm has persormed well on the basis of the evaluation factors.

If the outcome is positive i.e. if the system detects that the extracted data contain cyberbullying text, then the system will identify the cyberbully text . The Evaluation Parameters used are based on confusion matrix:

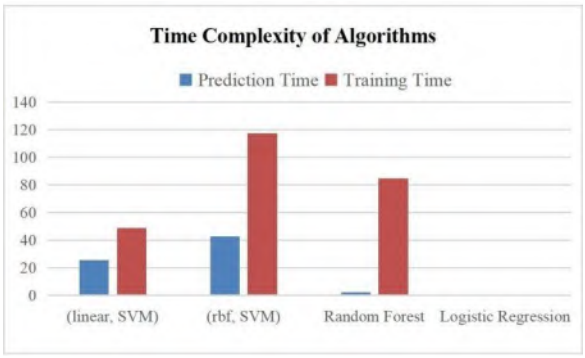


Graph 1: Classification summary of algorithms

Here we can see the comparison that linear svm has performed well as compared to other algorithms and thus giving the best accuracy for the testing dataset. Below is the table showing us the evaluation parameter results.

Table 2: Linear SVM giving best results

Algorithm	(linear, SVM)	(rbf, SVM)	Random Forest	Logistic Regression
Accuracy: Test	91.454611	91.219996	89.929616	90.976358
Precision: Test	95.087163	95.370505	92.706872	94.570526
Recall: Test	91.590341	90.910352	91.729115	91.368304
F1 Score: Test	93.306001	93.087034	92.215402	92.941841
Prediction Time	25.684785	42.596004	2.437246	0
Accuracy: Train	96.028001	98.441368	99.764078	94.194771
Precision: Train	98.084899	99.201585	99.880768	97.192051
Recall: Train	95.754689	98.392379	99.75588	93.771956
F1 Score: Train	96.905788	98.795325	99.818285	95.451377
Training Time	48.886756	117.323816	84.720345	0.374966



Graph 2: Time complexity of Algorithms

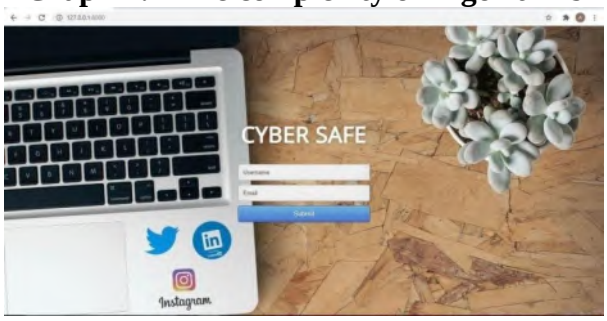


Fig. 3: Login page that accepts username and email of the user

Username and Email is stored in the database as soon as user login to this page. After logging in we can see a dashboard giving complete analysis of the twitter account as shown in the below screenshot.

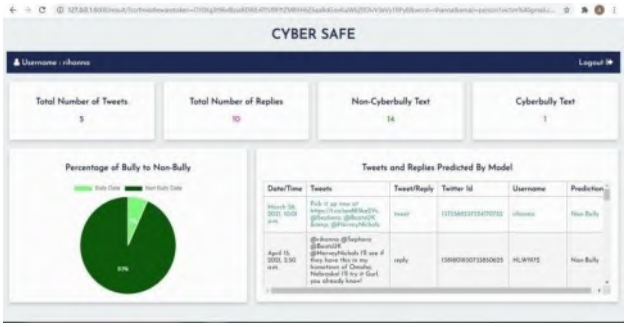


Fig. 4: Dashboard that shows bully and non-bully analysis

This is dashboard that comes up as soon as user is logged in. Features of the dashboard:

1. Username is displayed on the left corner of the navbar of user currently logged in.
2. Cards display:
   i. Number of tweets done by user
   ii. Number of Replies on user's tweets
   iii. Number of Non-Cyberbully texts predicted by ML model.
   iv. Number of Cyberbully texts predicted by ML model
3. Pie chart that displays the percentage of Bully texts predicted to the Non-bully texts predicted.
4. Table that displays complete detail of tweets and replies, along with the predictions made by the ML model.
5. Logout button provided on right side of the navbar that takes back to the login page for new session.

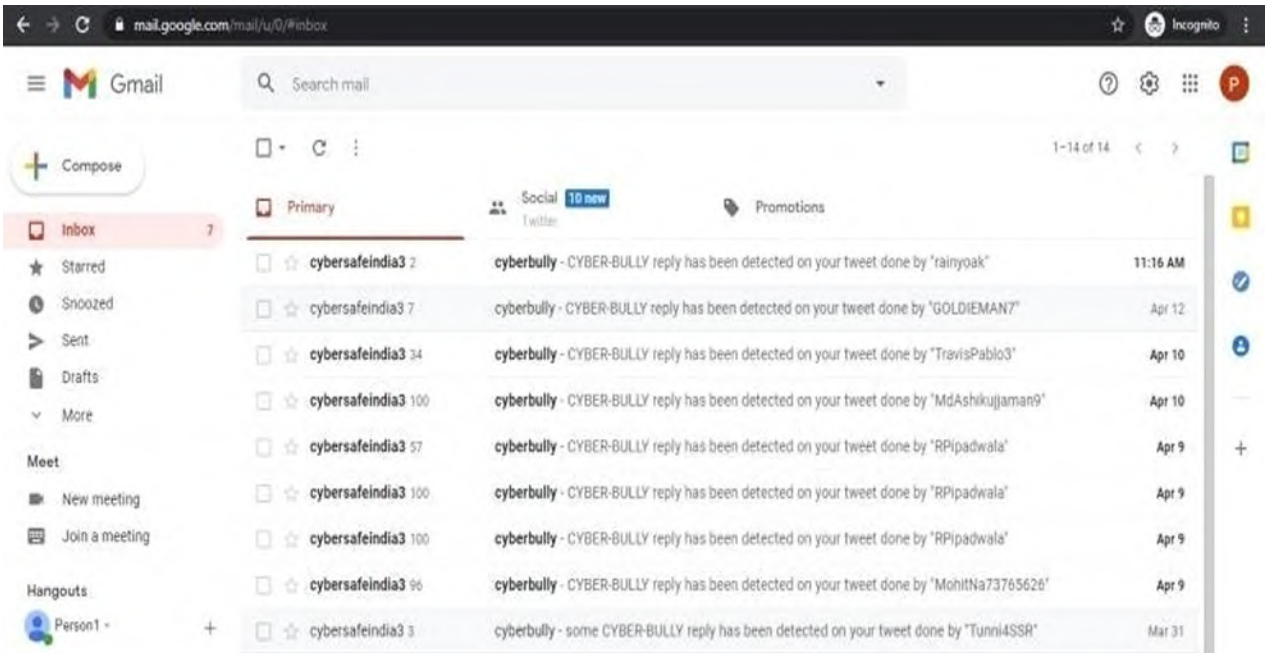


Fig. 5: Mail sent to the user regarding cyberbully replies predicted by the model

Warning mail has been sent to the user.

Application

The proposed system will help the society to deal with the problem of growing number of cases of Cyberbullying and act as a way to combat the effects of these cases, like suicides, etc. This system is much more user – friendly than the existing system and can be of great help to cyber security branch and police for investigations. As this system provides a user friendly dashboard that dynamically fetches tweets from twitter and gives the results as bully data and non-bully data along with the number of bully tweets recorded with date, time and monthly report. The graphical representation gives a clear picture of the bully data everyday, every week, every month generated. You can also search it for a particular Id, particular hashtag, any name, any word and it will show the data on the dashboard. It is a web-based application and can be accessed from anywhere and anytime.

Conclusion

The proposed work will be used for detecting the instances of cyberbullying and rumors in twitter using machine learning algorithm Linear SVM and TfidfVectorizer. This system will definitely help the police as well as cyber branch team in investigating and collecting evidence of the presence of bully traces on particular users twitter account.

Future Scope

This system is considered to detect cyberbully in tweets. This system can also be updated and can be used as personalized real time model to check your Twitter account for cyberbully anytime, anywhere on your device. Moreover this can be done with any other social media like Instagram, Facebook etc to also identify pictures.It can be changed into a module where user will be notified via mail or SMS about the bullyrecognized by the model along withe the user id of the person bullying.

We can create a website where users will register and will provide their twitter Id while registering. Every time User login to the website he/she will be able to see a detailed report of its account which will show no. of bully tweets per day/per month, bullying person's user id and can also keep track of if any particular user id is been reported bullying frequently so that user can take actions against it.Even more parameters and models can be used for defining the final results.

Acknowledgement

We wish to express our sincere gratitude to Dr. Deepali Vora, HOD of Information Technology Department, for her guidance and encouragement in carrying out this project.

We also thank faculty of our department for their help and support during the completion of our project. We sincerely thank the Principal of Vidyalankar Institute of Technology for providing us the opportunity of doing this projec

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TRYOLA: AN OPENCV BASED SOLUTION FOR APPAREL AND FRAMES TRIAL

R. Bahrani[1], D. Kawana[2], S. Jeswani[3] and S. Utala[4]

[1,2,3,4] Information Technology VESIT, Mumbai, India
[1]2017.ria.bahrani@ves.ac.in, [2]2017.divya.kawana@ves.ac.in, [3]2017.saurav.jeswani@ves.ac.in,
[4]sandeep.utala@ves.ac.in

ABSTRACT

COVID-19 outbreaks round the globe pushed con- sumers online to unprecedented levels. By May of 2020, e-commerce transactions reached dollar 82.5 billion — a 77 percent increase from 2019. Consumers have moved online to form purchases normally made in physical stores, like food and home items , apparel, and entertainment. Rapid developments in the technology, and societal behaviours are ushering in a major industrial revolution. We can now enjoy internet shopping from anywhere in the world thanks to the emergence of smart technology and smartphones. Customers who shop online are always concerned about how a particular fashion item in a product image will look on them. To address this issue, we have devised a strategy that allows buyers to try on items before purchasing them. This new technology can be beneficial to e-retailers. Our goal is to create a web application using OpenCV-python and Flask framework that will allow customers to virtually wear the clothes without having to wait in a long line.

Keywords: *Covid, E-commerce , virual try, OpenCV*

Introduction

With the advancement of technology, it is now possible to create a system similar to a virtual room for customers to try on clothes on the internet. The entire process allows customers to determine how well the garments will fit before making a purchase decision. By providing fitting information for various clothing styles, the virtual try-on scenario can assist customers in increasing their shopping pace. Customers generally select clothing that fits their personal sizes and preferences. Culture, fashion, style, body figure, and knowledge about those clothing selections are all factors that influence their purchasing deci- sions. Improper cloth sizes contribute to a distorted clothing fit. Larger clothing sizes tend to create extra space between clothes and the physical body, whereas smaller clothing sizes are more prone to rips and tears. In general, ill-fitting clothing exhibits wrinkles and unsightly clothing folds.

Customers' comments were obtained using a questionnaire survey to provide assessment for clothes fit observations by staff trained with experience. The majority of garments do not fit well on people, it was discovered. Fitting difficulties weremost prevalent in the spine area, which varies in shape from person to person. Because the virtual dressed model cannot assess the level of fit, a 3D model that lines up the body proportions nearly identical to the customer's body shape is used. With the help of this 3D model, a user created a virtual self and experimented with numerous outfits utilising the user interface.

Fitting satisfaction was discussed in a recent survey. The conclusion reached was that customers like to buy clothes that allows them to move about easily. You can use the virtual try-on to check how the clothing items will look on you. This is accomplished by placing the items on your UI-created virtual-self. When it comes to purchasing accessories such as sunglasses, face consideration is critical. Frames that contrast with the angle of your face look best on you. Tryola also allows you to try on such accessories.

Idea

Virtual try-ons require clothing that can adjust to the phys- ical body in order to be as realistic as possible. Because of the wide range of body forms, it costs a lot of money for manufacturers to create enough clothing sizes to meet everyone's preferences while also fitting them well. The goal of this study is to determine how well clothing fits on the physical body by dressing a person's model in virtual clothes. The procedure starts with the creation of garments and manufacturing designs, which are then fitted to the physicalbody.

The physical body that wears various clothing sizes is assessed for a proper fit, thanks to the clothing simulation. Within the garment sector,

the clothing fit evaluation can provide useful information for clothing products. A simple approach for visualising virtual glasses on the face of a given person is utilised for accessories such as sunglasses. This is accomplished by integrating a morphable 3D facial model with optimization algorithms to control the user's facial form. Virtual objects that are linked to the user's face are frequently personalised, resulting in a more realistic visualisation.

In addition, a virtual Glasses try-on system was developed in Tryola. Face detection and image processing are handled using OpenCV in the proposed system.

Literature Survey

A survey of various papers was conducted as part of the research. According to Cecilia Garcia Martin's [1] paper, an android application is integrated with the concept of aug- mented reality. The proposed technology augments the virtual clothes on a user's static image there. The entire application is run on an Android phone.

The virtual try-on network (VITON) is a coarse-to-fine framework, according to the paper proposed by Xintong Han, Zuxuan Wu, Zhe Wu, Ruichi Yu, and Larry S. Davis [2]. This framework uses a 2D image to seamlessly transfer a target clothing item in a product image to the corresponding region of a clothed person. The training setup, Encoder-decoder generator, Refinement network, and runtime are among the implementation details. This type of network necessitated a large dataset and increased GPU power.

Shreya Kamani, F. Isikdogan, and Vipin Paul [3] propose a paper focusing on the implementation of a virtual trial room application that proposes the use of a hardware sensor known as the Microsoft Kinect sensor. This sensor primarily measures an individual's bone density, which can be used to determine the size of the user's body on which the virtual cloth must be augmented. Microsoft Kinect has become a well-liked depth image sensor within the market after its launch in 2010. They selected the Kinect SDK because it supports a powerful real-time skeletal body tracker. Their method is as follows: extracting the user from the video stream using depth and user label data from the sensor, registering the material model with Kinect skeletal tracking data, and detecting the skin to regulate the order of layers.

Stephen Karungaru and Kenji Terada [5] introduced a technique for acquiring human body length / perimeter using Kinect in their study. Experiments have shown that a Kinect sensor may be used to collect human data. There were other issues discovered in the event of data acquisition errors. Improving the accuracy of data collecting and the CG were two future concerns in this project.

The RGB Normalization approach is used for face detection in the work proposed by Jamal Dargham and Ali Chekima [11]. On the other hand, Siddhanth Chopra [7] proposed a technique that was built utilising gluoncv with mxnet to assist them in achieving their goal of superimposing garments and ornaments on individuals. The processes in this system were carried out as a computer vision tool kit that implemented state of the art (SOTA).

1]RGB Normalization – OpenCV employed colour contrast to differentiate objects by finding pixels that were on the edges of colour changes that were substantial.

2]S.O.T.A – GluonCV included a number of routines that worked together to detect the contours of numerous objects in a frame.

3] Augmentation of colours and logos.

Paper [7] and paper [11] are the sources of inspiration for the Tryola system. The Normalization algorithm discussed in the paper is used in the Tryola application to produce a normalised image that is then processed for augmentation. The proposed system requires an outermost containing contour that corresponds to the T-shirt that the user or test object is wearing. Clothes and accessories were imposed on the created virtual body using the mxnet deep learning algorithm. User interactions were carried out using the Numpy/OpenCV packages for edge detection and Context Embedding.

Implementation

A. What is OpenCV?

OpenCV is that open-source for computer vision, machine learning, and importantly for image processing and it plays a significant role in today's era. By using it, we will pro- cess images to spot objects, faces, or perhaps

scripting of an individual. Using it by integrating libraries, like Numpy, python is in a position to process the OpenCV array structure for analysis. to spot its various image patterns and its various features we perform different mathematical operations on its features. The simplest thing is that it provides plenty of in-built functions to handle operations associated with image processing and Computer Vision. These are fundamental to most Computer Vision algorithms. OpenCV comes with these basic structures , and that they are all contained within the core module. Another advantage is that these structures are already optimized for speed and memory. We can install the OpenCV library by using pip install opencv-python

B. Face Detection

Opencv is an image-based processing library. It already has pre-trained classifiers such as eye, facial, smile, and so on. These trained classifiers are saved in an XML file, which is then saved at the specified location. The camera's image of the user has been loaded. The face is then shown. If a face is found, the position of the detected face is returned as rect (x,y,w,h).

When a user walks in front of the camera, the face is the structure that must be recognised in order to identify the user. We employ Haar-Cascade feature-based cascade classifiers to detect the face. Instead of using pixel intensity values, the haar classifier uses the difference in contrast values between adjacent groups of pixels. The variance difference between the pixel groups is then used to determine the image's relative bright and dark parts. It's a method based on machine learn- ing.As a result, the cascade function is learned from various types of photos to operate effectively with the algorithm. The classifier is shown a large number of negative images (images without faces) and positive images (images with faces) in order to train it to extract features from them.

These Haar Features are similar to windows in that they are placed over images to calculate a single feature. The feature is essentially a single value produced by subtracting the total of pixels in the white and black regions. We are simply extracting two features for demonstration purposes, hence there are only two windows here. The main trait is that the attention area is darker than the bordering cheeks and nose area. The second characteristic is that the eyes are much darker than the bridge of the nose. As a result, when the feature window moves over the eyes, one value is calculated.This value will be compared to a threshold, and if it passes, the next action will be taken. This value will then be compared to a threshold, and if it passes, it will be assumed that there is a foothold or other good attribute here.

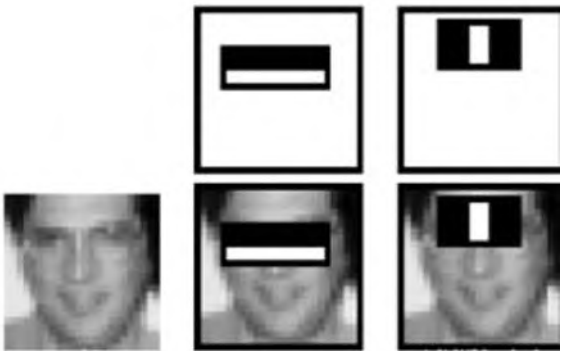

Fig. 1. Face Detection

C. Creating Apparel Masks

Using bitwise operations, OpenCv can create masks of any object. Using these operations, we created masks of garments to extract only the specified part of the image, which were then superimposed on the person when trying on clothes. The image masked simply has a number of its pixel intensity values set to zero. Wherever the pixel intensity value is zero in the image, the pixel intensity of the resulting masked image will be set to the background value, which is usually zero. Masking operations in the ROI function have no effect on a slice that does not have ROI.

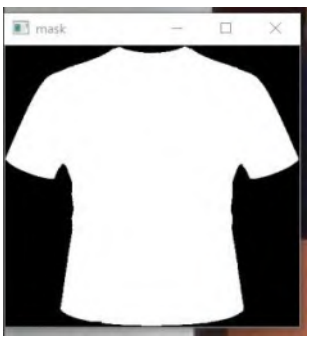

Fig. 2. Gray Scale image

Figure 2 depicts a grayscale converted image with the cv2.threshold function value used to

classify the pixel inten- sities in the grayscale image.

Figure 3 depicts the mask created by using the bitwise not operation to obtain the required cut out of clothing.

Fig. 3. Mask of an apparel (bitwise-not)

Fig. 4. Apparel ROI

Figure 4 depicts the ROI image, or region of interest. The ROI background contains the original image only where the shirt is not in the region that corresponds to the shirt's size.

D. Apparel Scaling

Scaling is the process of resizing an image to fit the circumstances. As the user moves ahead of the screen, the apparel's sizing and placement on the body should change. When the user moves closer to the screen, the image size should increase in accordance with the user, but the specific measurements of the apparel should not change. The distance between the webcam and the person standing is measured, and the face is detected; based on the calculations, clothing is superimposed over a body. Upper body part co-ordinates are calculated and approximate shirt width and height are set based on the four co-ordinates detected using the haar cascade frontal face classifier.

E. Image Denoising

Image denoising is a fundamental challenge in image pro- cessing and computer vision. Denoising estimates the first im- age by suppressing noise in the image. Image noise can also be caused by a variety of sources (sensor or environment), which are frequently impossible to avoid in real-world situations. As a result, image denoising is critical in a variety of applications such as image restoration, visual tracking, image registration, and image segmentation. While many algorithms are proposed for the purpose of image denoising, image noise suppressionremains an open challenge, particularly in situations where the images are acquired under poor conditions with a high background level.

The two main types of noise in image are salt and pepper noise and Gaussian noise.

To remove noise from image and and smoothen it we are using Non-local Means Denoising algorithm. It is defined like this: cv2.fastNlMeansDenoisingColored(src[,dst[,h [,hColor[templateWindowSize[,searchWindow Size]]]]])

The parameters are:

src: Input 8-bit 3-channel image.

dst: Output image with the same size and type as src . **h**: Parameter regulating filter strength for luminance com ponent. Bigger h value perfectly removes noise but also removes image details, smaller h value preserves details but also preserves some noise.

templateWindowSize: Size in pixels of the template patch that is used to compute weights. Should be odd.Recommended value 7 pixels.

searchWindowSize: Size in pixels of the window that is used to compute weighted average for given pixel. Should be odd. Affect performance linearly: greater searchWindowsSize - greater denoising time. Recommended value 21 pixels.

F. *Proposed application*

E-commerce has a lot of advantages over traditional reta but it still falls short when it comes to buying clothes or accessories because customers can't try them on and decide whether or not to buy them.

According to recent news and data, E-commerce businesses have seen a significant increase in orders as customers avoid going out during such a key period.

With the advancement of technology, it is now possible to create a system that functions as a

virtual dressing room allowing customers to try on garments over the internet. As a result, TRYOLA allows customers to try on clothing or eyewear before making a purchase.

Python Flask Web Application Interface was used to create the application. On the website, the user can look through garments and other wearables and decide whether to buy or try them on. If a person wishes to try on the wearable of their choice online, they can do so by picking the item and clicking the show button to see how it looks on them.

Figure 5 depicts the system architecture and describes how it works. The video is shot using the device camera, and the outfit picture is superimposed on the user's body in real time using OpenCV. If the consumer loves the outfit, they will want to check out or keep an eye on more wearables on the website, much like they would in a physical store.

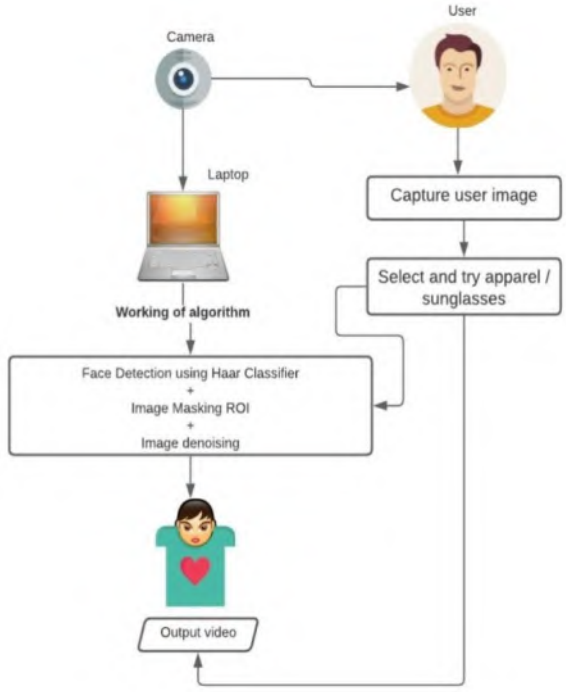

Fig. 5. System Architecture

Results and Discussion

Existing system which uses canny edge detection has some disadvantages:Inaccurate and sensitive to noise.Difficult to implement to reach real time response. Time consuming. The process of coaching the deep convolutional neural network is to get unique numerical features of the face may be a complex process that needs an enormous database of faces and a big computing ability of the PC. So to overcome these problems we used OpenCV as it has advantages like: It can work almost in real time on the CPU; As a result, we created a web application using OpenCV technology that will allow clients to visually try on garments. The results suggest that mapping to the user's body works and that it can eliminate the requirement for trial rooms. The accuracy of our system is 85%. We trained the system with set of images to check how accurately it can detect the faces.

Figure 6 is the output result of the dress. Figure 7 is the output of sunglasses trial.

The OpenCV DNN approach is the most precise. If speed is crucial, a haar-based approach is preferable. On the processor, Dlib HOG is the fastest approach. He does not, however, detect little faces. In most cases, knowing the size of the face in the image in advance is difficult. It is preferable to utilise OpenCV in such situations.

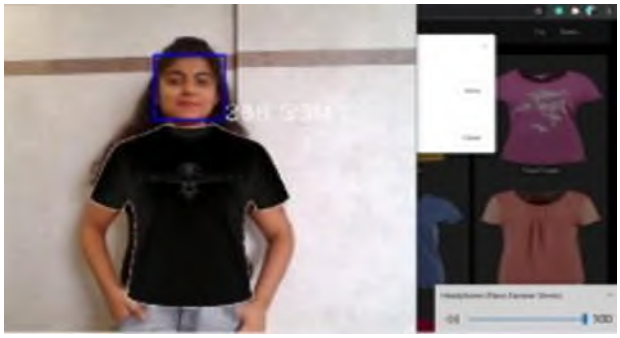

Fig. 6. Dress Output

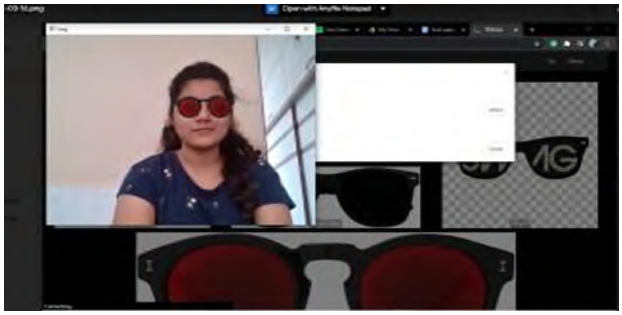

Fig. 7.sunglass try output

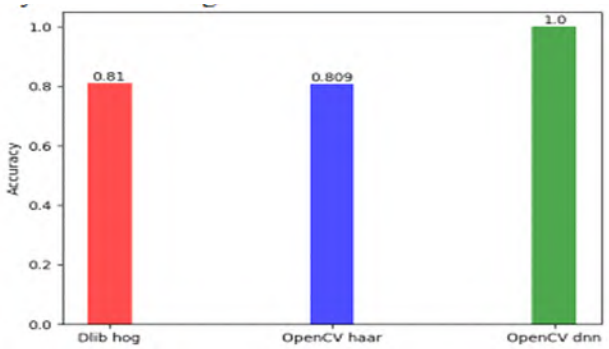

Fig. 8. Detection Accuracy

Future Scope

In the future, we will leverage our system, which may be a mobile application, to allow users to directly access cameras for trial purposes and to check out various accessories such as shoes, jewellery, and so on. Numerous clothes reference (for example, palazzo, top, and jacket together) how an individual is projected to seem with garments chosen from multiple reference photographs during a query image. Finally, there is room for improvement in the appliance's accuracy, particularly when it comes to clothing, which can be accomplished by taking multiple snaps of the material at various angles and then aligning the actual angle of the material with the actual angle at which the user is standing tilted.

Conclusion

A Virtual Trial Room was hence implemented in Python OpenCV. This application can help users save time by going to the shops to try on attires which they can do online as well. The application is in a position to trace the user's movement and angles with reference to the screen to accurately superimpose the apparel onto the user without having the user align to the device screen hence improving user experience. The application are often employed by online retailers and vendors to sell their wearable products which can surely attract more customers.

Acknowledgment

We would like to thank our mentor, Prof. Sandeep Utala, and the faculty of the Information Technology Department at the Vivekanand Education Society's Institute of Technology [VESIT] in Mumbai for their assistance and guidance.

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SURVEY ON ALGORITHMS USED FOR SATELLITE IMAGERY CLASSIFICATION AND MODELING URBAN GROWTH

V.V. Bhosale[1] and A. Patankar[2]

[1] Department of Computer Engineering, Vidyalankar Institute of Technology, Affiliated to University of Mumbai, Mumbai, MH, India

[2] Department of Computer Engineering, Thadomal Shahani College of Engineering, Affiliated to University of Mumbai, Mumbai, MH, India

Email: [1]varsha.bhosale@vit.edu.in, [2]archana.patankar@thadomal.org

ABSTRACT

Rapid urban development and change of Landscape have been observed since last two decades in metro cities because of Urbanization. To reduce uncontrolled and unplanned growth it is necessary to measure various changes in the landscape so that the Urban growth can be addressed in a planned manner. Research across the globe shows that geospatial technology can be used as an excellent tool for monitoring urban growth for better planning and resource sustainability. With the current improvements of Remote Sensing Technology and advancement in areas of Image Processing, Machine Learning & Artificial Intelligence, wide assortment of classification algorithms are designed to classify the changes seen in use of Land and it's cover. The land use (LU) change is driven by environmental and societal factors. This classification can be further used to model the rate at which the Land use is changed. Spatial metrices can also be used to interpret modeling results better, they give various details of area, patch, landscape etc. Urban growth modeling provides insights to predict growth and plan for future expansion accordingly. [2] The principal motive of this paper is to conduct a brief literature survey of various methods/algorithms applied to classify the remotely sensed digital images and the algorithms used to measure Urban Growth and to predict future growth of the region/s under consideration.

Keywords: *Classification, LULC, Change Detection, Urban Growth Modeling*

Introduction

The environment is seen to be persistently evolving in terms of landscape dynamics. Changes that are seen in Land Cover and Land Use over the years are important in the studying Urban Growth. (Henderson- Sellers and Pitman, 1992).

The LULC pattern have been continuously changing due to urban expansion, growth in population, moving of people to urban locality, economic growth, industrialization, infrastructure initiatives like construction of roads, rails, provision of infrastructure development, etc. [2]

The land use change in most recent two decades is urban development. The urban communities everywhere throughout the world proceed with unabated extension to consider the necessities of an ever-requesting populace. Land use change from undeveloped or agriculture lands to developed paved surfaces has two inverse components. From one perspective, urban area go about as motors of monetary and social development. Urban territories contribute fundamentally to the country's economy and keep on opening entryways for development and advancement. Subsequently, the rapidly increasing urban development has frequently been seen as an indication of the imperativeness of the local economy (Yang and Lo, 2003). On the flip side environmental and ecological degradation is observed due to rapid urban growth.[3]. The development of urban regions brings about the change of agricultural land or open space into urban land use, which infringes onto various important agrarian, forest, and natural land. The Urban development also brings about expanding surface temperatures in and around urban areas and this leads to neighborhood and worldwide atmosphere changes. Thus, changes of land use pattern, if left unattended, would hinder sustainable development and disturb the ecological balance. Finding the varied nature of change of land use and assessing its effects involves procedures of both measurement and modeling. There are many studies on ways in which the change in land use is measured and modeled. This paper highlights few methods used for classification and modeling.

Steps in Classification of Remotely sensed Images

The differences observed at different times in the objects or a surface or a process is known as Change detection. The image of the same study area considered on a temporal scale and various methods of Change detection are applied which detect and display the changes. Changes in remotely sensed images of the study area are studied for two or more dates. Different classes are identified/considered while applying the classification algorithms and the difference is the Classes Identified is noted which is further used for Predicting the growth.

Many classification algorithms are available, and selection of the algorithm and resources depends on the study under consideration, dataset used, resolution of the sensor, data availability and cost factors. Numerous authors have published the performances of well-established classification algorithms. The approaches for change in Land cover fall into two basic types i.e., they are continuous or categorical. In the first type, some attribute of the land area which is continuous measured appears changed. E.g., Change in the forest cover attribute, in this type of change detection the goal is to measure the amount of change in each space (like dense to parse). In the second type of change detection the changes observed are between land use or land cover categories, the example of this could be the area which were agricultural land is no longer agricultural land [4]. In the Classification algorithms used in remote Sensing, one of the grouping of types of algorithms for Classification is considered as Supervised & Unsupervised Classification. In Supervised Classification training samples are used to find different Classes. The new data is then classified in one of the Classes as identified from the training Samples. In Unsupervised classification algorithms the clustering algorithms are used to group the complete data into classes, no training samples are used.

Steps involved in image Classification of Remotely sensed Images and measuring Urban Growth may Include.[5]: -

- Finding a suitable Classification System
- Selecting Training Data Set
- Pre-processing of Image
- Feature Extraction
- Selecting Suitable classification Algorithm
- Post Classification Processing
- Accuracy Assessment

Literature Surveyed

A. This paper used Mumbai City's data set to conduct research to find previous urban land use changes using remote sensing data for the years 1973 and 2010. The maps were classified using Maximum likelihood algorithm. The Markov Chain Cellular Automata (MC-CA) model was used to predict city's growth was predicted between 2020-30. The elements affecting urban growth, were found by connecting the MC-CA model to multi-criteria evaluation. Highest growth rate of 142% in urban growth occurred between 1973 & 1990. Decline in the growth rates to 40% between 1990 & 2001 and to 38% between 2001 & 2010 was observed, this degradation affected open lands and agricultural lands the most. Predictions were made for growth in built-up areas of 26% by 2020 & 12% by 2030 in comparison to 2010 [6].

   For classification of the Urban growth of Kolkata metropolitan region in 1990,1999,2009 and 2017 the Gaussian Maximum Classifier was used, and urban growth was found using CA-Markov Model. Results indicated that urban growth from 4.1% in 1990 to 11.58% in 2017. Modeling results indicated the rise in urban areas by 14.94% by 2025[7]

B. The Urban Sprawl in Dehradhun city was done using LISS IV images, during the years 2004 and 2009, the Unsupervised classification method–ISODATA was used. CA-Markov model was used for modelling. Changes were observed in built up class (27%), agriculture (17.7%) and fallow land (10.2%) between 2004 and 2009.[8]

C. The LANDSAT Thematic Mapper 5 images were obtained for the years 1990,2000 and 2011 for the city of Dhaka and were used. The images were classified using Hybrid classification technique. Initially each image was categorized using ISODATA, various spectral signatures

were found, the algorithm Maximum Likelihood Classification was used, histograms were plotted, and Transformed Divergence separability methods was applied for each of the clusters. Land use change details, Markov chain analysis and cellular automata algorithms were used for future prediction. The result showed growth in built up category and rural settlements and decrease in Floodplain and cultivated land [9]

D. The study examined the effectiveness of five Change Detection algorithms on the study area in Karnataka - Yagachi of Belur for the years 2003 & 2011. The five algorithms used were: -

Pixel Based

- Image difference
- Image rationing
- Changed Vector Analysis

Transformation Based

- Tasseled Cap
- Principal component analysis

Classification was done with Maximum likelihood algorithm. The authors inferred that among the five change detection methods, the Change Vector Analysis (CVA) was the most able method for the study area. [10]

E. In modeling the urban growth of GCR (Greater Cairo Region) for three years 1984, 2003 and 2014, the classification algorithm used was Support Vector Machines. Land Change Modeler was used for modeling Prediction of Urban growth for year 2025. The Validation output on model outcomes stated urbanization by 2025 will be 14% of the vegetation & 4% of the desert of 2014 values. The urban zones surrounding the Great Pyramids, Islamic Cario and AI-Baron Palace (within a 5-km buffer) were determined, featuring an extreme urbanization particularly around the Pyramids; 28% in 2014 up to 40% in 2025. [11]

F. Machine Learning algorithms are used for non – parametric regression and classification purposes which focus on Automatic extraction of information from data by computational and statistical methods. Support Vector Machine, Artificial Neural Network were widely used Machine learning algorithms [12].
The comparison of six Machine Learning (ML) algorithms namely Support Vector Machines, K Nearest Neighbors, Random Forests, Learning Vector Quantization, Recursive Partitioning Trees, Gradient Boosting, of LANDSAT data in the years 1979, 1992, 2003 & 2014, executed similarly for performance, showed that Support Vector machine had greater accuracies and kappa coefficients, and a slight improved fit at individual class level, followed by the Random Forest classifier. These two algorithms showed better results than other methods. It indicated that results suggested that Support Vector Machines or Random Forests should be considered for classification.[13]

G. Classification was done of the LANDSAT images of the Capital city of Sri-Lanka, Colombo for the years 1992, 2001, and 2014. Changes of non-built-up to built-up across double cross interims -1992–2001 and 2001–2014 were calculated. The classification was done using Maximum Likelihood classification algorithm. Analysis of Land change Intensity, Gradient Change, Spatial Metrices were calculated. Multi-layer perceptron Neural Network (MLP –NN) was used to model transition potential map and CA-Markov model to predict future growth. The results showed change in the built-up land from 11,165 ha in 1992 to 35,876 ha in 2014 in last 22 years. The spatial pattern using driver variables and by using spatial metrics, showed that growth occurred adjacent to roads and schools. The modeling predicted increase in the city's built-up land to 42,500 ha by 2030 and 56,000 ha by 2050. [14]

H. Urbanization and sprawl for 10 Km buffer in Pune City was found by analyzing land use was by Gaussian Maximum Likelihood Classifier (Supervised classification). Some of the spatial metrices were also used for analysis.

Increase in built up area by 17.44% and decrease in vegetation by 4.53% from 1977 to 2013 was seen. Shannon entropy was used to find sprawl. [15]

To find the growth of Chennai city within a 10 km buffer, Random Forest method was used for Classification of LANDSAT images of the year 1991, 2003 & 2016. Six landscape metrics were calculated. Urban Sprawl (US) was measured using Renyi's entropy. Land change modeler predicted land cover for 2027. Between 1991 and 2016. 70.35% expansion in urban areas in suburban periphery of Chennai was observed. The suburban agricultural, forest, barren places were transformed into fragments of urban areas. The prediction for 2027 indicated a conversion of 16.57% -13,670.33 ha of existing forests and agricultural lands into urban areas.[16]

LANDSAT data of Mumbai, Delhi and Kolkata in India was classified using the object-oriented hierarchical classification method. The methodology used integrated spectral features with shape, neighborhood and texture features. Gradient analysis along with landscape metrics was used to find the spatiotemporal pattern of urbanization. The study found similarity & differences for spatial growth in Indian mega cities, cities in the same cultural area at about the same development stage regarding absolute populace. [17]

Spatial characteristics of landscape were quantified, and the growth was measured using the Spatial metrics namely Class area, Number of patches, Patch density, largest patch index, Normalized landscape shape index (NLSI), Total edge, Edge density, Clumpyness index (Clumpy), Percentage of land adjacencies, Cohesion index, Fractal index distribution, Contagion and Lacunarity

I. The Maximum likelihood classification algorithm was used to classify LULC of Su-Xi region in China for the years 1990, 2000 and 2010. A Cellular Automata (CA)–Markov model modeled changes for the year 2020. The projected results revealed extensive urban growth at the cost of farmland, wetland, and water bodies. [18]

J. The study of 10 Km Buffer of Chandigarh municipal boundary about urban growth pattern and land surface temperature was done using Gaussian Maximum Likelihood algorithm for classification of land use. The Landscape modeling was done using SLEUTH method, the results indicated growth in built-up from 3.7% to 16.16% during the span 1991 to 2017 and the average land surface temperature of the study area to increase almost by 12˚C (in March - May). [19]

K. The paper gives vital information of four metro cities Delhi, Mumbai, Kolkata and Chennai in India on the Intra and Inter spatio-temporal patterns of urbanization. Classification was achieved using Gaussian Maximum Likelihood algorithm. The urban extension and the urban growth dynamics was found using density gradient approach and spatial metrics which were pre-validated. With intra spatial patterns it was observed that gradients in and around the central business district could not undergo more urban expansion. Landscape metrics reveled that aggregation using clumping of patches form a dominant urban patch with various shapes and highly domination urban class. To find the overall spatial pattern of inter and intra region PCA was applied. From this it was observed that there was influence on buffer regions by patches with complex shaped multi class growth. Also, simple shaped clumped growth was observed in core city centers [20].

Conclusion

From the above literature surveyed for finding various classification algorithms used to classify digital remotely sensed images into various classes were: Maximum Likelihood Classification Algorithm(Popularly used), ISODATA Unsupervised Classification, Object Oriented Hierarchical Approach, ANN-Artificial Neural Networks, SVM -Support Vector Machines ,KNN- K-Nearest Neighbors , RF- Random Forests, LVQ-Learning Vector Quantization, RPART-Recursive Partitioning, Regression Trees ,GBM- Gradient Boosting.

Further Spatial matrices were used for describing structure. The modeling algorithms used for prediction of Future Urban growth were Cellular Automata-Markov model (Popularly used combination), multi-layer perceptron Neural Network (MLP –NN), Land Change Modeler, SLEUTH model, Principal Component Analysis. The table below summarizes the details. Further studies can be done by implementing and analyzing the performance of various algorithms by considering a given study area

Area of Study	**Algorithm Used forClassification**	**Algorithm Used forMeasurement/Modelling& Prediction**
Mumbai City	Maximum Likelihood	Markov Chains Cellular Automata
Kolkata Metropolitan Region	Gaussian Maximum Likelihood	CA-Markov
Dehradun City	ISODATA	CA-Markov
Dhaka City	ISODATA, Maximum likelihood; Transformed divergence (TD) separability method	Markov Chain Analysis (MCA) and Cellular Automata (CA)
Karnataka - Yagachi of Belur	Maximum Likelihood	-
GCR (Greater Cairo Region)	Support Vector Machines	Land Change Modeler (LCM)
	SVM, KNN, RF, LVQ, RPART, GBM	-
Colombo city, Capital of Sri Lanka	Maximum Likelihood Classification	MLP –NN was used to model transition potential map and CA-Markov model to predict future growth.
Pune City with 10 km buffer	Gaussian Maximum Likelihood	Shannon entropy
Chennai city within a 10 km buffer	Random Forest (RF)	Renyi's entropy. Land change modeler
Three mega cities Mumbai, Delhi and Kolkata in India	Object-Oriented Hierarchical Approach	-
Su-Xi region in China	Maximum Likelihood	Cellular Automata (CA)–Markov
Chandigarh Municipal Boundary with 10 Km Buffer	Gaussian Maximum Likelihood	SLEUTH
Delhi, Mumbai, Kolkata and Chennai in India [19]	Gaussian Maximum Likelihood	Density gradient approach and Spatial metrics

Table 1

Acknowledgment

We thank Vidyalankar Institute of Technology, Mumbai & University of Mumbai for the support rendered during the preparation of this study.

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CRICKET MATCH SIMULATION AND SCORE PREDICTION USING MACHINE LEARNING

S. Saluja[1], R. Gupta[2], S. Kharche[3] and Y.Shah[4]

[1,2,3,4] Department of Information Technology Vidyalankar Institute of Technology Mumbai, India
[1]saranjeet.saluja@vit.edu.in, [2]rohit.gupta@vit.edu.in, [3]sarvesh.kharche@vit.edu.in, [4]yash.shah1@vit.edu.in

ABSTRACT

Cricket is one of the most popular team games in the world, it is the second most watched sport in the world after football and encompasses a multi-million-dollar industry. There is a tremendous interest in simulating and more importantly predicting the output of cricket matches. Fans of the game love predicting the ongoing match results, and this is something that has ended up being a hobby for numerous people who observe the game. In this paper, we have focused on simulating T20 matches, which is the most interesting and most watched format of cricket. This is a sport with an abundant amount of statistics and using this information, we will make an evaluation on whether a team can win an ongoing match. To simulate the match, we have considered different factors pertaining to previous matches played and the statistics of the players. We have used three machine learning algorithms in the process of simulation, which are K-Nearest Neighbor (KNN), Random Forest and XGB Algorithm.

Keywords: *Machine Learning, Data Mining, Cricket Match Winner, Score Prediction, Indian Premier League (IPL), Simulation*

Introduction

The sport of cricket has a very long history dating back to the 16th century. Cricket is mainly played in three different formats i.e., Test matches, ODI (One Day International) matches and T20 matches. T20 is the most recent format of cricket which was first played in England between English domestic teams. Since, then T20 cricket has gained a lot of traction and has become the most popular format of cricket presently. T20 cricket has been successful in attracting both the younger and the older generation of viewers. The Indian Premier League (IPL) is the flagship T20 cricket tournament in India. IPL had its inaugural season in 2008 and since it has become one of the most popular and most watched cricket tournaments in the world. Since its inaugural season in 2008 IPL has grown immensely in terms of its monetary value i.e., higher Television broadcast revenue, Player contracts and sponsorship deals.

Nowadays professionals in every sport use some form of statistical modelling to improve their performance and increase their chances of achieving greater success. Similarly, in cricket, many teams use statistical analysis to better understand their strengths and weaknesses and also their opponents'. The betting industry has also encouraged the use of modelling and simulation of cricket matches to set the odds of various events during the match and also engage their customers in a more effective manner. But modelling and simulation of cricket matches is difficult as the game involves many complex rules that govern the game also the variations in the ability of players and their performances on a given day can create large deviations in the results of the simulation.

In T20 cricket, there are an endless number of questions that are not compliant to experimentation or direct analysis but could be easily addressed via simulation. For example, what would be the outcome of a game if a certain batsman bats third in the batting order as opposed to fifth, would it be beneficial to the team or not? Another example could be, what percentage of time would a certain team be able to score more than 180 runs against another team in the first innings?

In this paper we have tried to build a simulator which can simulate T20 matches in the Indian Premier League (IPL). The data used in the process of simulation includes the match details of the matches already played in the past in the IPL, Ball-by-ball data of these matches and the individual statistics of the players involved in the IPL. The individual player statistics are used to create a K-Nearest Neighbors clustering model to classify the batsmen into different clusters depending on their statistics, the same is done for the

bowlers. Then all this data (i.e., batsmen clusters, bowler clusters and ball-by-ball data of past matches in IPL) are used to build a Random Forest Classifier and Regressor along with XGB Classifier and Regressor to predict the outcome of each ball of the match.

Related Work

Jack Davis et al. [1] carry out their simulation through the process of determining the batting probability based on various attributes such as batsman, bowler, etc. These probabilities are computed using hierarchy based empirical Bayes approach. Moreover, the second innings is predicted on the basis of their target (i.e., the runs scored from the first innings).

Tim Swartz et al. [2] use certain batsman and bowler interactions i.e., to predict the probability of scoring runs which is derived from previous data over the years. In this, they use the Bayesian latent model to carry out the above. Madan Gopal Jhawar et al.[3], in their paper, have used a dynamic approach to implement simulation process. They have used career statistics of the players (batsmen and bowlers), their score (runs and wickets respectively), the order at which they usually are placed in the line-up, and the corresponding strength of the teams.

Vignesh Veppur Sankaranarayanan et al. [4] through their paper, have carried out simulation by combining archival data, plus the current state of the match along with the process of player clusters to determine the end result (i.e., winner) of that match.

Matthew J. Triggs [5] have taken into account budget constraints, and evaluation of players in order to build a successful IPL team keeping in mind the budget limitations. They have evaluated players on the basis of how much a player can contribute towards the team's positive performance.

Paramjit Gill et al [6], have tried to optimize the batting orders for a cricket team, taking into consideration various factors various unique factors, such as the team coach's advice, condition of the pitch the match is being played on, among others.

Kaluarachchi et al. [7] use various combinations of attributes such as the time of the day when the match is played, the team which has won the toss, the month in which the match is played among others, which are used to carry out the forecasting of the match result.

Riddhi Shah et al. [8] have carried out predictions of the cricket matches using powerful algorithms such as Support Vector Machines (SVM) and Logistic Regression based on a variety of features such as Venue, Home Team advantage, among others.

Methodology

3.1 Data-sets Selection:

The dataset was taken from Kaggle[9]. The data consists of the ball-by-ball data of about 750 matches between the years 2008 and 2019. Along with the above, another dataset which consists of the player statistics such as batting average, bowling economy rate was taken from data.world[10]. Over the years in the IPL, there have been many changes in terms of the players within the team, or introduction of new teams while scraping off of the old teams. Consider, "Delhi Daredevils" team, their current team's name is "Delhi Capitals". Similarly, many of the older teams, such as "Rising Pune Supergiants" have been replaced by teams like "Sunrisers Hyderabad". To ensure clean and usable data, we have considered only individual player statistics (irrespective of the team in which they have played/are playing).

3.2 Clustering of Players

The players from the second dataset have the following statistics:

- Batting Average

It is the number of runs scored by a batsman upon the count of the times his wicket has been taken.

- Batting Strike Rate

It is the average runs scored for every 100 balls faced.

- Bowling Average

It is the number of runs ceded by the bowler upon the total number of wickets taken.

- Bowling Economy Rate

It is the number of runs conceded by the number of overs bowled.

- Bowling Strike Rate

It is the number of balls bowled by the number of wickets taken.

Based on the Batting Average and Batting Strike Rate, the players are divided into 15 clusters (0 to 14). Similarly, based on the

remaining Bowling Average, Bowling Economy Rate and Bowling Strike Rate, the players are divided into 15 clusters (0 to 14). This process of clustering is carried out using KNN, i.e., K-Nearest Neighbors algorithm and saved into a Comma Separated Values (CSV) files.

3.2.1 K-Nearest Neighbors:

K-Nearest Neighbors or KNN is a type of supervised machine learning algorithm. KNN can be utilized to carry out classification as well as regression. We have implemented KNN to carry out classification.

The algorithm works in the following way.

In case of an unknown data point, this algorithm will find the distance to the nearest points. The class which will have majority of nearest points or largest probability, the unknown data point will be assigned that specific class.

The distance between the unknown data points and the remaining data points is usually carried out by Euclidean Distance Formula.

$$d(x,x') = \sqrt{(x_1 - x'_1)^2 + \cdots + (x_n - x'_n)^2}$$

3.3 Preparation of Final Dataset:

From the above CSV file, we have considered the Batsman cluster and Bowler cluster.

Similarly, from the ball-by-ball data, we take the following attributes i.e., inning, over, ball, total runs, players dismissed.

All the above attributes are combined to form a final dataset which will be used to predict the runs scored or wickets taken and thus carry out the simulation process.

3.4 Model Selection and Hyper-Parameter Tuning:

Four powerful algorithms have been used to carry out the prediction process of runs and wickets.

For prediction of runs, we have the Random Forest Regressor and XGB Regressor. However, for the prediction of wickets, which is essentially a classification problem (i.e., for a single ball, the result can be 0, which portrays no wicket taken, or 1, which portrays that a wicket has been taken), the Random Forest Classifier and XGB Classifier has been used.

To choose the right parameters for the selected algorithm, Randomized Search Cross Validation has been carried out for the above algorithms. An overview of the working of various algorithms used is given below:

3.4.1 Random Forest Regression and Classification:

It is a robust ensemble machine learning algorithm based on the Decision Tree algorithm. However, in this, as it is an "ensemble" algorithm, it implies that it takes into account multiple decision trees and their result to predict the eventual outcome. The problem of being susceptible to over-fitting for the Decision Tree algorithm, is solved by this dynamic algorithm.

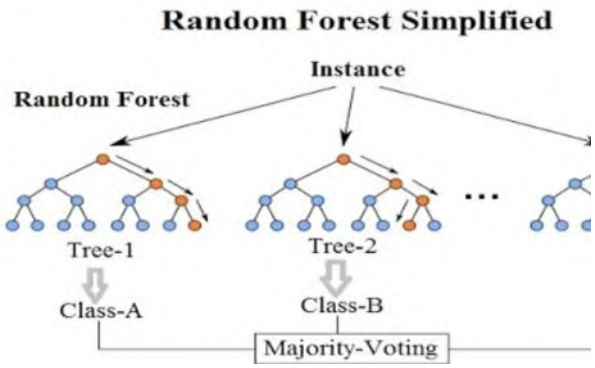

Fig.1 Random Forest Algorithm[11]

3.4.2 XGB Regression and Classification:

The XGB algorithm is a very robust ensemble algorithm categorized as one of the Boosting Techniques. This is carried out by building successive trees and reducing the errors by learning from the previously built trees.

This approach consists of the following steps:

- Consider, A0 to be the original model to predict y. Theerror will be given as
  $y - A0$
- Now, E1 is a model which is fit to the above errors.
- By combining A0 and E1, we create a new model, A1, i.e., which is nothing but an updated version of the previous model, i.e. A0. This updated model will have less MSE comparatively.
  $A_1(x) = A_0(x) + E_1(x)$
- Similarly, for n iterations, a generalized equation is given as:
  $An(x) = A_{n-1}(x) + En(x)$
- The equation can be further written as:
  $An(x) = A_{n-1}(x) + \gamma_n h_n(x, r_{n-1})$

Where,
x - learning rate
r -regularization parameters
h - function to calculate errors

It basically reduces the loss by using gradient descent algorithm.

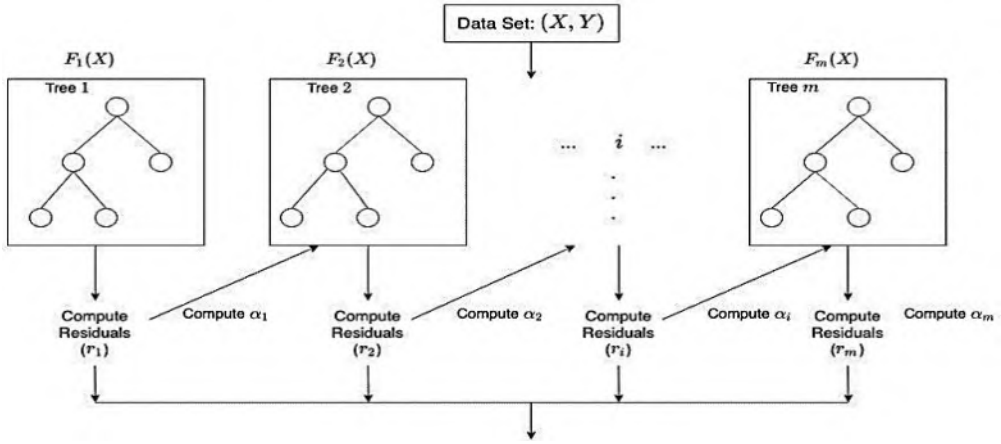

Fig. 2 Working of XGB algorithm[12]

3.4.3 Model Hyper-Parameters Tuning using Randomized Search Cross-Validation:

Hyper-parameters are the specifications of the model which are not derived internally (such as coefficients of Linear regression) i.e., on its own by the model, but are the criteria specified by the person implementing the model. The process of Hyper-parameter tuning involves finding the appropriate values in order to optimize model predictions.

Although, a variety of methods exist for this process, however, for this system, we have carried out Randomized Search Cross Validation for Hyper-Parameter tuning of our model as random combinations for every iteration, thus increasing the likelihood of finding the optimal hyper- parameter values. In this, we have created a dictionary of the hyper-parameters and their range. Using the RandomizedSearchCV from scikit learn, we use the hyper- parameters, we define the scoring (in order to evaluate the model, in this case, negative mean absolute error) and fit the training data. Random combinations are carried out to find the appropriate values. And hence, we can find the best estimator (which essentially contains the set of values required to optimize the prediction process).

Excerpt of the code used:

```
In [21]: clf = RandomForestRegressor()

In [22]: n_estimators = [100,200,300,400, 500, 600,700, 800 ,900,1000]
         # criterion = ['gini', 'entropy']
         depth = range(2,20,1)
         min_split=[2,3,4]
         min_leaf=[2,3,4]
         bootstrap = ['True', 'False']
         verbose = [5,10]

         hyperparameter_grid = {
             'n_estimators': n_estimators,
             'max_depth':depth,
             'bootstrap':bootstrap,
             'verbose':verbose,
             'min_samples_split':min_split,
             'min_samples_leaf':min_leaf,
             }

         random_cv = RandomizedSearchCV(estimator=clf,
                                        param_distributions=hyperparameter_grid,
                                        cv=5,
                                        scoring = 'neg_mean_absolute_error',
                                        n_jobs = 4,
                                        random_state=42)

In [23]: random_cv.fit(X_train,y_train)

In [24]: random_cv.best_estimator_
```

Fig.3 Hyper-Parameter Tuning

As mentioned in the official documentation of Random Forest Regressor[13], we have a variety of hyper-parameters available. Some of them, which have been taken into account are:

- n_estimators: The number of trees to be formed to carry out prediction process.
- depth: the maximum limit to which the tree can be expanded.
- min_split: the minimum number of nodes for the internal node to be split.
- min_leaf: the minimum number of leaf nodes

3.4.4 The Simulation Process:

The Simulation process is carried out by taking two lists consisting of the player names (as written in the database). It represents the way the team has been lined up for the match. The respective player cluster is fetched for each player in the list and a new list of only the player clusters is created for simulation purposes.

The innings, overs, balls, runs, batsman cluster and bowler cluster are used to carry out prediction and hence the simulation. This process is carried out for both innings. It represents the maximum potential for a probable line-up.

The final simulation is displayed in the format as given below:

overs	balls	runs	total runs	wickets	total wickets
1	1	2	2	0	0
1	2	1	3	0	0
1	3	0	3	0	0
1	4	0	3	0	0
1	5	0	3	0	0
1	6	0	3	0	0
2	1	0	3	0	0
2	2	0	3	0	0
2	3	0	3	0	0
2	4	0	3	0	0
2	5	4	7	0	0
2	6	0	7	0	0
3	1	0	7	0	0
3	2	0	7	0	0
3	3	0	7	0	0
3	4	0	7	0	0
3	5	0	7	0	0
3	6	0	7	0	0

Fig.4 Simulation Process –1

17	6	2	118	0	4
18	1	0	118	1	5
18	2	2	120	1	6
18	3	1	121	0	6
18	4	2	123	0	6
18	5	2	125	0	6
18	6	1	126	1	7
19	1	2	128	0	7
19	2	2	130	0	7
19	3	2	132	0	7
19	4	1	133	0	7
19	5	2	135	0	7
19	6	2	137	0	7
20	1	1	138	1	8
20	2	2	140	0	8
20	3	0	140	0	8
20	4	4	144	0	8
20	5	2	146	0	8
20	6	2	148	0	8

Fig.5 Simulation Process - 2

Results

The following table shows the accuracy table of twoalgorithms i.e., Random Forest Regressor and XGB Regressor for prediction of runs.

Both the algorithms show similar results in terms of accuracy i.e., about 41%. However,

the Random Forest Regressor shows slightly better results at 41.54% whereas XGBoost Regressor shows an accuracy of slightly less 41.33%.

Fig. 6 Accuracy of various algorithms for Runs scored.

The table below shows the accuracy table of two classifier algorithms i.e., Random Forest Classifier and XGB Classifier for prediction of wickets.

Both the algorithms show similar results in terms of accuracy i.e., about 86%. However, the Random Forest Classifier shows slightly better results at 85.77% whereas XGBoost Classifier shows an accuracy of slightly less 85.75%.

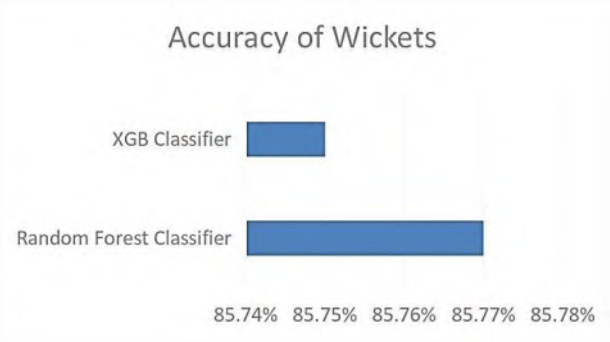

Fig. 7 Accuracy of various algorithms for Wickets taken

TABLE 1: OVERALL COMPARISON OF ACCURACIES FOR RUNS

ALGORITHM	ACCURACY
RANDOM FOREST REGRESSOR	41.54%
XGB REGRESSOR	41.33%

TABLE 2: OVERALL COMPARISON OF ACCURACIES FOR WICKETS

ALGORITHM	ACCURACY
RANDOM FOREST CLASSIFIER	85.77%
XGB CLASSIFIER	85.75%

Conclusion and Future Scope

We have created a Simulator which uses powerful algorithms to carry out the simulation process in an accurate way. The proposed system, thus, can be utilized by coaches of their teams to carry out analysis with experimental line- ups without proceeding to matches directly.

This system can be further enhanced by taking into consideration player-player interactions throughout the eleven seasons of the IPL. By taking into account such interactions, one can easily find probabilities of such interactions for the future. Even more parameters and models can be used to produce better results.

Acknowledgement

We wish to express our sincere gratitude to Prof. Yash Shah, Assistant Professor of the Information Technology Department, Vidyalankar Institute of Technology for his guidance and encouragement throughout this project.

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ASSESSING THE EFFECTIVENESS OF CRYOTHERAPY ON ARTERIOVENOUS FISTULA PUNCTURE RELATED PAIN AND BEHAVIOURAL CHANGES AMONG THE PATIENT ON HEMODIALYSIS IN SRM GENERAL HOSPITAL, KATTANKULATHUR,CHENGALPATTU DISTRICT

M.Malini[1*], P.Deepika[2], M.Suruthi[3], R.Swathika[4], N.Anu[5], T.Suseelal[6] and C.Kanniammal[7]
[1,2,3,4,5]SRM College of Nursing, SRM IST, Kancheepuram, Tamil Nadu, India
[6]SRM College of Nursing, SRM IST, Kancheepuram, Tamil Nadu, India
[7] SRM College of Nursing, SRM IST, Kancheepuram, Tamil Nadu, India
[1]malinimurugan1599@gmail.com

ABSTRACT

The chronic kidney disease is most dangerous disease which leads to death globally. Hemo-dialysisis the treatment given to the patients to prevent complication. The aims of the study is to evaluate the Effectiveness of Cryotherapy on Arteriovenous fistula puncture related pain and behavioural changes in the patients undergoing Hemodialysis in SRM General Hospital. A single blinded quantitative true experimental research design was used in this study. After decision from expert committee and explaining and getting the consent from the participants the data was collected. 90 patients (45 study + 45 control) were selected as simple random sampling technique. Pretest was done by demographic variables, clinical variables, Numerical pain scale and standardized FLACC behavioural scale for both group. Cryotherapy was given about 15 minutes for experimental group. Post test was done with same questionnaire after the insertion of the needle for both experimental and control group. The result revealed that in intervention group the pretest value for the pain level Mean is 5.31 with SD 0.97, whereas the post test value for the pain level Mean is 2.56 with Standard Deviation 0.94.The p value is 0.01. The pre-test value for the behavioural changes Mean is 2.0 with SD 1.98, whereas the post test value for the behavioural changes Mean is 0.36 with SD 0.71. The p value is 0.01 and it is significant. In control group, the pre test value for the pain level Mean is 5.09 with SD0.92, whereas the post test for the pain level Mean is 5.11 with SD0.91. The p value is 0.9. The pre-test value for the behavioural changes Mean is 3.0 with SD2.04, whereas the post test value for the behavioural changes Mean is 2.98 with SD2.07.Thep value is 0.66and it is not significant. The study concluded that the pain reduction and behavioural changes were significant in the intervention group. Hence the hypothesis formulated in this study is proved.

Keywords: *Cryotherapy, arteriovenous fistula puncture, Hemo-dialysis, pain, behavioural changes, complication*

Introduction

The chronic kidney disease is recognized as increasing in worldwide public problem for patients and family members among Indian population. It is associated with side effect of clinical outcome and quality of life and increasing cost of health care. (Michael Allon et al ; 2000)

Chronic kidney disease is most dangerous disease where these patients need to visit to the multi-specialized hospital. In chronic kidney disease, the physician advised for renal replacement therapy. (Ahmed A.Al-Jaishi et al ; 2017). It may be peritoneal or Hemodialysis treatment. The most preferable method is Hemodialysis, good standard for the Hemodialysis patient with arteriovenous fistula approach.

Peritoneal dialysis is a procedure in which the dialyser fluid is infused in to the peritoneal cavity and the waste fluid is drained externally. Hemodialysis is a invasive procedure in which the waste product like sodium, potassium, chloride from arterial blood is excreted through the dialyser. (Yu-Te Wu et al ; 2016) (Latha A et al ; 2016).

Cryotherapy is used during arteriovenous fistula puncture among patient with Hemodialysis to relieve the pain during inserting needle. 60 people (30 pre–experimental and 30 pre posted group) were enrolled after getting their consent demographic, modified Mccaffery's numeric pain rating scale for objective assessment of pain. Result of the study revealed reduced pain level and it was significant with $p < 0.05$. This study recommended for further study in hospital setting. (Vipin patidar et al ; 2015).

In India 800 per million population are suffering from chronic kidney disease and 1,20,000 are undergoing dialysis. In TamilNadu 65000 are undergoing for dialysis.

In Chennai <25,000 are undergoing Hemodialysis.

Effect of Cryotherapy among patient with Hemodialysis to relieve pain during insertion of needle. By using purposive sampling technique around 80 children (40 experimental and 40 control group) were selected. The result revealed that pain was reduced and it was significant with p<0.01. (Alifakes movahedi et al ; 2006) (RashaH.Ramadan et al; 2016).

Effect of Cryotherapy on arteriovenous fistula puncture among patient with Hemodialysis to relieve the pain during insertion of needle. By using random sampling technique around 60 people (30 experimental + 30 control) were enrolled after getting their concent, demographic, clinical characteristics, observation checklist and numerical rate scale was used for pain assessment. After the pretest intervention was done with ice cubes in the web 10-15 minutes before the insertion of needle. Posttest was done with same questionnaire. Analysis was done with descriptive and inferiental statistics. The pain was reduced and it was significant with p < 0.01. (Sabitha. P. B et al ; 2008) (Mr. Hiren Tilala et al ; 2020).

Seyed Reza Borzou, et al., (2016) done a study on the effect of health education on promoting lifestyle in Hemodialysis patients". By using simple random sampling technique around 70 patients (35 control group and 35 study group) undergoing Hemodialysis in training centers-medical Hamadan were enrolled. After getting consent, demographic variables and health promoting lifestyle score. The intervention was given for one individual for 30-minute during hemodialysis held over three weeks in a row the post-test was done for both group with same questionnaire. Result of the study revealed the significant is P<0.05 level. (Alireza Dashtidehkordi et al; 2019)(Sivagami R et al; 2011)

Cryotherapy can be used to relieve pain in invasive procedures. The patients may experience behavioural changes during needle insertion. On observation most of the patients have severe pain and they often cry during needle insertion. So, the researcher thought to help the patient during Hemodialysis to relieve the pain by applying ice pack during needle insertion in the AV fistula. When we apply ice the pain will reduce and behaviour will change, the patient will feel comfortable. Hence the researchers were interested to do this present study. (Apisadachumkam et al; 2015) (Morteza Dehghan et al; 2014) (Amin A Algafly et al; 2007).

Materials and Methods

A single blinded quantitative true experimental research design was used in this study. After decision from expert committee and explaining and getting the consent from the participants 90 patients (45 study + 45 control) were selected by simple random sampling technique. Pretest was done by demographic variables like age, gender, religion, marital status, educational, type of family, income per month, habit and hereditary disease, clinical variables like Duration of CKD, Duration of AV fistula, Frequency of dialysis per week, Inspection of AV Fistula site, Pulse rate and Blood pressure, Numerical pain scale and standardized FLACC behavioural scale. Cryotherapy was given about 15 minutes for experimental group. The post test was done with same questionnaire after the insertion of the needle for both study and control group.

Data collection was done from 27.01.2020 - 04.02.2020 at SRM General Hospital, Kattankulathur, Chengalpattu District, Tamilnadu, India. Before the data collection, Medical Superintendent granted permission, SRM General Hospital. Data was collected all the days expect Sunday. On 1st day of the data collection the pretest was taken to both study and control group. After 2 days the patient came for the next dialysis for about 10-15 minutes of ice pack was kept in contralateral arm between thumb and index finger. After the insertion of the needle the ice pack was removed, immediately the post-test was done to the experimental group with same questionnaire. After 2 days the patient came for the next dialysis, after the insertion of the needle, the posttest was done for control group with same questionnaire.

Analysis

The collected data was entered in the Excel sheet and it was analysed by SPSS Version 16.0. The values were presented as percentage

and mean. The p value < 0.05 was used for statistical significant.

Results

The demographic valuables of experimental group, revealed majority of the patients age group belongs to 55-66years 20 patients(44.4%). Considering the gender, majority of the patients belong to male about 27(60.0%).Regarding the religion majority of the patients are belong to the Hindu religion about 38(84.4%). Considering the marital status of the patients most of the patients undergoing Hemo-dialysis are married about 44(97.8%).

Regarding education 15 (33.3%) had middle school education. Respect to the type of family most of the patients belongs to joint family 22(48.9%). In relation to the monthly income of the family 11(24.4%) are getting income around Rs.7,887-Rs.13,160. It is inferred that most of the patient did not have any habits 37(82.2%). In respect to the hereditary disease majority of the patients are having hypertension about 31(68.9%).

Considering the duration of CKD most of the patients are belongs to more than 3 years 29(64.4%).Regarding the duration of AV Fistula most of the patient having more than 1 year are about 28(62.2%).In relation to the frequency of dialysis per week majority of the patient undergoing dialysis twice in a week about 40(88.9%).

Considering the inspection of the AV Fistula site most of the patient did not have any problems about 40(88.9%). Regarding the pulse rate of the patient the majority of the Hemo-dialysis patients are having 81-90 per minute about 27(60.0%). It is inferred that regarding blood pressure majority of the patient 19(42.2%) are having 161\100 to 180\110 mm of Hg.

According to control group, regarding the age of the patient most of the patients are belongs to 56-65 years around 13(28.9%). Considering the gender of the patient most of them are male around 27(60.0%). Respect to the religion most of them belongs to Hindu around 38(84.4%). Regarding the marital status of the patient majority of the patients are married about 42(93.3%). In relation to education majority of them had middle school education 14(31.1%).

In respect to the type of family, most of the patients belongs to joint family 28(62.2%). In relation to the monthly income of the family 20 (44.4%) of them are getting income around Rs.7,887-Rs.13,160. It is inferred that most of the patients do not have smoking, alcohol and tobacco habits 39(86.7%). In respect to the hereditary disease of the patient most of them having hypertension about 36(80.0%).

Considering the duration of CKD most of the patients are belongs to more than 3 years 25(55.6%). Regarding the duration of AV Fistula most of the patients are having more than 1 year 23(51.1%). In relation to the frequency of the dialysis per week majority of the patients are undergoing dialysis for twice in a week about 41(91.1%).

It is inferred that most of the patient did not having any problem in the arteriovenous fistula puncture site around 43(95.6%). Considering the pulse rate of the patient 26(57.8%) most of them are having 81-90 per minute. Regarding the blood pressure of the patient 19(42.2%) most of them are having 161\100-180\110 mm of Hg.

Table 1 Compare the pre and postlevel of pain after cryotherapy among hemodialysis patient in experimental group

N= 90

S. No	Level of Pain	Pretest Score		Post Test Score	
		No. of.Respondents	Percentage(%)	No.of.Respondents	Percentage(%)
1	No pain	0	0	0	0
2	Mild pain	0	0	40	89
3	Moderate pain	43	96	5	11
4	Severe pain	2	4	0	0

Table 2 Compare the pre and postlevel of pain after cryotherapy among hemodialysis patient in control group.

N= 90

S. No	Level of Pain	Pretest score		Post test score	
		No. of Respondents	Percentage(%)	No. of Respondents	Percentage(%)
1	No pain	0	0	0	0
2	Mild pain	1	2	3	7
3	Moderate pain	43	96	42	93
4	Severe pain	1	2	0	0

Table 3 Compare the pre and postbehavioural changes after cryotherapy among hemodialysis patient in experimental group.

N= 90

S. No	Level of behavioural changes	Pretest score		Posttest score	
		No. of Respondents	Percentage(%)	No. of Respondents	Percentage(%)
1	No changes	4	9	35	78
2	Minimum behavioural changes	38	84	10	22
3	Maximum behavioural changes	3	7	0	0

Table 4 Compare the pre and post-behavioural changes after cryotherapy among hemodialysis patient in control group.

N= 90

S. No	Level of behavioural changes	Pretest score		Posttest score	
		No. Of. Respondents	Percentage(%)	No. of. Respondents	Percentage(%)
1	No changes	0	0	0	0
2	Minimum behavioural changes	37	82	37	82
3	Maximum behavioural changes	8	18	8	18

Table 5 Comparision of overall mean score for experimental group.

N= 90

Tools	N	Pretest		Posttest		Student independent T-test
		mean	SD	mean	SD	
Assessment on pain by Numerical pain scale	45	5.31	0.97	2.56	0.94	t=21.75 P=0.00
Assessment on behavioural changes by FLACC behavioural changes	45	2.40	1.98	0.36	0.71	t=8.17 P= 0.00

Significant at P< 0.05

Table 6 Comparision of overall mean score for control group.

N= 90

Tools	N	Pretest		Posttest		Student independent T-test
		mean	SD	mean	SD	
Assessment on pain by Numerical pain scale	45	5.9	0.92	5.11	0.92	t= -0.09 P= 0.92
Assessment on behavioural changes by FLACC behavioural changes	45	3.0	2.04	2.98	2.07	t= 0.44 P= 0.66

Significant at P< 0.05

Regarding association with demographic variables and post pain score there is no significant association. In relation to post behaviour changes there was association found with type of family in the experimental group. In contol group, there was no association with post pain score and post behaviour changes with the demographic variables.

Discussion

A total number of 90 samples were selected for the study. Pre-test was conducted with demographic variables, clinical variables, pain rating scale and FLACC behavioural scale. After pre-test assessment during next dialysis before needle insertion in the fistula site ice pack will be kept 10-15 minutes between thumb and index finger for the study participants will be taken after the needle insertion by using the pain rating scale and Standardised FLACC behavioural scale.

Now a days non- communicable disease is prevalent all over the world. Kidney failure is pre-dominent among all age group. Most of the patients are undergoing hemodialysis currently many patients are undergoing kidney transplantation.

Pain is an unpleasant experience and it has to be minimized in any procedure. Present study on cryotherapy is useful in pain reduction during needle insertion with hemodialysis. During pain behavioural changes like cry, position, facial expression are observed. Studies supported that cryotherapy has brought changes in behaviour the patients are consoled.

The study findings correlate with the study done by Vipin patidaretal;(2015) on cryotherapy is used during arteriovenous fistula puncture among patient with Hemo-dialysis to relieve the pain during inserting needle. Analysis was done with descriptive and inferiential statistics. Result of the study relevent reduced pain level and it was significant with $p<0.05$. This study recommended for further study in hospital setting.

Conclusion

The present study done among the hemodialysis patients with cryotherapy revealed after the intervention there was pain reduction and significant changes in behavior for the experimental group. Hence the research hypothesis stated in this study was accepted was accepted.

Acknowledgement

The topic was conceived and the study was designed by all the Authors. Questionnaire was corrected by guide and Dean. The data was collected by M.Malini, P.Deepika, M.Suruthi, R.Swathika and N.Anu. Analysis was done by the Statistitian. Interpertation and drafting of the article was done by Miss. M. Malini and Dr.T.Suseelal. Dean college of Nursing has done the final revision and approval of version to be published.

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EMOTIONAL INTELLIGENCE IN ADOLESCENTS: A COMPARATIVE STUDY

B. Kumar[1*] and G. Dullet[2]
[1]Psychology, Himalayan Garhwal University, Pauri Garhwal, Uttarakhand, India
[2]Himalayan Garhwal University, Pauri Garhwal, Uttarakhand, India,
*Communicating Author: [1]singhal.bharat@rediffmail.com

ABSTRACT

Nature bestowed humans with emotions. Emotions are significant predictors of anyone's success. Emotional intelligence is an established phenomenon is under eye of psychologist. The objectives of this study were (i) to explore the level of emotional intelligence of adolescents. (ii) to find out the difference between emotional intelligence on the basis of gender and school. This research study used data from 1500 adolescents of senior secondary school, Dehradun, Uttarakhand, India. Sample was selected using convenient method. For statistical analysis, mean, percentage, standard deviation and t-test were applied. On the basis of mean value and t-test, result indicated that adolescents of private schools have higher level of emotional intelligence in comparison to adolescents studying in government schools. Male and female adolescents are significantly differed from each other on emotional intelligence on overall sample. Female adolescents found with more emotional Intelligent with high mean value.

Keywords: *Adolescents, Emotional intelligence, Gender, Private schools, Government schools*

Introduction

Humans are both cognitive and emotional, according to the concept of Emotional Intelligence. Every child is born with certain intellectual potential that grows and develops as they mature and gain new experiences. In terms of emotional sensitivity, emotional memory, emotional processing, and emotional learning capacity, one is also born with some natural emotional intelligence potential. As a result of one's life experiences, one's potential may be developed or harmed. In the field of intelligence, Emotional Intelligence is a relatively new concept.

Emotional intelligence (EI) is a psychological term that has just recently become popular. The notion has also thrived as a result of both cultural exchanges and orientations that emphasizes the formerly undervalued function of emotions, as well as increased efforts at standardized measurement of individual variances in personality (Mayer, Salovey & Caruso, 2002).

Emotions are present in every activity of human being. They are prime movers of thought and conduct. They play important role in influencing physical health, mental health, social life, character, learning process and area of adjustment. When our feelings become intense and excited, they become emotion. These are emotions which directly affect one's day to day life for long, it is believed that success at the work place depends on Intelligence Quotient (IQ) as reflected by one's academic achievements. But to know that how bright is one outside the classroom, we need a different kind of resourcefulness termed as emotional intelligence. The term "Emotional Intelligence" was first used in an article in 1990 by Peter Salovey and John D. Mayer. They defined emotional intelligence as a type of social intelligence that involves the ability to monitor one's own and other's emotions, to discriminate among them, and to use the information to guide one's thinking and actions. In emotional facilitation of thinking, emotions can be useful in terms of directing attention to pressing concerns and signaling what should be the focus of attention. Emotional intelligence can also be used in choosing among options and making decisions, being able to anticipate how one would feel if certain events took place can help decision makers choose among multiple. It can be used to facilitate certain kinds of cognitive processes. For example, positive moods can facilitate creativity, integrative thinking and inductive reasoning, and negative moods can facilitate attention to detail, detection of errors and problems, and careful information processing. Shifts in emotions can lead to more flexible planning, the generations of multiple alternative and a broadened perspective on problems.

In today's world, an adolescent's success is determined by a variety of factors including

personality, attitude, home environment, family history, academic achievement, anxiety, adjustment, and emotional intelligence, as well as many other characteristics of his or her conduct. The current research was thus commenced to evaluate the prevalence and grade of emotional intelligence among adolescents of class 11th and 12th studying in various CBSE schools Dehradun.

Review of Literature

Emotional Intelligence has been increasingly important in educational study in recent years. Numerous studies were conducted in India and overseas. Subbarayan and Visvanathan (2011) discovered that students' emotional maturity was exceedingly variable.

The merging of emotion and intelligence as a cognitive ability under the caption of Emotional Intelligence (EI) was proposed by Yale psychologists, Salovey and Mayer (1990). It offers solutions to a myriad of problems we are facing in work, education, and health domains. More specifically at the individual level it is suggested that it modulates parenting behavior, ego strength, choice of role models, communication of feelings, appreciation of aesthetics, moral and ethical feelings, social problems solving, leadership and spiritual feeling (Mayer and Salovey, 1995). Mayer and Salovy (1997) defined emotional intelligence as the ability to perceive emotions, integrate emotions to facilitate thoughts, understand emotions and regulate emotions to promote personal growth. According to Singh (2006) emotional intelligence is the ability of an individual to appropriately and successfully respond to a vast variety of emotional stimuli being elicited from the inner self and immediate environment. Some emotional reactions and emotional memories can be formed without any conscious, cognitive participation at all (Goleman, 1995).

Mishra (2012), Nwadinigwe and Azuka-Obieke (2012) discovered a link between emotional intelligence and secondary school students' academic achievement. Sangtam and Talawar (2013) discovered a link between emotional maturity and secondary school students' academic achievement. As per the work of Das and Ghosh (2014), emotional maturity and academic achievement of rural and urban secondary school children do not differ considerably. Puar (2014) found that high school adolescents' emotional maturity had little bearing on their academic achievement. Mallick et al. (2014) discovered that higher secondary school adolescents' emotional maturity was significantly unstable. There was also a substantial difference in emotional maturity between male and female high school students.

Research Problem

To study the degree of prevalence of emotional intelligence among adolescents.

Objectives

1. To investigate the degree of emotional intelligence among adolescents.
2. To investigate the degree of emotional intelligence among adolescents based on gender.
3. To investigate the levels of emotional intelligence among adolescents based on school type.

Hypotheses of Study

1. There is a significant difference in the degree of emotional intelligence between male and female adolescents.
2. There is a significant difference in the degree of emotional intelligence between adolescents studying in private and government schools.

Research Methodology

Tools Used For Data Collection

In the present investigation, Inventory for emotional intelligence by Dr. S.K.Mangal and Mrs. Shubhra Mangal was used (Mangal and Mangal 2004). It consists of 100 items divided into four components each having 25 items. This inventory measuring emotional intelligence on four areas namely: a) Intra-personal awareness b) Inter-personal awareness c) Intra-personal management d) Interpersonal management. For each statement there are two possible responses either yes or no, and the respondent has to mark on either of these two. A score of one mark is provided for the response indicating the presence of emotional intelligence and zero for the absence of emotional intelligence (Mangal 2007).

Population and Sample Collection

Population is the adolescents studying at senior secondary level in CBSE schools at Dehradun, Uttarakhand.Convenient method was used to select a sample of 1500 adolescents. Equal number of male and female adolescents were selected from equal number of private and government CBSE affiliated schools.

Statistical Analysis of Data

On the basis of the scores obtained by adolescents, sample was divided into seven categories. Percentage, mean and standard deviation were calculated for different categories of emotional level. t-test was applied to check significant difference in the degree of emotional intelligence level with regard to gender and types of schools.

Results and Discussion

Profile of Emotional Intelligence of Adolescents Based on Gender

As per Table 1, 6.13 % female adolescents have extremely high level of emotional intelligence as compared with 4.67% male adolescents and at higher level 7.07 % female adolescents are there as compared with 4.07 % male adolescents. At above average level a noticeable difference is observed between male female adolescents in regard to their emotional intelligence levels. Minor difference is observed at average level. At low and extremely low levels of emotional intelligence, a big difference is observed. Total 8.67 % male adolescents have lower category of score as compared with 3.20 % female adolescents. (Figure 1)

Figure 1: Distribution of Adolescent According to Level of Emotional Intelligence

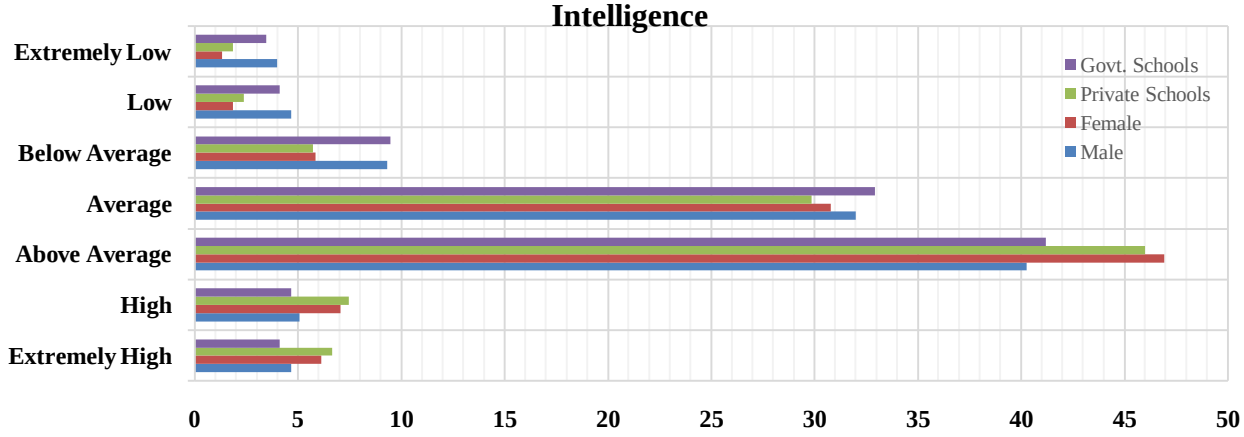

Table 1: Emotional Intelligence Score of Male and Female Adolescents

SN	Adolescents						Level of Emotional Intelligence
	MALE			FEMALE			
	N 750	%	Mean	N 750	%	Mean	
1	35	4.67	192.86	46	6.13	188.15	Extremely High
2	38	5.07	179.82	53	7.07	175.37	High
3	302	40.27	160.95	352	46.93	156.53	Above Average
4	240	32	139.36	231	30.8	133.76	Average
5	70	9.33	112.77	44	5.87	111.80	Below Average
6	35	4.67	99.2	14	1.87	98.29	Low
7	30	4.0	77.9	10	1.33	72.4	Extremely Low
Total	750	100	143.2	750	100	147.95	
	SD: 25.08		**VARIANCE:**629.13	**SD:**20.89		**VARIANCE:**436.53	

Profile of Emotional Intelligence of Adolescents Based on School Type

Table:2 reveals that 7.60 % adolescents studying in government schools have very low emotional intelligence as compared with 5.27 % adolescents of private schools. A big difference is observed at below average and at average levels. At high level of emotional intelligence, a significant difference is observed. More adolescents from private schools have good level of emotional intelligence as compared with adolescents studying in government schools.

Table 2: Emotional Intelligence Score of Adolescents Based on School Type

SN	Adolescents						Level of Emotional Intelligence
	Private School			Government Schools			
	N 750	%	Mean	N 750	%	Mean	
1	50	6.67	190.51	31	4.13	190.45	Extremely High
2	56	7.47	178.12	35	4.67	176.82	High
3	345	46	158.80	309	41.2	158.73	Above Average
4	224	29.87	136	247	32.93	136.92	Average
5	43	5.73	112.42	71	9.47	112.14	Below Average
6	18	2.4	99.46	31	4.133	98.26	Low
7	14	1.87	78.42	26	3.47	78.08	Extremely Low
Total	750	100	149.89	750	100	143.91	
	SD: 22.7946		**VARIANCE**:519.5956	**SD:** 24.3676		**VARIANCE:** 593.779242	

First Hypothesis

Statistical Analysis of Emotional Intelligence Scores of Adolescents Based on Gender

t-value is calculated to find out significant difference between male and female adolescents with regard to their emotional intelligence level. Calculated t-value is 3.9854, which is greater than the table value at 1% level of significance. (Table: 3). So, we can accept first hypothesis and it can be concluded that there is a significant difference in the degree of emotional intelligence of male and female adolescents.

Table 3: t-Test Score for Emotional Intelligence Of Male And Female Adolescents

Adolescents	Mean	SD	SEM	N	t- Value
Male	143.2	25.08	0.9158	750	3.9854
Female	147.95	20.89	0.7628	750	**Extremely Significant**

Second Hypothesis

Statistical Analysis of Emotional Intelligence Scores of Adolescents Based on School Type

Calculated t-value is 4.9081, which is greater than the table value at 1% level of significance. An extremely significant difference is indicated (Table: 4). So, we can accept second hypothesis and it can be concluded that there is a significant difference in the degree of emotional intelligence of adolescents studying in private and government schools.

Table 4: t-Test Score for Emotional Intelligence of Adolescents Based On School Type

Adolescents	Mean	SD	SEM	N	t- Value
Private Schools	149.89	22.7946	0.832341	750	4.9081
Government Schools	143.91	24.3676	0..889779	750	**Extremely Significant**

Interpretation and Conclusion

More female adolescents have higher level of emotional intelligence as compared with males. Private school adolescents have higher level of emotional intelligence as compared with government school adolescents. It is concluded from this investigation that there is an extremely significant difference in the emotional intelligence related to gender and type of schools. All the adolescents had not enjoyed the same level of emotional intelligence. Female adolescents are having better level of emotional intelligence. Result indicated that private and government school senior secondary adolescents differ significantly on emotional intelligence.

Limitations and Suggestions

Study is limited to 1500 adolescents studying in CBSE affiliated private and government schools in Dehradun. The more clarity of this study can be made through probability sampling, covering the large population from different areas.

Declaration

Author has **confirmed** no **relevant financial or non-financial competing interests exist.**

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SIGNIFICANCE OF RECTAL SWABS IN ISOLATION AND IDENTIFICATION OF VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE) AND CARBAPENEMASE PRODUCING ENTROBACTERIACEAE (CPE)

Mojtaba Mozaffari[1], Dr Naresh Kumar[2*]

[1,2]Department of Medical Laboratory Sciences, Lovely Professional University, Punjab, India
*Correspondingauthor:[1]nkslpu@gmail.com

ABSTRACT

The aim of this investigation was to evaluate the emergence rate of Multidrug-Resistant (MDR) inception during hospitalization and to examine some of the associate risk factors for carriage and inception at Medical Intensive Care Unit (MICU), Fortis Hospital Mohali. The emergence and prevalence of MDR become a life-threatening challenge in hospital settings in these last two decades. Extended-Spectrum β-Lactamase Producing Entrobacteriaceae (ESBLPE), Vancomycin-Resistant Enterococci (VRE) and Carbapenemase-Producing Entrobacteriaceae (CPE) pose a threat to healthcare worldwide. The MDR bacteria in MICU admitted patients in hospital. specimen was collected from newly admitted (1-5 days) patients in MICU, rectal swabs samples obtained and analysed. Out of (50) rectal swabs from MICU, 38 isolates (76%) had significant and 12 samples (24%) had no significant growth. Out of 38 isolates for gram-negative, 14 isolates (37%) were MDR, 5 samples were CPE. For Gram-positive out of 38 samples 20 enterococci obtained that out of them 4 isolates (20%) were vancomycin resistant and 11 sample (55%) were ampicillin resistant. The species most frequently detected during this study (among Gram-negative) was Escherichia coli (50%) followed by Klebsiella pneumonia (18%) and Proteus vulgaris (8%). Most of the admitted patients referred to MICU admitted from community (85%) and only (15%) admitted from other wards or ICU. The incidence of symptomatic MDR infections among those colonized should be under close surveillance and long-term screening especially for critically ill patients.

Keywords:*Multidrug-Resistant, Entrobacteriaceae, MICU, Vancomycin-Resistant Enterococci, Carbapenemase-Producing Entrobacteriaceae*

Introduction

The prevalence of infections due to antimicrobial resistant pathogens are associated with some consequences such as; longer hospitalization period, delaying in efficient therapy, higher mortality rate and more costs for patient. Although colonization by multidrug-resistant bacteria is known as the potential source of cross-transmission and as a risk factor for harbouring and developing of subsequent pathogenic infections[1].

In clinical settings in these last few decades, the Extended-Spectrum β_Lactamase (ESBL)-producing Entrobacteriaceae (ESBLE) indicates a major threat worldwide in hospital and community[2]. We have to consider this problem as worrying issue because ESBL enzymes are capable to hydrolyse almost all of β-lactam except cephamycins and carbapenems. [3].

Nowadays, Antimicrobial-Resistant Gram-Negative Bacteria (ARGNB) is an enormous challenge and threat worldwide. For treatment of this problem carbapenem considered to be reliable and efficient drug for Extended-Spectrum β-Lactamase Entrobacteriaceae but, recently serious global concern were raised due to emergence of carbapenem-resistant bacteria [4]. This crisis has made the colistin the last option for treatment of infections caused by Carbapenemase-Producing Entrobacteriaceae (CRE)[5]. Carbapenemase-Producing Bacteria CPB) raised a global concern throughout the world and prompt distribution of the Carbapenemase Producing Bacteria. The capability and special characteristics of the CPB poses a challenge for clinical settings and infection control management[6].

These types of bacteria are Gram-Negative Bacilli (GNB) and has some special characteristics which turn them into hazardous pathogenic infections agents. B-lactamase genes carried on mobile genetic elements are a key mechanism for rapid dissemination and spread of Multidrug-Resistant Gram-Negative worldwide[7].

Since the Gram-Negative Bacteria are responsible for nosocomial and community-acquired infection, the distinction between community-acquired infections and hospital

acquired infection have become eliminated over the last two decades due to rapid dissemination and outbreak in multidrug resistant genes located on Mobile Genetic Elements (MGEs) which are capable of effective emergence between host and bacteria in and out of hospital[8].

Gram-Negative bacteria are responsible for variety of infections particularly MDR. The leading provocative might of resistance in Entrobacteriaceae family is the presence of β-lactamase (that is encoded by $_{bla)}$ a rapidly developing list of β-lactamase-hydrolysing enzymes for which the number of unique proteins sequence as currently indexed has surpassed[7].

Some of bacteria related to this family carry additional plasmid-borne genes those are capable of rendering bacterial resistant to multiple antibiotics and are very strenuous against some classes of antibiotics[9].

The CRE have become rapidly widespread worldwide and last line defence drugs, more and more challenged by Mobile Genetic Elements (MGEs) harbouring Carbapenemase and other drug resistant genes. Growing number of people who are being affected by these pathogenic bacteria indicate that epidemiology of CRE is altering due to molecular mechanism of resistance that are evolving and mutating regularly [10].

According to clinical settings, due to the frequent and long period of hospitalization, associated to MDR pathogens, specially Extended-Spectrum β-Lactamase Producing Enterobacteriaceae [11][12].

A French study which has been conducted "between" (2010-2011) indicates that ESBL-E is increasing and 15% of patients admitted in ICU have had ESBL-E digestive colonization[13].

Hence, through screening of local epidemiological data and individual patient's risk factors leading physician for prescription of empirical broad-spectrum antimicrobial therapy including carbapenems that lead for origination of MDR pathogens[14]

The emergence of Vancomycin-Resistant Enterococci (VRE) become an actual challenge in hospital settings, because these bacteria are capable to transfer their resistant genes to more pathogenic gram-positive bacteria which could cause and produce serious pathogens[15].

Enterococci are a type of significant hospital-acquired pathogens[16]. They are resistant to many commonly used antibiotics agents (Aztreonam, penicillin, aminoglycosides, clindamycin, cephalosporin, the semi-synthetic penicillin and trimethoprim-sulfamethoxazole) and that was associated with dissemination of this type of multidrug-resistant organism in these last two decades[17]. Therefore, unrecognized Vancomycin and Ampicillin resistant in clinical Enterococcus faecium strains has developed in the past decade.

Material and Methods:

This project study was conducted in Medical Intensive Care Unit (MICU) in Hospital.

Medical Intensive Care Unit (MICU) divided in four sections that each section has 4 beds and total 16-bedded section for critically ill patients. This project study was conducted under supervision of Infection Control department of Hospital

Specimen collection:

Specimen were collected from each patient about first to fifth day of admission in Medical Intensive Care Unit. For sample collection we deployed rectal swabs. Rectal swabs were obtained by using Starplex Cotton Swabs (Etobicoke, ON, Canada). These swabs are used for detection of MDRGN, VRE and MRSA.

A single sterile swab used for each patient and the sample inoculated immediately on agar plates. For identification and susceptibility testing as well as Modified Hodge Test (MHT) we used form that single swab. However, the purified culture plates preserved for whole processing and sub cultured regularly.

Data Collection:

In this study following data were collected; gender, age, date of admission, category of patients and reference from where patients admitted to Medical ICU from community or hospital.

Sample collected from patients within 1-5 days of admission, category of patients refers to antibiotic's history of patients. It's divided to three types. Type 1 refer to those patients with no history of antibiotics in last three months,

type 2 indicates the history of antibiotics in last three months and type 3 in hospitalized patients with ward / ICU stay.

Microbiological Methods:

i. **Isolation of Gram-negative bacteria:** for isolation of gram-negative bacteria, obtained recta swabs transferred to the lab immediately and were inoculated instantaneously after receiving into two agar media. BD Columbia Agar with 5% sheep blood and MacConkey agar. After overnight incubation by colony characteristics and performing Gram staining, and sub cultured on MacConkey Agar for further identification.

ii. **Identification:** in this study we employed two media mainly for identification of bacteria Blood Agar and MacConkey Agar. After inoculation by considering colony characteristics and utilizing a series of biochemical tests find out different species of bacteria. However, identification of bacteria via using automation is more rapid and accurate.

Determination of susceptibility: MICs were determined with disk diffusion method (Kirby-Bauer test) and the results interpreted according to clinical and Laboratory Standard Institute guidelines for every single strain. The Modified Hodge Test (MHT) after obtaining results from antibiotic susceptibility have been performed and by following the standard principle and procedure the outcome noted.

Results:

In this time period only 50 specimens were collected and the test performance yields both positive and negative results on both Blood Agar and MacConkey Agar culture media, which gives better diagnostic results for identification of bacteria particularly Entrobacteriaceae family.

Out of (50) rectal swab specimens, 12 samples (24%) show Coagulase-Negative Staphylococcus (CONZ), no significant growth. Meanwhile, out of (38) samples after inoculation on culture plates and overnight incubation, on some culture plates multiple different types of colonies purified and isolated. Therefore, 38 samples for Gram-Negative and 20 sample for Gram positive (Enterococcus spp).

Out of (38) gram-negative isolates (14) samples 37% are Multidrug-Resistant Gram-Negative Bacteria (MDRGNB).

The culture indicates various types of Entrobacteriaceae on MacConkey Agar and Blood Agar. Including; Escherichia coli, Klebsiella pneumonia, Proteus vulgaris, Yersinia pseudotuberculosis, Citrobacter koseri, Enterobacter aerogenes, Shigella, Klebsiella oxytoca, Morganella morganii, Providencia rettgeri and Proteus mirabilis. Escherichia coli are the preeminent organism accounts about (50%) 19 samples, followed by Klebsiella pneumonia (18%) 7 samples, Proteus vulgaris computing about (8%) 3 samples, (5%) 2 samples isolates are Yersinia pseudotuberculosis and rest of bacteria single-single from each obtained strain.

Out of 14 MDRGN bacteria, 5 samples are (36%) are Carbapenemase-Resistant Entrobacteriaceae (CRE) including; (3) Klebsiella pneumonia, (1) Escherichia coli and (1) Proteus vulgaris which all are from Entrobacteriaceae family.

Gram-Positive Isolates:

Among (50) samples 20 samples (40%) are gram-positive (Enterococcus spp) purified and obtained. Out of (20) samples 9 samples (45%) are resistant to ampicillin and 4 samples (20%) are resistant to vancomycin.

Category of Patient and Referring From:

In this project study we recorded the patient category related to antibiotic therapy, which can help us to find out the root of infections and Multidrug-resistant bacteria in collaboration with place where patient admitted to MICU come from. These two factors will give a clear vision for healthcare workers and physician to prescribe adequate empirical antibiotics and aid them how to control the emergence of MDR in hospital settings.

Category of patients are generally three types:

1. Type 1 (No history of antibiotics in last three months)
2. Type 2 (History of antibiotics in last three months)
3. Type 3 (Hospitalized patient with ward / ICU stay)

Patients refer to hospital from two place, community and hospital.

Gram Negative Results:

Table. 4.1: Total results for Gram-Negative Isolates.

Gram-negative Isolates	Resistant Bacteria	Susceptible Bacteria	Total
	14	24	38
Percentage	37%	63%	100%

Out of 38 isolates of Gram-Negative bacteria, 24 samples were susceptible for used antibiotic disks, (Ceftriaxone, Ertapenem, Imipenem and Piperacillin. Tazobactam), but rest 14 samples are resistant at least for three antibiotics.

Figure 4.1: Show Resistance to Antibiotics

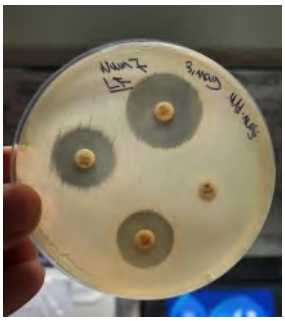
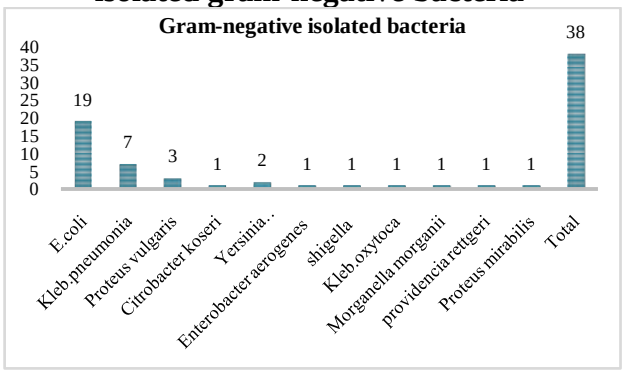


Figure 4.2: Show Susceptibility to Antibiotics

Figure 4.3: Graphical Representation of isolated gram-negative bacteria



This figure represents the total (38) of isolated bacteria from MICU patient within (1-5) days of admission. Predominant isolate is E. coli (50%), followed by Klebsiella pneumonia (18%), next one is Proteus vulgaris (8%) and Yersinia pseudotuberculosis (5%) and etc.

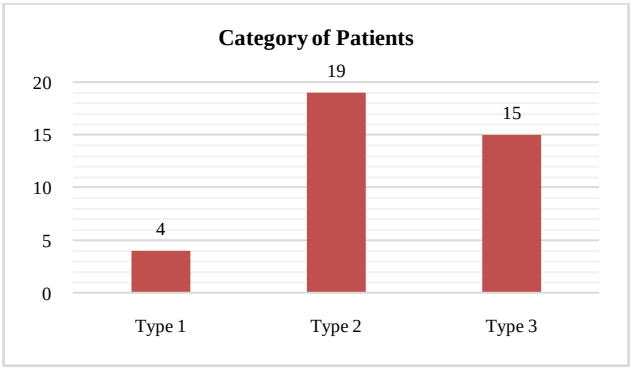


Figure 4.4: Graphical representation of category of patients for gram-negative bacteria

In this figure three types of patient's category mentioned and the number of patients with different types of antibiotic category. Most predominant isolated bacteria obtained from patients with history of antibiotics in these last three months (Type 2) 50%, followed by Type 3 (40%) and last one Type 1 (10%).

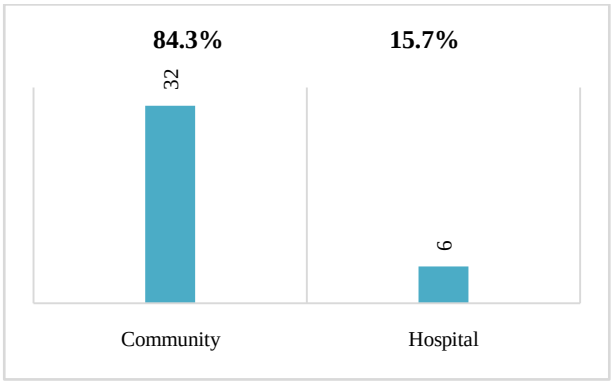


Figure 4.5: Graphical representation of patients referred to MICU ward

This graph indicates that for 38 isolates that obtained from patients, most of the patients admitted in MICU referred to hospital from community (84%) and rest of them from other wards or other hospitals. In addition, **out of these 38 patients (22) 58% were Male and (16) 42% Female**

Multidrug-Resistant Isolates:

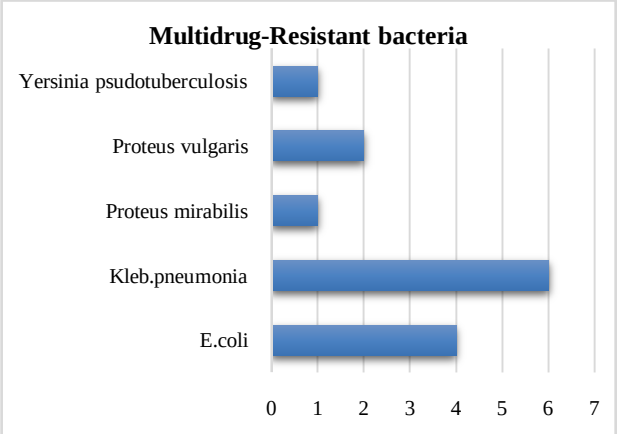


Figure 4.6: Multidrug resistant Gram-negative bacteria isolated from rectal swabs from MICU.

This figure represents the results of MDR-GN bacteria which all are form Entrobacteriaceae family.

Klebsiella pneumonia is the most isolated MDR (42%), followed by Escherichia coli (28%), next isolated bacterium is Proteus vulgaris (14%) and remaining are Proteus mirabilis and Yersinia Pseudotuberculosis. Out of these 14 MDR, 12 samples (85%) obtained from Male and 2 samples (15%) obtained from Female. The sample collection was a random process.

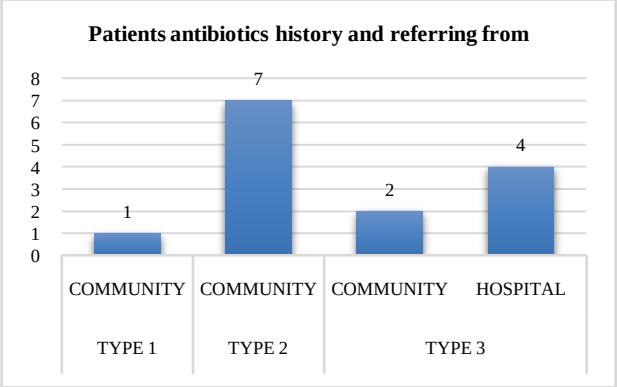


Figure 4.7: Graphical representation of antibiotic history and patient referring.

In this figure explained the number of patients those are resistant bacteria, one patient (7%) has no antibiotic history in last three months referred from community, 7 patients (50%) with antibiotic history within last three months referred from community, 6 patients (43%) hospitalized patient in ward or ICU stay that 4 of them admitted from other wards or hospital and 2 of the admitted from community were had MDR-NG bacteria.

Carbapenemase-Resistant Entrobacteriaceae (CRE):

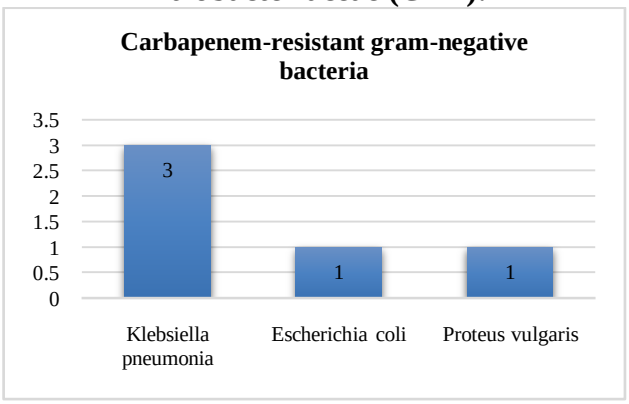


Figure 4.8: Shows the presence of Carbapenemase-Resistance Entrobacteriaceae

Out of 14 isolates of MDR Gram-Negative, 5 samples (35%) are CRE and those are including Klebsiella pneumonia **3** isolates (60%), Escherichia coli **1** isolate (20%) and Proteus vulgaris **1** (20%). Out of these 5 samples (4) samples obtained from Male and one sample from Female patients in MICU.

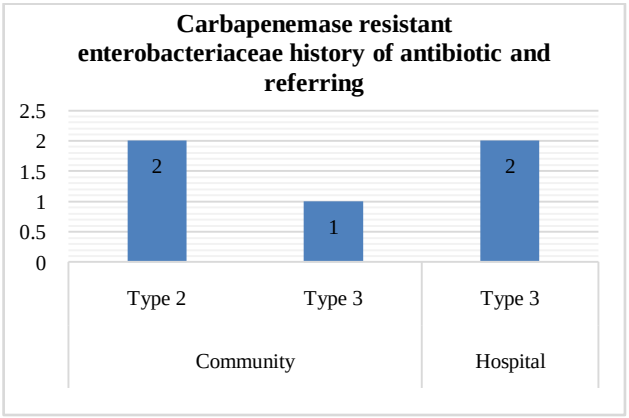


Figure 4.9: Antibiotic history and patient referring graphical chart.

This figure shows the category of patient (antibiotic history), and reference of patient admission.

In this project study out of 38 samples, 5 isolates are CRE which include; (2) Klebsiella pneumonia and (1) Proteus vulgaris obtained from patients with antibiotic history in last three months, (1) Escherichia coli and (1) Klebsiella pneumonia from hospitalized patient with ward / ICU stay.

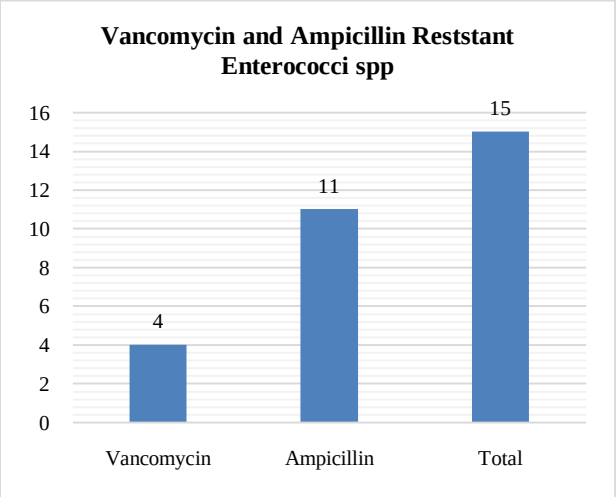
Gram-Positive (Enterococcus spp) Results:

Table 4.2: Results of Enterococcus spp

Gram-Positive Enterococci	Positive Results	Negative Results	Total
	15	5	20
Percentage	75%	25%	100%

This table shows the percentage of total 20 Enterococci, the positive and negative results for Vancomycin and Ampicillin resistance.

Figure 4.10: Graphical Results for VRE and ARE



This table show the presence and resistance of some isolates to Vancomycin and Ampicillin after identification and purification from rectal swabs. Out of (20) isolated Enterococcus spp, (4) isolates (20%) are Vancomycin-Resistant Enterococci (VRE) and (11) samples are (80%) are Ampicillin-Resistant Enterococci.

Conclusion

Multidrug-Resistant Microorganisms (MDROs) transmission and carriage constitute a significant and rapid growing health concern globally, prevalence infections due to antimicrobial resistant bacteria area associated with some consequences like; longer hospitalization period, delaying in efficient therapy, costly treatment for patients and higher mortality rate. Dissemination and prevalence of MDR is increasing steadily, it become a global concern. Annually millions of people infect with MDR organisms which cause various types of disease. This phenomenon has not been studied, identified and recognized in most of the countries all around the world particularly developing countries. MDR have been isolated from both gram-positive and gram-negative bacteria. Therefore, identification and isolation of MDR in bacteria plays very important rule in treatment of patients. This project study has been done reviewing previous related studies and personal experiences. This project title is "Isolation and Identification of Multidrug-Resistant Bacteria from Rectal Swab of Admitted Patients in MICU". In this research we focus on detection of MDR bacteria specially carbapenem-resistant which become a real threat in last two decades in many countries.

For performance of this kind of project and isolation and identification of MDR especially from critically ill patients in MICU. Rectal swab is the reliable and easy method and obtained results show positive and negative results. The resistance among gram-negative bacteria is more pathogenic than gram-positive, controlling and managing the spread and emergence of MDR will help healthcare-workers to restrain the dissemination of MDR in hospital and carriage of them to community. MDR dissemination can be managed by better diagnosis, new technologies and automation and more accurate and programmed surveillance culturing for isolation and identification of MDR. Nowadays, microbiology play major role in diagnosis and treatment of patients. Without microbiology techniques and diagnosis, treatment of a patient would be sophisticated.

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EXPLORING ROLES AND FUNCTIONS OF SCHOOL GOVERNING BODY IN MANKWENG CIRCUIT: TOWARDS QUALITY LEADERSHIP AND GOVERNANCE

Phaku Emmanuel Malatji[1], Khashane Stephen Malatji[2], Makwalete Johanna Malatji[3]

[1,2]Tshwane University of Technology, School of Education, Department of Primary Education, Soshanguve North Campus

[3] University of Pretoria, Faculty of Education, Department of Early Childhood Education, Groenkloef Campus

ABSTRACT

This study explored how SGB perform their roles and functions with a view to suggest possible ways of promoting quality school leadership and governance. The study followed a qualitative research approach to explore the roles and functions of SGBs in promoting quality leadership and good governance. Case study research design was followed with interpretive paradigm to evaluate the roles and functions of SGBs towards promoting quality leadership and good governance. The population comprises a parent component, teacher component, Learner Representative Council (LRC), and non-teaching staff in the SGBs from four secondary schools in the Mankweng Circuit. The researcher used un-structured and focus group interviews to collect data. The total sample size composed of 14 participants. Henderson's Ethically Based Model of Inquiry was used which explained what characterises a reflective governor. Thematic approach was utilised to analyse data. The study revealed SGBs were aware of their roles and functions to govern schools; however, challenges they experienced emanate from lack of competencies to work as team. The study recommended that SGBs of all schools should design a governance practice policy for all components of the SGBs, which will guide implementation and practices of SGBs roles and functions, and should have a compulsory adherence status.

Keywords: *Governing, teachers' component, learners' component, parents' component, SMT, SGB, leadership, governance, non-teaching staff*

Introduction

The School Governing Body (SGB) for this particular study is a legislative body of parents, educators, non-teaching staff, and learners from Grade 8 to Grade 12 who pursue to work together to promote the welfare and value of the school community, and thus enrich learning and teaching. Section 20 of the South African Schools Act (SASA), act 84 of 1996 as amended, defines various roles and functions appropriate to all SGBs. The roles and functions of the SGB includes embracing the advancement of the best interest of the school, and striving to ensure its improvement through the establishment of quality education; developing a constitution and the mission statement of the school.

SGBs may also request additional functions as listed in Section 21 of SASA from the Head of Department (HoD) in each province. The provincial minister of education may also confer these additional functions upon schools if he/she so determines and is satisfied that the SGB concerned have the capacity to perform such functions effectively. Education is a viable tool of fighting poverty and developing our society. For education to respond to the societal problems, leadership and governance are often used interchangeably in the context of schooling (Bush, 2008:134). However, roles and functions of SGB are viewed and practiced differently in different countries, both nationally and internationally, based on ability and capability of SGB members to holistically exercise their roles and functions, which will enable them to provide quality leadership and governance. Different countries adopt different frameworks and approaches when it comes to leadership and governance of their schools, because of their political influence and other influential agents in the country.

Day and Moore (2009:59) envisage that in the United State of America (USA) the aim of SGB is embracing, not only individual education and training, individual appraisal and career enhancement, but holistic staff development, as part of a dynamic and changing organisation. A school operates as an organisation where each individual member of the staff has roles and functions to fulfil (Mabasa & Themane, 2009:203). The main responsibility of realising good leadership and

governance rests on those in the position of SGB (Bradley, 2009). For a school to operate effectively, the roles and functions of each member of the SGB should be clearly defined.

The SGB in the context of Nigeria represents the school's governance structure, which is responsible for implementing the education policies in the schools (Hauwa, 2012). According to Hauwa (2012: 154), SGBs in Nigeria are entrusted with measuring teaching outcomes in schools to meet national goals; fundraising funds for schools to meet specific time based national objectives; and effective governance of underfunded public schools based on the directions of tough political leaders who coin their manifestos around free education (Hauwa, 2012). In South Africa, according to Department of Basic Education [DBE] (2010), one of the key facets of education governance is to develop leadership and technical management skills to ensure effective and efficient delivery within the education institution. However, the DBE is unable to achieve such key facets, since there is insufficient execution of governance roles and functions by SGB members, specifically in Mankweng circuit (Mathebula, 2016:73). The present study will therefore, explore the roles and functions of the SGB to suggest possible ways of promoting their leadership and governance.

School governance in South Africa is the single most significant aspect in education that appears to experience deceptively insuperable challenges (Motala, 2009:184). Bearing in mind that more than two decades have passed since the embracing of the South African Schools Act (1996), it appears that efforts to have effective leadership and governance in schools falls far short of the envisioned outcomes, which embraces quality leadership and good governance (Mgadla, 2011:302). Notwithstanding various attempts aimed at training and capacity building of school governors, and financial resources have been depleted for this purpose, studies abound report of numerous challenges in the governance of schools in South Africa (Brown & Duke, 2008:69).

In South Africa, according to South African School Act (1996), one of the key aspects of education governance is to develop leadership and governance skills to ensure effective and efficient delivery within education institutions. Therefore, holistic implementation of the roles and functions of the SGB (as mentioned earlier) is to enable school governors to practice quality leadership and governance in the schools (Sithole, 2013:118).

Among the school governance challenges is the capacity to lead and govern. While the provincial DBE, through purposeful units at head office and at district levels, engaged in the training of SGBs, the actual enactment of these roles and functions are often less ideal (Tsotetsi, Van Wyk & Lemmer, 2009:312). According to a study by Mgadla (2011), several SGB members struggle with procedure and capacity to contribute fruitfully to the school governance, since they are not skilled in governance roles and functions before they started their role. This manifests in problems such as unfamiliarity with meeting procedures, problems with the specialist language used in meetings, and difficulty in managing large volumes of papers. School governance challenges could be attributed to irrelevant and inadequate training of SGB members, which do not really address the core roles and functions of school leadership and governance (Steyn & Van Niekerk, 2009: 54).

The core business of DBE is teaching and learning; hence its vision is to equip the people of this province through the provision of quality, lifelong education and training with values, knowledge, and skills that will enable them to fulfil a productive role in society (DBE, 2009). For the DBE to achieve its vision, schools have to be properly led and governed. Moreover, for the school to produce better results and quality education, it requires SGBs to carry out their leadership and governance duties and responsibility effectively. Maile (2012:201) argues that in certain instances some SGB members in selected schools of Mankweng Circuit are not aware who is responsible for what among themselves, and this delays the operation of the school because they ended up shifting blames among themselves. Maile (2012) further reveals that the commitment of individual SGB members who work hard is interpreted negatively especially by other teachers and parents. Bradley (2009) mentioned that a lazy

SGB member is someone who wants to please the principal and this result into poor morale in other members. It is important for members of SGBs as school governors to know their roles and functions to ensure they are fulfilling their duties and responsibilities.

The researcher conducted observations and it was found that due to a apparent lack of knowledge and effective practices of SGB roles and functions, it is difficult for SGB members in Mankweng Circuit to explain and outline duties and responsibility of teachers, as they too are not clear of theirs. This results in many problems in schools. One of the key challenges of SGB members in rural provinces, according to Scheepers (2010:99), is to develop leadership as an act that will encourage all members of the school community to take responsibility for making a difference within the school. This includes regular fulfilment of their roles and functions to improve schools, and make them institutions where the focus is on providing quality teaching and learning. In the context of this study, the researcher has observed that SGB members in the schools of Mankweng Circuit do not fully implement their roles and functions, and this result in to poor leadership and governance of their schools, and an inability to fulfil their duties and responsibilities.

Problem Statement

The issue of school governing bodies' lack of capacity in implementing their roles and functions has developed into a number of challenges in the Capricorn district of the Limpopo Province. Most governors in Capricorn district seem to be uncertain of their roles and functions to the school. When SGB members in Limpopo Province are elected, they are taken on three day workshop, where they are trained about issues of leadership and governance (Mangena, 2008: 215). However, the duration of the workshop appears to be insufficient for SGB members to engage in deep learning on how to carry out their duties and responsibilities (Mabasa & Themane, 2009). Training manuals are written in English, but some SGB are unable to read and interpret them. In some instances, parents elect SGB members that are unable to read and write. As a result, such members are unable to read the documents and familiarise themselves with what is expected of them as SGB members. According to South African Schools Act 84 of 1996 as amended, SGBs are supposed to work with school management teams in governing their schools. The act further indicates that SGBs should ensure smooth leadership and governance of the school. However, the SGBs in Mankweng Circuit appear not to be clear about their roles and functions, and that affect the quality of their leadership and governance.

Research Question

- What are the challenges that hinder School Governing Bodies in performing their roles and functions in selected schools?

Research Objective

- To explore School Governing Bodies' challenges that hinders their roles and functions in the performance of their duties.

Theoretical Framework

Henderson's (1992) theory of Ethically Based Model of Inquiry on Reflective Practice was used. The theory is on reflective practice and it also discusses the importance of reflecting on the kind of work that is done. This theory is relevant to the present study, because the researcher looks at the characteristics of reflective practitioners to explain if the role and functions of SGBs in Mankweng Circuit enables them to fulfil their leadership and governance roles.

The model by Henderson (1992) indicates that the reflective practitioner should be a problem solver, have a knowledge base, and should have a love of teaching and governing of school. The theory assists the researcher to examine the kind of SGBs in secondary schools of Mankweng Circuit to explain their roles in the school. According to Henderson (1992), reflective teachers are expert teachers who know their subject matter, and are able to teach it well. They must be experts in time management, discipline, psychology, instructional methods, interpersonal communication, and learning theory. Reflective teachers willingly embrace their decision-making responsibilities. They regularly reflect on the consequences of their actions. They are receptive to new knowledge

and regularly learn from their reflective experience (Henderson, 1992).

Research Design And Methodology

This study followed qualitative approach with case study as research design. A qualitative study is defined as a process of "understanding a social or human problem, based on building a complex, holistic picture, formed with words, reporting detailed views of informants, and conducted in a natural setting" (Ajagbe, Peterson & Roberts, 2015:320). Therefore, the qualitative approach assisted the researcher to get in deeper to explore roles and functions of SGBs in Mankweng Circuit. In the context of this study, the researcher was the primary instrument for data collection and analysis. The SGBs, parents, teachers, and learners were interviewed and enabled the researcher to obtain in-depth knowledge of their daily experiences in fulfilment of the roles and functions as SGB members. Similarities and patterns were observed in every situation. The information that was gathered assisted the researcher to discuss the problem and come up with recommendations. The population for this study consisted of members of SGBs from four secondary schools in the Mankweng Circuit of Capricorn District. The sample consisted of 14 SGB members. Both individual and focus group were used to collect data. Themes emerged from interviews were used to generate discussions. Therefore, thematic approach was used to analyse data.

Results

The results of this study are summarized in the following themes: **Lack of competencies to work as team; fighting over SGB positions; policy development; lack of trust; lack of commitment; distribution of funds and curriculum change**which are used to guide the discussion below:

Lack of competencies to work as team

Most of the participants in this study indicated that the majority of SGB members lack the appropriate competencies to lead and govern their schools. SGB members seem to be confused when it comes to cooperation with other stakeholders; they seem to be competing with other stakeholders such as teachers, instead of working as a team. Among others,**II3** from school C, **II2** from school C, and **FG1** from school A emphasised that when there is good team-work between stakeholders such as teachers, principals, and SGB members, the results of the school will improve. They further emphasised that when managers (SMT) and governors (SGBs) are working together as a team, they can resolve any challenge that they encounter as a school. **II8** a parent's component who is a chairperson of SGB in school B, said:

"…there is insufficient team work amongst the SGB members in our school. We have meetings once in quarter to discuss matters in the school but to our surprise there are members who are always absent without any apology as well as others who always forward apology to such meetings. The reason why we experience poor team work is because some SGB members are not willing to come on board and participate fully in education of their children." **(Dataset 1: Individual interview)**

Contradictory to **FG1**, **II7** from school C and **FG2** from school B outlined that as Learner Representative Council in the SGB, they always work as a team with other components within the SGB. They also have social media platforms where they consult with other SGB members and fellow learners, as well as updating learners about what has been done at school. Taking into consideration the above quotation, one can maintain that some SGB members do work together in some schools. However, the majority of SGB members seem to struggle when it comes to working as a team to design strategies that will enhance learners' academic performance in some schools, because they lack competencies to work as a team. It is essential for learners, teachers, and parents to work collectively as a team so that they are able to diagnose weaknesses and challenges encountered in the school, and to provide remedial action and appropriate solutions to improve quality leadership and governance. On the other hand, **II4** from school B outlined that:

"…I do have knowledge that learners, teachers and parents must work together as team to have common understanding in solving challenges around the school environment and community at large. We do find it difficult to construct sustainable strategies to improve

learners' academic performance. The level of education from SGB members has major influence when it comes to this role of enhancing learner's academic performance. The higher the level of education the better the understanding and good practices, the lower the level of education increases the chances of poor understanding and poor practices". ***(Dataset 1: Individual interview)***

II3who is a male teacher component in the SGB from school B, made it clear that something should be done to improve how SGB members work together in schools. Most participants agreed on working together but have no idea on how to work with one another to improve quality leadership and governance. Contrary to **II1** and other previous participants, **II14,** who is a male teacher component in school D, indicated that once a term, SGB members meet and plan strategies on how to help learners who are struggling in the classroom. **II12** further indicate that:

"…Our principal through the SGB secretory invite us and present to us how learners have performed in each grade. Then we strategies on how to provide support to those who failed, since their parents are also summoned to assist their child together with SGB members and sometimes class teachers how to help the learners. I am good with old teaching of mathematics so every time when there is a child with mathematical challenges the class teacher refer the child to me. I come to school earlier before the period starts just to assist all learners with challenges in mathematics as well as remaining in the afternoon twice in a week". ***(Dataset 2: Focus group interview*)**.

It is not all school SGBs that do not have an idea on how to work as a team to improve learners' academic performance. From what participants in school D said, SGB members in their school are working together as a team to improve quality leadership and governance in the school.

Fighting over SGB positions

The SGBs are made up of different components who elect their representatives separately and then come together to meet and constitute the SGBs. During this meeting, members are expected to nominate a chairperson, deputy chairperson, secretary, deputy secretary, treasurer, as well as additional members to their respective SGBs. According to **II5,** a female teacher's component from school B, the meeting is supposed to be peaceful, since they are meeting for the first time, but in their school, it seems as if some members met before the official meeting. Similar to **II4**, **II3** a male teacher's component in school C indicated that:

"*…some parent's component members meet before the official meeting and try to lobby other to elect them in to certain positions within the SGBs. When difference arouses or when those influenced to elect certain member in to certain position differ with such idea that is where fighting over position start. Most of the positions that parents components fight over are chairperson, secretariat and treasury. Such conflict over positions creates permanent dysfunctional and separated SGBs from the beginning of their leadership and governance, they will never unite throughout their term of office"* ***(Dataset 2: Focus group interview*)**.

Contrary to **II5** and **II7, FG2** from school B presents different view on how SGB members are elected into positions. They also portrayed dissatisfaction on how members are nominated in to positions, since both **II7** and **FG2** indicated that principals had much influence on who takes which position in the SGBs. Both **II7** and **FG2** concur on how SGB members are given positions in their school, since they indicated that:

"*…in our school it is the principal who dictate the cabinet in terms of positions in the SGBs, the principal has a tendency of visiting elected members in their private space before the official meeting to constitute and, offer then positions in the SGB. When we meet to constitute there will be conflict because some components like teachers are not agreeing to such conduct. Those who accepted such offers from the principal will also be biter if things do not go as they anticipated. It becomes difficult to work with such demoralised member going forward because of principals who interfere in matters of governance for their own personal gains."* **(Dataset 1: Individual Interview and *Dataset 2: Focus group interview*).**

Looking at the above responses one can conclude that conflict among the SGB members is inevitable during the first meeting to constitute the SGBs of various schools

within Mankweng circuit. This conflict affects negatively on their teamwork and has the potential to creating permanent division amongst SGB members.

Policy development

The successful implementation and good practice of SGB roles and functions in most schools lies in the policy development of that particular school. SGB members of various schools are responsible for developing policies such as a language policy, admission policy; discipline policy, or code of conduct for their schools, guided by the South African School Act 84 (1996). Policy documents in the school should guide every stakeholder around the school, including SGB members on how to perform their responsibilities, roles, and functions. If there were good policies which other stakeholders and SGBs could refer to in terms of scope of work and what is expected of them as members of SGBs, quality leadership and good governance could be realised in most schools, and learners' academic performance might improve. **FG2** from school D explained that the SGB policy document does not explain in detail how they as Learners Representative Council in the SGB should work together with other SGB components to improve curriculum implementation and academic results of the school.

In support of **FG1, II6** who is a female parent component in the SGB from school B, stated that as SGB members, they do not understand how the policy have been developed, even though they are supposed to be the ones who draft such policies for their schools, ensure compliance, and provide support throughout the implementation process to other stakeholders, such as learners and teachers. She further emphasised that if the policy had a different version where it clarifies what SGBs must do to help learners and teachers to improve quality leadership and governance, then it would have been easier and better to understand, especially to the illiterate and uneducated parent components within various SGBs around Mankweng circuit. The researcher tried to establish why many participants have brought up the issues of policies development several times when asked about sufficient understanding of SGB roles and functions as well as implementation of those role and functions in their daily practices. One member of the SGB, who was a chairperson from **II5** in school B indicated that:

"…According to the South African School Act 84 (1996), SGB members must work together as a team. SGB members know that they should take a lead in policy development and he further indicated that majority of SGBs understands their roles and functions but SGB members just choose to ignore the policies" ***(Dataset 1: Individual interview)***.

Taking into considering the above quotation, some SGB members are aware that they are responsible for developing the school policies as well as teamwork that is encouraged amongst the members of SGBs to attain a common goal. But as the researcher probed for more clarity, participants such as **II7** who is a teacher's components from school C, indicated that in most schools the policies are available but because SGB members have little educational knowledge, or they are illiterate and reluctant to learn about their roles and functions, they need somebody to interpret the policy for them, particularly when it comes to good practice towards the implementation of SGB roles and functions that will enable improvement on quality leadership and governance , as well as enhanced day to day running of the school.

On the other hand, participants such as **FG1** a chairperson of SGB in school D, and **II9** a male teacher's component in school D, shared a similar understanding that SGB members must sit together and reach agreement on the content and context of the policy they are developing. Both **FG1** and **II9** outlined that:

"…SGB members must work collectively to be successful in attaining their roles and functions, like when we are developing school admission policy and language policy in the school. We invite every SGB members in time and provide suggested agenda for the meeting highlighting key issues to be discussed. Therefore, it becomes easier for every member to come up with ideas and recommendations to be included in policies that we can use to simplify the implementation and practice of SGBs roles and functions. Such policies should guide every stakeholder within the SGBs on how to work together to develop conducive

*environment for the process of teaching and learning as well as coming up with strategies to improve the results."***(Dataset 1: Focus group interviews, *Dataset 2: Individual interview*).**

The above quote clearly reveals that in some schools SGB members are united and work together with one another towards the successful implementation and practices of SGB roles and function. From this quotation, the researcher learned that there are SGBs members who understand the importance of collective leadership to simplify their implementation and practices of SGBs role and functions. Furthermore, if SGB members work as a team it becomes easier for every stakeholder within the SGB to contribute positively towards the shaping and governing of the schools. It was also clear that much attention is still needed to equip SGB members with effective strategies to improve quality leadership and governance in their respective schools. This might be because SGB members have limited knowledge on how curriculum is delivered from teachers to learners, therefore to provide quality leadership and governance seemed challenging to the majority of SGB members.

Lack of trust

Among all challenges that were mentioned by participants, many mentioned that there is lack of trust between the parent component, learner component, and teacher component in the SGBs. Participants such as **II3** from school A and **FG2** from school B noted that there is no way they can work as a team without trust between SGB members. They further mentioned that, due to lack of trust, some members find it useless to attend meetings with people who do not trust them. **II7** from school C highlighted that:

"…We do want to work as a team as SGB members of our school, the main barrier for SGBs to work as a team is lack of trust amongst SGB members. They do not tell us everything about the finances of the school. They only tell us to sign cheques for them and approving school budget. As for what they are going to do with the money we do not know since we normally approve budget that is already spent at the end of the year. Learner performance is responsibility of one component, which is teacher's components…? We never discuss learner performance in details. They only tell us how many passed and how many failed. That is it. They do not trust us, so they will not tell us everything. Furthermore, the lack of trust also exists amongst SGBs towards some teachers, this lack of trust has resulted in some committee to be dysfunctional" ***(Dataset 2: Individual interview).***

The above quote from an SGB member displays that they are willing to work as a team with all stakeholders and be inclusive to all SGB components, but because of distrust between them, it is not easy. When the above participant was asked for more clarity on the challenges they face when collaborating to improve learners' academic performance, the researcher was alarmed by his response. Moreover, **II1** from school A indicated that parents do not trust SGB members with their children because of many factors such as SGB members' level of education, religion, and the relationship between some SGB members and other parents in the school. He further mentioned that there was one SGB member who was once alleged of witchcraft by parents. Therefore, it becomes difficult for SGB members to be part of learners' academic performance.

Similar to the above quotations, **FG 2** from school B postulates that:

*"It is not easy for parent's components and teacher's components members to work closely with one another when it comes to learners' academic performance. SGB members are leaners, teachers and parents who are relatives to other learners in the school. Therefore, it is difficult to tell SGB members about performance of other children without informing entire parents as well as requesting permission to disclose performance of their children through SGBs meetings. Parents will start complaining because they do not trust SGB members. Parents sometimes accuse SGB members and NSNP feeders of witchcraft. Therefore, exposing each child's academic performance to everyone will make things worse for parents. They will not trust everyone in the school".***(Dataset 2: Focus group interview).**

The issue of trust in school is complex and very sensitive. This means that SGBs must play their role by assuring parents they represent that their children are safe in the hands of other SGB members or any parent who wish to help learners in the school. Among other reasons, the researcher established a need to continue with his research as it would unpack what constrained SGB members to work as a team that trust each other to improve quality leadership and governance.

Lack of commitment

One of the roles and functions of SGBs is to make sure that there is a smooth day-to-day running of the school. Therefore, if SGBs members are not committed to their roles and functions, it will be difficult for such SGBs to lead and govern their schools as a team. **II4** from school B indicated that:

"As the SGBs chairpersons of the schools it is our responsibility to make sure that learners, teachers and principals are supported and committed to their work and learners' academic performance is improved throughout the year with sufficient support system in place from the SGBs. Such support can only be realised if SGBs members are also committed to perform and practice their roles and functions throughout their term of governance". ***(Dataset 1: Individual interview).***

The response from the SGB chairperson in school B above shows that he is willing to engage all stakeholders and the entire SGB in learners' academic performance. However, lack of commitment still persists among some SGB members in some schools, since they need to be pushed to commit themselves through intrinsic and extrinsic motivation such as paying their travelling costs to meetings, as well as better catering during SGB meetings. SGB members must be equipped with sufficient training to understand that learners' academic performance is their roles and functions without being forced to participate by the principal. **II3** from school B indicated that sometimes some SGB members are not committed to their roles and functions, because in the beginning of their term of office, they were not formally trained or guided on how to support teachers and principals as well as how to work as a team to improve quality leadership and governance. This theme concentrated on challenges that hinder SGB roles and functions in the performance of their duties such as to enhance learners' academic performance. It was found in this theme that some of the factors hindering good practices and implementation of SGB roles and functions by SGB members include lack of trust, poor communication, curriculum change, and lack of commitment. Concerning lack of trust, the study revealed that there was no trust between learners, teachers, principals, and SGB members, especially on issues of finance and learners' academic performance.

Distribution of funds

SGBs are allocated with some money (norms and standards) which assist schools to improve day to day running of a school such as sports with 10% of the funds, curriculum (teaching and learning) with a share of 60% of the funds, administration with a 10% share, transport for a 5% share, and recently with Covid 19 with a share of about 15%. Therefore, there is a need for SMTs and SGBs to trust each other for successful management and governance of the schools. The study also found that there was poor communication between learners, teachers, principals, and SGB members on how the money from norm and standards is spent. Language and communication was found to be a barrier, especially when finances are presented and discussed by the principals and treasurers of the SGBs, especially when finance committees were communicating with SGB members using English, which was found not to be their first language. **II9** who is male teacher's component in school D indicated that:

"….most of the SGB members struggles and finds it difficult to design financial report as well as designing school budget. Such SGB members are comfortable with approving the budget that they do not even understand. This conduct is one of the major causes of fruitless expenditure that is experienced by many schools within the circuit, since they fail to understand how to distribute money from norms and standards. What they understand better is to fight over the norms and standards funds." ***(Dataset 2: Focus group interview).***

Parallel to **II9**'s response, **FG2** in school B and **II5** from school B stressed out that since they were elected to the SGB of their school, they never had opportunity to draft a school budget; they further indicated that they do not know how the funds from norms and standards are spent. The responses from **II4** and **FG2** are as follow:

"*….the school principal is a dictator who does not share how finances of the school are spent, the principal is not even willing to grant the SGB members the opportunity to draft or discuss the content of school budget. There are only few trusted members by the principal who will have the opportunity to view such budget, especially the treasurer and his financial committee. The rest of the members are excluded from school finances.*" ***(*Dataset 2: Focus group Interview*).***

Taking into consideration the above responses, one can conclude that financial knowledge is still a foreign language to the majority of SGB members, especially in schools that are based in rural areas in Mankweng circuit. There is still a need to orientate SGB members through financial workshops, to enable smooth running of finances in the respective schools.

Curriculum change

The South African curriculum has gone through several changes over a short period. Most SGB members were taught through Bantu Education and the majority of teachers were trained with the same old methods of teaching. When the curriculum is changed, it means that SGB members should also change the way they provide support to their respective schools, and teachers must change the way of teaching without being trained on the new curriculum. **II4 from** school B noted that when they try to engage teachers and orientate other SGB members to become familiar with the school curriculum, the Department would change the curriculum again at any given time, which creates total confusion to teachers and SGB members. Similar to **II2, FG1** from school D said:

"It is not that parents' components in SGB do not want to help our children with school work and support teachers in their respective schools with academic performance, they do not understand the new curriculum that we are teaching. Even teachers find it difficult at some times to cope with the constant changes in education" ***(Dataset 2: Focus group interview).***

However, the participants from **FG3** from school C made it clear that whether the curriculum is changing or not, teachers and parent components in SGBs must find ways to work as a team and come up with better strategies to improve the results. He further lamented that schools are under a lot of pressure as teachers and SGB members find it difficult to understand a new curriculum with limited time and insufficient workshops. The DBE does not want to appreciate the circumstances and conditions that teachers are working under. They are only preoccupied by the drive for good performance. It is for that motive that the researcher found the need to come up with a framework that will resonate with both the DBE and the schools to have a better approach to dealing with challenges when it comes to poor leadership and governance.

On the other hand, curriculum change was found to be one of the reasons for poor implementation and practices of SGB roles and functions to enable better and quality leadership and governance. Both teachers and SGB members found it difficult to perform their roles and functions and address challenges that came because of curriculum change. Therefore, the above section was based on the following headings: Fighting over SGB positions, Policy development, Lack of trust, Lack of commitment, Distribution of funds, and Curriculum change in schools. The above sub-themes will be discussed in the next chapter, which is a discussion and analysis. The above findings show that SGBs have many challenges which need an emergent solution. Quality leadership and governance was found to be affected by more issues than what the researcher anticipated. The above challenges helped the researcher to look at possible ways to improve implementation and practices of SGB roles and functions, with a view to improve leadership and good governance. Poor implementation and practices of SGB roles and functions resulted in dysfunction schools.

Fighting over SGB positions

The study revealed that some of the positions within SGBs are politicised; it came out that some of the parents lobbied to be considered on certain positions without having the expertise to occupy such positions. Therefore, such conflict over the positions created dysfunction and conflict, which affected the governance roles and functions. The study also found that the principals had a tendency of dictating who should occupy certain positions, which compromise the entire process of a SGB committee. Moreover, the study revealed that SGB members found it difficult to operate in such a demoralising environment. Wills (2015) argues that infighting within SGBs delay the development in most of the schools. Similar to Wills (2015), Skhulu (2015) revealed that in some schools, infighting has resulted into killings, which affect school governance. In contrast, Martins (2017) argues that most of the divisions in the SGB are because of principals who have their favourites with the SGB committees. Pomeratz (2016) is of the view infighting comes as a result of some of the SGB members challenging school principals. In the same vein, Mathole (2013) argues that in most cases, principals do not want SGB members who question how school finances are utilised within the school. In this study, it came out that infighting among SGB members resulted into unnecessary conflict that affected their day-to-day practices.

Discussion of Findings

Policy development

The study revealed that SGB members should work together for the development of school policies such as admission policy, finance policy, and language policy. However, in this study it came out that SGB members did not have the skills to develop the policies that assist in governing the schools. Silverton (2016) argues that the skills of policy development require a specialised knowledge, which most of the SGM members are lacking. Weiniger and Lareau (2014) argue that policies that govern the schools need to be prepared in English, which becomes difficult for SGB members who do not know enough English to contribute. Therefore, it becomes to include policy development as part of the SGB training. Hillary (2015) also suggests that SGB members need to be provided with basic literacy skills to assist them with communication during the meetings and during policy development as part of their responsibilities. In this study, SGB members were unable to contribute to policy development due to lack of knowledge and literacy skills.

Lack of trust

The study revealed that even though SGB members work together, they do not trust each other. It came out that schools do not have transparency when it comes to finance issues. In some instances, SGBs were found to sign some cheques without understanding. Hoope (2014) argues that in any working environment if there is no trust that affects the production. In this study, lack of trust among SGB members result into poor school governance. George (2017) is of the view that SGB members should work together and trust each other because of the key decisions that they take that affects the operation of the school. In this study, it came out that principals did not trust SGB members and at the same time, SGB members did not trust principals either.

Lack of commitment

The study revealed that most SGB members were not committed to their work. Banabai (2016) argues that most the schools perform poorly because of lack of commitment. In this study, it came out clearly that SGB members were not committed to their work due to some tension between SMT and SGB members. Mokoena (2011) argues that SGB members lack commitment to their work due to lack of incentives. In line with this argument, Wills (2015) is of the view that due to intensive work done by SGB members, there should be a stipend that should be offered to SGB members.

Distribution of funds

The study revealed that most of the SGB members were unable to design and interpret a school budget or a financial report. Such weaknesses have resulted in fruitless expenditure in most of the schools. The study also found that school principals dictate how

school finances should be utilised without considering other SGB members' views. In some instances, principals selected their favourites, share the school budget with them only, and lobby them to vote on his/her favours during SGB finance meetings. These practices have resulted in some other SGB members not feeling comfortable to participate during budget meetings. Mathole (2013) argues that most of the SGB members lack skills when it comes to financial management of the schools. In addition, Zwane (2016) suggests that SGB members should be provided with intensive training on financial management. Such training would assist them with proper school budgets and management.

Curriculum change

The study revealed that curriculum change affects SGB participation in terms of supporting learners and teachers. It came out in this study that even some teachers found it difficult to keep up with curriculum changes. Therefore, it did not come as a surprise that SGB members lack knowledge on curriculum matters. On the other hand, curriculum change was found to be one of the reasons for poor implementation and practices of SGB roles and functions to enable better and good academic performance. Both teachers and SGB members found it difficult to perform their roles and functions, and address challenges that came because of curriculum change. Dibete (2016) argues that curriculum development in South Africa has compromised the quality of education in the country. In the study, due to curriculum challenges, SGB members were unable to provide the relevant support to the schools. Wilkins (2013) suggests that SGB members need to be provided with training on issues of curriculum development.

Conclusion

The study concludes that quality leadership and governance is very important for the success of the school. The study further concluded that SGB members should have mutual relation with other stakeholders to promote quality leadership and governance. Furthermore, there should be workshops about SGB roles and function and how quality leadership and governance can be realised in schools. The SGB members should have regular meetings with the parents and other stakeholders, and consult on curriculum issues as well as to account on distribution of funds to the school community.

Recommendations

- SGBs of all schools should design a governance practice policy for all components of the SGBs, which will guide implementation and practices of SGB roles and functions, and should have a compulsory adherence status. The presence of this policy should improve leadership and governance of schools, and therefore learners' academic performance. The policy should clearly state: roles, functions, duties, and responsibility of each component, expected conduct, and behaviour of SGB members, and nature or type of role and functions to be covered within a particular duration.
- SGBs should adequately discharge their roles and functions to monitor and ensure mutual working relations as well as teamwork among SGB members and other stakeholders.
- Both SGB members and SMTs should be equipped with explicit guidelines on how to work together as a team and collaborate effectively on issues of conflict management. The principal seems to be the only person in the SGB who is well equipped with the expertise to manage and resolve conflict in schools and other related governance matters.

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GENDER DIFFERENCES ON HARDINESS, PERCEIVED STRESS AND JOB SATISFACTION OF UNIVERSITY TEACHERS OF INDIA

P. Banerjee[1], J. Das (Tewary)[2]
[1,2]Adamas University, Kolkata, West Bengal, India
[1]payalbanerjee8819@gmail.com

ABSTRACT

Teaching is not just a profession, it's way to shape the personality of a student. The way a teacher is perceiving the events occurring in one's life will affect the overall personality of the teacher. Perceived Stress is how a person is perceiving every situation and hardiness means how a person is handling the stressful event. If a teacher is hardy enough, he/she can handle the negative event in a tactful way, on the other hand, a non-hardy teacher won't be able to handle the stressful event, and will perceive the situation in a highly stressful manner. Since, teachers are an integral part of part of our society, Job satisfaction level of teachers can influence the overall performance in classroom. The present study was done to evaluate the effect of gender on Job Satisfaction, Hardiness and Perceived Stress. For this purpose, 500 teachers who were working in various Universities of India were included in the sample. The sample was divided into two groups based on their respective genders. 250 males were included in one group and 250 females were included in second group. Perceived Stress Scale (PSS-10) (Cohen et.al.1988) was used to measure perceived stress, and Personality Hardiness Scale (Bartone,1995) was used to measure hardiness, and Job Satisfaction Scale (Munir& Khatun,2015) was used to measure job satisfaction among teachers. After the application of Independent Sample t test, significant difference was found between the two groups in all the variables. This data will help to reflect in the issues faced by teachers and is used to find out the reasons for job dissatisfaction, so that, it can be helpful for both the genders to achieve satisfaction in job and perform better in their work field and to build up a healthy environment, which will automatically improve the overall performance of the University.

Keywords: *Stress, Hardiness, Job Satisfaction, Teachers, Males, Females, University*

Introduction

There is one more important factor that can affect the personality-is stress. A person has to pass from different circumstances in his/her life. It is important to note that how a person is perceiving the event. A person who is hardy enough will face the situation in better way than a non-hardy person. So, personality of a teacher will have an impact on the students' performance. Teaching is not just an occupation or profession; it shapes the personality of a person. Various ideas and principle are formulated in different stages of life. For example, in school age, the emotional and social development occurs. When this child grows up, and enters in to the college and universities, the person had to take serious decision regarding career. The character of the person is moulded in University. And in this process, teachers play an important role in shaping the personality of a person.

So, the way of perceiving the world, will affect the level of hardiness and the stress level in the person.

Hardiness

The combination of various personality characteristics which helps in coping with the various stressful events in the life and shapes the personality, is known as hardiness. It is something which defines the structure of personality. Hardiness comprises of three main factors, namely commitment, control and challenge. When a person is ready to engage himself/herself in some work and is ready to dedicate all his/her time in that particular work, with his/her own free will, that readiness could be termed as commitment. Control means, when a person feels that he/she can have a control over the events that are happening in one's life or surroundings, by putting his/her own efforts. Challenge is the belief of the person to change something around him/her for the betterment. It comprises of the motivating attitude for personal growth and perceiving stress in a less threatening manner. Hardiness is mixture of all these factors that together provide motivation and courage to the person that is needed to face any stressful situation and mould the life in a positive direction. This fact is proved by Kobasa, Maddi and Hoover, 1982.

Perceived Stress

Perceived stress is a way how one is perceiving the stressful events in the world. It is the

attitude of a person towards one's life's stress events. It is way of coping with the stressful situation. Perceived stress is very much related to the profession of teaching, where a teacher has to deal with the various problems of a student and have to resolve it in a positive way. A teacher who is perceiving stress at a high rate, won't be able to tackle the negative situation that he/she might have to face in their educational settings, as stress is one of the factors which can affect the productivity, as there is a direct relationship between stress and the behaviour of a person. Role of teacher is crucial in educational settings so they must handle the stress in a positive manner, and the nature of handling stress would make teaching successful. This would also influence their personality, and would change their outlook of looking at the world around.

Miles (2000) remarks that work related stress manifests itself in poor physical and mental health and is associated with organizational symptoms such as low productivity, low job satisfaction, absenteeism and high employee turn-over. A teacher's degree of hardiness will depend on a number of influences such as teaching qualifications held, student motivations and discipline (Angel, 1997). Personality hardy teachers ably cope with stressful situations successfully (Galla, Hyman, Stewart, & Fehr, 1994).

Job Satisfaction

Job satisfaction is one of the important factors which can affect the performance in job. Job satisfaction can be defined as the extent of emotions and outlook of individuals towards their occupation and its conditions. It refers to the overall satisfaction which a person receives from his/her job which has a role in successful occupation (Bakhshayesh & Azarniad, 2011). And teaching is a noble profession. It prepares the students for future exams of their life. It shapes the personality of the students. So, teachers' performance has an overall impact on students. But does satisfaction in job, can have any effect on performance or there are other factors also which can affect the job satisfaction of teachers?

Individuals should go for such a job that suits their interest. Jobs should be related to their specialisation, so that it would give them satisfaction. People need to value their day-to-day work activities and people need to have a sense of accomplishment or pleasure from the work itself, then only the work will act as a powerful motivator. Sometimes, it is also seen that a well-educated individual is not satisfied with his or her job because of the expectations they have after completing a particular degree.

Different individuals hold different perceptions about the role. Job satisfaction is determined by this factor also. The more accurate the role perception of an individual is, the greater is the satisfaction. If a person is having greater experience within a specific field of interest, then, there are more chances of getting success at each stage of development and will automatically promote satisfaction in his or her job.

Some other factors are personal achievement, social achievement, introduction of rewards, need for influence, advancement, recognition, desire for personal career development, improvement in one's own life standard, better education and prospect for children improving one's own work performance can affect the job satisfaction level of a person. Job satisfaction is closely affected by the number of rewards that an individual derives from his job.

The level of performance is closely affected by the basis for attainment of rewards. There is a positive relationship between performance and reward. Employees are satisfied with their current job if they see a path available to move up the ranks in the company and be given more responsibilities. Some companies encourage employees to acquire more advanced skills that will lead to the chance of promotion. Companies often pay the cost of tuition for employees training courses.

Another major determining factor for job satisfaction is that recognition. Recognition for the efforts and the work of employees, appreciating one's work or providing better opportunities will motivate and encourage the employee to contribute more to the firm.

Apart from these factors gender could also be one of the factors for job satisfaction. Women had to play many roles in her day-to-day life. From being a daughter, to being a mother, she tries to play each and every role in a proper manner. Women always strives for perfection and balancing the work around environment. In

Indian scenario, sometimes, males feel that they have the responsibility to take care of the whole family and they have to earn for their whole family. They are being the head of the family, they responsible for satisfying the need of food and clothing for the complete family, and if they are unable to do so, they feel low self-esteem.

Literature Survey

Psychological hardiness is one of the factors which effects one's personality. Hardiness is not only related to adjustment in day-to-day life, but it is also related to one capability to face negative and stressful events of life. Kobasa has explained hardiness as a personality trait which has three factors: commitment, control and challenge. According to American Psychological Association, psychological hardiness is termed as a technique of adapting yourself in traumatic events, tragic events or stressful situations. It means getting back to normal state after facing difficult situations. One can relate hardiness to the adjustment made in difficult situations and problematic situations. In a research by Amanda M. Munsterteiger (2015), on 90 undergraduate students from two colleges was included in the sample. Gender was also taken as one of the variables in the research. The research was done to see the relationship between psychological hardiness and happiness among the students including males and females as a part of the sample. The results not only showed that hardiness is positively corelated with happiness but also it was found that males were hardier than females.

A five-year study was conducted by Kobasa and editors (1982)to examine the role of hardiness in relation with stressful events of life to present health status. The results showed that hardiness is indirectly related to less development of illness in the presence of stressful life events which supports the fact that hardiness can act as a resistance resource. In a research by Rhodewalt and Zone, 1989reveals that hardy women are more satisfied than less hardy women and are less prone to suffering from stress and burnout feelings.

Keane et al., (1985) used Kobasa's theory to study the effects of hardiness on stress. For this purpose, nurses of ICU and non –ICU were included in the sample. Their sample consists of 96 nurses from one hospital. The result indicates that the nurses in ICU did not experience burnout than nurses in another unit. From the results it can be assumed that since the nurse working in ICU are more prone to facing stressful situations, they have become used to of that. Kilinc (2014) conducted a study for examining Psychological Hardiness of primary school teachers of demographic variables. The sample that was include in the study, consisted of 369 teachers who were working in 12 primary schools in Ankara. The research studied the impact of personality hardiness to demographic variables such as gender, branch, age, seniority and years in current school. The results showed that Psychological hardiness was not significantly related to the variables gender, branch, age, seniority and years in current school.

Teachers experience an increase in stress when there is a decrease in the time dedicated to teaching, and little support from the administration (Li & Perry, 2011). Staff-to-child ratio and workplace support are interconnected with teacher stability (Casas, Raikes, Torquoati, 2007). In addition, the stress associated with high stakes testing and accountability increase the teacher's level of stress. This stress can lead to further teacher burnout and retention (Boyd, Loeb, Lankford, and Wycoff, 2007). These events or situations are perceived as threats or challenges to the individual and can be either physical or psychological (Pastorino & Portolli, 2009).

Administrative support can also have an impact on teacher stress and burnout. Teachers see an increase in stress when there is a decrease in the time dedicated to teaching and little support from administration (Li & Perry, 2011).

Administrators do not value the teachers' opinions or involve them in the decision-making. Administrators do not support teachers in disputes with parents (Tapper, 1995). Teachers need administrative support, societal support, and increased teaching controls of the environment, as well as opportunities to influence policy to reduce job stress and increase job satisfaction (Li & Perry, 2011).

Need Hierarchy Theory

Abraham Maslow, founder of humanistic psychology, developed the need hierarchy

theory of motivation in which human needs are arranged in a hierarchy of importance. According to Maslow, we always want those things which we do not yet have. Consequently, the needs that we have already satisfied no longer provide any motivation for our behaviour and new needs must rise to prominence. Once we have satisfied our lower needs, we can pay attention to the higher-level needs. These needs are: Physiological Needs including food, air, water and sleep, Safety Needs which means the need for physical shelter and for psychological security and stability. The third need is Belongingness and love needs that means the social needs for love, affection, friendship, affiliation that involve interaction with an acceptance by other people. The fourth need is Esteem needs, which means the need for self-esteem, admiration and respect from other people. Self-Actualization needs means the need for self-fulfilment and for achieving our full potential and realising our capability. These needs should be satisfied in the order presented.

The belongingness needs can be important motivating forces in the job. Workers can develop a social support network and a sense of belonging to interactions with co-workers. Esteem needs can be satisfied by buying a bigger house or car, which contributes to the feeling that we are successful and through on the job rewards such as praise from the boss or any incentive or reserve car parking space. To satisfy the self-actualization need, employees should be provided with the opportunity for growth and responsibility so that they can exercise their abilities to the outmost. A routine and boring job will not satisfy the self-actualization needs no matter how high the salary is.

Job Characteristics Theory

Another theory by Hackman and Oldham, which was known as job characteristics theory of motivation was developed, which suggests that the presence of certain job characteristics causes employees to experience positive emotional state when they perform their job. This condition motivates them to continue to perform well on the expectation that good performance will lead to good feelings and the strength of an employee motivation to perform well depends on the strength of the need to grow and develop. The stronger the need the more one will value the positive emotion feelings that result from good job performance. Thus, the job characteristics theory states that specific job characteristics will lead to psychological condition that led in turn to higher motivation, performance and satisfaction- if employees have a higher growth need to begin with.

Other Studies

Another study conducted on school teachers by Van Houtte (2006). The aim of the study was to gauge the level of job satisfaction of teachers working in 34 secondary schools in Belgium. The sample size was 711. The final results of the study revealed that the factor such as socioeconomic status did not influence the teachers' job satisfaction significantly. More specifically, teachers who taught practical subjects (e.g., woodwork, physical education), as opposed to general subjects (e.g., history, mathematics), were found to have higher levels of job satisfaction. So, it can be said that even the subjects taught by teachers can influence the job satisfaction level. Similarly, Van Houtte (2006) also found that teachers who felt that they could trust their pupils were found to have higher levels of job satisfaction than other where there is a trust issue with pupils.

Another interesting finding was revealed by Skaalvik & Skaalvik (2009) from their study, was that years of experience as a teacher had a weak and negative relationship with job satisfaction ($r = -0.24$). In other words, it can be said that, over time, a weak tendency exists for teachers to become less satisfied with their work as an educator.

In a study done on teachers, conducted by Kremenitzer et al. (2008) showed that if a teacher is having higher Emotional Intelligence, then he/she will be able to establish positive, satisfying and supportive relations with pupils which may lead to an emotionally warm climate in the classroom, that will automatically promote students' performance.

If we consider the role of job satisfaction, there can be many factors that are influencing job satisfaction. In a research conducted on teachers, by Cheung (2006) demonstrated the relation of self-efficacy and job satisfaction and

commitment, and found a correlation between the variables. Similarly, the results of research conducted by Caprara and colleagues (2006), Ahmadi (2015) has shown that teachers' self-efficacy beliefs are meaningfully correlated with their job satisfaction.

It was cited by Kobasa and Maddi, (1999) that individuals who believe that stressors are changeable factor and can be control, also believe that these stressors can influence what goes on around them and they act according to their believes.

Additionally, to these researches, a research by Rasouli (2012), showed that hardiness and job satisfaction of members of the scientific community have positive and meaningful correlation. Another research performed by Judkins and Rind (2005) considering hardiness and job satisfaction as their variables, showed that nurses with higher levels of hardiness have less stress and high levels of job satisfaction.

A study was conducted on high school teachers by Tayebeh Nasiri (2016) to evaluate the relationship between Hardiness and Self-Efficacy with Job Satisfaction. The results of the study showed positive and meaningful correlation exists between hardiness and job satisfaction also positive and meaningful correlation exists between hardiness and self-efficacy with job satisfaction.

So, there are various factors which can affect the level of job satisfaction in teachers. But our main aim is to study that, apart from these known factors, does gender of a person has any effect on the level of satisfaction among teachers.

Objective of the Study

1) To study whether there is any Gender Difference in Hardiness of University Teachers
2) To study whether there is any Gender Difference in Perceived Stress of University Teachers
3) To study whether there is any Gender Difference in Job Satisfaction of University Teachers

Hypothesis

1) There will be significant difference in level of hardiness among male and female teachers
2) There will be significant difference in level of perceived stress among male and female teachers
3) There will be significant difference in level of job satisfaction among male and female teachers

Methodology

Data Collection and Sample Selection

The aim of the study was to see whether there is any significant difference in level of hardiness, perceived stress and job satisfaction among male and female teachers working in various Universities of India. For this purpose, data was collected from the sample of 500 Teachers, out of which 250 teachers were male and 250 Teachers were females. Data was collected through google forms. The link for filling the form was sent via mail to different teachers. The form consisted of 3 parts- Form A includes the consent form for being a participant of the study, Form B consists of personal information like name, age, gender, name of the University in which they are working, time period of the present job and Form C consists of the three scales used for measuring Hardiness, Perceived Stress and Job satisfaction.

Only those teachers were included in the sample who are working for more than 3years in that particular University.

Tools Used

1. Perceived Stress Scale

The Perceived Stress Scale (PSS) was developed by Sheldon Cohen in 1988 and is the most widely used psychological instrument for measuring the perception of stress. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way. Cohen et al. (1988) show correlations with PSS and: Stress Measures, Self-Reported Health and Health Services Measures, Health Behaviour Measures, Smoking Status, Help Seeking Behaviour.

2. Personality Hardiness Scale

This scale was developed by Paul T. Bartone in 1995. This is a 15-item scale includes positively as well as negatively keyed items covering the three conceptually important Hardiness facets of Commitment, Control and Challenge. It shows excellent psychometric properties, including Cronbach's alpha coefficients ranging from .70 to .77 for the facets, to .83 for the overall scale. This scale has demonstrated appropriate criterion-related and predictive validity in several samples, with respect both to health and performance under high-stress conditions.

3. Job Satisfaction Scale

It was developed by Shagufta Munir and Tahira Khatoon in 2015. The final form of the test has 20 statements which is bi- dimensional instrument in which 12 items are worded positively and 8 items worded negatively. It is a 5-point Likert type instrument that assesses positive and negative dimensions of job satisfaction. Job satisfaction scale has split-half reliability of 0.84 and Cronbach's alpha 0.86. The content validity of the job satisfaction Scale was established along with the construct validity.

Data Analysis

After collection of the data, Independent Sample T Test was used to analyse the results of the data and checking of significance level.

Results

After application of Independent Sample T Test, in case of hardiness, the mean score of males is 25.04 and females is 27.87 which is shown in Table 1.

Table 1

Hardiness	***Gender***	***N***	***Mean***	***S.D.***	***S.E.***
	Male	250	25.04	7.83	.496
	Female	250	27.87	9.106	.576

Table 2 shows the level of significance difference between two groups, that means there is difference in level of hardiness between males and females. This proves our hypothesis 1 which claims that there will be significant difference in level of hardiness among male and female teachers. So, we can accept our Hypothesis 1.

Table 2

	Independent Sample Test								
		Levene's Test for Equality of Variances				**t-test Equality of Means**		**95% Confidence Interval of the Difference**	
		F	**Sig.**	**t**	**df**	**Sig.(2tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**
Hardiness	**Equal variances assumed**	6.770	.010	-3.732	498	<.001	-2.83	.76	-4.32	-1.34
	Equal variances assumed			-3.732	487.202	<.001	-2.83	.76	-4.32	-1.34

Table 3 shows the means score of males and females, in case of perceived stress, which is 19.35 (males) and 16.75 (females), respectively. And Table 4 shows the level of significance, in case perceived stress, which is less than 0.001 that means there is difference in level of perceived stress between males and females. This proves our hypothesis 2 which claims that there will be significant difference in level of perceived stress among male and female teachers. So, we can accept our Hypothesis 2.

Table 3

Perceived Stress	***Gender***	***N***	***Mean***	***S.D.***	***S.E.***
	Male	250	19.35	8.59	.544
	Female	250	16.75	6.08	.385

Table 4

	Independent Sample Test								
		Levene's Test for Equality of Variances				t-test Equality of Means		95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Perceived Stress	**Equal variances assumed**	16.65	<.001	3.903	498	<.001	2.600	.666	1.291	3.9
	Equal variances assumed			3.903	448.26	<.001	2.600	.666	1.291	3.9

After application of Independent Sample T test, significant difference was found between the two groups. Table 5 shows the mean score of males that is 109.85 and females is 137.21

Table 5

Job Satisfaction	***Gender***	***N***	***Mean***	***S.D.***	***S.E.***
	Male	250	109.85	54.34	3.4
	Female	250	137.21	57.81	3.6

Table 6 shows the level of significance difference between two groups, that means there is difference in level of job satisfaction between males and females. This proves our hypothesis which claims that there will be significant difference in level of job satisfaction among male and female teachers. So, we can accept our hypothesis.

Table 6

Independent Sample Test									
	Levene's Test for Equality of Variances					t-test Equality of Means		95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	10.38	.001	-5.45	498	<.001	-27.36	5.01	-37.21	-17.5
Equal variances assumed			-5.45	496.107	<.001	-27.36	5.01	-37.21	-17.5

Discussion

The present study was used to evaluate the difference in level of hardiness, perceived stress and job satisfaction among male and female teachers. After collecting the data from University teachers, and application of Independent Sample T test, both all the three hypotheses were proved, that is significant difference was found in level of hardiness, perceived stress and job satisfaction among male and female teachers who are working in various Universities of India.

The high mean score of females, in case of hardiness, indicates that females are more psychologically hardy than males. Also, the results showed that females perceived less stress than males. The response to stress is different in both the gender. Both have different hormonal system, as a result the reaction varies from one gender to another. Sometimes, the reaction to stressful situation is more emotional and one feels exhausted, but if one is hardy enough, he/she will perceive the situation in a tactful way, and will try to find out ways or techniques to solve the situation rather than being upset and grumbling about the situation. Though each person reacts in a different way to the stressful situation, but the triggers are similar in most cases. According to our results, males are more prone to stressing out than females. This could be the result of low level of hardiness.

Women had to play many roles in day-to-day life. From being a daughter, to being a mother, she tries to play each and every role in a balance manner. Women always strives for balancing the work around environment. Since, they have to play different roles, they get habituated of stressors which they are facing and become hardier as per time. This helps them to face the stressful situation in a better way. Some of the major causes of stress a

woman had to face are finding balance between work life and personal life, and finding time to have a healthy relationship with their partners. Also, the everyday struggles of motherhood add to the stress level of women and helps in becoming more psychologically stronger and hardier.

High level of stress can affect the physical, emotional and psychological well-being of the person. The most common problems faced by the person with high level of stress are sleep problems, constant fatigue, unbalanced digestive system, eating unhealthy foods or extreme loss of appetite, with being impatience at a time and losing emotional balance. These symptoms cause feeling of burn out in a person. A person may feel lack of self-esteem, weight problems, depression, anxiety and having trouble in socializing with people.

If we talked about Indian scenario, males have a fixed schedule, that is going to office and coming back to home, having dinner and sleep. So, they are not as much habituated of changes in schedule as in case of females are. So, a slightly change in routine can cause stress in the males. Also, as per our result, the low level of hardiness can be one of the causes of high level of stress among males. Also, sometimes, males feel that they have the responsibility to take care of the whole family and they have to earn for their whole family. They are being the head of the family, they responsible for satisfying the need of food and clothing for the complete family, and if they are unable to do so, they feel low self-esteem. This dominant personality among males can be one of the causes of stress in their life.

There could be other aspects also, which could influence the stress level and hardiness among males and females which could be studied in future to have better understanding of personality differences.

Our third variable which was job satisfaction, the results showed that females are more satisfied with their job as compared to males. Sometimes, it is seen that females have low expectation level. They adjust with every situation, they encounter. Females tries to accept the situations and tries to find balance in their professional and personal life. As a result, they feel content and satisfied with the work they are doing. On the contrary, males feel that they have the responsibility of whole family and they have to earn for the whole family. For this reason, they always tried for better jobs, and sometimes, are not satisfied with the work that they are doing.

However, in the study done by Nabanita Chakrabarty (2018) on teachers, concluded that gender do not have any effect on job satisfaction. A study conducted on effects of gender on Organisational Commitment and Job Satisfaction by Suki, disclosed that there is no significant effect on perception of job satisfaction among male and female teachers. However, Kumar and Bhatia in their study observed that the attitude and job satisfaction in physical education teachers is least affected by marital status, gender, income and minimum qualification. Another study conducted by Zilli and Zahoor to compare the organisational commitment between male and female teachers of higher education revealed that the female teaching staff have higher level of organisational commitment as compared their male teaching staff.

Some personal factors like seniority, status is important for a personal job satisfaction. The longer people have been in a given job and the higher their status, the greater their satisfaction. (Zeith,1990). Similarly, the greater the extent to which jobs are closely matched to individual's personal interests, the greater is their satisfaction. (Fricko and Beehr,1992). In addition, certain personal traits are closely related to job satisfaction. For instance, research findings indicate that differences in what have been termed core self-evaluations-individual's basic assessment about themselves and their self-worth may play a key role (Judge, Locke and Durham,1997). Such core self-evaluations involve four basic factors: self-esteem, generalized feelings of self-efficacy, locus of control (people's beliefs about their ability to influence their own outcomes) and emotional stability. Persons with positive core self-evaluations in many different settings (Judge etal.1998).

Conclusion

At the end, it could be said that gender is an important determinant of human health and there is a clear pattern of sex differences in level of hardiness and perceived stress. Since,

the personality of teacher can affect the performance of students, Universities could start counselling sessions for teachers, so that the stress could be handled by the teachers and does not impact the performance of the teacher in the class.

Future Implications

The first and foremost step is to recognise that stress exists and finding the cause of stress. One should understand that stress is not a normal way of living and it should be handled with positive attitude. The next step would be to change the habits and relax the mind and body by practicing breathing exercises, meditation, creativity and working on the internal behaviour pattern. A training in mindfulness can also help in handling the situation and promote positive mental health among teachers.

There is a need to change in the mentality of the society. Men should not think that they are only responsible or they have to earn for the whole family. Women should also contribute and the society should give as much importance to the work done by women as they are giving to the work done by men. The family should not impose all the responsibilities of earning on the men of the family. Parents should teach their children that it is the responsibility of both to take care their family, and both should work for their livelihood and be independent. Further research can be done on different areas like special fields, schools etc. Job satisfaction could be checked in special educators and teachers who are working in different schools.

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THE EFFECT OF PERSONAL BRAND ORIENTATION ON DIGITAL FIRM PERFORMANCE, WITH MEDIATING ROLE OF NETWORKING CAPABILITIES AND DIGITAL LEARNING CAPABILITIES

Eddy Yansen[1], Anton Wachidin Widjaja[2]

[1] Pelita Harapan University, Indonesia
[2] President University, Indonesia
[1]eddy.yansen@gmail.com

ABSTRACT

A construct related to digital firm performance that has yet to be researched and assessed is the effect of personal brand orientation (PBO) on digital firm performance for small, and medium-sized enterprises (SMEs) in online social commerce as mediated by networking capabilities (NC) and digital learning capabilities (DLC). Furthermore, it is linked to marketing studies. The topic of personal brand orientation is an interesting one that should be investigated empirically in social commerce context. The purpose of this study is to examine whether or not the NC and DLC can mitigate the impact of personal brand orientation on business performance. Research methodology was quantitative, employing partial least squares structural equation modeling (PLS-SEM) and the sample size of 355 small and medium-sized enterprises (SMEs) was collected in September 2021. Based on the findings of this study, it appears that the NC and DLC can moderate the relationship between Personal Brand Orientation and Digital Firm Performance in SMEs in Indonesia.

Keywords: *Personal Brand Orientation, Networking Capabilities, Digital Learning Capabilities, Digital Firm Performance*

Introduction

Influencers are cutting out the middlemen and starting their own company. Most of this money goes to the influencer, although there are also management businesses, influencer marketing agencies, and platforms (380 in 2019 according to Influencer Marketing Hub). Also, these rich sponsorship deals may soon shrink. While we recognize the importance of influencer marketing in growing businesses (Jin et al., 2019), is the new culture of influencer brands harming business? But the remedies may be simpler than many apparel magnates imagine. Who hasn't used influencers to expand reach? However, with greater participation on social media, influencers are gradually becoming the easiest method to earn a living.

In recent years, influencer-founded brands aligned with self-branding have become more prevalent (Whitmer, 2019) in the Indonesian market. Titi Kamal developed her own cosmetics line, "Kamalia Beauty," Putri Marino did the same with "Kala & Senja," and Luna Maya did the same with "Nama Beauty." Meanwhile, another Indonesian content creator, Tasya Farasya, founded the cosmetics line "The Needs." Other influencers prefer to collaborate with established companies rather than develop their own, such as Rachel Goddard, who collaborated with Mizzu to launch "Canggu."

Customers trust influencer referrals because they are genuine (Jun & Yi, 2020). The difference between influencers and companies is that the latter are often viewed as having an ulterior agenda - 'always out to sell you something'. Influencers enrich their followers' lives by providing entertainment, art, or a window into another world (Lou & Yuan, 2019). Starting a business is considered as a method for influencers to regain creative and personal control over the things they promote, as well as secure their financial future. Influencer to brand owners is already happening.

SMEs must innovate to remain competitive, as new product creation contributes significantly to economic growth and market valuation (Martins & Fernandes, 2015). There is a wealth of information available on new product launches. It focuses on the success criteria for new products and the innovation inputs (Cooper, 2019). Additionally, there has been a strong emphasis on the success of new product launches, particularly on sales and profitability (Saunila et al., 2014). However, the success of

new products is contingent upon both competitive advantage and brand equity (Calantone et al., 2014). Despite their superiority to alternatives, a large number of these technologies fail (Chiesa & Frattini, 2011). Only a few businesses are successful in commercializing their findings, thereby generating new cash streams (Danneels & Kleinschmidt, 2001). To achieve this level of success, a client must be aware of and receptive to an invention.

it is challenging to take a customer-centric approach to innovation. A customer's opinion of and reaction to an idea may be diametrically opposed to that of an expert (van Riel et al., 2021). While experts are concerned with functionality or technology, customers are concerned with the experience that an invention may provide (Danneels & Kleinschmidt, 2001). Studies that investigated the relationship between brand performance and innovation performance (Andonova & Losada-Otálora, 2020).These research defined holistic brand knowledge as a brand prototype, whereas specific brand knowledge is referred to as product sophistication. According to empirical study, brand is a significant driver of innovation performance (Sharma et al., 2016).

This business phenomena is highly associated with influencer entrepreneurial behavior, networking capabilities and digital learning capabilities cannot be separated from the influencer founded brand. How influencers' personal brands interact with brand awareness, loyalty, and success of their own brands has become critical in today's increasingly connected social media environment. Align with Symbolic Interaction Theory, personality is individual construct like the SME founder is importance (Zhan et al, 2021) in building meaning, relationship with the followers (Stokburger-Sauer, 2012), loyalty & support (Porter & Donthu 2008), especially how influencers present themselves in social media (Wells, LaFon & Gratian, 2021), as usually consumer never knew the influencers directly.

The study contributes to the body of knowledge by examining personal brand orientation and business success in an emerging economy. This concentration aims to address researchers' needs for additional research on brand orientation in non-Western service environments in order to build theory (Anees-ur-Rehman et al. 2016). The purpose of this study is to determine the effect of personal brand orientation on the link between consumer, competitor and entrepreneur orientations and brand performance together with product innovation. This is predicated on the notion that organizations may benefit from merging multiple strategic orientations (Dutot & Bergeron, 2016).

Theoretical Background

1.1 Personal Brand Orientation

When deciding whether or not to employ a brand, the brand orientation position is critical in the quest for a competitive advantage during the marketing strategy. It is a method of conducting business in which the organization's operations are centered on continuous interaction with its target customers, with the goal of achieving long-term competitive advantages in terms of the brand's terms, as well as creating, developing, and safeguarding the brand's identity (Urde, 1999). It is possible to develop brand orientation through the use of brands in the development of a company's strategy, which means that well-established brands improve a company's ability to compete while also generating growth and profitability (Urde, 1994).

Everyone has a brand, but it isn't enough to distinguish oneself. In order to build their personal and professional brands, founders might use social media platforms. It is possible for entrepreneurs to add value to both their own and their companies' brands through strategic planning and active participation on social media platforms. Entrepreneurs must engage with consumers honestly and display concern if they are to improve consumer awareness and loyalty. As a result, building the personal brands of the company's founders on social media becomes a coordinated professional team activity and an integral component of the company's social media objectives. Managing brands on social media should be a component of a company's strategic planning, and everyone in the organization should be aware of the importance of social media in today's world (Karaduman, 2013).

The objectives for brand building must be agreed upon by all members of the SME organization in order to ensure that employees and the company function in a consistent manner based on brand values. Everyone, from the company's creator to its front-line employees, must work together to safeguard and strengthen the brand's integrity. It is essential that everyone in the organization understands what branding is and what it implies for success in order to make this united effort a success (Anees-ur-Rehman et al., 2018). As a result, the creator must educate and train all of his employees so that they understand and support the concepts of his personal brand (Yin Wong & Merrilees, 2008).

Personal brand orientation in this study is defined as a strategic orientation of SMEs organization toward the owner's personal brand, to turn that popularity into competitive advantages. Resource based theory (Barney, 1986) highlighted that brand & personality need to be orchestrated - acquired, structuring, bundling - in order to turn into competitive advantage (Gupta, Briscoe, & Hambrick, 2017).

Previous studies have shown the importance of personal brand and brand orientation (Urde, 1994; Urde; 1999. Yin et al, 2008), however there is lack of studies on the role of which capabilities that provide a crucial role to turn into competitive advantage. This study investigated networking capabilities and digital learning capabilities in mediating personal brand orientation into competitive advantage that reflected on the increment of digital firm performance.

1.2 Networking Capabilities

A growing body of research shows the importance of social networks in the birth and growth of new businesses. Given the complexity of social networks, the balance of weak and strong links is crucial (Falahat et al., 2021). Network connections help entrepreneurs locate possibilities, acquire resources, and build legitimacy.

Branding a company's promise, client interactions, and corporate experience can help it succeed (Foroudi, 2020). The brand promotes quality standards, reputation, and trust by enhancing supplier and customer networking capabilities and fostering interconnection (Battistella et al., 2017). Brand orientation is linked to better intangible relationship performance. (Chang et al., 2020)

It also supports the growth of a dense network of strong ties between official and informal founder networks. Personal networks fluctuate with time, and their contributions to the venture development process change as well. The entrepreneur's personal network shifts from identity-based and dominated by strong relationships to one controlled and dominated by weak ties. To attain their goals, entrepreneurs must look beyond their strong links and reach out to their strong ties' friends. The issue is which weak links will be updated and how frail weak links will be upgraded to more robust strong linkages (Gerschewski et al., 2020).

This study is to explore the mediation effect of networking capabilities, suspected that higher personal brand orientation will create higher networking capabilities Where SMEs can utilize the owner's popularity and turn it into a networking doorway to other businesses, suppliers, government and other institutions that are important to increase business performance.

1.3 Digital Learning Capabilities

Businesses that want to remain competitive in today's rapidly changing business environment need to invest in knowledge development activities that transform brand orientation initiatives into effective strategies for boosting organizational performance (Nonaka et al., 2006). A dynamic interaction between internal stakeholders (workers) and external stakeholders (customers), according to the knowledge creation theory, results in the generation of new knowledge (Liow et al., 2019).

SME learning skills are used to investigate crucial areas of resource orchestration that are explored by these impacts. However, while digital learning capability has an impact on a firm's ability to bundle its resources and capabilities, it also has a significant impact on the structuring of the firm's resource portfolio and the ability to better leverage the firm's existing resources and capabilities in order to foster firm performance. Researchers claim, in

particular, that a small firm's digital learning capabilities may enable it to manage its resources more effectively, hence increasing the success of its Personal brand orientation efforts.

This study focuses on investigating whether personal brand orientation will positively increase the SME's organization digital learning capabilities that will further improve the business performance. Digital learning capabilities are organization level learning ability on digital marketing like utilize digital marketing tools, digital marketing analytics, social media marketing, and more.

1.4 Digital Firm Performance

Brand orientation, according to Boso, Carter, and Annan (2016), has a positive impact on sales success. Ciunova-Shuleska, Palamidovska-Sterjadovska, Osakwe, and Omotoso (2017) discovered a strong correlation between brand orientation and financial performance in businesses. The strategic value of branding for a church is conceptually linked to its ability to attract new followers and boost existing followers' engagement in the church's purpose (Mulyanegara, 2011).

Researchers employed a laddered technique to explore brand orientation as an operational foundation of brand administration in small and medium-sized businesses (Ciunova-Shuleska et al., 2017). The findings suggest that organizations' overall efficiency improves as they advance from a minimalist to an embryonic to an integrated brand approach. Organizations with a high level of brand integration are more valued than those with a low level of brand orientation. Reports on brand orientation clearly distinguish between lower-level small firms and stable (upper) and rapidly rising small and medium-sized businesses (Anees-ur-Rehman et al., 2018).

Previous research primarily assessed brand performance in three contexts: marketing environment, competition, and firm. The financial performance of a brand is defined by Lai, Chiu, Yang, and Pai (2010) as the brand's financial income. However in social commerce context on SMEs level, how personal brand orientation interplay with firm level capabilities like networking and digital learning capabilities to create better digital firm performance is still unclear. Digital firm performance defined as firm performance on social media commerce, in this study that focused on Instagram.com transactions and performance. That in this study is a proposed model to investigate the mediating effect of network capabilities and digital learning capabilities of personal brand orientation toward digital firm performance.

Therefore, this study propose the following hypothesis are :

H[1]. Personal Brand Orientation will have a positive effect on Digital Firm Performance

H[2]. Personal Brand Orientation will have a positive effect on Networking Capabilities.

H[3]. Networking Capabilities will have a positive effect on Digital Firm Performance

H[4]. Personal Brand Orientation will have a positive effect on Digital Learning Capabilities.

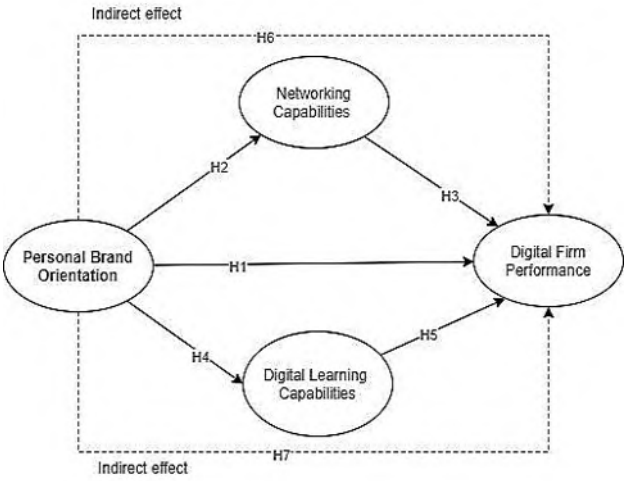
H[5]. Digital Learning Capabilities will have a positive effect on Digital Firm Performance

H[6]. Effect of Personal Brand Orientation on Digital Firm Performance mediated by networking capabilities.

H[7]. Effect of Personal Brand Orientation on Digital Firm Performance mediated by digital learning capabilities.

The research model of this study is shown in Figure 1.

Fig. 1. Conceptual Framework



Research Method

The participants in this study were SMEs represented by one employee who is working in social commerce founded by influencers in

Jakarta, Indonesia, within the previous three months, according to the study's findings in September 2021, a self-administered survey was created with the help of the website SurveyMonkey.com. The target demographic for this research is SMEs that can be discovered on social media Instagram and are offering some kind of product or service with a minimum of one year in operation, which relates to the topic of this research, which is SME with founder exposure. In September 2021, inflact.com Instagram profile search tools detected 1.999 accounts in the social commerce category, which were filtered with particular categories in Food, Apparel, Clothing, and Beauty. This study is based on a sample size of 355 samples with a degree of freedom of 1 and a confidence level of 95%, a margin of error of 0.05, and a margin of error of 0.05. A minimum of 191 samples is necessary, and 355 samples were successfully collected and analyzed in this study.

All of the constructions were modified versions of previous work. With the use of past study scales, the measurement model was developed and evaluated. The structural equation model (SEM) is used to examine causal relationships and estimate the conceptual model. PLS can be used to test the validity of indicators, concepts, convergent and discriminant relationships, and more. Personal brand orientation is measured from the adaptation of previous studies on brand orientation that explore the brand capabilities perspective (Evans et al., 2012).

2.1 Respondent profile

A total of 355 respondents were obtained as samples that were valid and usable. Out of this total of 355 representations of SME employee with following distribution of 48 SMEs with founder followers on instagram between 1,000 - 10,000 followers, 63 SMEs with founder followers on instagram between 10,000-50,000, 119 SMEs with founder followers on instagram between 50,000 - 500,000 followers, 46 SMEs with founder followers on instagram between 500,000 - 1,000,000 followers and 79 SMEs with founder followers on instagram more than 1,000,000 followers. Each SMEs is represented by one employee in the organization with the following distribution: 63 were working less than one year in the SMEs, 161 were working 1-3 years in the SMEs, 89 were working 3-5 years in the SMEs and 42 were working more than 5 years in the SME.

2.2 Measurement Model

A non-probability sampling strategy is employed in this study to obtain samples that meet the research's objectives. Populations will be segmented first, then sampled. This study looked at 355 SMEs having Instagram profiles, one responder per SMEs. The sampling approach also required the respondent's email and phone number from the acquired data. They can also be contacted and located at any time. This study assumed that all respondents would cooperate in language and literacy (in terms of understanding the contents of the questionnaire). A poorly constructed survey can suffer from low response rates. A gift voucher was presented to each respondent in this study to encourage response and reduce the likelihood of non-respondents being statistically different from respondents (Heberlein & Baumgartner,1978). Mediation analysis is conducted to investigate serial mediating effect (Baron and Kenny, 1986; Zhao et al, 2010, Cepeda Carrion et al, 2017).

Developing reliable and valid metrics for reflecting measurement models (i.e., indicator and internal consistency reliability) is necessary for the evaluation of reflective measurement models (see Figure 1). (i.e., convergent and discriminant validity). In order to assure indication reliability, indicator loadings should be greater than 0.7. In order to establish internal consistency reliability, Cronbach's alpha and composite reliability (CR) must both be greater than 0.7. In order to evaluate convergent validity, the extracted average variance (AVE), which should be greater than 0.5, must be greater than 0. Furthermore, rather than relying on established methods for determining discriminant validity, such as cross-loadings and the Fornell-Larcker criterion (Fornell & Larcker, 1981), researchers should apply the heterotrait-monotrait (HTMT) criterion (Fornell & Larcker, 1981; Henseler et al., 2014).

Tab. 2. Result of Validity and Reliability

Construct Item		Outer Loading
Personal Brand Orientation (AVE : 0.769 ,Cronbach Alpha : 0.850)		
PBO1	Personal Founder kami sendiri adalah jaminan mutu pada pelanggan kami	0.892
PBO2	Karakter dan Sifat Founder kami mewakili nilai usaha kami.	0.862
PBO3	Setiap perubahan yang dilakukan tidak mempengaruhi Personal Brand dari Founder kami.	0.877
Networking Capabilities (AVE : 0.726 ,Cronbach Alpha : 0.817)		
NC1	Toko kami senantiasa mencari rekan media, youtuber, instagramer untuk kolaborasi.	0.874
NC2	Founder kami selalu aktif dalam mencari rekan media, youtuber, instagramer untuk kolaborasi.	0.862
NC3	Founder-Follower kami memberikan referral pada pihak lain yang mampu membantu kami..	0.818
Digital Learning Capabilities (AVE : 0.802 ,Cronbach Alpha : 0.755)		
DLC1	Founder kami berkomitmen waktu dan dana untuk proses belajar teknologi media baru di toko kami.	0.876
DLC2	Staf di toko kami dapat bekerja sama dengan baik untuk menghadapi masalah baru dalam pengelolaan media baru.	0.914
Digital Firm Performance (AVE : 0.716 ,Cronbach Alpha : 0.866)		
DFP1	Penjualan di Social Media kami terus bertumbuh secara kuantitasnya.	0.747
DFP2	Penjualan di Social Media meningkatkan jumlah volume penjualan toko kami.	0.800
DFP3	Follower Akun Sosial Media toko kami terus bertambah.	0.923
DFP4	Jumlah interaksi di Akun Sosial Media toko kami terus bertambah.	0.903

Research Result

This study used bootstrapping using 5000 resamples to evaluate the statistical significance of path coefficients, as well as two-tailed statistics, to arrive at its conclusions (Tenenhaus et al., 2005). To be deemed relevant, standardized pathways should have a standardized path length of approximately 0.20 and ideally above 0.30. (Meehl,1990). Specifically, according to Falk and Miller (1992), explained R^2 values should be equal to or more than 0.10 for a given endogenous concept to be considered sufficient in terms of variance explained. The findings of this study explain 27.9 percent of digital firm performance in the conceptual model, according to the researchers. Furthermore, it accounts for 65.5 percent of digital learning capabilities. Furthermore, the model accounts for 33.3 percent of the variance in networking capabilities.

Tab. 3. Result of R^2 evaluation

Construct (Endogenous)	R^2
Digital Firm Performance	27.9%
Digital Learning Capabilities	65.5%
Networking Capabilities	33.3%

Hypothesis testing is performed by determining whether or not the p-values are less than 0.05.

When the p-values are less than 0.05, the hypothesis is supported. On the other hand, it is not supported. The value of the standardized path coefficient can be used to determine the strength of the relationship or correlation between independent factors and the dependent variable. The standardized path coefficients have values ranging from -1 to +1. Closer to 1 path coefficients indicate a high latent effect or construct link. While a path coefficient nearing zero suggests a lack of effect or a weak relationship in the latent construct (Hair et al., 2018). Associated with a high degree of relationship relevance. All hypotheses are supported in this study, with all positive significant path coefficients.

Tab. 4. Result of Hypothesis Testing

Hypothesis	Std. Path Coefficient	p-Values	Decision
H^1. Personal Brand Orientation will have a positive effect on Digital Firm Performance	0.132	0.033	**Supported**
H^2. Personal Brand Orientation will have a positive effect on Networking Capabilities.	0.577	0.000	**Supported**
H^3. Networking Capabilities will have a positive effect on Digital Firm Performance	0.288	0.000	**Supported**
H^4. Personal Brand Orientation will have a positive effect on Digital Learning Capabilities.	0.809	0.000	**Supported**
H^5. Digital Learning Capabilities will have a positive effect on Digital Firm Performance	0.188	0.007	**Supported**
H^6. Effect of Personal Brand Orientation on Digital Firm Performance mediated by networking capabilities.	0.166	0.000	**Supported**
H^7. Effect of Personal Brand Orientation on Digital Firm Performance mediated by digital learning capabilities.	0.152	0.011	**Supported**

Conclusion and Discussion

This study offers a model of the relationship between personal brand orientation, mediated networking capabilities, and digital learning capacities, and the performance of digital firms in online social commerce. Organizational capacities in networking and digital learning literacy are regarded to be important factors in improving digital company performance, which is found to be significantly mediating personal brand orientation towards digital firm performance. This study constructs and tests a mediation model that connects personal brand orientation to digital firm performance, and it shows support for the majority of the correlations proposed in the literature. That Personal Brand Orientation has a significant positive effect on Digital Firm Performance with p-values 0.033 and positive path coefficient of 0.132, that align with previous literature that brand orientation increases firm performance.

Personal Brand Orientation also has a significant positive effect on Networking Capabilities, and networking capabilities is a significant positive effect to digital firm performance. Together with the findings of significant mediating effects of PBO to DFP. That explains that personal brand orientation is improved through better networking capabilities of the organization, like utilizing the SMEs owner's popularity to form better relationships with suppliers, government officials, business association and others to improve the SMEs business performance.

Meantime Personal Brand Orientation also has a significant positive effect on Digital Learning Capabilities, also DLC is positively effect DFP. And the mediating effect of DLC is supported in the path of PBO to DFP. This explains better digital learning capabilities in the SMEs as key factors to develop successful personal brands into marketing strategies. That SMEs that can learn to use digital marketing

tools , metrix, technologies well believed to be able to create better marketing strategies to maximize the SMEs owner popularity.

Finally, this study gives a model for the effects of personal brand orientation on digital business performance at the level of the SMEs organization, which may be applied to other organizations as well. That the findings of this study indicate separate mediating effects by revealing that personal brand orientation is positively supported by networking capabilities and digital learning capabilities for company success, and that these findings give distinct mediating impacts This provides management with a new perspective on how to maximize the personal brand of the owner in the context of the business, while also extending networking possibilities and boosting the digital learning process in the SMEs.

Limitation and Future Research

This study was limited to Indonesian SMEs that are framed with a population that is searchable on inflact.com, which means its findings may not be applicable to other countries. In industrialized countries, small and medium-sized enterprises (SMEs) account for the majority of economic activity, and because the participating firms come from a variety of industries. Consequently, this study recommends future research to evaluate personal brand orientation in different organizations and industries to check whether the study findings applied.

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EMPLOYEE AWARENESS OF THE SOCIAL MEDIA POLICY, GUIDELINES, USES AND LIMITATIONS AT WORK

Jessie I. Quierrez[1], Jennifer D.G. Munsayac[2]

[1,2]Polytechnic University of the Philippines, Manila, Philippines
[1]jiquierrez@pup.edu.com, [2]jdgmunsayac.0302@gmail.com

ABSTRACT

This study attempted to understand the employees' awareness on the social media policy, guidelines, uses and limitation at the workplace. Descriptive-Survey method was used to gather the needed data, from a total of 216 respondents from the business industry. Findings showed that majority of the employees are extremely aware on the Social Media policy, guidelines, uses and limitation at work. Facebook and YouTube are the most commonly used social media utilized by the respondents. It can be concluded that many organizations have already came up with their different strategies, and/or have already included, during their work orientation on their employees, the policy and guidelines in using Social Media. It is assumed that employees are aware that their main responsibility in their workplace is to serve for the betterment of the company as this will impact their image as employees and as individuals on how their organization stand and level up with the rest of those organizations in the business industry; whatever age, gender, or position they are in, they recognize that whatever actions they do and for whatever purpose they use the social media at work, they know their limitations and its purpose at work.

Keywords:*Employee awareness, Social media, Policy, Guidelines, Limitation at work*

Introduction

Social media is a term most commonly used at this age where the internet of things is at its peak and most of the young and old generations alike are hooked in communicating in any form of media tools. As defined, social media are interactive computer-mediated technologies that facilitate the creation and sharing of information, ideas, career interests, and other forms of expression via virtual communities and networks (Kietzman & Hemkens, 2011; Singh, D.P. & Dwivedi, 2013; Drury, 2008). The use of social media has become an integral part of the public and personal lives of civil servants and emerged into mass use.. And because of its inherent ability to reach large number of public, it is widely used to convey message to build public opinion and awareness; share and interact with each other; user-generated content (Deka, 2013; Boyd and Ellison, 2008; Utz, 2010; Leftheriotis and Giannakos, 2014). Thus, it must responsibly be used to improve productivity and governance; it is imperative to formulate a policy that will guide government agencies and employees on the responsible use of social media and ensure that such will redound to global competitiveness, performance accountability, shared governance, organizational and personal effectiveness, and service excellence as well as counterpart government transformation (Goldstein and O'Connor, 2000; Hanna, 2010). This study was utilized to explore the level of awareness of the employees on this matter as very few studies were taken to further understand where they stand on this subject.

An organization is made up of different individuals who are committed to excel on their jobs and bring an organization to success (Burton, 2012; Gotsi & Wilson, 2001). They are essential elements in establishing a positive corporate image, thus, they should be valued and let them feel a "sense of belongingness" in and around the organization (Hatch and Schultz, 2003). With the advent of social media and its ever-increasing platforms, this becomes part of an employee's daily life and communication personally and at work.

Studies were done by various researchers from different countries, however, focused was only on how each one of these employees use social media on different situations. In fact, various studies done by researchers have focused on various organizations' management considering social media to be included in crafting their policies, company guidelines, employee contracts (Cox and Rethman, 2011; Stafford & Mearns, 2009; Hutley, 2009; Aguenza et.al, 2012), and provided clear information on the limitation of its uses, which

will reflect employee understanding of the policies and guidelines (Bennett, 2010). As other studies said, avoiding or controlling social media use in the workplace may reduce productivity and may result to legal litigation, (Skeels & Grudin, 2009; Bennett, 2010). Founded from Greenspan's Social Awareness Theory (1981), the researchers was able to achieve the following: (1) understand the different views of employees about social media policy, guidelines, uses and limitation at work; (2) explore the employees' level of awareness on the social media policy, guidelines, uses and limitation at work; and (3) develop a research hypothesis that will be used for a similar study conducted by the researchers. Greenspan established the idea of this theory on Social awareness which describes Social Awareness as a person's capability to recognize the different processes that are included in the social event regulation, knowing and understanding people, and social events. "The emphasis on interpersonal understanding as the core operation in social awareness indicates that this construct is a cognitive component of human competent" (Greenspan, 1981). It is a 'multi-dimensional hierarchical construct' which involves social sensitivity, which incorporates the sub-domains of role-taking and social interference, social insight sub-domains of social comprehension psychological insight, and social communication and social problem-solving.. Social awareness is one of the factors of a bigger model of personal proficiency which comprises emotional and physical, conceptual and practical intelligence. Fig. shows the Model of Social Awareness by Greenspan (1981).

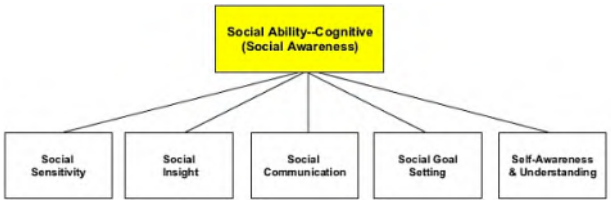

Fig. 1 shows Greenspan's Model of Social Awareness.

For better understanding, Table 1 shows how Greenspan defined the following constructs of social awareness (Black and Langone, 1997).

Constructs	Greenspan's Definition (1979, 1981)
Social sensitivity	The ability to accurately label the meaning of a social object or event
Role taking	The ability to read people and put oneself in the shoes of others; the ability to understand how others are experiencing the world
Social inference	The ability to read social situations accurately and comprehend what is happening in a social gathering or event
Social insight	The ability to understand the processes underlying social events and to make evaluative judgments about such event
Social comprehension	The ability to understand social situations and processes, such as an understanding of social class, friendship and social reciprocity
Psychological insight	The ability to understand personal characteristics and motivational processes of people
Moral judgment	The ability to evaluate social situations in relation to moral codes and ethical principles, taking into consideration intentionality
Social communication	The ability to understand how to intervene effectively and influence the behavior of others
Referential communication	The ability to convey accurately to others what one is thinking or feeling
Social problem solving	The ability to resolve conflicts and an understanding of how to influence the behavior of others to achieve desired goals

Table 1. The Different Constructs of Social Awarenes as Defined by Greenspan

It is useful to the researchers to come up with one goal "Employee Awareness with the social media policy, guidelines, uses and limitations at work" in order to better understand them. It emphasizes the employee's ability and understanding on how they are aware with the organization's policy. Social awareness is more important in general, as it is a relevant factor at work. It helps to reduce the possibilities of dramatic problems. If employee's are not aware with policy, not only the cost of money and hurt reputation for a company but can cause a great deal of suffering to staff and destroy workplace unity via social media personal attacks.

Materials and Methods

As the study aimed to systematically and accurately describe a situation or a certain phenomenon such as the employee awareness of the social media policy, guidelines, uses and limitation at work, which can be answered by questions such as what and how, Quantitative research approach was used to achieve proper result. As stated by Sukamolson (2017) quantitative research is basically focused on collecting numerical data in order to describe a particular phenomenon. Other than the reviews on various literature and studies made in order to establish concrete basis on this venture, this study also employed a researcher-made survey questionnaire which is the main tool for a descriptive type of research design. It is composed of two parts. The first part was a request for the respondents to supply a few of their personal details such as age, sex, position at work and the social media platforms they usually utilize. The second part of the survey is composed of close-ended questions with a 5-point Likert scale (5 having the highest value and 1 having the lowest value) focusing on the main subject of the study. Content-validation was done prior distribution of the questionnaire. The survey instrument was tested for reliability and validity.

A total of 216 copies of the instrument were generated for a period of three months to randomly selected employees in Metro Manila at the time of the conduct of the survey. Since the total population of employees in Metro Manila cannot be determined at this time of the survey, using the WarpPLS 7.0 software was utilized to determine the sufficiency of the sample used in the study.

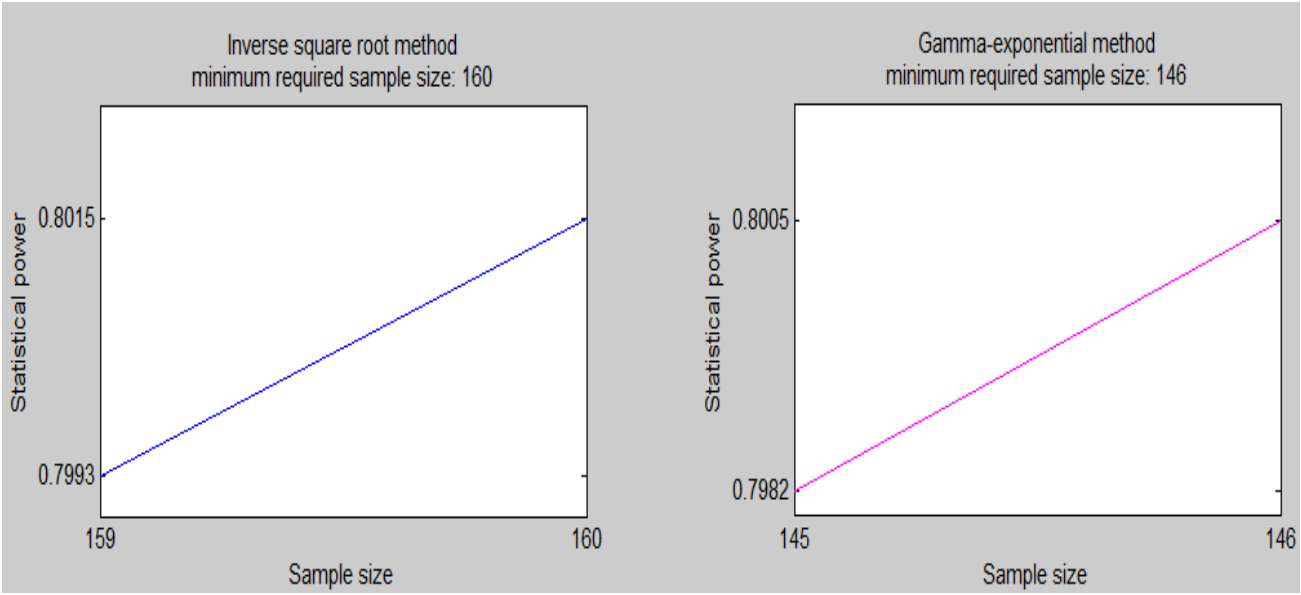

Fig. 2 Sample Size computation based on Inverse Square Root Method and Gamma-Exponential Method

Having a 0.05 level of significance and a 0.95 power level, a sample size of 160 or no less than 146 samples as shown in Fig. 2 are sufficient enough as samples for the study when the population is not known (Manheim, et.al, 2006: Kock & Hadaya, 2018). Since the sample size taken in the survey was 216, the

sample used in this study was sufficient enough to achieve accurate results.

Likewise, to test the reliability of the researcher-made instrument, All items on this part are close-ended where participants in the survey are provided options that they can choose as their response [41] and measured using a 5-point Likert Scale having 5 as the highest score (Extremely Agree) and 1 as the lowest score (Strongly Disagree). Likewise, to further test the construct reliability of the instrument, it was assessed using Cronbach's Apha and Composite Reliability test which was shown on Table 2.

Aspects	**Cronbach's Alpha**	**Composite Reliability**	**No. of items**
Social Media Awareness on Policy	0..646	0..754	8
Social Media Awareness on Guidelines	0..657	0.763	6
Social Media Awareness on Uses and Limitations at Work	0.605	0.721	5

Table 2. Reliability Test- Cronbach's Alpha and Composite Reliability Test

Results showed all three aspects generated a Cronbach's Alpha value which are greater than 0.6 value (Chetty and Shruti, 2015) and the Composite Reliability that is equal to or higher than 0.7 [Peterson & Kim, 2013). Results show that the instrument used is reliable and valid to be used in the said study. As soon as all survey forms were validated, proper statistical tools such as frequency and percentage, mean, and Analysis of Variance (ANOVA Test) were used to analyze and interpret the data gathered from the respondents.

Observations/Results

Age	***f***	**Sex**	***f***	**Work Position**	***f***	**Social Media Platform**	***f***
18-22	36	Male	80	Top	18	**Facebook (FB)**	**72**
23-27	**68**	**Female**	**136**	Middle	98	**FB and YouTube (YT)**	**72**
28-32	34			**Lower**	**100**	FB and LinkedIn	8
33-37	14					FB Youtube LinkedIn	6
38-42	18					FB YT and Blog	4
43-47	22					FB YT Twitter	38
48-52	16					FB YT Blog (B) Twitter (T)	14
53 +	8					FYLBT	2
Total	216		216		216		216

Table 3.Respondents' Profile

Table 3 presents the profile of the respondents. Results showed that majority of the respondents belong to age bracket 23-27 (31.5%) with the least age of 53 and above (with 3.7%); female respondents with 136 (63%) while males are 80 (37%); more respondents belonging to lower position (46.3%) followed by the middle position (45.4%). Most of the respondents utilize Facebook (72 or 33.3%) or Facebook and Youtube (72 or 33.3%) followed by those who used Facebook, YouTube, and Twitter with 38 respondents (17.6%).

On the succeeding tables, respondents who participated in this study expressed themselves to be Extremely Aware with the Social Media Policy, Social Media Guidelines, and Social Media Uses and Limitations at Work having a Weighted Mean of 4.483; 4.408; and 4.327 respectively. It definitely supports the literature and studies earlier reviewed which states that Social Media serves as a powerful tool in their communicating inside and out of their work environment (Holland, Cooper & Hecker, 2016) brought positive effects to them as it helped them in improving the way they communicate (Leftheriotis and Giannakos, 2014) enhance better human relationships, and had a better sharing of knowledge and connections for information, of common interests all around the world (Cao, X., Guo, X., Vogel, D. and Zhang, X., 2016; Zoonen, van der Meer, Verhoeven, 2014) in just a matter of seconds. On the area of the academe, Social media serves as an effective instructional tool to acquire and share

knowledge among faculty members while students are also actively searching at the internet which they find it very significant in assisting them in learning collaboratively. (Lory, 2010; Hill et.al, 2004; Moran, Seaman, & Tinti-Kane, 2011).

Statements on SMP	**EA 5**	**VA 4**	**MA 3**	**SA 2**	**NA 1**	$\bar{x}$	**Verbal Interpretation**
			f				
1. Post a comment that will not hurt other people.	158	46	10	0	2	4.6574	Extremely Aware
2. Any comments can affect the image of the company.	164	36	10	2	4	4.6389	Extremely Aware
3. Observe content and information made available through social media.	142	50	16	4	4	4.4907	Extremely Aware
4. Use the best judgment in posting material that is neither inappropriate nor harmful to its employees, or customers.	116	66	26	2	6	4.3148	Extremely Aware
5. Prohibits social media conduct include posting commentary, content, or images that are defamatory, pornographic, proprietary, Harassing, libelous, or that can create a hostile work environment.	132	54	28	0	2	4.4537	Extremely Aware
6. Social media use should not interfere with employee's responsibilities and computer systems are to be used for business purposes only.	132	48	28	8	0	4.4074	Extremely Aware
7. After-hours online activity that violates the Company's Code of Conduct or any other company policy may subject an employee to disciplinary action or termination.	116	68	20	12	0	4.3333	Extremely Aware
8. Employees keep their Company related social media accounts separate from personal accounts, if practical.	146	50	18	2	0	4.5741	Extremely Aware
General Weighted Average	**4.4838**						**Extremely Aware**

Table 4. Respondents' Level of Awareness on the Social Media Policy

On the respondents response on their awareness with the Social Media Guidelines as shown in Table 5, it can be assumed that various organizations are very much aware that employees while at their workplace especially in front of a computer with internet connections may access social media at any time. It is at this point that the management came up with their own way on how to control such uses through proper guidelines. This is true with the different studies done in previous years where it was concluded that management of every organizations should balance any actions of their employees and has to closely observe the use of social media for a quality and reliable exchanges of information which will be used for the advantage of the organization's communication, better public relations and community-building and for a much improved organizational processes. (Moorhead et.al, 2013; Rokka, Karlsson & Tienari, 2014; Macnamara & Zerfass; 2012; Treem & Leonardi; 2013). Likewise, other studies conducted (Bizi, 2017) focusing on HR officers' quandary about social media policies, on the impact of social media use in work performance (Leftheriotis and Giannakos, 2014), and on social media and the world of work, did not focused on understanding employee awareness on the use of social media policies, guidelines, and limitations at work (Dreher, 2014; Charoensukmongkol, 2014). Furthermore, the reviews made by Stafford & Mearns, (2009) on the previous studies done by various researchers showed that employees are very much aware on the good and bad effects on the use of social media.

Statements on SMG	**EA 5**	**VA 4**	**MA 3**	**SA 2**	**NA 1**	$\overline{x}$	**Verbal Interpretation**
				f			
1. Using social media must be minimal and takes place substantially outside of normal working hours, such as, breaks, lunchtime	122	74	18	2	0	4.4630	Extremely Aware
2. Using social media must not interfere with the business or office commitments.	122	78	12	4	0	4.4722	Extremely Aware
3. Using social media must comply with company the co policies including relevant policies such as Equal Opportunities Policy, Anti-Harassment Policy, Data Protection Policy and Disciplinary Procedure.	124	60	26	2	4	4.3796	Extremely Aware
4. Avoid social media communications that might be misconstrued in a way that could damage our business reputation, even indirectly.	130	58	22	4	2	4.4352	Extremely Aware
5. Not posting anything that colleagues or customers, clients, business partners, suppliers or vendors would find offensive, insulting, obscene and/or discriminatory.	128	50	26	2	10	4.3148	Extremely Aware
6. Disclosed affiliation as an employee of the organization, they must ensure that their profile and any content post are consistent with the professional image present to client and colleagues.	118	72	20	4	2	4.3889	Extremely Aware
General Weighted Average	**4.40895**						**Extremely Aware**

Table 5.Respondents' Level of Awareness on the Social Media Guidelines

Presented in Table 6 is the respondents' level of awareness In terms of Social Media Uses and Limitations at Work, the findings achieved in this study supports the study conducted by Pence (2011) where he concluded that "organizations were able to adapt clear employee guidelines and policies on how the use of social media be controlled, filtered, and sets its limitations at work, which shall not hamper the smooth operation and damage the good reputation of the organization, as well as brings negative effect on the performance and productivity among employees". The article of Bertot (2012) also stated that their government has already came up with the policies on the social media usage specifically in terms of trust, security, participation and recordkeeping, Findings also revealed that people are extremely aware that the basic knowledge of others' way of communications is a vital role in giving people useful information related but not limited to personal, interpersonal and other related information which will definitely support them positively in their interactions to people across nations (Leonardi and Meyer, 2015; Benson, et.al, 2015; Bucher, Fieseler & Suphan 2013). It also revealed from previous studies that employees agree that social media and social networks are already a part of the one's characterization or behavior and that individuals need to satisfy their desire to communicate and interact with people they know (Golder, Wilkinson and Huberman,2007), and is considered by many as now a normal part of life that is why it attracts millions of users worldwide (Buffardi and Campbell, 2008). Lastly, in this age of social media, professionals should understand that it is not enough to know how an individual can properly retrieve and process information in various social settings, but more importantly is to rationally manage with information overload, uncertainty, and annexation (Bucher, Fieseler & Suphan, 2013).

Statements on UAL	EA 5	VA 4	MA 3	SA 2	NA 1	$\overline{x}$	Verbal Interpretation
	f						
1. The company reserves the right to restrict or prevent access to certain social media websites if personal use is considered to be excessive. Monitoring is only carried out to the extent permitted or as required by law and as necessary and justifiable for business purpose	110	72	26	6	2	4.3056	Extremely Aware
2. Misuse of social media websites can, in certain circumstances, constitute a criminal offense or otherwise give rise to legal liability against you and the company.	120	68	24	2	2	4.3981	Extremely Aware
3. Report if you notice any use of social media by other members of staff in breach of this policy.	94	72	48	0	2	4.1852	Very Aware
4. An employee has failed to comply with this policy, they will face the company's disciplinary procedure. If the employee is found to have breached the policy, they will face a disciplinary penalty ranging from a verbal warning to dismissal.	114	70	26	4	2	4.3426	Extremely Aware
5.The penalty applied will depend on factors such as the seriousness of the breach, the nature of the posting; the impact it has had on the organization or the individual concerned, whether the comments cause problems given the employee's role, whether the employer can be identified by the postings; other mitigating factors such as the employee's disciplinary record etc.	124	62	26	2	2	4.4074	Extremely Aware
General Weighted Mean	**4.32778**						**Extremely Aware**

Table 6. Respondents' Level of Awareness on the Social Media Usesand Limitations at Work

Table 7 presents the ANOVA Test to determine whether there is a **significant difference on the respondents' level of awareness** on the said policy, guidelines, and uses and limitations a work when they are grouped according to their age, sex, and work position.

Variables	Profile	F-value	P-value	Decision	Remarks
Social Media Guidelines	Age	1.008	.456	Failed to reject H_o	Not Significant
	Sex	1.052	.412	Failed to reject H_o	Not Significant
	Work Position	1.041	.423	Failed to reject H_o	Not Significant
Social Media Policy	Age	.856	.608	Failed to reject H_o	Not Significant
	Sex	.664	.803	Failed to reject H_o	Not Significant
	Work Position	.649	.817	Failed to reject H_o	Not Significant
Social Media Uses and Limitations	Age	1.768	.060	Failed to reject H_o	Not Significant
	Sex	1.235	.268	Failed to reject H_o	Not Significant
	Work Position	.865	.592	Failed to reject H_o	Not Significant

Table 7.ANOVA Testing on the Significant Difference on the Respondents' Level of Awareness on the Social Media Policy, Guidelines, and Uses and Limitations at Work When Grouped According to Profile

Based on the result presented in Table 7, most of the f-value generated are more than 1.0 and all p-value generated are higher than the 0.05 level of significance which mean that it failed to reject the null hypothesis and the decision is '**there is no significant difference on the respondents' level of awareness** on the said policy, guidelines, and uses and limitations a work when they are grouped according to their age, sex, and work position. Although there were previous studies which presented negative thoughts about social media use such that this becomes a distraction in performing their tasks and productivity, (Warnakula and Manickam, 2010; Mastrangelo et al., 2006; Sherman, 2009) distort work-life balance, exacerbate

tensions, and threatens personal privacy, (Walden, 2016) affects personal and office relationships and personal relationships (Herraiz and De Castro, 2013), increase narcissism (Wallace and Baumeister, 2002; Treem & Leonardi, 2013), yet it can still be assumed that employees, whatever legal age they belong, male or female, or whichever position they are in, recognize that whatever actions they do and for whatever purpose they use the social media at work, they know their limitations and its purpose at work.

Discussion

Based on findings, it can be assumed that employees are very much aware on how Social Media should be used at their workplace. It can also be concluded that many organizations at this time have already came up with their different strategies, and/or have already provided and make it sure to be included during their work orientation on their employees about the policy and guidelines in using Social Media. Likewise, as researchers are also employees, it is further assumed that employees are aware that their main responsibility in their workplace is to serve for the betterment of the company where they work as this will impact his/her image as an employee and as a person on how their organization stand and level up with the rest of those organizations in the business industry. With social media as their support in order to work in a much better result, organizations should have just to orient their employees of the pros and cons on the usage of it and its impact not only on their work productivity as well as on their personal aspect and on the image that may be created of the company they work for. It is also concluded that a deeper study of this matter may bring clarity and answer questions on how aware are the employees on the policies, guidelines, and limitation at work on the use of social media.

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A SCALE FOR MEASURING DAIRY FARMERS' ENTREPRENEURIAL ABILITIES IN THE CENTRAL INDIAN STATE OF CHHATTISGARH

R.K. Gupta[1*] and A. Saha[2]

[1,2]Department of Agricultural Extension, Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati (A Central University), Sriniketan, West Bengal, India
[1]raviguptaphd@gmail.com

ABSTRACT

The present study of dairy farmers in the central Indian state of Chhattisgarh was conducted to assess their entrepreneurial abilities. With the new concept, dairy farmers' entrepreneurial abilities are interpreted into scale construction. Through the juries' method and relevancy score method, the Likert-type scale was considered along with parameters and parameters of statement preparation and validation. In a non-sample area, the scale was pretested. Statement analysis of thirty (30) filtered parameters reduced to fifteen (15) reliable entrepreneurial parameters in the final scale with accepted "t" values, and each 15 parameter statement reduced to 5 reliable statements with accepted "t" values, with final scale statements identified based on highest relevancy mean score. The Cronbach alpha value of 0.832 and the split-half reliability full test value of 0.66 after Spearman-Brown correction indicated that the scale was reliable. The content validity method test revealed that the scale was valid. The scale was administered to the sample farmers, and a five-point continuum response on the Likert scale was used to categorise farmers into five groups: least level of entrepreneurial abilities, less level of entrepreneurial abilities, medium level of entrepreneurial abilities, high level of entrepreneurial abilities, and very high level of entrepreneurial abilities. Measuring entrepreneurial abilities using a standardised scale of stakeholders aids policymakers in future strategy and decision making. It can be validated further by meeting several future innovative extension methods.

Keywords: *Dairy Farmers, Decision Making Ability, Entrepreneurial Abilities, Leadership, Information Seeking Behaviour, Innovation*

Introduction

India is the world's largest milk producer, so the role of dairy farmers in the dairy industry and in the socio-economic development of society is very important. In this context, the development of an index for measuring the entrepreneurial abilities of dairy farmers was felt to be necessary. An issue of discussion among researchers has long been the measurement of the entrepreneurial profile. Since that of Schumpeter (1934)Theoretical, empirical and methodological debates in the entrepreneurship research become more debates (Connelly, Ireland, Reutzel, and Coombs, 2010). The theory of economic development increased the importance of the entrepreneur in society's advancement; interest in the phenomena of developing and defining entrepreneurial orientation has grown (Serje Schmidt et. al. 2018). Entrepreneurship research has focused on the phenomenon's central figure: the entrepreneur. These studies begin with the same analysis point, measurement of enterprise idiosyncratic behaviours and the understanding that entrepreneurial activities are not only linked to the opening up of companies but also with individual features of disposition, personality, beliefs, interests, values, self-conceptions, abilities and emotional patterns (Rauch and Frese, 2007; Kautonen, et al. 2013; Vasconcelos et al.2009; Schmidt and Bohnenberger, 2009; Nascimento et al. 2010; Obschonka *et al.*, 2010; Bornia, et. al. 2011; Brandstätter, 2011; Karabey, et. al. 2012; Minello and Scherer, 2012; Mathieu and St-Jean, 2013; Moraes and Robbrecht, 2013; Tajeddini et al. 2013; Roxas and Chadee, 2013). The process of the discovery / creation, evaluation and exploitation of opportunities for producing goods and services in business research is usually defined as entrepreneurial activity (Shane, 2012). To be an independent company contractor in the work environment today (Zacher, et. al. 2012). As well as risk management, uncertainty, creativity, leadership and proactivity, enterprise also calls for continuity and passion. All of these variables are highly related to ESE. As a result, ESE has emerged as a key psychological construct in entrepreneurship research (Miao, Qian, and Ma, 2017). It was discovered to have an impact

on entrepreneurial motivation, intention, behaviour, and performance, as well as being a critical objective result of entrepreneurship training and education. Furthermore, due to the growing influence of entrepreneurial thinking and acting on career development and vocational behaviour (Obschonka, et. al. 2017; Uy, Chan, Sam, Ho, and Chernyshenko, 2015). Researchers, educators and policy makers that aim to promote enterprise activities independently or within organisations have become important questions of how individuals think and act in a business way (Hisrich, Langan-Fox, and Grant, 2007). Although a recent meta-analytical study looked into the relationship between ESE and entrepreneurial company performance (Miao et al. 2017). The study did not look into the effects of ESE on other ESE outcomes or the variables that promote ESE, as another recent review of central career constructs in the field of vocational behaviour did (Duffy and Dik, 2013; Johnston, 2018It will also help educators and policymakers to develop educational solutions and training to improve entrepreneurship among the next generation to prepare themselves for a dynamic world of work that enhances the value of business thinking, entrepreneurship and conduct (Brooks, Huang, Kearney, amd Murray, 2014). The aim of this study is to identify neglected areas of research and literature inconsistency and to identify the opportunities to empirically and theoretically promote the field of research. In the section below, we highlight the techniques developed a scale for measuring dairy farmers' entrepreneurial abilities in the central Indian state of Chhattisgarh.

Material and Methods

measurement of dairy farmers' Entrepreneurial Abilities was studied in this study. Meanwhile, an Entrepreneurial Abilities scale was created using the Likert et al. al. (1932) method of summated rating scales as an extremely popular method for measuring Entrepreneurial Abilities, a most effective and efficient method in developing highly reliable scales (Dwyer 1993). In addition, this method was moderately simple and time-saving. In the present study standards procedure was followed of Ghosh et. al. (2009), Choudhary et. al. (2007), and Sahoo et. al. (2019), and the entrepreneurial abilities scale was formulated through the following steps:

1. The Scale on Dairy Farmers' Entrepreneurial Abilities was developed by following a standard procedure and collecting parameters based on a literature review.
2. A set of parameters (30 for this study) was chosen to be included in the questioner, with a sample of experts judging the relevance of each in dairy farmers' entrepreneurial abilities.
3. A questioner survey of 30 experts (in the fields of agricultural extension, dairy science, dairy entrepreneurs, and so on) was conducted to determine the content validity of each parameter and its relevance to dairy farmers' entrepreneurial abilities. The judges' responses were then categorised into three categories: "most relevant," "relevant," and "less relevant," with scores of 3, 2, and 1 assigned to each. Each of the 30 judges had the opportunity to respond. The following formula was used to calculate the Relevancy Weightage (RW) of each parameter based on these responses.

$$\textbf{Relevancy Weightage (RW)} = \frac{\text{Most relevant x 3 + Relevant x 1 + less relevant x 1}}{\text{Maximum possible score (30x3 = 90)}}$$

4. The parameters were screened for relevance using the relevancy weightage. As a result, parameters with a relevancy weightage of more than 0.75 were taken into account. Using this method, Sahoo et al. (2019) chose parameters with a relevancy weightage of more than 0.75. The selected twenty-six parameters were 't-tested' based on relevancy weightage. The respondents were arranged in ascending order according to their total score. Then one-third of respondents with the highest total score (33.33 percent) and one-third of respondents with the lowest total score (33.33 percent) were chosen. The criterion groups for statement analysis were provided by these two groups. The critical ratio (t) for each statement was calculated by using the following formula.

$$\textit{'t'} = (\bar{x}_H - \bar{x}_L)/ (s_H^2/n_H + s_L^2/n_L)^{1/2}$$

Where,

$\bar{x}_H$ = the mean score on a given parameters /statement for the high group

$\bar{x}_L$= the mean score on a given parameters /statement for the low group

s_H^2= the variance of the responses of high group

s_L^2 = the variance of the responses of low group

n_H = the number of respondents of the high group

$n_{L=}$ the number of respondents of the low group

5. The parameters to be included in the EADI were screened using statistical analysis and the Likert summed rating scale construction technique (likert, 1932). After screening for significant t-values at the 0.05 level of probability, 15 parameters were chosen.
6. Scale – product Methodology (Kumar, 1999) was used to weight each of the screened statements in the EADI, and an index was created to measure the overall entrepreneurial abilities of dairy farmers.
7. As a result, the statements for each of the fifteen entrepreneurial abilities were framed based on a review of the literature and discussions with experts in agricultural extension, dairy science, and dairy entrepreneurs. With the applicability of statements suited to the area of study in mind, a tentative list of 16 statements, consisting of positives and negatives, was drafted under each parameter.
8. An expert panel of judges examined the statements under each of the 15 parameters to determine their relevance and screening for inclusion in the final scale. As a result, a list of those statements was sent to the judging panel. Experts in agricultural extension from the Indira Gandhi Agriculture University (IGKV) in Chhattisgarh, the Chhattisgarh Kamdhenu Vishwavidyalaya (CGKV) in Chhattisgarh, and scientists from collaborating Chhattisgarh KVKs who are involved in dairy entrepreneurial management and dairy production served as judges for the statements' relevance. The statements were sent to 30 judges, who were asked to critically evaluate each one and respond in three categories: most relevant, relevant, and less relevant, with unipolar scores of 3, 2, and 1 for each. Each of the 30 judges had the opportunity to respond. These responses were used to rework the Relevancy Weightage (RW) formula and processors for primarily identifying the relevant statements, as mentioned previously.
9. Statement analysis of statements ('t-test') was worked out the formula stated above as well as also above procedure followed to the second stage identifying the statement. Five statements under every 15 parameters were finally selected based on the highest relevance means to score.
10. The developed scale was standardised further by proving its reliability. When applied to the same sample at different times, a scale is said to be reliable if it consistently produces the same or similar results. The credibility of test results is determined by the test's reliability. The stability and consistency of test scores are expressed by a test's reliability (Dwyer, 1993). The reliability coefficient is a numerical value between 0 and 1 that reflects the instrument's stability. Four basic methods are commonly used to calculate reliability coefficients (Ferguson, 1981):
    a. **Test-retest method:** The same test is given to the same group of people twice (before and after), with each administration separated by a time interval.
    b. **Parallel-forms method:** After a period of time, the same group is given an alternative test form.
    c. **Split-half method:** Two scores are obtained after dividing a test into two parts. The observations that are paired are correlated.
    d. **Internal-consistency methods:** It is calculated using the average correlation between statements and the number of statements on the test.

In this present study Cronbach's Alpha and Split - half method was administered for measuring the entrepreneurial abilities scale internal consistency as follows.

Cronbach's Alpha Method: Cronbach's alpha increases as the correlations between the

statements increase. As a result, the coefficient measures the test's internal consistency. It usually has a maximum value of 1 and a minimum value of 0. The coefficient alpha is the basic formula for determining the reliability of test scores based on internal consistency for statements that are not dichotomous (Nunnally, 1967). According to Cronbach (1951), the coefficient alpha (∝) is the mean of all possible split-half coefficients that can result from different splitting of a test and can be used as an index of inter-statement homogeneity. Cronbach's alpha is calculated in a more straightforward manner by comparing the variance for all individual statement scores to the total score of each observation for each scale parameter (typically individual survey respondents or test takers). The number of test statements, the average covariance between pairs of statements, and the total score variance all influence Cronbach's alpha.

Split - half method: The scale was tested using the split-half method in this method. The scale was given to 40 non-sample respondents (from outside the study area) and was divided into two halves based on the number of statements that were odd or even. Correlation analysis was performed on the total scores obtained for odd and even-numbered statements. On the scores of even-numbered statements and the scores of odd-numbered statements, the Pearson product-moment correlation coefficient is calculated.

11. After that, the developed scale was standardised by determining its Validity. Validity is a measure of a test's ability to accurately measure what it was created to measure (Dwyer, 1993).. A test may be appropriate for one group but not for another. Validity is the process of gathering and evaluating data in order to determine how well a test measures what its authors claim it does. Despite the fact that there are numerous procedures for determining validity, all aspects of validity are interconnected. When developing instruments to measure psychological traits, the following types of validity are usually considered:

The validity of the newly developed scale was tested in this study. Though there are various methods for determining validity, in this case, content validity was used. Kerlinger (1986) defines content validity as the representative or sampling adequacy of a measuring instrument's content, substance, matter, and topics. A group of experts determined the content validity. Because the statements were chosen from the universe of content, it was ensured that they covered all aspects of dairy farmers' entrepreneurial abilities in the central Indian states of Chhattisgarh.

Result and Discussion

Construction of Entrepreneurial Abilities Development Index (EADI)

The present study was conducted in a central Indian state of Chhattisgarh. The scale on entrepreneurial abilities of dairy farmers was developed by applying standard procedure which is mentioned as under of the step by step procedure followed:

Collection of Parameters

The gathering of parameters Thirty entrepreneurial abilities parameters were identified after a review of literature on various measures of entrepreneurial abilities and discussions with experts in the fields of agricultural extension, dairy science, and dairy entrepreneurs. Following that, using the scales construction technique developed by Likert (1932), a group of subjects were asked to define or measure a large number of statements or parameters, and to respond to each statement with their agreement or disagreement with the parameters. These thirty parameters were mailed to a panel of judges in the fields of extension education, communication, administration, and dairy entrepreneurs for this purpose. In total, 30 judges were asked to rate the parameters' appropriateness (relevancy) for inclusion in the scale.

Relevancy Test

The parameter was screened for relevance using the relevancy weightage. As a result, parameters with a relevancy weightage of more than 0.75 were taken into account. Twenty-six parameters with a relevancy weightage of more than 0.75 were chosen using this method.

Item Analysis of Parameters (Calculation of t-value)

The goal of statement analysis is to identify statements that form an internally consistent scale and eliminate those that do not represent the scope of the study (Spector, 1992). The selected twenty-six parameters were 't-tested' based on relevancy weightage. The respondents were arranged in ascending order according to their total score. Then one-third of respondents with the highest total score (33.33 percent) and one-third of respondents with the lowest total score (33.33 percent) were chosen. The criterion groups for statement analysis were provided by these two groups. Formula was used to calculate the critical ratio (t) for each statement. The significance of the difference between these two groups' means was then determined by the't' test. The 't' value is a measure of how well a given parameter distinguishes between high and low groups based on score, and the t – values were used to sort the rank order. Significant t-values at the 0.05 level of Probability were used to screen parameters.

Selection of the parameters

After calculating the t value for Parameters was screened with significant t- values at the 0.05 level of Probability were finally selected. The EADI Included 15 Parameters s, Viz. Innovativeness, Leadership, Decision-making ability, Persistence, and hard work, Adoption propensity, Personal Efficacy (Who Am I?), Communication Skills, Ability in rational marketing, Ability to co-ordinate activities, Cosmo politeness, Level of aspiration, Scientific orientation, Competition orientation and Personality and Information seeking behaviour which is clearly depicted from the Table 1. that the parameters and their Relevancy Weightage, Mean, standard deviation, t – Value and Probability (P) values.

Table 1. Parameters analysis to develop Entrepreneurial abilities of dairy farmers based on judge parameters relevancy weightage and their respective t - value

Sl. No.	Parameters	Relevancy weightage	Mean	Std. Deviation	t-value	P-value
1	Innovativeness	0.81	2.43	0.57	-3.28	0.01
2	Leadership	0.76	2.27	0.58	-2.25	0.05
3	Decision-making ability	0.83	2.50	0.57	-3.00	0.02
4	Persistence and hard work	0.79	2.37	0.49	-3.67	0.01
5	Adoption propensity	0.76	2.27	0.52	-2.75	0.02
6	Personal Efficacy (Who Am I?)	0.86	2.57	0.57	-2.24	0.05
7	Communication Skills	0.79	2.37	0.61	-5.01	0.00
8	Ability in rational marketing	0.83	2.50	0.63	-4.00	0.00
9	Ability to co-ordinate activities	0.79	2.37	0.61	-6.00	0.00
10	Cosmo politeness	0.78	2.33	0.66	-4.00	0.00
11	Level of aspiration:	0.86	2.57	0.57	-3.21	0.01
12	Scientific orientation	0.84	2.53	0.57	-4.74	0.00
13	Competition orientation	0.81	2.43	0.57	-3.21	0.01
14	Personality	0.77	2.30	0.60	-3.28	0.01
15	Information seeking behaviour	0.79	2.37	0.61	-3.28	0.01

Identifying the Crucial parameters through the Scale – Product Methodology

Thereafter, selection of parameters, Scale – Product Methodology(Kumar, 1999), and Ghosh et al. (2009) procedure was used to determine the importance of 15 EADI parameters. Respondents were asked to assign a weighting to each statement in the range 0-100, based on the Importance of the Particular Parameters for Measuring the EADI for Dairy Farmers, so that all of the relevant identified parameters received a total of 100.

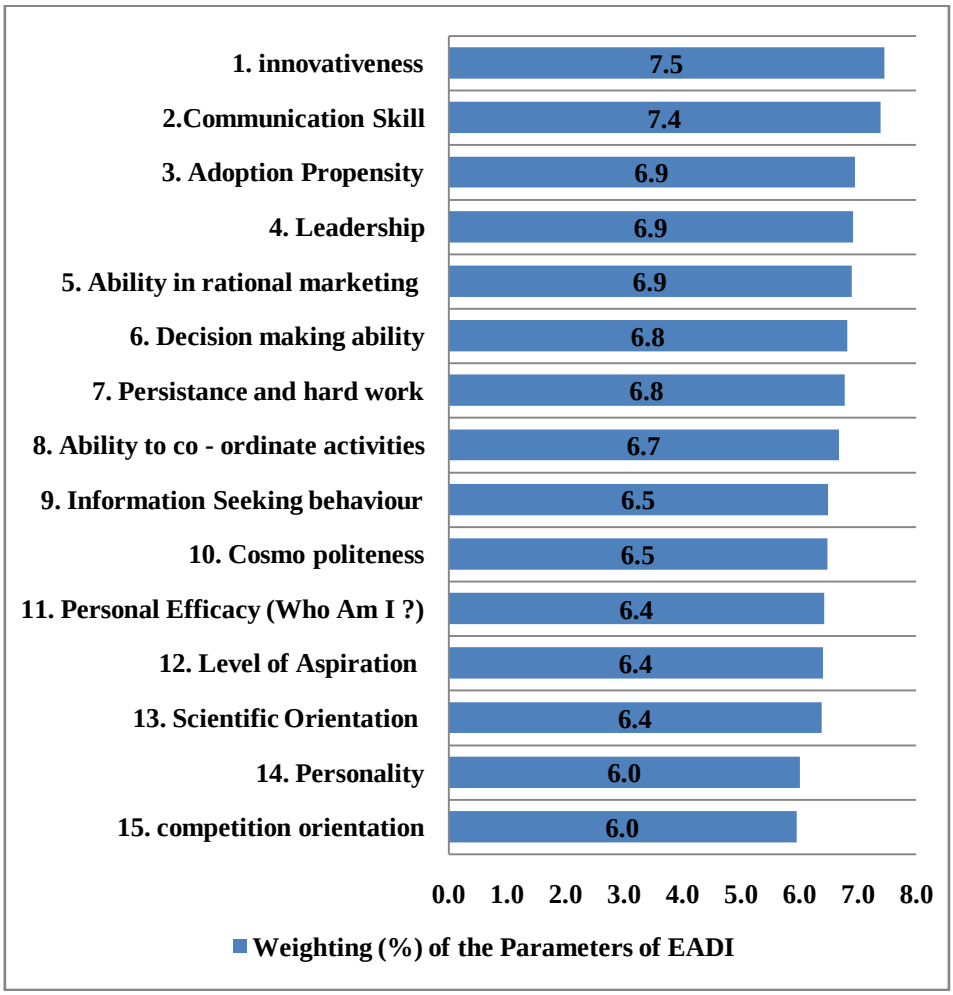

Figure1. Entrepreneurial Abilities Development Index (EADI) with its Parameters

The critical nature of each statement alluded to its significance in assessing dairy farmers' entrepreneurial abilities. The EADI's final framing, including the parameters chosen and their respective weighting, is depicted in Figure 1. The weighting of the parameter s varied from 6 to 7.5 %. Innovation was perceived as a most crucial parameter in the EADI with 7.5 % weighting, followed by Communication Skill (7.4%), Adoption Propensity (6.9%), Leadership (6.9%), Ability in rational marketing (6.9%), Decision-making ability (6.9%), Persistence and hard work (6.8%), Ability to coordinate activities (6.7%), Information Seeking behaviour (6.5%), Cosmo politeness (6.5%) Personal Efficacy (6.4%), Level of Aspiration (6.4%) Scientific Orientation (6.4%) Personality (6.0%) and competition orientation (6.0%).

An index was developed to measure the overall entrepreneurial abilities of dairy farmers by using the following formula:

EADI = (0.75 *W_1 + 0.74* W_2 + 0.69* W_3+ 0.69* W_4 + 0.69* W_5 + 0.69* W_6 + 0.68* W_7 + 0.67* W_8 + 0.65* W_9 + 0.65* W_{10} + 0.64* W_{11} + 0.64* W_{12} + 0.64* W_{13} + 0.6* W_{14} + 0.6* W_{15} **)**

EADI = $\sum_{i=1}^{n} X_i W_i$

W_i **= (**W_1= Innovation W_2 = Communication Skill, W_3 = Adoption Propensity, W_4 = Leadership, W_5 = Ability in rational marketing**,** W_6 = Decision making ability, W_7 = Persistence and hard work, W_8 = Ability to Coordinate Activities, W_9 = Information Seeking Behaviour, W_{10} = Cosmo politeness, W_{11} = Personal Efficacy, W_1W_{12} = Level of Aspiration, W_{13} = Scientific Orientation, W_{14} = Personality and W_{15} = Competition Orientation**)**

Selection of the Statements of EADI

Therefore, the statement selections were framed of each parameter of the step-by-step procedure followed as same the selection of

Parameters of scale. It has been widely discussed by Likert et. al. (1932) in that it has consciously developed and selected more statements than ever, because many of the statement would be unsatisfactory for the purpose intended of the instrument. The declarations were edited according to Edward's 14 criteria (1969). Following that, five statements were chosen for each parameter based on the highest relevance means score (Ghosh et. al., 2009). Averaging the scores of five statements produces the mean value of each parameter. The following are the interpretations for each of the EADI's 15 parameters (Table 2):

1. Innovation is defined as the application of better solutions to meet new requirements and unarticulated needs of dairy farmers. These parameters are measured with the help of five statements Viz. Are you using Artificial Insemination for a dairy animal, While others see nothing unusual in the surrounding, I can perceive in it new business opportunities, Do you want to learn new techniques to improve dairy farming, If you get the opportunity to expose to the new ways of managing the dairy farming, would you attend and Having pregnancy diagnosis done between 60-90 days after service.
2. Communication skills are abilities to use when giving and receiving various types of information such as new ideas, feelings, or even a dairy update. These parameters are measured with the help of five statements Viz. There is timely communication regarding the dairy farming/changes if any, Gather information on farm technology from different sources, Give clear instructions to farmworkers about the job to be done, Participate in the discussions with extension workers and There is clarity in the information received regarding dairy farming.
3. Adoption Propensity of dairy farming technology is associated with financial, scale, demographic, and other factors of dairy. These parameters are measured with the help of five statements Viz. Do you keep proper sanitary conditions inside byre?, Do you get dairy animals vaccinated against the diseases like H.S., F.M.D., and B.Q. etc? Do you isolate diseased animals?, Do you possess improved breeds of dairy animals?, Do you allow the calf to suckle the recommended quantity of milk before and after milking?, and Do you feed concentrate mixture for balanced feeding of a calf, heifer, pregnant and milch animals?.
4. Leadership captures the essentials of being able and prepared to inspire others, dairy farmers. These parameters are measured with the help of five statements Viz. Should show concern to the feeling of his subordinates, Whenever you see a new practice, did you initiate a discussion about it with your colleagues?, Leader should appreciate when subordinates do a good job and Do the other people regard you as a good source of information on new practice?.
5. Ability in Rational Marketing is a method of creating advertising that appeals to dairy consumers by stating how it will meet their practical needs using logical arguments. These parameters are measured with the help of five statements which consider Proper handling and packing of milk products to avoid transportation losses, Considering the prices customers prepared to pay for the products before marketing, Collecting information about malpractice, delayed payment of money, and other pilferages if any, at various markets and participate in the discussions with extension workers and Do market information play an important role in dairy farming in selling milk?.
6. Decision-Making Ability is defined as the mental process that leads to the selection of a belief or a course of action from a set of alternatives dairy resources. It explored the five statements referring to Implementation of the decision, Breed of a milch animal to be purchased, Applying new practices, ideas, technologies, Vaccination against contagious disease and identification, and analysis of the problem.
7. Persistence and Hard Work is an attitude of sticking to a single idea, discipline, ideal, or set of rules in order to succeed or achieve a goal, despite the challenges that

dairy farmers face. Its includes five statements as I don't allow failures to discourage me, Once I have started on a task I usually carry it to its completion, I work just as hard as most people I know, I find myself working harder under stress and When I fail in a goal, I immediately turn my attention to another goal.

8. Ability to Co-ordinate Activities refers to the ability to perform difficult dairy Spatio-Temporal Movement Structures quickly and purposefully. It is assessed the five parameters as When did you consult the veterinarian about the health of `animals, When did you estimate the required quantity of fodder, Do you take precautions for clean milk production? If yes, when?, Collecting information about 'various marketing available to sell the produce and When did you vaccinate the animals?.
9. The act of actively seeking information to respond to a specific dairy query is the information seeking behaviour. It is evaluated on the basis of five statements that address, Preserve in the form of printed literature like leaflets, folders, clippings appeared in newspapers, etc, Discussion with officials of the State Department of Animal Husbandry, Discussion with family members, friends, fellow farmers, progressive farmers, and neighbors, By conducting demonstrations to show the practical aspects of received information and Weigh the merit of innovation in the light of experience.
10. Cosmo Politeness is the ideal behaviour of human beings, who adheres to the views of what constitutes this community may include a focus on moral standards or cultural forms of dairy farming related technology practices. It is assessed concerning five parameters addressing, A dairy entrepreneur learns many things from the happenings and experiences of his village only, There is no need to collect additional information from outside the village for a successful entrepreneur, Keeping contact with a progressive dairy entrepreneur is useful for managing the dairy enterprise, There is no need to collect additional information from outside of the village for a successful dairy entrepreneur and An entrepreneur learns many things from the happenings and experiences of his village only.
11. Personal Efficacy (Who Am I?) refers to beliefs about dairy farmers' capability to accomplish challenging goals which evaluated through the past experiences of dairy farmers and make judgments about what chooses to try to accomplish in the future. These parameters measured with the help of five statements that address a Something about your dislikes i.e., all those things which you do not like, You have something ambitions in your life, What would you do if some hurdles come in implementing the plan you are proposing to take up for action?, I doubt my ability to cope under a new untested condition and Even if I am capable, hard-working, and ambitious, if I don't have money, I can't start dairy farming.
12. Level of Aspiration is a conceptual approach to a group of dairy farmers or individual dairy farmers' performance that assumes that one's initial goals and ambitions influence both particular performances and their emotional, motivational, and behavioral consequences. It is assessed concerning five parameters addressing, Where on the ladder do you feel personally stood five years ago?, Where on the ladder do you feel personally stand at present?, You may be thinking of increasing your business every year and you may try to do, We all to education to our children but the level of education to which we want to provide to our children may be different and Did you try to increase our income in many ways, either by increasing the period of work or by increasing the level of work.
13. Scientific Orientation is adaptability, or a willingness to change as circumstances change, which is fostered by these basic notions of dairy process differences. It is assessed the five parameters as a good entrepreneur experiment with new ideas in a dairy enterprise, New methods of dairy farming give better results than the old methods, The way of managing dairy is our forefathers are still the best way to

manage it today, Traditional methods of dairy management have to be changed to raise the level of living of a dairy entrepreneur and Even a dairy entrepreneur with lots of experience should use new methods of dairy farming.

14. Personality is defined as the set of behaviours, cognitions, and emotional patterns that dairy farmers develop as a result of biological and environmental factors. Its explored the five statements referring, Do you worry over what people think of you?, Do you like to take the lead in a social gathering?, Do you like to talk before a group of people"?, Do you always try to make others agree with you? and do you suffer from a feeling of inferiority?
15. Competition Orientation is a constant reassesses its strengths and weaknesses relative to its competitors in dairy markets, The better milk production in comparison to the neighbors brings more prestige, It is not good for milk production to become too ambitious in life, I feel that unfriendly attitudes toward one another develop when individuals compete. I always welcome healthy competition to give a quality product to the market and the key points of success should not be divulged to other dairy farming.

Table 2. Statements analysis to develop Entrepreneurial abilities of dairy farmers based on judge statements relevancy weightage and their respective t – value

Sl. No.	Parameters of Entrepreneurial Abilities	Relevancy Weightage	Mean	Std. Deviation	t-Value	P-Value
1. Innovativeness						
1	Are you using Artificial Insemination for dairy animal	0.91	2.73	0.52	-2.236	0.052
2	While others see nothing unusual in the surrounding, I can perceive in it new opportunities for business.	0.86	2.57	0.68	-2.236	0.052
3	Do you want to learn new techniques to improve dairy farming?	0.82	2.47	0.51	-2.689	0.025
4	If you get the opportunity to expose to the new ways of managing dairy farming, would you attend?	0.77	2.30	0.70	-3	0.015
5	Having a pregnancy diagnosis is done between 60-90 days after service.	0.76	2.27	0.78	-4.714	0.001
2. Communication Skill						
1	There is timely communication regarding the dairy farming/changes if any	0.91	2.73	0.52	-4.58	0.00
2	Gather information on farm technology from different sources.	0.91	2.73	0.52	-3.28	0.01
3	Give clear instructions to farmworkers about the job to be done.	0.86	2.57	0.68	-2.24	0.05
4	Participate in discussions with extension workers.	0.86	2.57	0.63	-3.00	0.02
5	There is clarity in information received regarding dairy farming	0.82	2.47	0.57	-2.24	0.05
3. Adoption Propensity						
1	Do you keep proper sanitary conditions inside byre?	0.86	2.57	0.57	-3.00	0.02
2	Do you get dairy animals vaccinated against the diseases likeH.S., F.M.D., and B.Q. etc? Do you isolate diseased animals?	0.83	2.50	0.57	-2.24	0.05
3	Do you possess improved breeds of dairy animals?	0.81	2.43	0.57	-3.28	0.01
4	Do you allow the calf to suckle the recommended quantity of milk before and after milking?	0.79	2.37	0.61	-2.69	0.03
5	Do you feed concentrate mixture for balanced feeding of calf, heifer, pregnant, and milch animals?	0.79	2.37	0.49	-2.25	0.05
4. Leadership						
1	Should show concern to the feeling of his subordinates	0.88	2.63	0.56	-2.333	0.045
2	Whenever you see a new practice, did you initiate a discussion about it with your colleagues?	0.83	2.50	0.63	-2.333	0.045
3	Leader should appreciate when subordinates does a good job	0.77	2.30	0.60	-3.00	0.015

4	Did you participate in a discussion on new practices on your enterprise in the group meeting or peer groups?	0.77	2.30	0.75	-2.862	0.019
5	Do the other people regard you as a good source of information on new practice?	0.76	2.27	0.64	-3.28	0.01
5. Ability in Rational Marketing						
1	Proper handling and packing of milk products to avoid transportation losses	0.86	2.57	0.57	-2.69	0.025
2	Considering the prices customers prepared to pay for the products before marketing	0.86	2.57	0.57	-4.00	0.003
3	Collecting information about malpractice, delayed payment of money, and other pilferages if any, at various markets.	0.84	2.53	0.57	-5.01	0.001
4	Collecting information about 'various marketing available to sell the produce.	0.83	2.50	0.63	-2.69	0.025
5	Does market information play an important role in dairy farming in selling milk?	0.81	2.43	0.57	-3.28	0.01
6. Decision-Making Ability						
11	Implementation of the decision	0.86	2.57	0.57	-2.69	0.025
1	Breed of a milch animal to be purchased	0.83	2.50	0.57	-2.25	0.051
4	Applying new practices, ideas, technologies	0.79	2.37	0.61	-2.24	0.052
7	Vaccination against contagious disease	0.79	2.37	0.61	-2.24	0.052
15	identification and analysis of the problem	0.81	2.43	0.57	-3.28	0.01
7. Persistence and Hard Work						
1	I don't allow failures to discourage me.	0.88	2.63	0.73	-3.28	0.01
2	Once I have started on a task I usually carry it to its completion.	0.86	2.57	0.80	-2.27	0.052
3	I work just as hard as most people I know	0.86	2.57	0.74	-2.69	0.025
4	I find myself working harder under stress	0.84	2.53	0.76	-3.00	0.015
5	When I fail in a goal, I immediately turn my attention to another goal	0.82	2.47	0.75	-3.00	0.015
8. Ability to Co-ordinate Activities						
1	When did you consult the veterinarian about the health of `animals?	0.84	2.53	0.57	-4.00	0.00
2	When did you estimate the required quantity of fodder?	0.81	2.43	0.57	-3.28	0.01
3	Do you take precautions for clean milk production? If yes, when?	0.79	2.37	0.61	-6.00	0.00
4	When did you estimate the capital required for dairy farming?	0.78	2.33	0.66	-6.00	0.00
5	When did you vaccinate the animals?	0.77	2.30	0.60	-3.28	0.01
9. Information Seeking Behaviour						
1	Preserve in the form of printed literature like leaflets, folders, clippings appeared in newspapers etc.	0.84	2.53	0.57	-3.28	0.01
2	Discussion with officials of the State Department of Animal Husbandry	0.83	2.50	0.63	-5.01	0.00
3	Discussion with family members, friends, fellow farmers, progressive farmers and neighbors	0.81	2.43	0.57	-6.00	0.00
4	By conducting demonstrations to show the practical aspects of the received information	0.78	2.33	0.66	-3.28	0.01
5	Weigh the merit of innovation in the light of experience	0.77	2.30	0.60	-4.00	0.00
10. Cosmo Politeness						
1	A dairy entrepreneur learns many things from the happenings and experiences of his village only	0.88	2.63	0.56	-2.33	0.05
2	There is no need to collect additional information from outside the village for a successful entrepreneur.	0.83	2.50	0.63	-3.00	0.02
3	Keeping contact with progressive dairy entrepreneur	0.80	2.40	0.77	-3.28	0.01

	is useful for managing the dairy enterprise					
4	There is no need to collect additional information from outside of the village for a successful dairy entrepreneur	0.77	2.30	0.60	-4.81	0.00
5	An entrepreneur learns many things from the happenings and experiences of his village only.	0.77	2.30	0.60	-2.33	0.05
11. Personal Efficacy (Who Am I?)						
1	Something about your dislikes i.e., all those things which you do not like.	0.91	2.73	0.52	-4.81	0.00
2	You have something ambitions in your life.	0.88	2.63	0.56	-3.28	0.01
3	What would you do if some hurdles come in implementing the plan you are proposing to take up for action?	0.86	2.57	0.68	-2.24	0.05
4	I doubt my ability to cope under a new untested condition.	0.82	2.47	0.57	-2.24	0.05
5	Even if I am capable, hard-working and ambitious, if I don't have money, I can't start a dairy farming	0.80	2.40	0.77	-4.58	0.00
12. Level of Aspiration						
1	Where on the ladder do you feel personally stood five years ago?	0.86	2.57	0.63	-3.50	0.01
2	Where on the ladder do you feel personally stand at present?	0.84	2.53	0.51	-3.00	0.02
3	You may be thinking of increasing your business every year and you may try to do	0.82	2.47	0.51	-2.69	0.03
4	We all to education to our children but the level of education to which we want to provide to our children may be different.	0.77	2.30	0.75	-3.00	0.02
5	Did you try to increase our income in many ways, either by increasing the period of work or by increasing the level of work?	0.77	2.30	0.70	-3.00	0.02
13. Scientific Orientation						
1	A good entrepreneur experiment with new ideas in dairy enterprise.	0.83	2.50	0.57	-2.25	0.05
2	New methods of dairy farming give better results than the old methods.	0.83	2.50	0.63	-2.33	0.05
3	The way of managing dairy is our forefathers are still the best way to manage it today.	0.81	2.43	0.57	-3.28	0.01
4	Traditional methods of dairy management have to be changed to raise the level of living of a dairy entrepreneur.	0.79	2.37	0.49	-3.00	0.02
5	Even a dairy entrepreneur with lots of experience should use new methods of dairy farming	0.76	2.27	0.58	-2.45	0.04
14. Personality						
1	Do you worry over what people think of you?	0.86	2.57	0.57	-2.69	0.03
2	Do you like to take the lead in a social gathering?	0.86	2.57	0.63	-2.69	0.03
3	Do you like to talk before a group of people"?	0.84	2.53	0.51	-3.00	0.02
4	Do you always try to make others agree with you?	0.82	2.47	0.51	-3.00	0.02
5	Do you suffer from a feeling of inferiority?	0.77	2.30	0.70	-3.50	0.01
15. Competition Orientation						
1	The better milk production in comparison to the neighbors brings more prestige.	0.86	2.57	0.57	-2.69	0.03
2	It is not good for milk production to become too ambitious in life.	0.84	2.53	0.57	-4.00	0.00
3	I feel that unfriendly attitudes toward one another develop when individuals compete.	0.81	2.43	0.57	-3.28	0.01
4	I always welcome healthy competition to give a quality product to market	0.79	2.37	0.61	-3.28	0.01
5	The key points of success should not be divulged to other dairy farming.	0.79	2.37	0.61	-2.24	0.05

Standardization of the scale:The developed scale was standardised further by determining its reliability and validity.

Reliability of the scale

The Crobanch 's Alpha method and the half-technique for reliability testing are employed in the present study.

***Cronbach's Alpha Method*:** Cronbach's alpha is calculated more simply by comparing the variance for all individual statement scores to the total score for each observation for each scale parameter (usually individual survey respondents or test takers). The alpha coefficient of reliability, which is used to provide a general assessment of a measure's reliability, ranges from 0 to 1. If all of the scale statements are completely unrelated to one another (i.e., they are not correlated or share no covariance), alpha equals 0; if all of the statements have a high covariance, alpha approaches 1 as the number of statements in the scale grows. In other words, the more the parameters have shared covariance, the higher the 'alpha' coefficient, and probably the same underlying concept is measured.Dairy farmers' entrepreneurial abilities In the case of social sciences, the Cronbach alpha value was 0.832, indicating high reliability.

Split - half method:Split-half reliability is the resulting coefficient. On the basis of the analysis, the split-half reliability correlation coefficient was found to be 0.49 significant at a 0.01 probability level. On a 15-parameter test, for example, 8 of the parameters would be correlated with the other 7 parameters, with each set of correlated parameters having similar content to adjust the split-half reliability into full test reliability. In effect, the correlation between paired scores would occur based on scores from two tests of seven and eight parameters. However, the overall test of 15 parameters must be reliable. As a result, the Spearman-Brown (SB) formula is used to approximate the overall test's reliability. The total test reliability (15 parameters) was 0.66, which was significant at 1% probability ($p<0.01$). The alpha Cronbach Reliability test was administered to 40 non-sample respondents (from outside the study area) to compare the significant reliability of 15 parameters of dairy farmer entrepreneurial abilities. A Cronbach alpha value of 0.66 was found here, indicating the same level of reliability. The Cronbach alpha value and the Spearman Browns reliability value both indicated that the scale was reliable. According to the study, the test is reliable for assessing the entrepreneurial abilities of dairy farmers in the state of Chhattisgarh in central India.

Validity of Scale

Guilford (1954) defined the validity of a test as "measuring what it is supposed to measure." The validity of a test, according to Anasthasi (1976), is determined by what the test measures and how well it does so. The degree to which the scale is capable of achieving the goals or purposes is referred to as the scale's validity. It is determined by the validity of the content. The content validity of the scale was investigated to see how well it represented the subject matter under investigation. To construct the current scale, sufficient care was taken in collecting and selecting parameters and statements. It included statements that represent the universe of the content of dairy farmers' entrepreneurial abilities for maintaining the dairy enterprise, and it covered important parameters responsible for the entrepreneurial abilities of dairy farmers based on the judge's ratings. The scale satisfied the content validity because all possible parameters and statements covering the universe of content were chosen after consulting with experts, subject matter specialists, and reviewing the available literature on the subject, as well as calculating relevancy weightages.

Administration of the scale

The final scale, which would assess dairy farmers' entrepreneurial abilities, had 15 parameters and five statements under each parameter. Positive statements were rated as Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree on a five-point scale, with scores of 5, 4, 3, 2, and 1 for positive statements. In the case of negative statements, reversed scoring was used. The dairy farmers were given the final entrepreneurial abilities scale. The score obtained for each parameter under each statement was summed up to get the entrepreneurial abilities of dairy farmers in central Indian states of Chhattisgarh.

Category	Score
Strongly Agree	5
Agree	4
undecided	3
Disagree	2
Strongly Disagree	1

Categorization of the Respondents

Following the total Entrepreneurial abilities score, the respondents would be categorised as follows based on the range values of the Entrepreneurial abilities score possible, Mean ±2 sd. The formula for categorization, which is clearly defined in table 3, is as follows:

Table 3. Respondents categorization based on managerial efficiency.

S. No.	Category	Managerial efficiency
1	Least Level of Managerial efficiency	$\bar{x} - 2\sigma$
2	Less Level of Managerial efficiency	$\bar{x} - 2\sigma$ to $\bar{x} - \sigma$
3	Medium Level of Managerial efficiency	$\bar{x} - \sigma$ to $\bar{x}$
4	Highly Level of Managerial efficiency	$\bar{x}$ to $\bar{x} + \sigma$
5	Very highly Level of Managerial efficiency	$\bar{x} + \sigma$ to $\bar{x} + 2\sigma$

$\bar{x}$ = Mean, σ = Standard Deviation

Conclusion

The study conclude that when assessing the direction and intensity of dairy farmers', scientists', resource partners', or other stakeholders' entrepreneurial abilities, the standards scale would be useful, making it easier for policymakers to make the best decisions possible. During the reliability test, the scale was able to distinguish between the different categories of farmers. There is merit in classifying dairy farmers into five categories based on their entrepreneurial abilities and the percentage of total respondents. This method is particularly useful for assessing behavioural characteristics such as entrepreneurial abilities. The scale is a reliable one that can be used to investigate different farmers' entrepreneurial abilities in relation to the same business at different times. By validating the scale further, it can be applied to a variety of future innovative extension methods. The relevance analysis points out that the statistical significance of the selected statements is relevant. This scale can therefore be used by all individuals and organisations to objectively measure the entrepreneurial abilities of dairy farmers.

Acknowledgments

The writers express their heartfelt thanks to the tribal communities in of Chhattisgarh. The authors are very grateful to Dr. (Mrs.) Anindita Maam, Dr. Digvijay Singh Dhakre Sir, and Ankur Gupta Sir for their valuable input and successful participation in the study. We extend our gratitude to faculty members and staff from the Agricultural Extension Department, Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati (A Central University), Sriniketan, West Bengal, India for guidance, support, and encouragement.

Author Contribution

This manuscript research was conducted and drafted by Ravi Kumar Gupta under the supervision of Dr. (Mrs.) Anindita Saha,. Therefore, I would like to fully assure you that, this manuscript was critically reviewed by the Author and Co-Author of this Manuscript.

Declaration About Ethics Committee Approval

I am a Ph.D Research Scholar in dept. Agricultural Extension in and I would like to say that Visva - Bharati Research Board (ethical committee) was approved the My study protocol on the entitled a scale for measuring dairy farmers' entrepreneurial abilities in the central Indian state of Chhattisgarh..

Declaration About Procedures Was Carried Out In Accordance With Relevant Guidelines".

I would like to say that all the Scale development standard procedures were carried out in accordance with Research guidelines of

Visva - Bharati Research board and following the processor of well known authentic Research methodology book on Foundations of Behavioral Research: Educational and Psychological which is written by Kerlinger.

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PROCESS ENHANCEMENT IN EMERGENCY DEPARTMENT – A LEAN APPROACH IN A MULTI-SPECIALTY HOSPITAL, CHENNAI

Bhoomadevi A[1], Nithya Priya S[2], Ganesh M[3]
[1,2]Sri Ramachandra Faculty of Management Sciences, SRIHER(DU), Chennai, Tamil Nadu, India
[3]Department of Physiology, ACS Medical College, Chennai, Tamil Nadu, India
[1]bhooma.ganesh@gmail.com

ABSTRACT

Purpose: *The need for enhancing the emergency department is with respect to the speed of service, crowding and patient safety is now widely accepted. Unlike outpatient and inpatient services in a hospital, there will be unscheduled and unanticipated patient inflow. Considering each minute as important while treating patients, the study focuses to assess the time taken for each step in the emergency process through lean approach.* ***Methods:*** *Quantitative study conducted on patients who visited emergency department during the months of June and August 2019 were considered except the complicated cases which require lot of procedures and dead cases (n=289) using simple random sampling technique. The workflows and time sequences was analyzed using value-stream mapping since many emergencies have begun to apply 'lean' as a way to fight against the problems of crowding, delays and waiting time. A preliminary assessment was done to understand the workflow and to know the exact steps in the emergency process and time sequence of each activity.* ***Results:*** *It was found that emergency department process show slight variation in cross consultant time and overall turn-around-time was either due to common causes or special causes. Process also showed the presence of non-value added activities, which were causing delays.* ***Conclusion:*** *approximately 30-50% of the work does not add value to patients. Process enhancement is possible through reduction of unnecessary waiting time and duplication of work can be reduced without adding more facilities into the process.*

Keywords: *lean, process, enhancement, emergency*

Introduction

The emergency department (ED) is the most operationally complex clinical setting of any modern hospital. The work hour in the emergency department usually will be in shifts. The employees will be having mixed skillsets. Hence, the emergency department is considered as continually challenged to perform an increasing number of high-quality services to treat increasing patient populations. Several reports have documented the prevalence and severity of ED overcrowding at specific hospitals. It has a major impact on increasing stress among nurses, ED waiting times, and the boarding of admitted patients in the ED while waiting for beds[6].

The ED process should be reviewed from the patient's point of view. Approximately 30 – 40% of process steps involve "handoffs" leading to error, duplication, or delay. Apart from that, repetition of paperwork, transportation delay, waiting, and unnecessary movements are the major types of waste from the patient's perspective. No one is accountable for the patient's "end to end" experience. Lean management helps to find out the non-value added and time-wasting processes to streamline the patient flow in the emergency department.

The objectives of the study are to identify the current patient process flow in the Emergency Department and the number of steps in the process, to assess the time taken for and between each step and to analyze the non-value-added steps.

Lean thinking is a philosophy that focuses on eliminating waste or non-value-added elements from the processes so that customers are given greater value[1]. One of the wastes in the emergency department is the time spent waiting, for example, the time waiting to be seen or waiting, for the next treatment. When waste is removed, patients flow smoothly and continuously[2]. The effects of Lean on employees were rarely discussed or measured systematically, but there were some indications of positive effects on employees and organizational culture. Success factors included employee involvement, management support, and preparedness for change[7].

A Value-stream map is a diagram that identifies all the steps in the patient pathway from order to delivery[3,4,5]. Time consumed for each step from registration to discharge is to be measured and documented on the value-stream

map to quantify the amount of value-added and non-value-added time in each step.

Materials and Methods

Study area: A multi-specialty hospital with around 1600 beds are concerned about the emergency departments' process flow which has non-value-added elements in the process and plans to improve the quality of ED through lean-approach.

Research problem: Waiting time in the Emergency department. The study is attempted to address this underlying problem through lean-approach.

Research design: It constitutes the overall framework of the research activities carried out in this study – lean-approach.

Sampling technique: The sample comprises patients who visited ED during the study period (June – August 2019). 289 randomly selected patients' were observed using observational time tracking sheets to check the time taken for the selected patients. The data collected from the staff through individual interviews usually in a conversational manner. Quantitative data comprises the time taken for the selected patients who visited the ED.

Tools for data analysis: Control charts for analyzing the variations, Value stream mapping for tracking the time, Pareto diagram for knowing the vital reason for discharge against medical advice, Root cause analysis to understand the problems causing waiting time.

Ethical committee approval was obtained from the Institutional Ethics Committee (IEC).

Limitations: It was not possible to capture all the activity which is consuming less time for few non-emergency patients. Complicated cases which require a lot of procedures and death cases are excluded from the study.

Results

An emergency department is a 24-hour operation, with a mixed set of skills who traditionally work 12-hour shifts with 28 beds (medical emergency – 6 beds, major trauma – 8 beds, minor trauma – 6 beds, pediatrics – 2 beds, barrier nursing – 1 bed, decontamination – 1 bed and observation – 4 beds). The selected ED has around 35 doctors (8 ER doctors and 4 junior doctors in each shift); 86 nurses (28 nurses and 2 triage nurses in each shift). Apart from that, 10 technicians (4 technicians in each shift) will work along with nurses; around 10 transport workers (3 in each shift); 6 ward secretaries (2 in each shift), and 6 administrators (2 in each shift). The shift timings in the ED are 7 am to 1 pm, 1 pm to 7 am and 7 am to 7 pm respectively. On average 70 - 80 patients enter into the hospital through ED who may turn later into inpatients (60%) or may get a discharge with completion of treatment and or discharged against medical advice (40%).

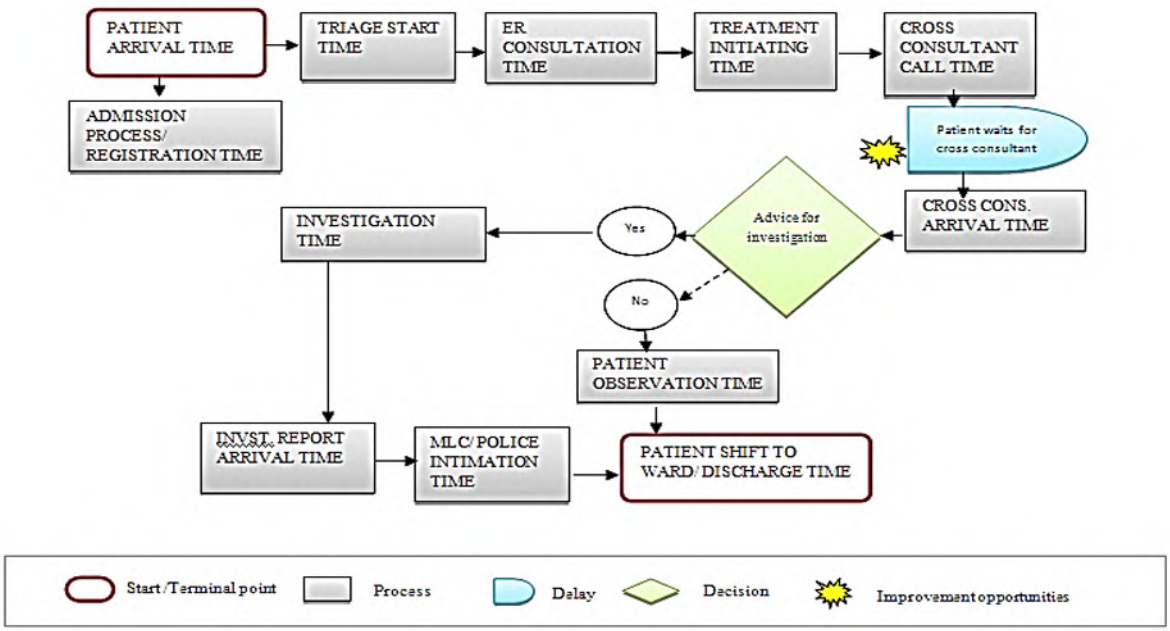

Figure.1 Value Stream mapping of emergency department

The flow chart is constructed for the emergency department process from the entry of the patients till they get admission or discharge or transfer to ICU as depicted in figure 1. Patients enter the emergency department by ambulance or by walk or car to the triage area where the triage nurse segregates the patients based on the priority number given. The emergency doctor starts initiating the diagnosis and treatment. The admission process (registration activity) happens parallel to the treatment process. The doctor may require investigations (radiology, lab test, etc) to be done for the patients to give an accurate diagnosis. If necessary he may call a cross consultant for seeking expert opinion/ decision based on the patient's condition. Meanwhile, the patient has to wait to get the investigation report or wait for the cross consultant to reach the emergency department. Then the doctor reviews the result of the report and advice the patients for further treatment or discharge.

In this study, after few discussions with the administrators, nurses, and patients, triaging, faster diagnosis, and treatment needs were taken. From the patient's perspective, the value for time is identified as one of the critical factors in the emergency department based on the patients' condition. The data were collected through direct observation in 3 months between 8 am – 4 pm. The time of entry and exit of 289 patients and the time they consumed at the department were recorded. The time taken for investigations, some administrative processes like registration/admission and discharge process, and the time spent at the waiting area were also observed and collected. Since the patient flow at the emergency department is complicated, and each patient condition is unique, only the normal and most repeated cases are considered. The overall turnaround time (TAT) for the emergency department process is 4 hours (Fig.2).

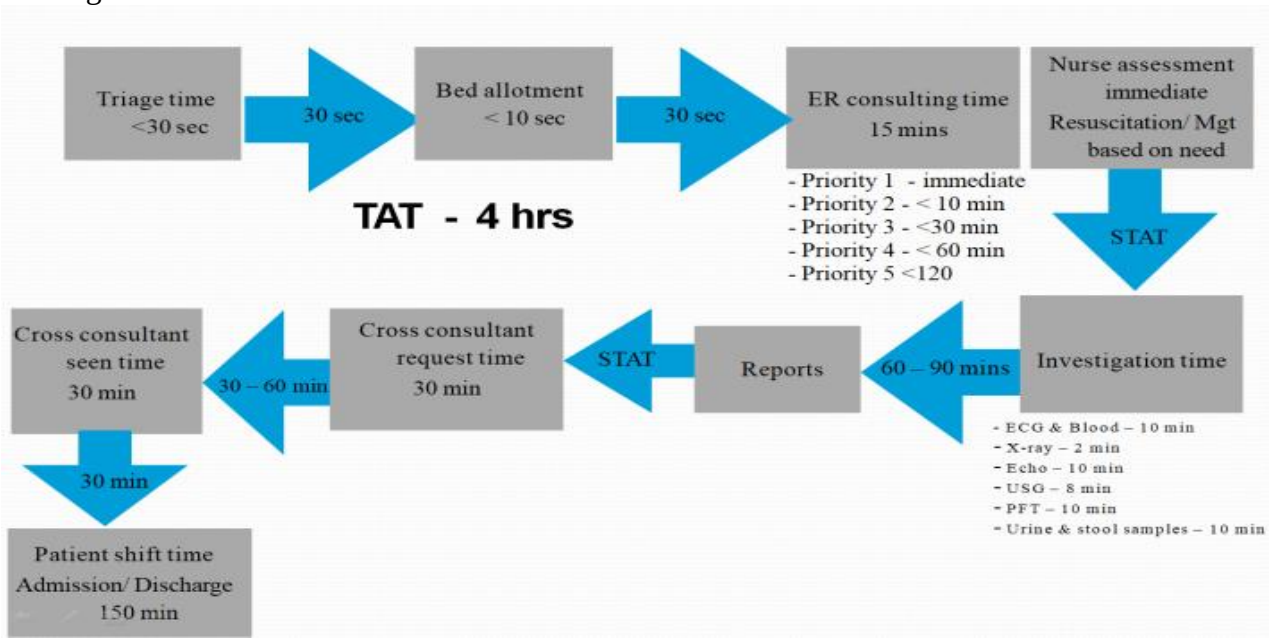

Figure.2 Value stream mapping with time

Table.1 Value-added and non-value added activities

Value-Adding Process	Value Enabling Activity	Non-Value Added Activity
Assessment by an Emergency paramedic Triaging Bed allotment	Preliminary assessment and triaging	Waiting for Bed allotment
Nursing assessment (Immediate) ER physician assessment	Treatment started Report writing	Wait for initial assessment (Nurse & ER) Waiting for the nurse to prepare the device. Repetition of Report writing
An investigation based on examination	Investigation started	Waiting for investigations Waiting for test (lab, x-ray, CT) reports

Cross consultant request	Plan of care enabled by the specialty consultant	Waiting for cross consultant
Admission (SRMC / ICU) /Discharge after getting treatment/ Discharge against medical advice	Transferred for further treatment/ discharge	Waiting for admission Waiting for discharge

From the above table, the average time taken for the whole process was 4 hours, of which 70 – 80 percent of the time is due to non-value-added activities, some of which are necessary but the majority of which were primarily waiting times.

Root Causes for waiting time (Non –Value Added activity) in the emergency department

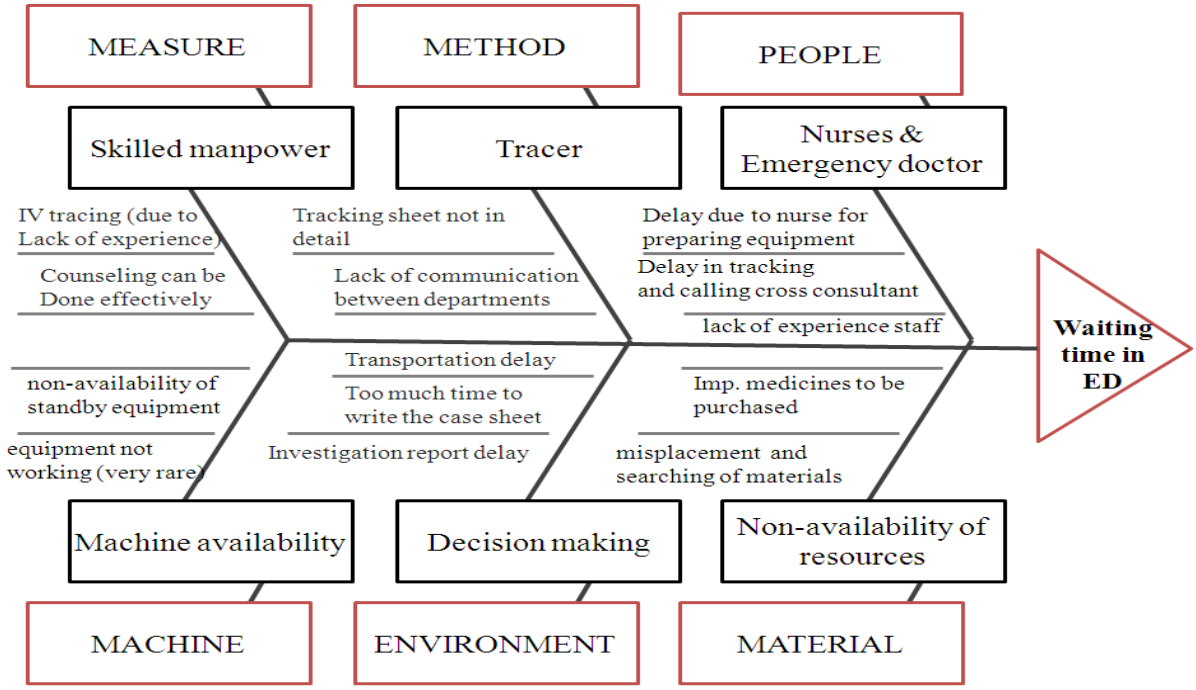

Figure.3 Cause and effect diagram

Through direct observation, the root causes of waiting time which is one of the non-value added activities were identified and the reasons are less number of experienced staff, time taken to prepare the equipment, tracking and calling the cross consultant, delay in transportation, and time taken for receiving the investigation report are the main reasons for waiting time in the emergency department.

Reasons for discharge against medical advice

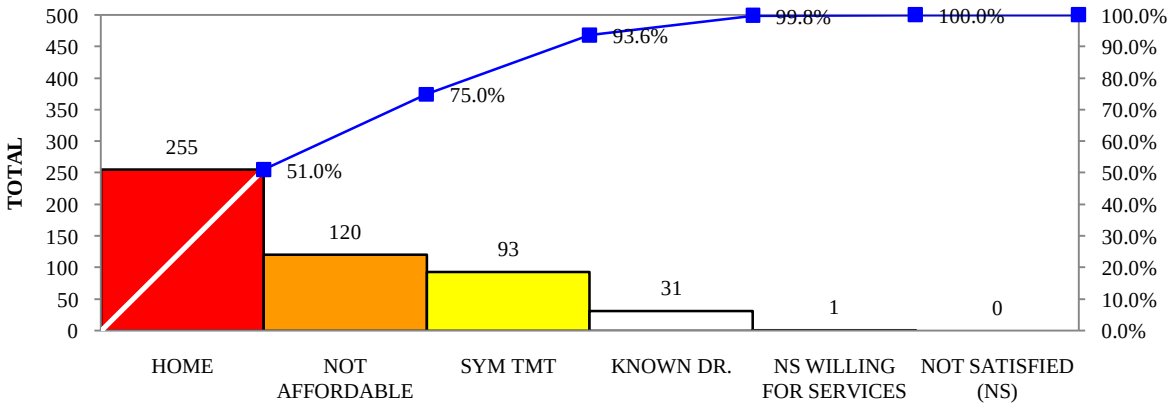

Figure 4 REASONS FOR DISCHARGE AGAINST MEDICAL ADVICE

From the above Pareto chart (Figure 4), solving just the two most important types of defects – going home earlier and the treatment not affordable – will remove 75 percent of all the defects. This is derived according to the Pareto principle, 80 percent of the results are determined by 20 percent of the causes.

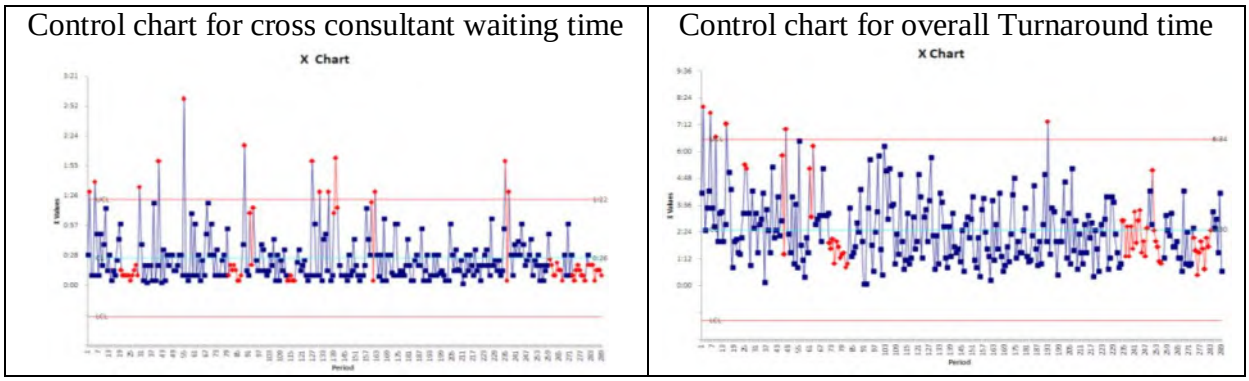

Figure 5 control charts for consultant waiting time and overall turnaround time

From figure 5 special causes for variation are detected on control charts by noticing certain patterns. The few points going beyond the control limits is one pattern which means there exists special causes for consultant waiting time are due to consultants held up in operation theatre, ICU rounds, the line was busy, etc. and special causes for overall turnaround time are due to the cumulative time delay of all the activities in the emergency process.

Discussion

Although several other studies have suggested that lean-type interventions can reduce time to consult a physician,[9,10,11,12,13] this study indicates that emergency department processes show slight variations in cross consultant and overall TAT was either due to common causes or special causes. However, some data points showing extreme variation. Process flow also showed the presence of non-value-added activities, which were causing delays. The study concludes by providing the following implications which are based on lean principles

- Effective counseling to retain the DAMA cases.
- RTLS implementation to track patients from entry to discharge will be effective.
- Kaizen principle.
- Software management (comprehensive HIS)
- Barcode time tracking - patient in and out time clocked through bar code scanning by the patient.
- Established process - Wait times to be reduced by not mixing the with review patients.
- Continuous training of manpower.
- Availability of separate Cross consultant for ED.

Lean approaches are becoming increasingly popular as EDs attempt to improve quality, efficiency, and patient outcomes,[7] and some jurisdictions such as the province of Saskatchewan are implementing its techniques broadly across the whole health care system.[8] In the United Kingdom, where the 4-hour rule was introduced for total time spent in the ED, one study also found that time to consult a physician did not improve.[12] Like any health care intervention, the implementation of lean should be evidence-based, with reasonable expectations of benefits, proper evaluation, and an awareness of potential downsides.[15,16]

Acknowledgments

The authors would like to acknowledge all the participants and the staff who cooperated while data collection in this study.

Disclosure

Ethics approval and consent to participate: Institution Ethics approval and informed consent were obtained.
Consent for publication: Yes
Availability of data and materials: Yes
Competing interests: The authors hereby declare there is no potential competing interest.
Funding: Nil.

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WORKFORCE ENGAGEMENT USING GREEN OCEAN STRATEGY AMONG NURSES IN A TERTIARY CARE HOSPITAL

Meera Aishwarya S[1], Syed Mohammed Ali M[2] and S. Nithya Priya[3]
[1,2]SSri Ramachandra Institute of Higher Education and Research, Porur, Chennai, India
[3]Sri Ramachandra Institute of Higher Education and Research, Porur, Chennai, India

ABSTRACT

The core theme of the study is truly based on "Green Ocean Strategy" (GOS), which is tested on "Workforce Engagement" in Healthcare Industry. Where GOS stands to exploit new demand & engage in self-competition. Instead of commonly benchmarking against the competition, the focus is can really submit or convey what the healthcare industry can really submit or convey. And the need of employees to be engaged in the Healthcare sector is about being entailed as members of the team, empowering in nature, Organizational goals, evolve new skills, support, and recognition for achievement. At the end of the study, it can be understood that how the workplace environment and its employees influence Product and Customer Services by creating more value concerns.

Keywords: *Green Ocean Strategy, Workforce Engagement, Healthcare Sector, Workplace Environment*

Introduction

Employee Engagement is also known as Representative strengthening can be characterized in various manners. It's about responsibility and trust. It's the point at which you give representatives a specific level of self-rule and duty regarding dynamic in their everyday work. Yet, it's something other than that. At the point when you enable representatives to venture up, settle on their own choices and clear their own way to progress, you make a superior working environment culture.

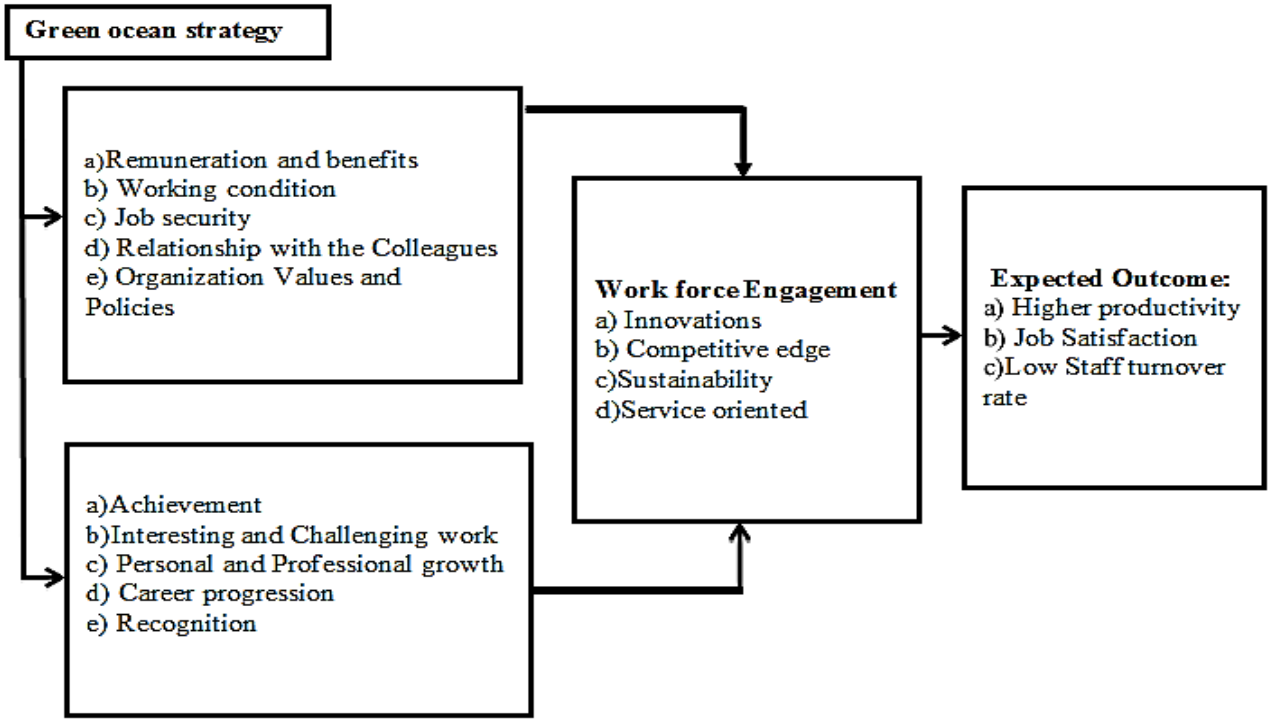
Employee engagement involves the following aspects, The idea of the actual work, Whether the representative feels intellectually invigorated, The trust and correspondence between the workers and the administration, The capacity of a worker to perceive how their own work adds to the general organization execution, The chance of development inside the association, The degree of pride a representative has about working or being related with the organization.

The advancement model being talked about in this examination is known as the "green ocean strategy" which is a crossbreed hypothesis got from the more famous speculations, "blue ocean strategy" and "red ocean strategy".

Our hypothesis isn't to be mistaken for comparatively named systems that manage the natural effect of business; rather, we're discussing a totally different worldview that can cleverly mix the best segments of Blue Ocean and red ocean procedures to give sustainable, serious advantages to an organization's development exercise.

The Green Ocean Strategy (GOS) alludes to setting out open doors from natural dangers and pressing factors, ecological mindfulness among customers, and ecological plan, advertising, and advances. It isn't just about organizations continuing with their business and dealing with the climate, it is more about organizations dealing with the climate as their business and making benefits en route.

Conceptual Framework:



Literature Review:

Benjamin Balbuena Aguenza, et al., (2012) studied "**MOTIVATIONAL FACTORS OF EMPLOYEE RETENTION AND ENGAGEMENT IN ORGANIZATIONS"** in which they observed Maintenance is the cycle of actually keeping worker individuals in an organization as it is one of the key basics that are vital for hierarchical achievement. In a globalized environment, maintenance and commitment of high imminent workers are a tremendous test to associations particularly in the midst of high turnover rates. As a rule, even drew-in workers are at times disappointed with the results of authoritative execution which may lead them to look somewhere else. Because of these reasons, this hypothetical paper researches persuasive elements that impact representative maintenance and analyzes their effects on the two associations and workers. This paper contends the inspirational elements that are essential in affecting worker maintenance are monetary prizes, work qualities, vocation improvement, acknowledgment, the executives, and balance between serious and fun activities. Accordingly, associations ought to detail fitting maintenance techniques in a comprehensive way to lessen turnover rates, and these require responsibility from managers, however, it will be certainly worth the interest in the long haul.

Adrian Dumitru Tanţău, et al., (2013) studied **"THE GREEN OCEAN INNOVATION MODEL"** in which he observed the point of this paper is to focus on another development the management model that would intently reflect existing speculations in corporate administration and can be effectively applied to the worlds business choices. To introduce this conversation, the analyst would disentangle the main hypothetical bits of this new advancement model worldview while setting out its significant ideas and thoughts. The Green Ocean model joins the best components from the Blue Ocean model and Red Ocean model and is pertinent in numerous spaces of action.

Initial Assessment:

In the cutting edge serious world, business associations are confronting steadily developing difficulties in regards to engagement, responsibility, conviction, enlistment, and maintenance of their representatives. Employee engagement has over the years became a very crucial part of Human Resource Management in organizations and therefore the study is undertaken to measure the effectiveness of Workforce Engagement using Green Ocean Strategy

(GOS). Employee engagement is an effective tool for the progressive change in attitude and behavior of the employees in an organization. Hence this study intends to analyze the effectiveness of Workforce Engagement from the employees.

Firstly, To determine the Motivational factors (Achievement, Interesting and challenging work, Personal and professional growth, Career progression, Recognition) of Workforce Engagement in the healthcare industry among nurses.

Secondly, To determine the Hygiene factors (Remuneration and Benefits, Working condition, Job security, Relationship with colleagues, Organization values, and policies) of Workforce Engagement in the healthcare industry among nurses.

And Finally, To determine the relationship between the Hygiene factor and the Motivational factor of Workforce Engagement in the Healthcare Industry, in the context of the Green Ocean Strategy.

Method:

In this study, a descriptive research design is adopted. Descriptive research is characterized as an exploration technique that portrays the qualities of the populace or marvel that is being considered. This technique focuses in addition on the "what" of the research subject as opposed to the "why" of the research subject. Descriptive research is used to assess workforce engagement among nurses. In which questionnaires were given to the Nurses(with the limitation of Nurses having experience of 3years and more than 3 years with this organization) working in a Tertiary care Hospital. Nurse's responses were collected through written forms.

Data Collection:

Data collected from 150 Nurses from various Departments with the limitation of Nurses having experience of 3years and more than 3 years with this organization. The sampling method used here is a **Simple random sample**. Simple random sampling is sampling techniques where every item in the population has an even chance and likelihood of being selected in the sample. A simple random sample is intended to be a fair- minded portrayal of a gathering. All the primary data the motivation behind the investigation is been gathered through a poll. The poll is planned dependent on the target of the examination. Information gathered from Nurses was stacked in Microsoft dominant and Tools like Percentage examination, ANOVA, Correlation, and Chi-square Analysis were utilized for additional Analysis. The moral endorsement was gotten from the Sri Ramachandra Institute of Higher Education Research (DU).

Measures:

Effective Workforce Engagement was measured using the Questionnaire method. The questionnaire is used to evaluate which factor influences more in Workforce Empowerment (Motivational factors or Hygiene factors) in relationship with Green Ocean Strategy. The questionnaire focuses on the parameters like Motivational factors (Achievement, Interesting and challenging work, Personal and professional growth, Career progression, Recognition) and Hygiene factors (Remuneration and Benefits, Working condition, Job security, Relationship with colleagues, Organization values, and policies).

The total numbers of questions are 35, which was divided into IV sections. The general score is typically determined dependent on the level of reaction. All responses were recorded and analyzed using various analytical tools to find out the problems faced by Employees. Hence, this leads to improving the satisfaction of the Employees.

Analytical Strategies:

Percentage Analysis one of the fundamental measurable instruments which is broadly utilized in the investigation and understanding of Primary information. This kind of examination is applied in this investigation to make a possibility table from the recurrence circulation and address the gathered information for a better agreement. It is used to analyze the percentage of Employees who responded to various factors. Secondly, the Chi-Square Test of Independence determines whether there is an association between categorical variables (i.e., whether the variables are independent or related). It is likewise called a "goodness of fit" measurement since it

estimates how well the noticed appropriation of data fits with the distribution that is normal if the factors are autonomous. This kind of examination is utilized to analyze the observed data of the obligation market financial backers with the information expected to get as indicated by particular speculation figured in this investigation. Thirdly correlation coefficient is a mathematical proportion of some kind of connection, which means a measurable connection between two factors. The factors might be two segments of a given data index of perceptions, regularly called an example or two parts of a multivariate arbitrary variable with a known appropriation. At long last Analysis of Variance (ANOVA) is an assortment of factual models and their related assessment systems used to dissect the distinctions among bunch implies in an example. ANOVA was developed by statistician and evolutionary biologist Ronald Fisher.

Analysis:

Basic details of the Nurses:

Percentage analysis is made for all the parameters in the Basic details of the Nurses. The total number of respondents (Nurses) was 35, in which 48.67% of the respondents were in the age bunch of 31-40, 86.67% of the respondents were female, 58.67% of the respondents were with the experience of 6 years and above, 73.33% of the respondents were married, and 46.67% of the respondents were in the range of monthly income less than Rs.20,000.

Relationship between the Organization and the Career of the Nurses:

Percentage analysis is made for all the parameters in the Relationship between the Organization and the Career of the Nurses. In which 93.33% of the respondents have decided their career (Nursing) out of interest, 90.67% of the respondents feel free to offer comments and suggestions, 100% of the respondents create a great patient experience and 41.33% of the respondents can work and deliver exceptional results.

Motivational Factors:

Percentage analysis is made for all the parameters in Motivational factors. In which 66.67% of the respondents sharing knowledge and helping others succeed motivates them to work, 68% of the respondents gain patient satisfaction through quality treatment, 46.67% of the respondents have difficulty in long working hours & working on holidays and weekends, 65.3% of the respondents think good communication is important for a nurse, 69.33% of the respondents have developed problem-solving skills from their experience, 30.67% of the respondents it is procrastination that stopping them from career progression, 84.67% of the respondents are accepting that the organization delegates tasks based on their experience and skills, 50.67% of the respondents are satisfied with the recognition based on the image of the organization and 47.33% of the respondents are satisfied with the duration of employees being rewarded and recognized.

Hygiene Factors:

Percentage analysis is made for all the parameters in Hygiene Factors. In which 48.67% of the respondents are satisfied with the incentives given are based on their skills, that 50% of the respondents are satisfied with the benefits based on performance appraisal, 51.33% of the respondents are satisfied with the health and safety standards of work, 52% of the respondents are satisfied with the availability of required resources, 51.33% of the respondents are satisfied with the systems in place to identify, 49.33% of the respondents are satisfied in using computers, 48% of the respondents are satisfied in working independently, on a team or through a combination of both, 72.67% of the respondents handle a conflict with their co-worker by discussing the problem face-to-face, 76.67% of the respondents are accepting that there is equal distribution of work and 72.67% of the respondents are accepting there are tight rules and regulations to be followed.

Chi – Square Analysis:

Age * Residence

H_0: There is no significant difference between age and residence H1: There is a significant difference between age and residence.

	Value	Degree of Freedom	Asymptotic Significance (2- sided)
Pearson Chi-Square	2.612[a]	3	.455
Likelihood Ratio	3.390	3	.335
N of Valid Cases	150		

a.4 cells (50.0%) have expected count less than 5. The minimum expected count is .99. Degree of Freedom: 3 Calculated value: 2.612 P – value: 0.455

Interpretation:

T – test was conducted to access the significance between age and residence on Employee Engagement using Green Ocean Strategy. Since P-value is greater than 0.05 H0 is accepted.

ANOVA:

Monthly income and Experience:

H_0- There is no significant difference between the age and outcome of treatment process H_1 – There is significant difference between the age and outcome of treatment process

	Sum of Squares	Degree of Freedom	Mean Square	F	Sig.
Between Groups	.890	2	.445	1.111	.332
Within Groups	58.903	147	.401		
Total	59.793	149			

Interpretation:

Since P value is greater than 0.05 H0 is accepted thus, there is no significant difference between Monthly income and Experience.

Correlation:

Conflict with Co-worker and Difficult part in Job:

		Conflict with Co - worker	Difficultpart in Job
Conflict with Co – worker	Pearson Correlation	1	-.127
	Sig. (2-tailed)		.122
	N	150	150
Difficult Part In Job	Pearson Correlation	-.127	1
	Sig. (2-tailed)	.122	
	N	150	150

Interpretation:

From the above table, the correlation coefficient between, The Arising of Conflicts with Co – workers and The Difficult part in the Job is – 0.127 and is Negatively Correlated.

Results:

The significance of employee engagement couldn't possibly be more significant – representative commitment methodologies have been demonstrated to lessen staff turnover, improve profitability and proficiency, hold customers at a higher rate, and make more benefits. In particular, engaged employees are more joyful, both at work and in their lives. "Sustainable development" is improvement that addresses the issues of the present without bargaining the capacity of people in the future to address their own issues."

Based on the analytical results of our study there are some suggestions, such as to Conduct Wellness programs to nurses as they are the first in contact with the patients. Communication classes for nurse's especially English classes should be taken. Conduct induction program by the HR department to every nurse on equal interval sessions and the employees must have a record of it which should be verified by the in - charge regularly. Give extra insurance benefits to the family members of the nurse. Management classes can be conducted to the nurses like soft skills, leadership quality improvements, interactive sessions, Networking skills etc., Games, events related to nurse practices, duties and responsibilities can be conducted by the HR department. Regular feedback forms can be given to the nurses from the organization side so that organization improvement and Nurse needs can be fulfilled. Computer leaning sessions can be implemented to have a update in their knowledge and become familiar in using computers. Billing process can be simplified to the patients. Rewards, Recognitions like best employee of the month, Best performer, Certificates, Appreciation of employees by the senior staffs in front of their colleagues can be given. Anger management, Stress management, Yoga sessions, Short Nap times, can be given to nurses. Suggestions and feedback form boxes can be kept in each ward so that the nurses can give their true feedback

and grievances on the organization and it will be useful in the development of the organization. Volunteering programs like health camps in village areas and rural places can be implemented and regularly followed for the development and trust in our hospital. Daily tasks, scheduled works, with shift timings can be regularly updated to the employee through social media like WhatsApp, email, etc., Consent forms can be given in English as well as in regional language (Tamil) so that it is easy for the Physicians and Nurses to elaborate on their treatment and procedures. Installing at least a new system (computers) with updated software. Motivate the employee to have high aspirations.

From the result of our study, GOS is an optimum strategy to organizational engagements like, **Employees creating a great work experience, Volunteering experiences, having Healthy and Secure working environment, Working Environment that motivates the employee to work, High Career Aspirations, Recognitions, Health and Safety Standards of work, Conflicts Handling between the employees and the Betterment of the organization.**

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A STUDY OF FACTORS INFLUENCING CONSUMER BUYING BEHAVIOUR WITH SPECIAL REFERENCE TO INSECTICIDES

V.Wankar[1], N.Sanap[2] and N. Anute[3]
ASM's Institute of Business Management and Research, Pune, Maharashtra
[3]nileshanute@gmail.com

ABSTRACT

This review provides the comprehensive summary of study of factors influencing consumer buying behavior with special reference to insecticides. This research mainly conducts a Survey method of data collected from respondents. The present study highlights the important factors which affects the consumer behavior and preference towards insecticides. Therefore, while using insecticide the quality of product must be maintained. The consumer prefers to buy the products of good quality. The higher positive displayed by the consumer leads to the higher product's market demand. The implementation of manufacturing not only subjected to the processing techniques but also demand for products in the market. Therefore, to overcome all this points, questionnaire was framed through which we observed the consumer's attitude, knowledge and trust regarding insecticides, quality as well as safety concerning the point of purchase, frequency of buying products behavior and the environmental concern and willingness of consumers to pay for such products. All these factors play a vital role where each and every consumer is highly sensitive towards every information related to products.

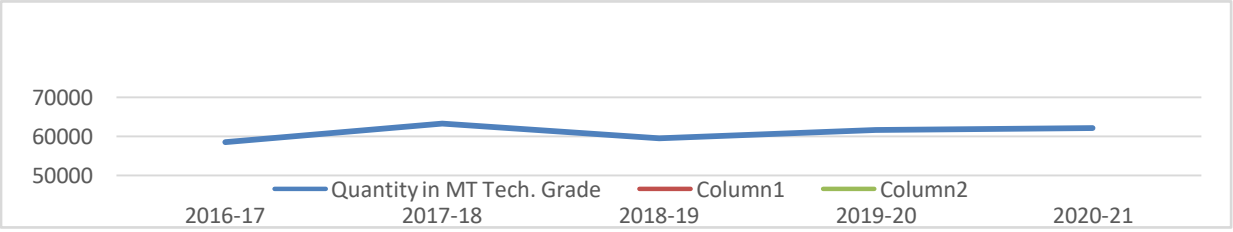
Keywords: *Consumer buying behaviour, Insecticides, Farmers, Influence.*

Introduction

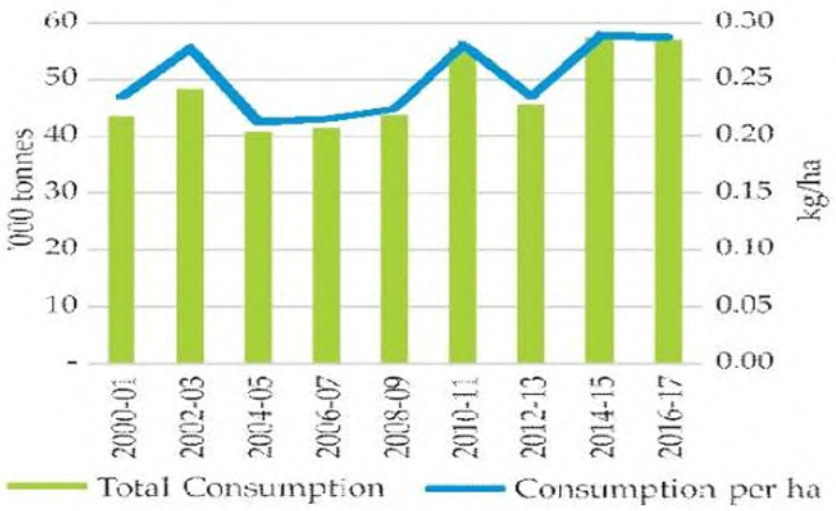
Insecticides are chemicals which are specially used by the farmers to protect the crop from insects by killing them or preventing them from engaging in undesirable or destructive behaviours towards crops and Farm produce.In India agriculture industry is ranked fifth in terms of production, consumption, export and expected growth. Over 58% of India's population is directly depends on agriculture. In India 76% of the pesticide used is insecticide, as against 44% globally. In India consumption of pesticide is about 2% of total world market which is 22 billion Rs or 0.5 Billon USD. Maharashtra state is the highest consumer of insecticide but in terms of per capita consumption is highest in Punjab followed by Haryana and Maharashtra. The average losses cause by insect and pest is around 30-50 %.The average use of chemical insecticide is increased by 4% from 2017 to 2020 over the year. In India the annual production of pesticides is about worth 8000 crore from which worth 6000 crore consumed in the country and worth 2000 crore pesticides are exported. The pesticides are produced in the country by about 60 companies and their formulations are produced by about 500 units.

According to the Ministry of agriculture and farmers welfare in their insecticides, fungicides, and herbicides are consumed in India, while the insecticides forming highest consumption. India is among the largest producer of insecticides, fungicides, and herbicides in the world. Database research & markets shows the domestic consumption of pesticides was worth Rs.197 billion in 2018 and the projected growth of Rs.316 billion by 2024. The annual growth rate is 8.1% during year 2019 to 2024 as of Oct 2019 a total 292 pesticides were registered in India.

Year wise consumption of chemical pesticides



Trend in consumption of pesticides (technical grade) in India



Source: Based on data from Ministry of Chemicals and Fertilizers, ICAR-NIA

Literature review

- P.Abhilash and N Singh (2008), they observed that India is the biggest producer of pesticides in the Asian Continent and ranks 12th globally in the use of insecticides. Most of the population of India is engaged in farming due to which the use of insecticide causes the daily life and some health problems. So to sum up what they're trying to say is how to make use of insecticides, to make use of the insecticide technology as well as how to reduce the health as well as environmental issues.
- P. Venugopal. (2009), According to his research paper,in India, more than 50 pesticidal brands are used. The retailers don't have that much knowledge about the pesticides. While buying the pesticides, Customers don't think about the retailer's knowledge. They buy pesticides from private retail shop. Farmers are totally dependent upon the retailer's advice and knowledge and hence they buy the pesticide without knowing it's brand.
- M.Jallow, D. Awadh, et.al(2016), pesticide risk behaviours and factors influencing pesticide use among farmers in Kuwait" According to their research paper, the use of pesticides is affecting human health which is becoming a big issue. The excessive use of pesticides has negative impact on humans' health. The farmers buy pesticides without knowing it's brand and knowledge, they do as the retailer's advice them and hence they use the pesticides at heightened risk without any positive impact. The farmers get influence by the retailers and hence the use of pesticide is increasing day by day. And here is a big question that how to reduce the use of pesticides which is provided in this research paper.
- P. Devi, J.Thomas and R. Raju (2017) in their research paper they observed that Pesticide contributing major role in national economy it has more export oriented. The domestic demand and consumption is relatively constant. The analysis says that the consumption of pesticides in most of the state show the positive growth. While the highest consumption takes place in Maharashtra, UP and Panjab. But highest consumption growth observed in J&K and Tripura. The North-East states show negative growth except Sikkim, Meghalaya, Tripura and Nagaland show positive growth in pesticide consumption
- R. Rezaei, A. Christos A. Damali's, and G.Zadeh, (2017), "Understanding farmers' safety behaviour towards pesticide exposure and other occupational risks: The case of Zanjan, Iran" The main aim of this study is the theory of planned behaviour

with knowledge about pesticides and name is additional construct in original TPR model. They had taken approximately 400 cereal samples from the land of farms. They had taken a great step and made a big change amongst the farmers who use insecticides and pesticide. They had told them about the effects of insecticides and pesticides on plants. This is the best initiation to aware farmers which badly affects the crops.

- A. Bagheri, M. Sadeghet al. (2019), the main aim of this study is the theory of planned behaviour from the ground land of farms. They had taken a great step and made a big change amongst the farmers who use insecticides and pesticides. They had told them about the effect of insecticides and pesticides on plants. This is the best initiation to aware farmers about the pesticides and insecticides

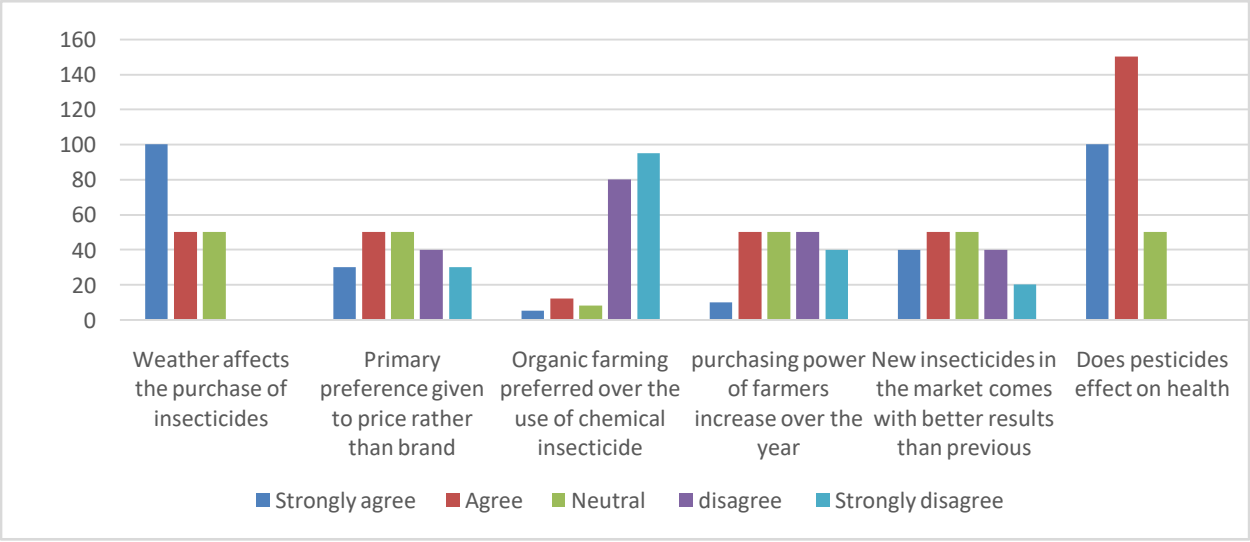
Objectives of the Study

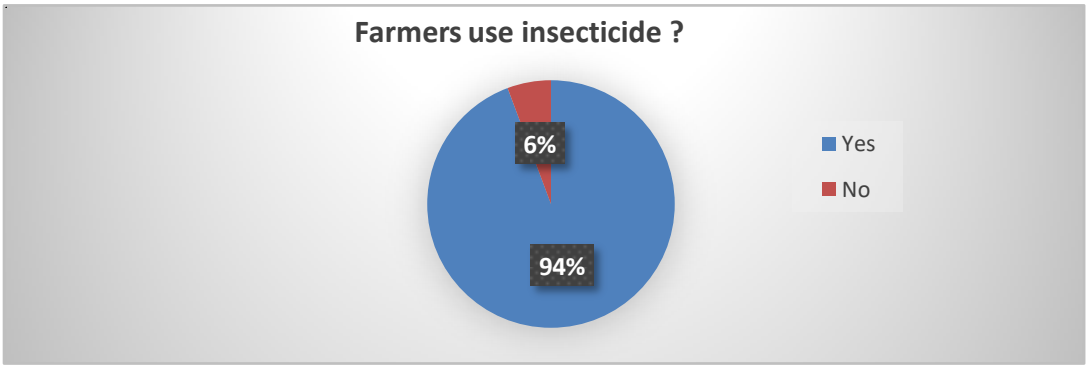
- To study the need and importance of insecticides.
- To study the buying behaviour of farmers while buying insecticides.
- To study various factors influencing the consumer- buying intention of insecticides

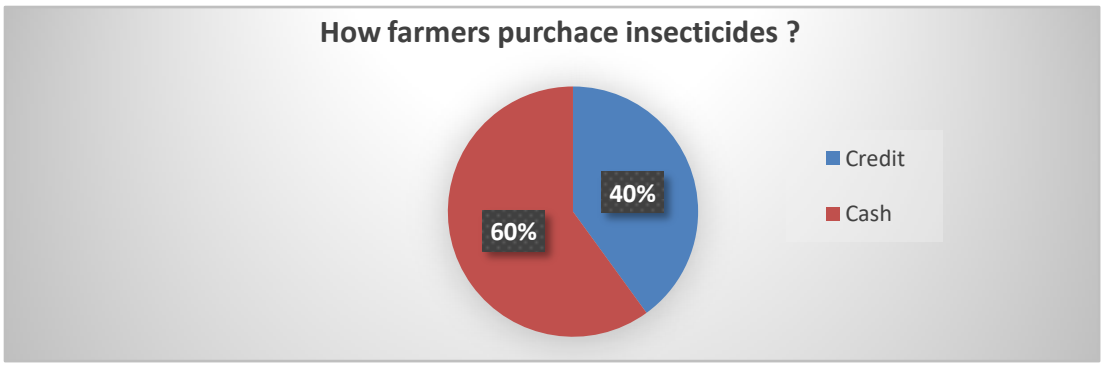
Research Methodology

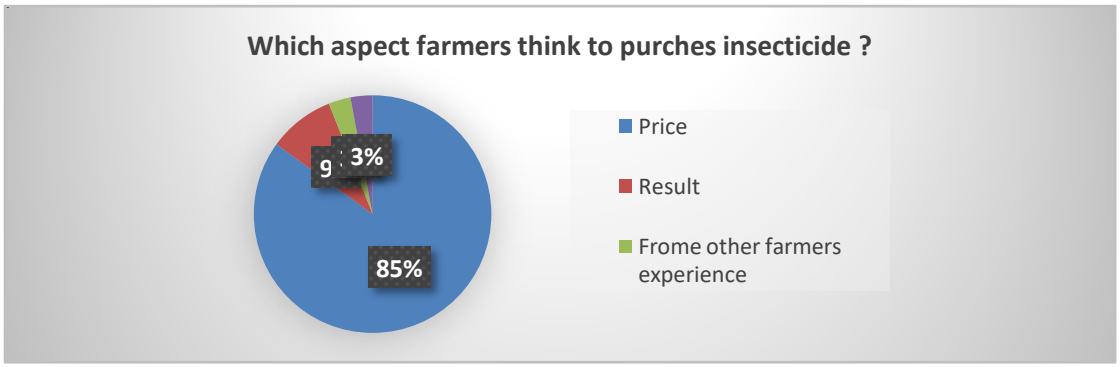
- Type of Research Design: Descriptive research
- Sampling Method: Non-Probability Convenience Sampling
- Sample Size: 200
- Sampling Area: Vidarbha region of Maharashtra specially Akola, Amravati, Wasim and Buldhna district.
- Data Collection:
  - ➢ Primary Data – field visit, direct farmer contact and Questionnaire.
  - ➢ Secondary data – Websites and journals
- Data Analysis Tool:Ms-Excel

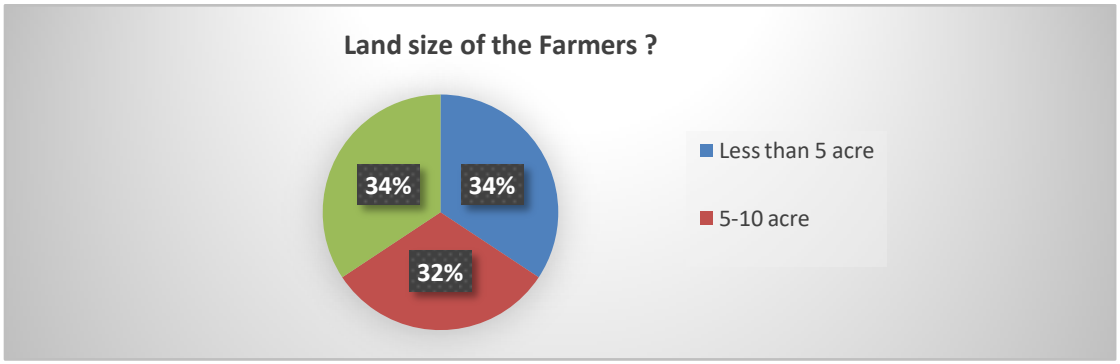
Data Analysis











Findings

- It has been observed that most of the farmers use the insecticide. Around 94% farmers prefer use of chemical insecticide and only 6% farmers practice organic farming
- We collect the data mostly from lead farmers, The farmers who have 5 acres, 10 acres or more than 10 acres of land make the use of insecticides.
- While making the use of insecticides, the farmers generally think about its price and at what price they can get it. 85% of the farmers purchase the insecticides after looking their price.
- 9% of the farmers purchase the insecticides by looking at their results.
- 3% of the farmers purchase the insecticides based on the experience of the other farmer's results.

- Most of the farmers get the information about the insecticides from the MDO or Field Officers and the insecticide companies in their region.
- Other farmers get the information about the insecticides from the Krishi Kendra and other sources.
- Around 60% of farmers purchase Agri-input or insecticide in cash, while 40% of farmers purchase on credit basis.
- Because of heavy application of chemical insecticide, the insect and pest are more susceptible and resistance than previous years.
- Over the years use of chemical insecticide is increases, farmers apply heavy chemical doses to get better results Because of this the resistance power of insects are also increased in past few years.
- The major giants in the agro-chemical sectors dominating the market with their products e.g., Bayer, Syngenta, UPL, Dhanuka, O-BASF, etc.
- The insecticide companies need to come up with better products with better R&D.

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INFLUENCE OF ADVERTISING APPEALS ON CONSUMER BEHAVIOUR

S. Patra[1] and N. Anute[2]
ASM's Institute of Business Management and Research, Pune, Maharashtra.
[1]sonalipatrabhm@gmail.com, [2]nileshanute@gmail.com

ABSTRACT

The agenda of this research was to investigate the "influence of advertising appeals on consumer behaviour". Advertising is one of the most important marketing tools that helps to sell products, services, ideas and images, etc. If we talk about advertisement, it isn't necessary that messages will specifically mention about a product or service. In this research paper we are focusing on the advertisement appeal and its effects on the consumer behaviour. Advertising appeal is a powerful tool which inspires consumers to fetch products or services. This advertising appeal plays an important role which influences on consumer behaviour. Each of companies will have their own advertisement appeal (which may vary). The advertising agencies and the companies uses certain types of advertising appeals which helps them understand and influence the consumer behaviour. Most common type of advertisement appeal can be emotional, sex, rational, brand appeal, etc. This research is based on a stored database(secondary) and has a descriptive design. Findings of from this research paper will be helpful to gain insights about the features of the products and benefits a consumer will receive when using the product.

Keywords: *Advertising appeals, Consumer behaviour, Advertisement, Emotional appeal, Rational appeal.*

Introduction

It's not uncommon to any of us about advertising as we receive a bunch of them almost on a regular basis. It is required for the growth and success of any kind of businesses and industries. It generally aims at a particular segment from the population for targeting audience .Advertisements can be seen in the newspapers, magazines, on television, andthe internet also sometimes heard on radio. Advertising convinces audience to purchase products. When you see an advertisement, sometimes you are emotionally played, sometimes you are scared, sometimes you are moved and burst in tears. Therefore, this particular part of advertisement is called advertisement appeals. It means that advertisement appeals is the core of advertisement. It is the plays an important role to gain the attention of consumers.

Advertising appeal is the main message to be used for advertisement. Advertisement appeals focuses to influence the way a consumer views the products and how purchasing of certain products can be of their use. Advertising appeals are built in such a way so as to create a positive impact on the individuals who will use certain products. Advertising agencies and companies uses certain types of appeals to trigger the purchasing decisions of people. Advertising appeals should be based on product or service, creative brief, advertising objective, means-end chain, and personal preferences of agency and client.

Advertising messages can be based on a different sort of appeals. Advertising has turned into the most expensive and time consuming as well as an important part of marketing activity. Firms have a great roles in the growth and success of their advertising campaigns, and, at times, even the survival depends on it. This appeal is the motive to direct and influence a person towards goal which the advertiser has set. Advertising appeals are created for the goods and services with the research of identifying reasons for buy that. After the identification of advertisement, agencies build advertisement campaigns around those appeals. A great amount of time, money and energy is spent into the work of developing advertising appeals to influence the behaviours of consumers. Through these appeals, they take the help of the product features and their attributes to make the appeals, or seek to influence the perception of consumers, and changes in attitude towards the advertised product or brand. Advertising appeals might be product-inclined or consumer-inclined. Today different types of appeals in the adverts can be seen in the media. Advertising appeal is categorized into rational appeal and emotional appeal. In this report, we are focusing on different types of appeals and their influences on consumer behaviour.

Literature Review

B. Nwankwo, J. Aboh, et.al. (2013), in their research paper they mentioned that, the result of the study on the influence of advertising appeals and personality on telecom consumption preferences showed that the first hypothesis states that there will be a significant influence of advertising appeals on telecom consumption preferences was accepted. It is because the advertising appeal has significant influence on telecoms consumption preferences. The result of this study supports the hypothesis that is emotional appeal works more effectively than rational appeal.

J. Bao, C. Wang et. al. (2017), in their research paper they mentioned that, the effects of the different emotional green appeals have segregated impacts on consumers attitude towards advertisement, perceived value, and its green purchase intentions. Attitude towards the advertisement is the most triggering reflection of the quality of green appeal information. This can help enterprises to seek correct advertising ideas that are relevant to the consumers' psychological state.

Q. He and H. Qu (2018), in their research paper they mentioned that, this paper studies advertising appeal on the purchase intentions under the socialized media ecosystem, and tries to justify the influence mechanism between the advertising appeal, brand state and the purchase intentions of the consumers.

A. SaeidSadat (2019), in his research paper hementioned that,the main purpose of the paper was to investigate the role of advertising appeals on consumer buying intentions in Turkey. The main objective of the research was to understand the effects of the four aspects of appeals on consumer purchase intention of smartphones users in Turkey for the betterment of the advertisement strategy of smartphones companies.

A. Hussain, G. Parvaiz, (2020), in their research paper mentioned that,this study was conducted to know the influence of appeals on the consumer's buying intention. The advertisers and marketers should both use the appeals in the advertisements for their own branding. Overall the results suggest that emotional advertising appeals are more effective to influence consumer buying intention as compared to the rational advertising appeals.

Research Methodology

Objectives of the Study

- To study the different types of advertising appeals.
- To study the role of advertising appeals in the formation of advertisements.
- To study the influence of advertising appeals on consumer behaviour

This research paper is basically based on secondary data. The data collection from several social media sites, blogs, educational websites, journals, research papers etc. are referred for this research paper. This is a descriptive research design.

Secondary Data Analysis

Type of Advertisement	Advertisement Example	Advertising Agency Name	Year	Link of Video	Description of Advertisement	Influence on Consumer
Brand Appeal	Apple	TBWA /Media Arts Lab	2021	https://youtu.be/t72nquFeCQQ	Basically in iPhone 12 advertising they are showing the quality of screen they are providing, ceramic shield glass so that the display does not get damaged if unfortunately cell phone gets dropped because without display you can never use a smart phone or screen touch phone moreover they are showing they are different from other brands and for them quality matters the most.	The impact which this advertisement makes on Consumer is they provide us with quality screen that no other brand is providing.

	Adventure Appeal	Mountain Dew	Wunderman Thompson	2021	https://youtu.be/jPJqh6YwRr4	Basically this advertisement is targeted to people who love doing adventurous things and to boost their confidence drinking mountain dew , it focus on building confidence and taking risk to achieve something.	The impact which this advertisement makes on consumer is to never give up and take risk in life or whenever doing anything adventurous mountain dew is used as the medium which is people will feel like after drinking this our confidence will get boost up and we can achieve anything.
	Scarcity Appeal	Cadbury dairy milk special valentine collection pack	Ogilvy	2018	https://youtu.be/l3pZdXTHihM	In this advertisement, it is showing that the limited addition pack is available for valentine's day and may be after valentine you won't be getting that kind of special addition pack it is a rare one so go and grab it .	The impact which it makes on consumer is to take it as soon as possible because it's a limited edition pack may be you won't be finding it soon . So if you want it go grab it as soon as possible.
	Statistics Appeal	TOO YUMM CHIPS	The FMCG division of the RP-Sanjiv Goenka Group	2021	https://youtu.be/rEmSt9RD3ME	The advertisement shows missing of spices in chips which are having low saturated fats in it, so this particular brand has 40% less saturated fats in it with same spicy masalas in every flavour so that the taste remain same as well as healthy eating.	The impact which it makes on audience is that yes they can still eat chips a kind of healthy chips with same enjoyment and spicy masla.
	Humour Appeal	Happydent	Perfetti Van Melle	2020	https://youtu.be/v1YZzSHBHpw	In this advertisement they are using humour of what their product is capable of or what it can do they are showing happydent gives shine and whitening to tooth and it works so fantastic that I can act as similar to a light bulb and with this you can create brightness.	Who doesn't want bright white teeth full of shine so that when you smile people should appreciate it and that can be done by chewing happy dent and so does the humour in advertising attracts customers towards it.
	Fear Appeal	Life Insurance	R K Swamy BBDO, DDB Mudra, Crayons	2020	https://youtu.be/zWilI5n51n0	The advertisement firstly attracts you with how precious is family , how precious are moments which you are spending with them from your birth till you get married and have a baby basically how precious is life so this particular insurance company is always there for you in any phase of your life.	The impact which it makes is to secure your life and your loved ones life by buying insurance so that you can enjoy life's every moment with your loved ones by insurance and let's get secure.

Social Appeal	Tata Tea	MullenLowe Lintas	2010	https://youtu.be/YK26IH0dIPg	This advertisement gives you social message of not to give bride and not to encourage corruption they have smartly used word patti which have two meaning one is tea leaves and other is money harri patti in India.	The impact which it makes on consumer is to remember their social duty and attract them with social message of not encouraging corruption and the brand thinks about the country and people of country.
Musical Appeal	Docomo	Tata Tele services	2009	https://youtu.be/pkIS5tBEazI	This advertisement attracts customers with the beautiful tune and music of the brand docomo and they have used unity of people in the metro in such a way that everyone is aware of this brand music.	The impact which it makes on consumer is attraction to music and tune of the brand which is popular among all and encourage them to use the sim card of this brand.
Emotional Appeal	Dairy milk	Ogilvy India	2021	https://youtu.be/z_OtC06ndUE	This advertisement supports girls power to do something greal in live and make big in life and how your near and dear ones are with you and celebrate it with dairy milk.	The impact it makes is emotional on society is support girls to do something great in life and this positive attitude of advertisement makes you to celebrate your success by having Cadbury.
Rational Appeal	Horlicks	FCB India	2020	https://youtu.be/Mbz18RTcIi4	The advertisement shows mindset of people who still thinks girls can't doanything comparing them with men but Horlicks for woman or girls make them strong enough to do anything in life.	The impact which Horlicks makes is drinking Horlicks for woman make them strong enough to deal with the hardest things in life.
Sexual Appeal	Fogg	The Womb	2018	https://youtu.be/VhmXlFT88Vw	In this advertisement the company shows how strong is their fragrance it's not just gas but a real fragrance in it that last long even if there is hurricane it will destroy everything that comes in its way but can't vanish fragnance of fogg and that is what impresses girl and makes her attracted towards the guy who have used fogg perfume.	The impact it makes is it encourages guys to buy it so that fragrance last longer and can attract lots of girls towards it.
Youth Appeal	Pepsi	BBDO India	2008	https://youtu.be/ks4jfppS5Uc	This advertisement shows that how youths can be smart enough to handle any situation and people is encouraging them that it's so easy when you make it look easy .	The impact it creates on consumer is you are smart enough to handle things easily you just need a pepsi.

Popularity Appeal	BYJU's App	Mindshare	2018	https://youtu.be/_W7UP7O7qAA	This advertisement is an appeal to parents who think with online studies it's not at all possible to deal with and they have used Shahrukh Khan as popular face to make it look he too trusts Byjus for online studies.	The impact which it creates on consumer is with Byjus online quality study is possible and they can make their kids enrol with it and it is so popular that even Shahrukh Khan is suggesting it.
Bandwagon Appeal	Oral-B	Sociowash	2017	https://youtu.be/v5gt5AaE4cY	The advertisement shows how the toothbrush is different from other tooth brushes & it cleans 99% germs of your tooth and it's recommended by doctor too.	The impact which it creates on consumer is that it's quite different from other tooth brushes and does the work perfectly and also suggested by doctor.
Endorsement Appeal	FAIR AND HANDSOME	Emami Limited	2018	https://youtu.be/Zv0vhpaB2Zo	In this advertisement company is showing people who are using girls fairness for their skin is not suitable because men's skin are harder band different than woman skin type and this diffence is presented by Shahrukh Khan in such a way that it shows Shahrukh Khan himself uses fair and handsome men's fairness cream for his fair skin.	The impact which it makes is make people believe that fairness cream is different for two different genders and this fairness cream is special designed for men's that Shahrukh Khan himself uses.
Romance Appeal	NIVEA	Publicis Groupe	2020	https://youtu.be/XYtDNjZjFAk	In this advertisement company has used romantic attractive things to attract audience just like using Anuska Sharma is using nivea pearl deodorant which doesn't makes her underarm smell during workout and keep the skin attractive like pearl soft and clear seeing this a guy doing workout is attracted to it and the environment of advertisement is romantic kind of attraction.	The impact which it makes is attraction for woman's for no underarm smell as it will keep them fresh and not stinky and people will be attracted to them for this.
Less-than-Perfect-Appeal	Viviscal	CRT/tanaka	2010	https://youtu.be/vxee2tfJBLI	This advertisement shows the thinning of hair can be converted into thick hairs buy using this product . It indirect shows you need to used this to gain perfect hair's to woman.	The impact which it makes woman believe that their hair can be thick and healthy and they can look perfect with healthy hairs and attractions consumer to buy it.
Beauty Appeal	LAKME	O&M	2014	https://youtu.be/5h_Y9mGOb44	This advertisement shows how beautiful and finding and glowy the skin can be by using this lakme product so that people are attracted to your beauty seeing you once.	The impact which it makes it, feel that by using this product your skin will be so beautiful and attractive so that

						people will get attracted to you and woman who want their skin to be like this will be attracted towards it.

Conclusion

In this research paper the researcher dived into different types of advertising appeals. The advertisers and marketers uses both the appeals for their branding. Advertisers uses different appeals which includes emotional and rational appeal to convey their message and also to reach desired marketing objectives and goals. This study further adds context of consumer behaviours by determining the impact and outcome of rational and emotional appeals. Advertising appeals plays an important role to influence people to buy a product or service.The advertisers and marketers should use many kinds of advertising appeals in the advertisement for their brand. Each of the company have a unique advisement appeal. There are many types of advertising appeals. Advertising agencies and companies give lots of effort to make an advertisement appeal.

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STRATEGIC ANALYSIS OF MUTUAL FUNDS IN INDIA

B. Kunte
ASM'S Institute of Business Management and Research, Pune

ABSTRACT

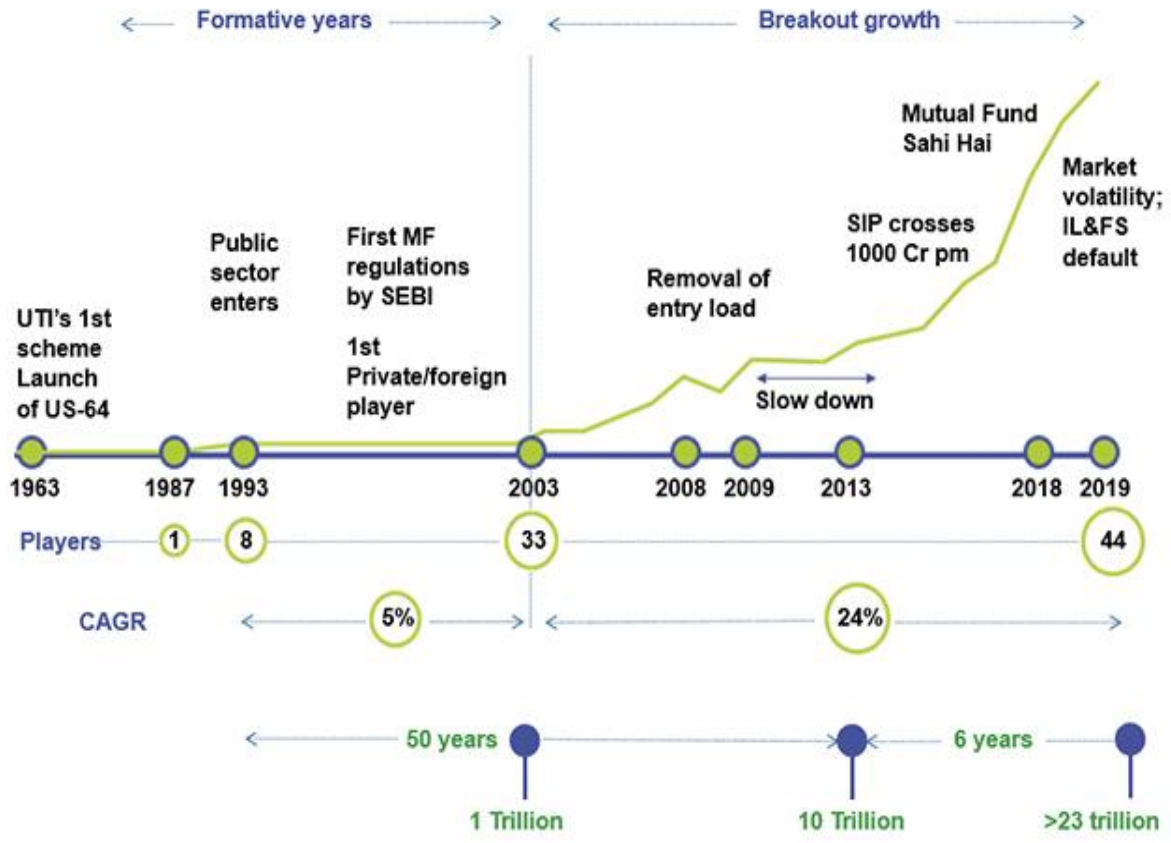
The main objective of writing this research paper is to identify the scenario of the mutual funds in India.The research mainly focused on present scenario of mutual fund with special reference to selected industries. This research is based on secondary data. This research study focuses on history of mutual fund in India, Growth of Indian Mutual Fund assets, Mutual Fund assets under management, Advantages of Mutual Funds, and mutual funds holdings in Banking and Finance, FMCG, Software, Pharmaceuticals, Petroleum sectors. This research will be helpful to all mutual funds to identify challenges and opportunities in front of them and to design their strategic plan accordingly. It will be also helpful to Banking, Finance, FMCG, Pharmaceutical, Software, Petroleum industries to understand their present scenario with special reference to mutual funds.

Key Words: *Mutual funds, Strategic Analysis, Assets Under Management (AUM),*

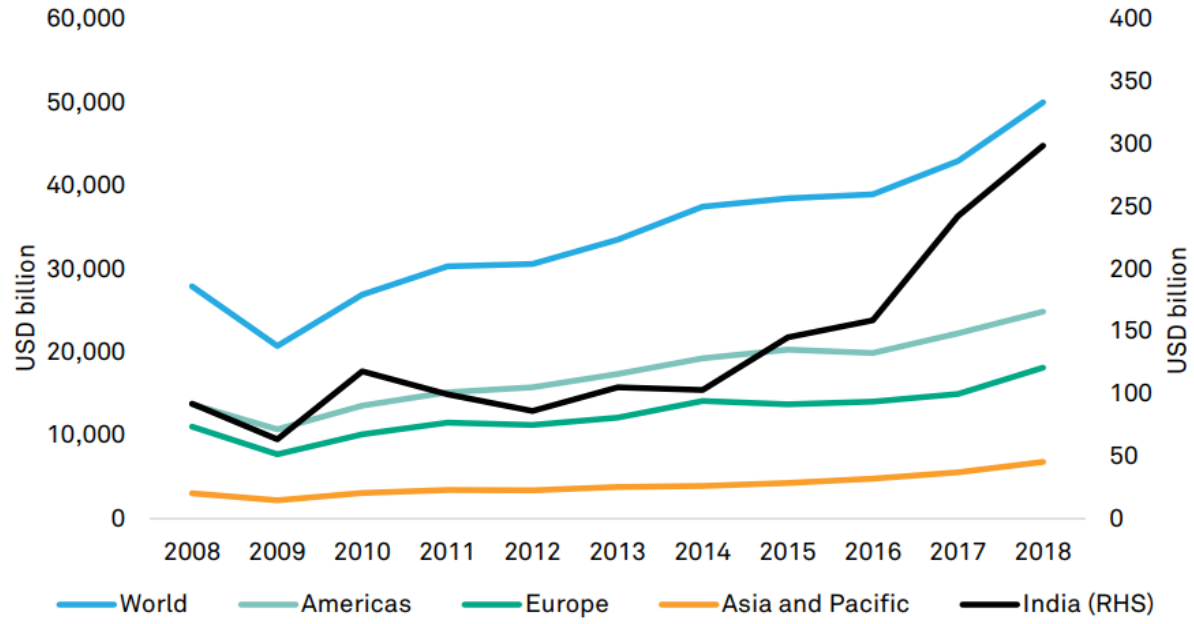
Introduction

A mutual fund is a type of financial vehicle that consists of a pool of money that many investors collect to invest in securities such as stocks, bonds, money market instruments, and other assets. The portfolio of an investment fund is structured and managed in a way that corresponds to the investment objectives set out in the prospectus. 4,444 Assets Under Management (AUM) of the Indian mutual fund industry were 36.73,893 as of September 30, 2021. Assets under management of the Indian MF industry increased more than 5½ times in 10 years, from 6.42 trillion from yen as of September 30, 2011 to 36.74 trillion yen as of September 30, 2021.

History of Mutual Fund in India

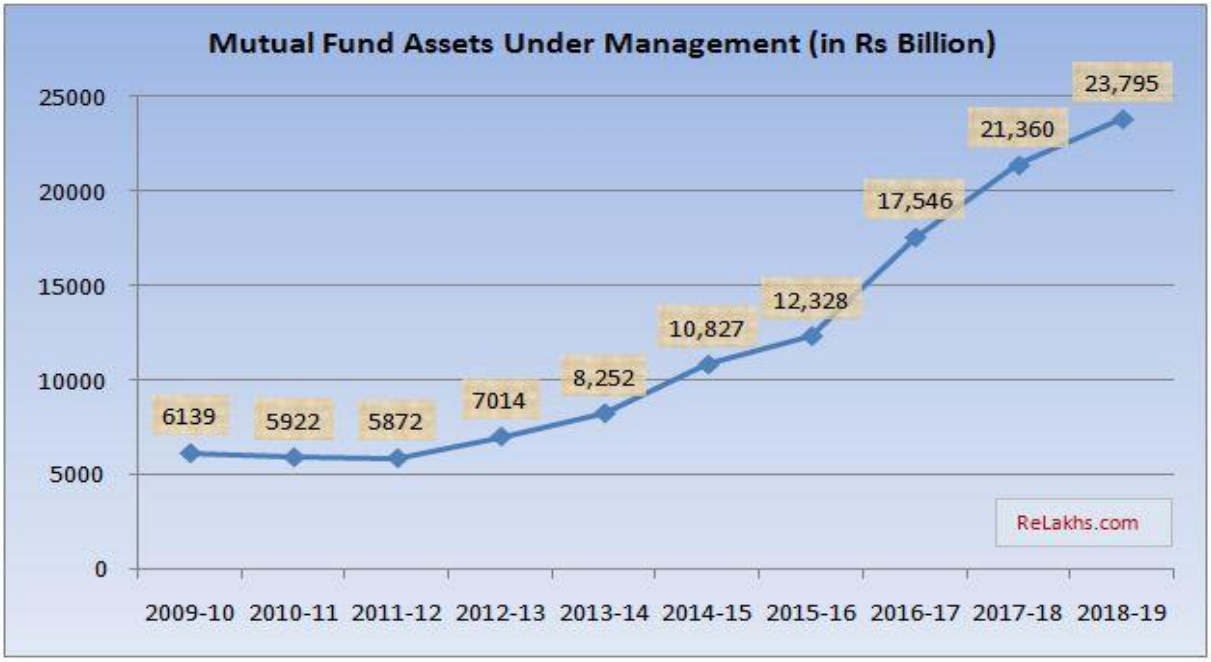


Growth of Indian Mutual Fund assets versus the world and major regions



Data used for representation pertains to first quarter of the respective calendar year for open-ended funds only
Source: IIFA

Mutual Fund assets under management



Advantages of Mutual Funds

In last few years mutual fund sector has grown at a remarkable rate. In fact, thereisrevolutionary change in the mutual fund sector in view of it's important advantages of mutual funds are stated below:

- Professional Management
- Diversification of Risk
- Liquidity of Investment
- Flexibility Mutual funds
- Convenience
- Transparency
- Low Operating Costs
- Safe Investment
- Tax Benefits
- Shareholders Services
- Better Yields

Literature Review

T. Vanniarajan, and P. Gurunathan (2007) stated that the most important issues influencing investment in mutual funds are money, the main product, the strength of the fund, promotions, customer expectations and quality of service. The study concluded that mutual funds must develop an appropriate product strategy to meet client needs. Since most investors are risk averse, mutual funds need to focus on the strength of the fund, customer expectations and quality of service, in addition to monetary factors.

S. Sankaran (2008) examined the growth and future of the mutual fund industry. The study also looked at the regulatory framework for mutual funds in India, suggesting that regulations should be strengthened to ensure well service to investors.

Khurana & K. Panjwani (2010) evaluated the performance of fifteen open hybrid mutual fund systems. The study finds that all systems outperformed the market on most of the measures used in the study, with the exception of ICICI Prudential Balanced FundG and Principal Balanced FundG.

Raju & K. Rao(2011) studied the risk-adjusted effect of selected mutual funds in India from Jan 2008 to Dec 2010. Used the Treynor index, the Sharp and Jensen index shows that many infrastructure fund systems and Index funds do not outperform the market; there is a low average beta, a risk / reward mismatch for some systems, and a negative net selectivity for a larger number of systems.

R. Bal & P. Paul (2012) found that the growth of the mutual fund industry has suffered several times. He stated that fiscal year 200809 was a difficult year for the mutual fund industry in India as it went through the financial tsunami caused by the collapse of the global economy. However, the study shows that the industry experienced robust growth in fiscal 2009-10 and beyond due to strong government efforts and supporting SEBI regulations.

Research Methodology

This research paper is grounded on secondary research. The data is gathered from news articles, blogs, educational websites and some research papers. This research paper is mainly focused on strategic analysis of mutual fund companies in India.

Research Objectives

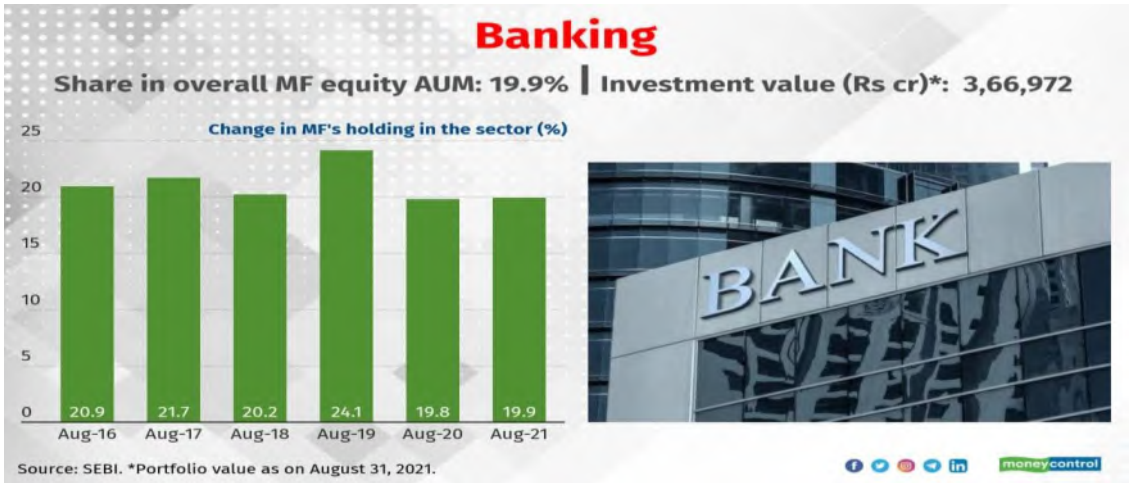
- To study the scenario of selected mutual fund companies in India.
- To study the present status of mutual funds wrt selected industries.
- To study the opportunities and challenges for mutual fund companies in India.

Secondary Data Analysis

Banking is the sector on top of the list of mutual fund holdings. But allocation to pharmaceuticals have gone down, despite being one of is top most sectors. Though most mutual funds follow a bottom-up approach while choosing stocks, fund managers are conscious about picking the right sectors. They look for sectors having healthy growth potential and consistent profitability. Over the past two years, COVID-19 has impacted businesses across the world and reshaped the way they operate. Many sectors have become flavors of the season' while many turned out of favour.

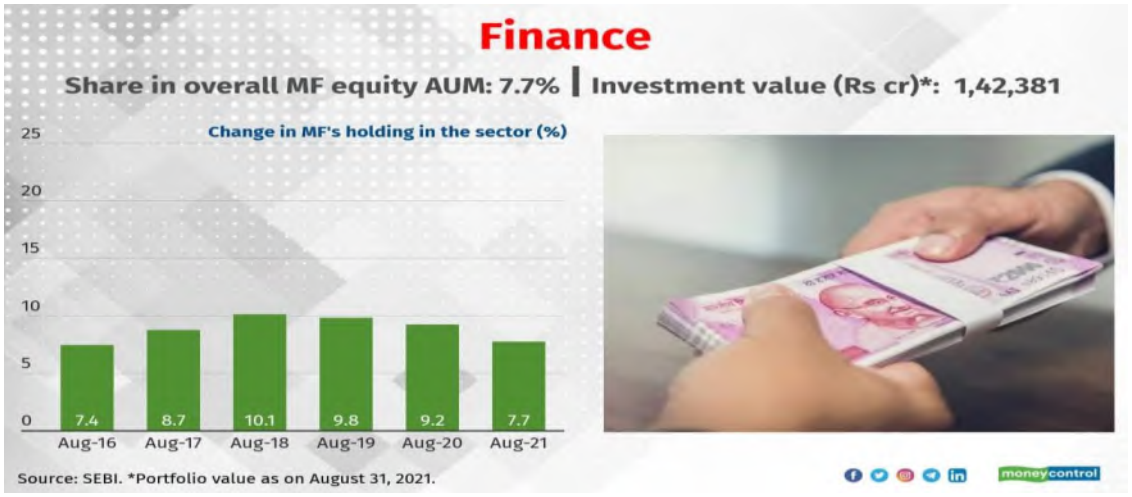
Banking sector and Mutual Fund holdings

Banking has been the most preferred sector for MFs accounting for about one-fifth of the industry’s equity AUM. The sector has grown faster than India’s GDP over the last two decades. ICICI Bank, HDFC Bank, State Bank of India, Axis Bank and Kotak Mahindra Bank are the top five banking stocks held by mutual funds.



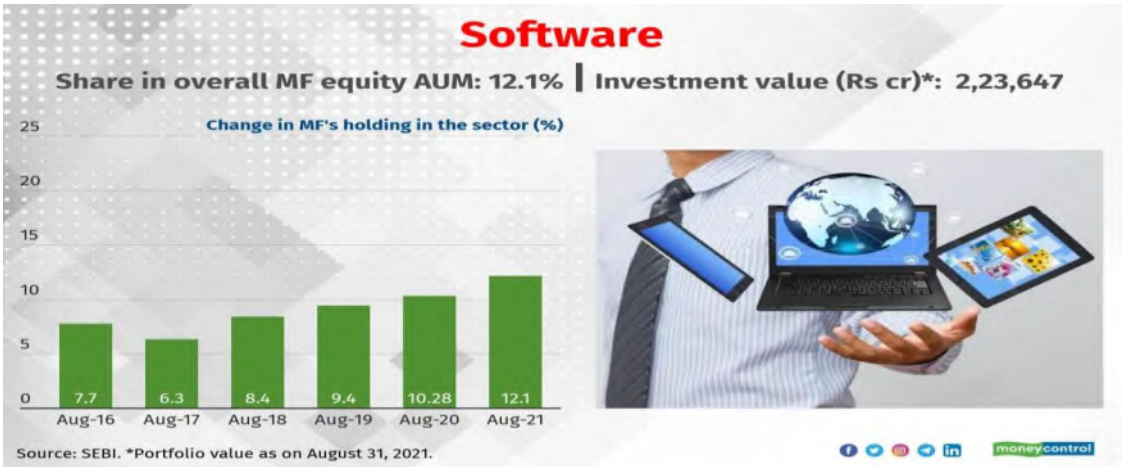
Finance sector and Mutual Fund holdings

With fund houses, insurance companies, non-bank firms getting listed, that opened up avenues for fund managers to capitalize on newer income streams. Financial services companies that are held by most mutual funds include Bajaj Finserv, SBI Life Insurance Company, HDFC Ltd, Bajaj Finance, and Max Financial Services.



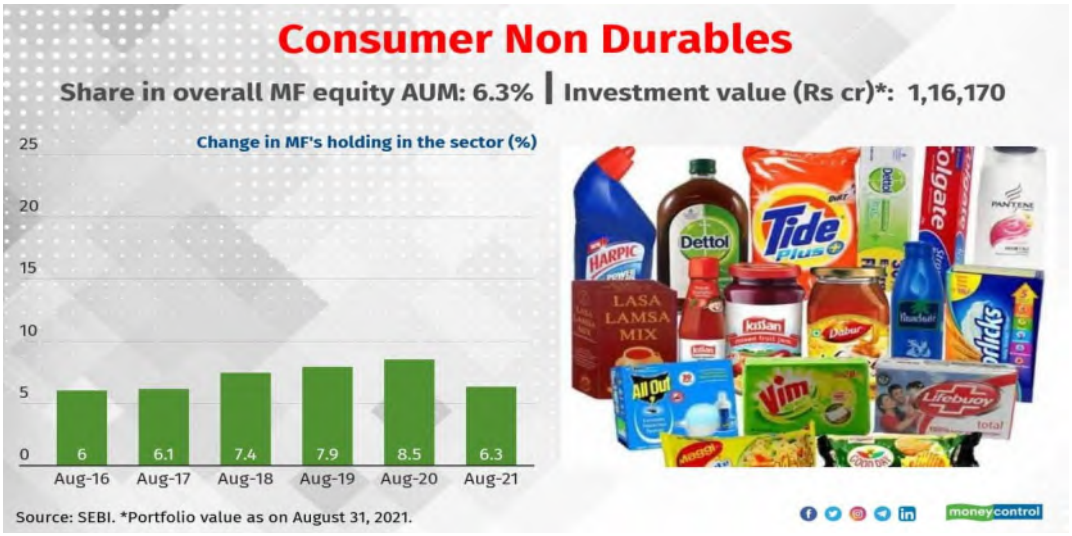
Software sector and Mutual Fund holdings

As businesses get increasingly digitized and invest more in technology, software companies capitalized on the trend and did well. Stocks that are favorites are Tech Mahindra, Tata Consultancy Services, Infosys, HCL Technologies, and Info Edge (India).



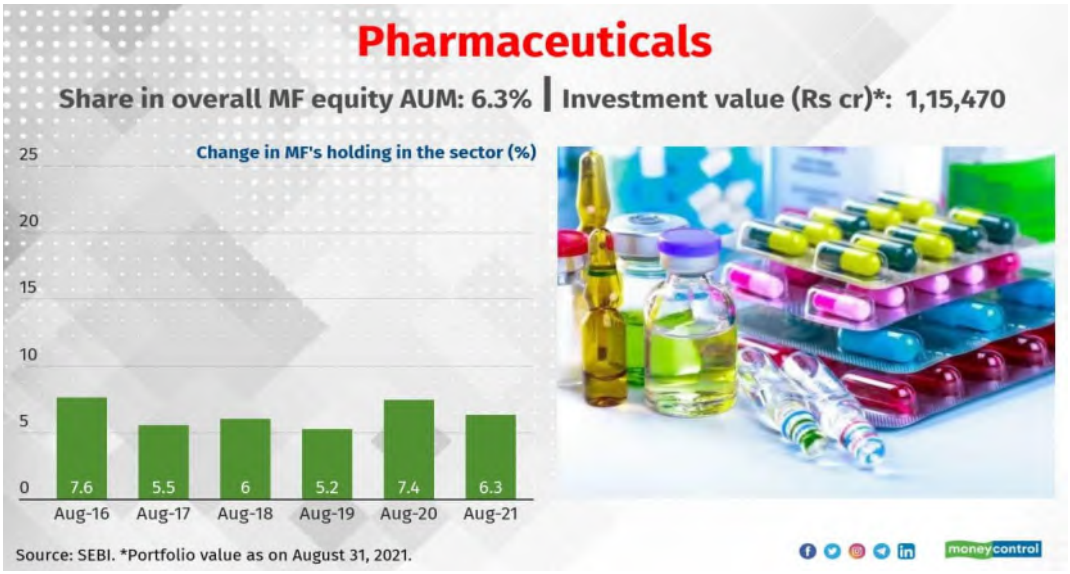
FMCG sector and Mutual Fund holdings

FMCG, once perceived as defensive sector, has seen growth in these tough times. With continued fear of complete lockdown, food-based retail chains and essential commodity providers have emerged as winners. Top stocks in the sector include ITC, Hindustan Unilever, Asian Paints, Nestle India and Tata Consumer Products.



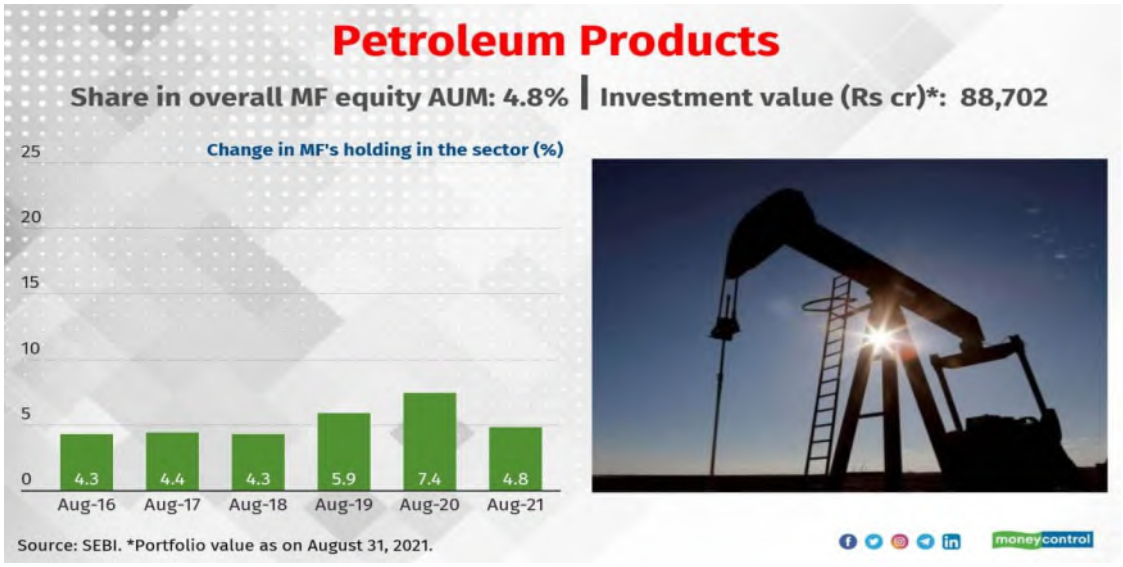
Pharmaceutical'ssector and Mutual Fund holdings

Between 2015 and 2020 Indian pharma companies had a rough ride. However, rising demand for certain drugs during the Covid-19 pandemic pushed pharma stocks higher. Sun Pharmaceutical Industries, Divi's Laboratories, Cipla, Dr. Reddy's Laboratories and Ipca Laboratories are a few preferred stocks among mutual funds.



Petroleumsector and Mutual Fund holdings

The top five preferred stocks for mutual funds in the petroleum product sector include Hindustan Petroleum Corporation, Reliance Industries, Indian Oil CorporationBharat Petroleum Corporation, and Castrol India.



Challenges in front of Mutual Funds

- In an effort to beat benchmarks, many mutual fund systems pursue strategies that don't work well in the long run
- Too many mutual fund programs pursue too few quality actions
- Inability to create product differentiation
- Pressure to exceed benchmarks.

Conclusion

Mutual funds are having very good opportunities in Indian market. All the sectors, Banking and Finance, FMCG, Software, Pharmaceuticals, Petroleum, have good holdings of mutual funds. Banking sector have 19.9% share in overall mutual fund, with the investment value of (Rs. cr) 3,66,972.Finance sector have 7.7% share in overall mutual fund, with the investment value of (Rs. cr) 1,42,381. Software sector have 12.1% share in overall mutual fund, with the investment value of (Rs. cr) 2,23,647. FMCG sector have 6.3% share in overall mutual fund, with the investment value of (Rs. cr) 1,16,170. Pharmaceutical's sector has 6.3% share in overall mutual fund, with the investment value of (Rs. cr) 1,15,470.Petroleum sector have 4.8 % share in overall mutual fund, with the investment value of (Rs. cr) 88,702.

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MIXTURE PROPORTIONING AND STRENGTH PARAMETERS OF M20 GRADE AND M50 GRADE OF SELF-CURING CONCRETE INCORPORATED WITH PREWETTED SINTERED FLY ASH LIGHTWEIGHT AGGREGATES

D.S. Patil*, S.B. Anadinni[1] and A.V. Shivapur[2]

[*]VTU, Belagavi, Department of Civil Engineering, AIKTC, Panvel, MS, India.

[1]Department of Civil Engineering, Presidency University, Bengaluru, Karnataka, India.

[2]Department of Water and Land Management Program, Department of Civil Engineering, VTU, Belagavi, Karnataka, India

[*]Corresponding Author: patildadas2@gmail.com

ABSTRACT

Curing is maintaining of required temperature and enough moisture for the concrete mass in the initial period after placement to enhance its performance. It is an essential process to develop the desired strength and durability requirements. When good practices of external curing are not adhered to on construction sites, concrete will be of poor quality. Self-Curing, also known as Internal Curing is an apt solution. It can very well cater to the issues associated with concreting in windy and hot weather. Self-Curing is strongly recommended for low water-cement ratio (≤ 0.35) concrete. However, it is equally beneficial for the concretes with high water-cement ratios as well. Large scale usage of High Performance Concrete (HPC) across the world necessitates the Self-Curing. It has a typical advantage of more amount of cement getting hydrated in a timely manner. Internal Curing leads to high early strength, less cracking, low permeability, higher internal relative humidity (RH), very low autogenous shrinkage, elimination of self-desiccation, etc. Therefore, it finds its applications in diverse structures. Prewetted porous Light Weight Aggregates (LWAs) are mixed with conventional concrete to create water reservoirs inside the concrete mass. The LWAs gradually give out the water through desorption process in order to internally cure the concrete after it sets. Self-Curing is brought about by modifying the conventional concrete through substitution of prewetted porous LWAs as a partial replacement of natural aggregates. LWAs are utilized for Self-Curing due to their substantial water absorption capacity. The absorption ranges from less than 10% to more than 30% depending upon the aggregate type and extent of prewetting. In this experimental work, prewetted sintered fly ash LWAs were added in concrete for the partial substitution of fine aggregates (crushed sand) to develop Self-Curing concretes of M20 grade with 0.55 water-cement ratio and M50 concrete with 0.34 water-cement ratio. LWAs of size 4-8 mm in Saturated Surface Dry (SSD) condition, after absorbing water for 24 hours, were mixed at 10%, 15% and 20% by the volume fraction of crushed sand. The various mixture proportioning approaches as per the available literature, aiming at determining the mass of dry LWAs to be incorporated and the mass of LWAs actually mixed in the concrete by trial and error method are compared. Compressive strength, split tensile strength and flexural strength were obtained. Conventional specimens were kept in water, whereas the Self-Cured specimens were placed in an ambient atmosphere inside laboratory. The maximum values of strength parameters were obtained at 15% addition of LWAs. The workability measurement by slump cone test indicated that LWAs also help to increase the rheological properties of the concrete, thereby enhancing the workability.

Keywords: *Concrete, Self-Curing, Degree of hydration, sintered fly ash LWAs, water-cement ratio, etc.*

1. Introduction

Through the process of Self-Curing, sufficient water gets supplied to interior of concrete elements by incorporating prewetted LWAs [1]. It is a means to make the sufficient water available for the complete hydration of cement particles [2, 3], which cannot be done by the mixing water alone. The LWAs are of various types like expanded shale, clay, slate, sintered fly ash aggregates, etc. For concretes with low water-cement ratios (< 0.43 and more significantly < 0.40), porous LWAs, replacing a part of sand, makes the additional curing water available which is desorbed in to the mortar (paste). If this extra water is not provided, the concrete mixes, especially with low water-cement ratios start self desiccating due to lack of water needed for hydration process. This leads to less cement quantity getting hydrated as well as generation of capillary pores filled with the water-vapor. This, in turn, leads to significant amount of autogenous shrinkage. It results in concrete cracking in early period. The high internal RH caused by Self-Curing reduces the self-desiccation. Internal curing creates reservoirs filled with water within the concrete mass. These provide water in sufficient quantity to cement paste for effective hydration from

mixing time (i.e. decreasing plastic shrinkage as well as attaining required workability) till the instance of attainment of moisture equilibrium between the cement paste and the reservoirs (decreasing autogenous as well as drying shrinkage) [4]. Prewetted LWAs have pore sizes much greater than the pores in the cement undergoing hydration. Hence, as pores in LWAs start giving out water through process of Self-Curing, the capillary stresses caused by self-desiccation are much less than that in conventionally cured concrete. The desorbed water does not alter water-cement ratio. Thus, Self-Curing helps in significantly eradicating autogenous shrinkage, thereby avoiding the concrete to crack in the initial phase [5, 6 and 7]. Autogenous shrinkage is a part of the total change in concrete volume. It becomes higher with the decreasing water-cement ratio. When tensile stress becomes more than the tensile strength, concrete tends to crack. Autogenous stress reduction combined with tensile strength enhancement decreases the possibility of early age cracking. If cracking in initial stage can be well-controlled, it can reduce cracking tendency at later-age and thus can decrease the entry of chlorides and corrosion vulnerability [8]. The period after setting during which concrete properties undergo change at a rapid rate is referred to as early age. For most of the concrete mixes, it is within initial 7 days [9]. However, the driving mechanism for adopting Self-Curing is chemical shrinkage. It refers to the products of hydration reaction exhibiting lower volume than the initial reactants [10, 11]. It is the decrease in volume occurring during hydration owing to the prevailing chemical reaction. When the concrete is not set, the volume change does not pose any problem because it is still in fluid form as the chemical shrinkage takes place; grains of cement re-adjust themselves to occupy the voids generated due to chemical shrinkage. After the concrete undergoes setting, its rigidity does not permit reconsolidation of particles. This leads to generation of vapor-filled voids in the concrete [12]. In low water-cement concretes, Self-Curing works better to cater to the chemical shrinkage associated with Portland cement hydration as well as lesser permeability of the system. Water mixed in to and adsorbed by products of hydration exhibits a certain volume which is lower in comparison with total volume of water; cement undergoing hydration imbibes water (around 0.07 g water/g cement) from the surrounding ingredients [2]. For concretes with low water-cement ratio, permeability becomes low at a rapid rate so that there is no enough entry of water from the external source inside the concrete body [13]. This clearly conveys the significance of Self-Curing concrete. The most crucial period during which sufficient curing is needed is initial 12 to 72 hours. Therefore, internal curing overcomes the deficiencies associated with external curing due to negligence or any other reason. More importantly, products of hydration tend to clog the pathways which are essential for water meant for curing to reach particles of cement which are in the dire need of enough water. Self-Curing proves to be an appropriate solution. This is because cement getting hydrated has very high thirst for water, pores of concrete exhibit strong capillary action and water held in the well-dispersed LWAs exhibits high fluidity [14]. In addition to arriving at the required volume of LWAs, their uniform distribution inside the concrete is a vital parameter to be considered. Fine LWAs are more preferred to coarse LWAs. This is because finer aggregates have less distance between them, thereby providing the sufficient curing water to a larger paste volume [1].

The effectiveness of Self-Curing largely depends on the Self-Curing ingredient used, procedure adopted, other concrete constituents i.e. cement, fine aggregates, coarse aggregates and admixture. The material must be comfortably batched. Concrete should get easily mixed as well as transported without LWAs getting hampered. LWAs should not give out the water held in their pores, until needed for the Self-Curing. The Self-Curing concrete is expected to be effortlessly pumped, placed and finished similar to the conventional concrete. LWAs are expected to exhibit the appropriate desorbing property to supply the water to the paste. It is desired that Self-Curing concrete should exhibit the properties desired by the engineer/ designer in its fresh, hardened as well as service state. To attain these requirements, concrete must contain enough water internally for adequate curing, decrease autogenous shrinkage and maintain the

required internal RH in order to eliminate self-desiccation. In this laboratory work, prewetted sintered fly ash LWAs were mixed with M20 and M50 grades of concrete at three different dosages in order to produce Self-Curing concrete which would be sufficiently fluid with good consistency and high workability in plastic state and giving strength parameters in hardened state on par with water-cured conventional grades.

2. Research Significance

The work was aimed at assessing the influence of prewetted LWAs on workability and strength parameters of M20 and M50 concrete grades. Internal curing effect commences quickly with the hydration of cement during the initial period, so that its advantages can be seen as early as 2 to 3 days [15]. The experimental results would reflect on the effectiveness of LWAs in bringing about the expected concrete attributes in plastic and rigid states. More significantly, the results would provide the information on the optimum dosage of LWAs to attain the target strength for both the grades.

3. Materials Used

i) Cement: Ordinary Portland Cement (OPC) of 53 grade was used. It confirmed to the requirements of IS 12269: 1987. 3.12 was its specific gravity.
ii) Fine Aggregates: Crushed sand conforming to zone II of IS 383: 2016 was used. Specific gravity was 2.70.
iii) Coarse Aggregates: 10 mm and 20 mm CAs in 40:60 mass ratios, with specific gravity of 2.72 were used. They confirmed to IS 383: 2016.
iv) Water: Curing and mixing water used was potable, conforming to IS 456:2000.
v) Superplasticizer: Sulphonated Naphthalene Formaldehyde Condensates (SNF) based high range water reducing, super-plasticizing and slump retaining admixture was used for M20 concrete. Polycarboxylic Ether (PCE) based low viscosity; high performance superplasticizer was made use of for M50 concrete.
vi) Prewetted Sintered Fly Ash LWAs: They were prewetted by inserting in the water for 24 hours absorption to obtain the SSD state. Table 1 shows the properties of LWAs.

Table 1: Properties of Sintered Fly Ash LWAs

Property	Details
Color/Shape/Nature	Pale brown/ Round pellets/Porous
Size	4 to 8 mm
Bulk density (oven-dried)	849 kg/m^3
Bulk density (SSD)	1000 kg/m^3
Specific gravity (SSD)	1.65
30 minute water absorption	16%
1 hour water absorption	16%
15 hour water absorption	16%
24 hour water absorption	18.7%
Crushing value (supplier literature)	32%
Bulk porosity (supplier literature)	35-40%
Average strength (supplier literature)	> 4 MPa

Figure 1: Sintered Fly Ash LWAs

Figure 1 shows the porous LWAs in a dry state. The commercial name is Sintagg. Aggregate shape has considerable effect on interlocking of aggregates as well as packing of particles inside matrix [16]. Spherical shape of aggregates had an internal core, black in color. It's because of iron oxidation state and carbon content.

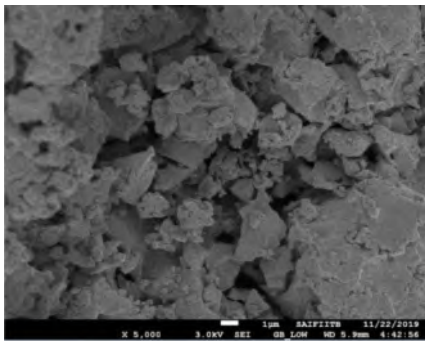

Figure 2: Microstructure of Sintered Fly Ash LWAs

Scanning Electron Microscopy on sintered fly ash LWAs was carried out in this study as shown in figure 2. The aggregate has smooth microstructure but, micro-scale shows roughness with open pores. Pore structure has a size around 10- 200 µm and is distributed (figure 2). The shape index of LWAs greatly influences the concrete's mechanical properties [17]. The shape index of spherical aggregates is generally less than that of aggregate with angular shape. With the equal aggregate strength, aggregate with greater index impart higher strength to the concrete [17]. The harshness of the concrete in plastic state may be influenced by the surface frictional properties of the mix, which depends on surface texture of LWA. For rough surface porous LWAs, cement paste or products of hydration may enter in to bigger pores or cavities on the aggregate surface. They act as numerous hooks and bind paste phase together with aggregate phase [18].

4. Interfacial Transition Zone (ITZ)

ITZ shows considerable influence on the mechanical and durability properties of hardened concrete. ITZ quality relates to surface texture, density and type of aggregate and its moisture condition. Because of excellent bond between LWAs and cement paste, concrete with LWAs usually shows very good performance when subject to harsh exposure [19]. There is intrinsic size difference between cement particles and aggregates. Due to this, wall effect exists for the conventional concrete. This leads to inferior concentration of cement particles in the vicinity of aggregate surface in comparison with bulk cement paste. In the early period, ITZ normally has greater water-cement ratio and inter-particle spacing is also more in comparison with bulk paste [20]. Insufficient curing in the initial period may lead to imbibing water from ITZ pores. It results in to generation of larger pores on the ITZ [21]. SEM examination showed that wall effect is not there for LWA; moreover, almost continuous and uniform microstructure of hydration products reclines alongside and partly enters LWA [22]. Dry aggregates exhibit better ITZ as compared to that of prewetted aggregates [23, 24]. Also, water contained in the LWA while mixing will be useful for Self-Curing at later ages within the matrix. This process decreases pores around LWAs and subsequently decreases percolated pathways. Micro hardness test carried out by Kong et al. [24] shows that LWA concrete's hardness and thickness values are greater than that of conventional concrete. The cause for the superior ITZ is because of greater absorption of dry LWA. It results in decrease in water-cement ratio around aggregates. Figure 3 depicts ITZ of various types of aggregates [25].

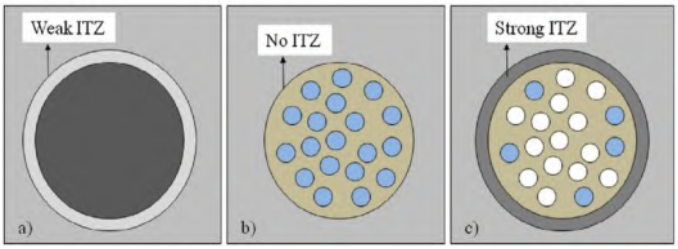

Figure 3: a) ITZ on Normal Aggregate Concrete; b) ITZ on Prewetted LWA Concrete; c) ITZ on Dry LWA Concrete [25].

Along with mechanical interlock, chemical reaction as well prevails in fly ash aggregate concretes' ITZ. It is due to pozzolanic reaction, which is brought about by SiO_2 and Al_2O_3, major composition of sintered fly ash aggregate. In conventional concrete, precipitation of $Ca(OH)_2$ on aggregate surface is attributed to heterogeneous nucleation and consequent $Ca(OH)_2$ growth on aggregate surface from an oversaturated solution to create

a duplex film [26]. This layer is not strong in comparison with paste and aggregate phase in conventional concrete. However, LWA may absorb liberated $Ca(OH)_2$ within aggregate and can bring about pozzolanic activity around the aggregate. Ozturan and Kockal [27] made an important observation that LWA concrete hydrated cement paste appears to have uniform color; moreover, it shows microstructure which is homogenous and dense.

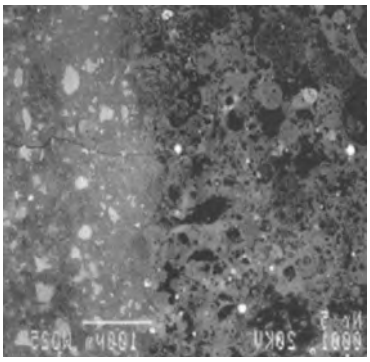

Figure 4: Interfacial Zone Microstructure between Cement Paste and Fly Ash Aggregate (X 200) [18].

Figure 4 shows the sintered fly ash aggregate concrete's typical ITZ. Interface zone was tight, interface was crack-free between aggregate and paste phases in LWA concrete. As the temperature of heat treatment on aggregate increases, pozzolanic reactivity between paste and aggregate also increases [28]. Whether LWA has highly porous outer shell or is without any outer shell, interfacial zone is homogenous and very dense. These aggregates exhibit excellent bond between cement paste and aggregate because of improved mechanical interlocking [29]. As per many researchers, ITZ thickness is only 40-50 µm. Hence, it's difficult to know the chemical reaction taking place in paste-aggregate interface directly [30, 31]. Therefore, researchers investigated cement mixture and powdered LWA paste to understand chemical reaction. However, it leads to incongruity in results. Pozzolonic reaction between fly ash aggregate and cement is negligible [31]. Mineral compound recrystalization during sintering process may be responsible for this. Sintered aggregate's chemical reactivity is comparable with fly ash reactivity at later ages also [30]. Sintered fly ash aggregates have more chemical reactivity as compared to that of expanded clay and shale rock. Further, the reactivity increases with water-cement ratio [32].

5. Mixture Proportioning

Conventional concrete mix design was carried out by referring to the guidelines mentioned in IS 10262:2009 in combination with IS 456:2000 recommendations. At 28 days, the target strengths for M20 concrete and M50 concrete were set as 26.60 N/mm^2 and 58.25 N/mm^2 respectively. The coarse aggregates and crushed sand bear a ratio of 60:40 by mass, for both the grades. Table 2 shows the masses and proportions of concrete constituent materials in SSD state.

Table 2: Concrete Constituent Materials (SSD State)

Concrete Grade		Water	Cement	Crushed Sand	Coarse Aggregates
M20	kg/m^3	176	320	880	1040
	Proportion	0.55	1	2.75	3.25
M50	Kg/m^3	153	450	820	1050
	Proportion	0.34	1	1.82	2.33

From the practical consideration of developing a Self-Curing concrete, Ready Mix Plant Engineer should beforehand know how much prewetted LWA is needed to bring about an effective internal curing for a particular concrete mix.

Method 1: Bentz and Snyder [2] proposed an equation for proportioning the concrete mix with an idea of balancing the water provided by prewetted LAWs with water demand by cement for hydration. The equation gives required quantity of dry LWAs needed to supply water in order to occupy the voids generated by chemical shrinkage. This equation developed for a concrete with OPC is as below

$$M_{LWA} = \frac{(C_f \; X \; CS \; X \; \alpha_{max})}{(S \; X \; \Phi_{LWA})} \quad (1)$$

Where:

M_{LWA} = dry LWA mass required per unit volume of concrete (kg/m^3);

C_f = cement factor (content) for concrete mix (kg/m^3);
CS = chemical shrinkage of cement (g of water / g of cement);
α_{max} = maximum expected cement hydration degree;
S = degree of saturation of LWAs (0 to 1), however, equation (1) is valid only for non-zero values of S, because LWA quantity required diverges to infinity; and
Φ_{LWA} = absorption of LWA (kg water/kg dry LWA).

Cement factor (C_f) refers to known parameter. Chemical shrinkage (CS) of cement can be determined by knowing the composition. The two terms in equation have fixed values. Maximum possible hydration degree of cement (α_{max}) is dependent on available water. However, there are certain problems associated with this equation. The two terms in denominator vary with the type of LWAs. If LWAs incorporated are less than the optimum, they desorb water at a lower rate, resulting in cement not attaining the maximum amount of hydration. Some LWAs cannot attain saturation or rapid desorption. As the desorption is very vital in initial and final setting stages, initial 30 minutes water absorption [33] is regarded as an indication of early availability of absorbed water. The various LWAs like shale, clay, slate, etc. have their unique characteristic expansion with resulting pore or void configuration and thus absorption capacity will also differ for each LWA. More significantly, some voids have greater size, some are extremely minute, some are interconnecting, and some are not. Depending on LWA type, 24 hours absorption values lie between 5% and 25%. As such, same mass of LWA may exhibit different capacity to supply water for the cement hydration. This equation does not cater to the other issues related to internal curing. Many factors affect the mixture proportioning. For instance, equation (1) may result in the excess water quantity for greater water-cement ratio mixes because not all the chemical shrinkage volume may need to be filled. As such, excessive LWA volume may not lead to advantages gained by Self-Curing [34]. The environmental exposure in which concreting is done and cured need a consideration. When concreting is done in a harsh environment, plastic shrinkage or quick drying is an issue and hence, more prewetted LWAs need to be added in to concrete. When concrete is in fresh state, water is taken out of LWAs to compensate for the bleed water lost through evaporation. If due consideration is not given to this water quantity (or LWAs), resulting concrete mix may become under-proportioned. Moreover, advantages of Self-Curing will not be fully achieved.

Water held in LWAs can travel only about 1.8 mm in to paste surrounding the aggregates [35] and therefore, lightweight fine aggregates are made use of for effective Self-Curing due to their greater dispersion than that of coarse aggregates. The water quantity desorbed from LWAs depends on aggregate pore size distribution, spacing of LWAs, pore size distribution of paste matrix, paste permeability and internal RH around the aggregates [36]. As cement hydrates, capillary tensile stresses get developed and it consumes water from capillary pores in the paste matrix. Water is then desorbed from LWA pores in to paste capillary pores. The lower limit of useful size of pores is about 100 nm [36]. Owing to different pore size distributions, different LWAs exhibit dissimilar desorption behaviour. For Self-Curing, desorption properties are more important than absorption properties [7].

Chemical shrinkage (CS) ranges from 0.06 to 0.08 at room temperature for OPC based concrete. It can be considered as 0.07. 24-hour water absorption of sintered fly ash LWA found in the laboratory was 18.7%, so Φ_{LWA} = 0.187. Degree of Saturation (S), defined as volume ratio of absorbed water to water content for SSD state can be assumed as 95% [37].

There are two approaches for obtaining maximum degree of cement hydration (α_{max}). If water-cement ratio is greater than 0.36, maximum expected degree of cement hydration can be considered as 1 [7]. As per this theory,

$\alpha_{max} = 1$ (2)

For water-cement ratio less than 0.36, maximum expected degree of cement hydration under saturated condition (which should not vary much with curing temperature) is given by [7]

$\alpha_{max} = (w/c) / 0.36$ (3)

The second approach is an outcome of study conducted by Mills [38] on a wide range of cements to arrive at α_{max} depending on the quantity of chemically bound water after the completion of hydration. α_{max} is greatly influenced by water-cement ratio [38, 39]. Mills [38} proposed the following equation

$\alpha_{max} = (1.031\, w/c) \,/\, (0.194 + w/c)$ (4)

Method 2: There exists one more method of determining the mass of prewetted LWAs needed for Self-Curing [40]. It is independent of maximum degree of cement hydration term.

$M_{LWA} = [C_f \; X \; CS \; X \; (1 + A)] \,/\, (A \; X \; D)$ (5)

Where:

A = absorption of LWAs, expressed as a percentage of oven-dry mass.

D = desorption of LWAs, expressed as a percentage of the absorbed water that is released by the aggregate in drying conditions compared to the total absorbed water (assumed as 95%).

For M20 concrete, equation (1) becomes

$M_{LWA} = (320 \; X \; 0.07 \; X \; \alpha_{max}) \,/\, (0.95 \; X \; 0.187)$

$M_{LWA} = 126.09 \; X \; \alpha_{max}$ (6)

From first approach, α_{max} = 1 for water-cement ratio of 0.55 ($i.e. > 0.36$).

Therefore, equation (6) gives mass of dry sintered fly ash LWAs as 126.09 kg/m^3.

From second approach, $\alpha_{max} = (1.031 \; X \; 0.55) \,/\, (0.194 + 0.55) = 0.7621$

Therefore, equation (6) gives mass of dry sintered fly ash LWAs as 96.09 kg/m^3.

Using second method by referring equation (5) for M20 concrete,

$M_{LWA} = [320 \; X \; 0.07 \; X \; (1 + 0.187)] \,/\, (0.187 \; X \; 0.95) = 149.67\ kg/m^3$.

Mass of prewetted sintered fly ash LWAs is 149.67 kg/m^3.

Therefore, mass of dry sintered fly ash LWAs is $(149.67 \,/\, 1.187) = 126.09\ kg/m^3$.

Comparing equation (6) and the above value, it is seen that this method assumes α_{max} = 1.

However, in the laboratory for both concrete grades crushed sand was partially replaced by the prewetted sintered fly ash LWAs by trial and error method, at the rates of 10%, 15% and 20% on volume basis because of the considerable difference in specific gravities of crushed sand and LWAs. Figure 5 shows an example of a typical volumetric representation of various constituents of LWA concrete.

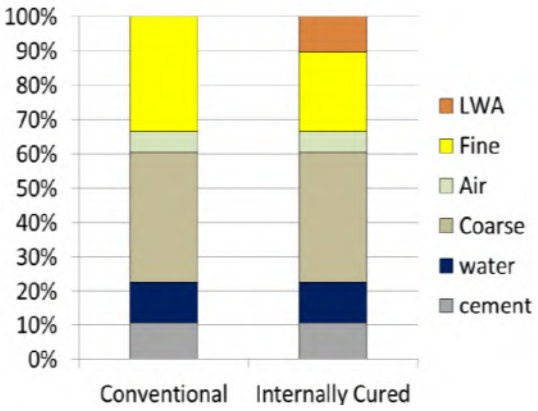

Figure 5: Volumetric Representation of Various Constituents of LWA concrete

Referring table 2, the mass of crushed sand for M20 concrete is 880 kg/m^3.

Crushed sand volume = (Mass of crushed sand / Sp. gravity of crushed sand) = (880 / 2.70).

Volume of crushed sand = 325.926 $litres$.

Volume of prewetted LWAs at 10% replacement = $(0.10 \; X \; 325.926) = 32.592\ litres$.

Prewetted LWAs mass = (Volume X Sp. gravity of LWAs) = $(32.592 \; X \; 1.65) = 53.77\ kg/m^3$.

Therefore, dry mass of LWAs = $(53.77 \,/\, 1.187) = 45.305\ kg/m^3$.

Similar calculations at 15% replacement give dry mass of LWAs = 67.958 kg/m^3.

Similarly, dry mass of LWAs at 20% replacement = 90.611 kg/m^3.

For M50 concrete, equation (1) becomes

$M_{LWA} = (450 \; X \; 0.07 \; X \; \alpha_{max}) \,/\, (0.95 \; X \; 0.187)$

$M_{LWA} = 177.315 \; X \; \alpha_{max}$ (7)

From first approach, $\alpha_{max} = (0.34/0.36) = 0.94$, for water-cement ratio of 0.34 ($i.e. < 0.36$).

Therefore, equation (7) gives mass of dry sintered fly ash LWAs as 166.67 kg/m^3.

From second approach, $\alpha_{max} = (1.031 \; X \; 0.34) \,/\, (0.194 + 0.34) = 0.6564$.

Therefore, equation (7) gives mass of dry sintered fly ash LWAs as 116.397 kg/m^3.

Using second method by referring equation (5) for M50 concrete,

$M_{LWA} = [450 \; X \; 0.07 \; X \; (1 + 0.187)] \,/\, (0.187 \; X \; 0.95) = 210.473\ kg/m^3$.

Mass of prewetted sintered fly ash LWAs is $210.473\ kg/m^3$.
Therefore, mass of dry sintered fly ash LWAs is $(210.473 / 1.187) = 177.315\ kg/m^3$.
Referring table 2, mass of crushed sand used in laboratory for M50 concrete is $820\ kg/m^3$.
Crushed sand volume = (Mass of crushed sand / Sp. gravity of crushed sand) = (820 / 2.70).
Volume of crushed sand = $303.704\ litres$.
Volume of prewetted LWAs at 10% replacement = $(0.10\ X\ 303.704) = 30.370\ litres$.
Prewetted LWAs mass = (Volume X Sp. gravity of LWAs) = $(30.370\ X\ 1.65) = 50.11\ kg/m^3$.
Therefore, dry mass of LWAs = $(50.11 / 1.187) = 42.216\ kg/m^3$.
Similar calculations at 15% replacement gives dry mass of LWAs $= 63.325\ kg/m^3$.
Similarly, dry mass of LWAs at 20% replacement = $84.433\ kg/m^3$.

Table 3: Mass of dry LWAs as per two methods and laboratory trial and error method

Con.	Mass of Dry LWAs (kg/m^3) as per Method 1		Mass of Dry LWAs (kg/m^3) as per Method 2	Mass of Dry LWAs (kg/m^3) by Trial and Error Method in lab. with Replacements of		
				10%	15%	20%
M20	α_{max} = 1	α_{max} = 0.7621	126.09	45.30	67.96	90.61
	126.09	96.09				
M50	α_{max} = 0.94	α_{max} = 0.6564	177.31	42.21	63.32	84.43
	166.67	116.39				

Table 3 shows the comparison of quantities of dry LWAs required as per the two methods and the actual quantities of LWAs mixed in the concrete in the experimental work.

6. Experimental Program

For determining density and compressive strength, (150 mm X 150 mm X 150 mm) size cubes were used. Cylinders having dimensions (150 mm dia. X 300 mm height) were used for split tensile strength test. For determining flexural strength, beams of dimensions (150 mm X 150 mm X 700 mm) were used. Specimens were cast as per IS 10086: 1982. Preparation and material weighing, cube and beam casting, mixing and compaction of concrete were carried out referring to IS 516: 1959. The split tensile test cylinders were made ready as per IS 5816: 1999. The conventional concrete specimens were cured by water; whereas the Self-Curing specimens were placed in the laboratory in an open air for air-curing.

7. Testing

7.1 Slump Test for Workability

For fresh concrete, slump test was done in order to assess the fluidity of the concrete. Guidelines from IS 7320: 1974 (Revised 2004) were followed. The slump retentions after 30 minutes were observed to see the practical applicability.

7.2 Test for Density of Hardened Concrete

The average densities (kg/m^3) of a set of 3 hardened cube specimens at 3, 7 and 28 days were found out by taking their weight in air (A, kg) and weight in water (B, kg). The density of specimen was determined by using the formula [A / (A – B)] X 1000.

7.3 Test for Compressive Strength

The experiments were done in Compression Testing Machine (CTM) on a set of 3 cubes at 3, 7 and 28 days as per IS 516: 1959. The compressive strength at failure load, σ (N/mm^2) = Load (P) Newton / Area (A) mm^2. The average strength was considered.

7.4 Test for Split Tensile Strength

Experiments were done on a set of 3 cylinders at 3, 7 and 28 days in CTM as per IS 5816: 1999. The split tensile strength T (N/mm^2) =

(2P/πLD), where P is compressive load (N), L is length of cylinder (mm) and D is diameter of cylinder (mm). The average strength was indicated.

7.5 Test for Flexural Strength

The experiments were done on a set of 3 beam specimens at 3, 7 and 28 days in flexure testing machine as per IS 516: 1959, using 4-point loading for pure bending condition in order to determine modulus of rupture (flexural strength). All the test specimens exhibited cracks within the middle-third part; the modulus of rupture was calculated as f_b (N/mm^2) = (Pl/bd^2) , where P is peak load (N), l is span between two roller supports (600 mm), b is specimen width (mm) and d is the specimen depth (mm) at the cracked section. The average strength was taken in to account.

8. Results and Discussion

8.1 Mixture Proportioning

Referring table 3 in section 5, it is observed that the sintered fly ash LWA quantities incorporated in to the mix in the laboratory at three replacement percentages are considerably less than that obtained by method 1 and method 2 of arriving at dry mass of LWAs. This is because the proposed methods are silent on the type of LWAs. Depending on the internal structure and type of LWAs used, their absorption and desorption characteristics and degree of saturation differ with each other significantly. Moreover, method 1 comprises of two approaches of arriving at maximum degree of cement hydration; whereas method 2 always assumes the value as 1 (i.e. full hydration). The water absorption of sintered fly ash LWAs for the initial 30 minutes was 16%, which is about 86% of its 24-hour absorption (18.7%). This clearly conveys that desorption capacity of sintered fly ash LWAs used is excellent, thereby requiring relatively less amount as a part replacement of crushed sand. Further, the equations in both the methods don't specify size of LWAs. As relatively fine size of 4-8 mm of sintered fly ash LWAs were used, their dispersion properties are excellent, thereby resulting in the higher degree of hydration.

8.2 Slump and Slump Retention

Table 4: Slump and Slump Retention

Concrete Grade		Sintered Fly Ash LWAs (%)			
		0	10	15	20
M 20	Slump (mm)	120	140	175	175
	30 minutes slump retention (mm)	95	95	110	120
M 50	Slump (mm)	155	150	210	240
	30 minutes slump retention (mm)	130	105	160	200

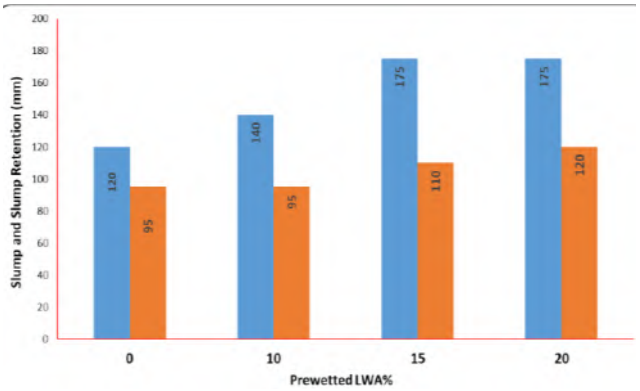

Figure 6: Slump and 30 Minute Slump Retention for M20 Concrete

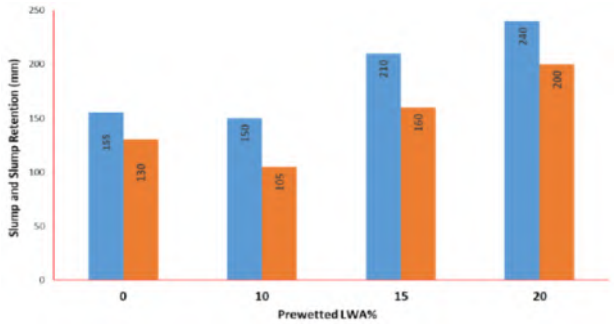

Figure 7: Slump and 30 Minute Slump Retention for M50 Concrete

For M20 concrete, the dosage of SNF based admixture was at 1.4% by the weight of dry cement for all the four mixes. The slump and slump retention values for LWA-modified concrete were observed to be higher. Moreover, with the increase of LWA dosage, slump and slump retention were seen to increase. For M50 concrete, the dosage of PCE based admixture was at 1.2% by the weight of dry cement for all the four mixes. Exactly same trend as that of M20 concrete was observed in this case also. However, the overall slump and slump retention values were more in comparison with M20 concrete due to superior performance of PCE based admixture. Slump is usually a function of self weight of concrete.

Even with the same slump values, LWA concrete may show higher workability. The workability of Self-Curing concrete increased because of advantage of spherical shape of LWAs. The results clearly indicate that along with acting as Self-Curing agent, LWAs facilitate to provide necessary fluidity to the concrete mass. More importantly, the LWA concrete can be easily pumped, placed and finished.

8.3 Hardened Concrete Density

Table 5: Density of Hardened Concrete of M20 Grade

LWAs (%)	Average Density (kg/m^3)		
	3 days	7 days	28 days
0	2482.44	2487.99	2492.09
10	2433.83	2449.81	2409.54
15	2371.57	2365.15	2329.37
20	2337.62	2327.36	2332.99

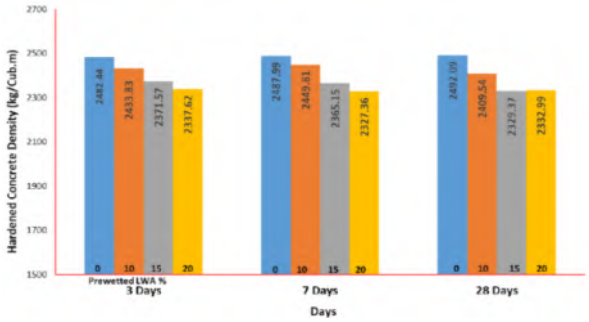

Figure 8: Density of Hardened Concrete for M20 Grade

Conventional concrete cubes' density was higher at all the cuing periods. As the dosage of LWAs was increased, the density was observed to exhibit decreasing trend owing to the fact that LWAs have specific gravity of 1.65 which was considerably lower than that of crushed sand and coarse aggregates. For conventional mix, density increased with curing period. For 15% LWA-modified concrete, density continuously decreased with curing period. However, for 10% and 20% replacements, no particular trend was seen. Density does not only depend upon the constituent materials, but it is also affected by pores, compaction, etc.

Table 6: Density of Hardened Concrete of M50 Grade

LWAs (%)	Average Density (kg/m^3)		
	3 days	7 days	28 days
0	2499.00	2493.95	2499.02
10	2435.94	2437.63	2412.69
15	2405.13	2398.82	2391.94
20	2380.52	2386.60	2380.91

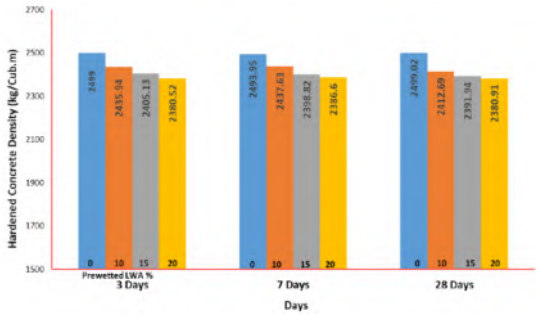

Figure 9: Density of Hardened Concrete for M50 Grade

At all the curing stages, conventional concrete cubes exhibited greater density values. With the increase in LWA dosage, density expectedly reduced. The one-to-one comparison of corresponding density values from table 5 and table 6 revealed that for M50 concrete, the values are on higher side. This is because, the crushed sand used was 820 kg/m^3 for M50 grade against 880 kg/m^3 for M20 concrete; so, same percentage of LWA addition resulted in to lower quantities of LWAs in case of M50 concrete. Moreover, M50 concrete has greater cement content combined with lower water-cement ratio, leading to relatively less pores.

8.4 Compressive Strength

Table 7: Compressive Strength of M20 Concrete

LWAs (%)	**Average Compressive Strength (N/mm^2)**		
	3 days	7 days	28 days
0	14.03	21.04	35.39
10	20.12	25.90	32.65
15	20.19	27.08	36.00
20	16.38	19.84	25.94

Referring table 7 for M20 concrete, the compressive strengths of 10% LWA concrete and 15% LWA concrete at 3 and 7 days are more than that of conventional concrete; with 15% LWA concrete exhibiting higher values. At 28 days, the strength of 15% LWA concrete has highest value and is marginally more than that of conventional concrete. Moreover, concrete with 10% LWAs shows strength less than the two. However, these three mixes exhibited 28 days' compressive strength more than the target strength.

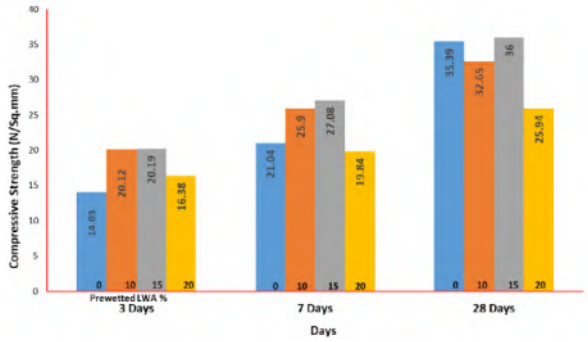

Figure 10: Compressive Strength of M20 Concrete

With 20% addition of LWAs, the strengths at all the curing ages show the lowest values. The strength at 28 days is less than the target strength. This shows that adding the optimum amount of prewetted LWAs in to concrete produces good results at early ages as well as at 28 days due to better desorption property of sintered fly ash aggregates. However, addition of more volume than the optimum at 20% LWAs might have resulted in to higher water content inside the already high water-cement (0.55) concrete, thereby decreasing the strength. At high water-cement ratio, additional water due to LWA porosity is less than the excess mixing water available from use of high water-cement ratio; decreasing the effect on strength at higher water-cement ratios. Moreover, hydration products penetrate inside the LWA pores, leading to enhanced bonding between cement matrix and aggregates and greater strength. It's known as hook effect.

Table 8: Compressive Strength of M50 Concrete

LWAs (%)	Average Compressive Strength (N/mm^2)		
	3 days	7 days	28 days
0	36.89	46.73	67.72
10	34.02	39.81	49.98
15	38.94	48.71	60.66
20	38.92	45.20	52.07

Referring table 8 for M50 concrete, strength of conventional concrete is highest at 28 days, followed by 15% LWA concrete. As relatively more amount of cement is available, cement paste may penetrate in the outer porous layer of LWAs. This may strengthen the bond, but may also partially block the transfer of absorbed water to the water-demanding self-desiccating paste. The lowest strength at 28 days was exhibited by 10% LWA concrete.

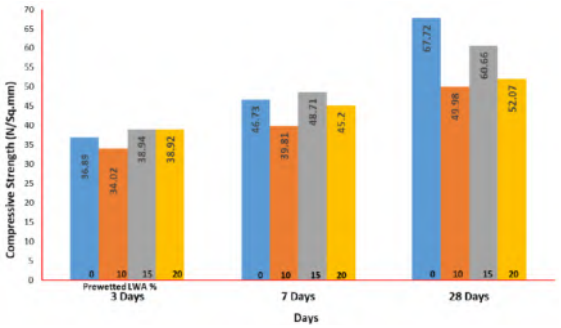

Figure 11: Compressive Strength of M50 Concrete

10% LWA concrete and 20% LWA concrete could not achieve the target strength. However, 15% LWA concrete exhibited the highest strength values at 3 and 7 days. The concrete with 20% LWAs showed comparable values at 3 and 7 days; but, lower value at 28 days. The excellent desorption property of LWAs in the initial stage leads to better strengths at early ages. However, the rate of strength gain gradually reduces over 28 days as the water-cement of 0.34 is relatively on lower side. The stresses taking place around the inclusions in a uniaxial compressive test, due to elastic mismatch, may result in LWA splitting. LWAs have lower crushing strength in comparison to normal weight aggregates. Strength of a particular LWA is dependent on its porosity, pore size distribution and the strength of pore-free vitreous material surrounding the pores.

8.5 Split Tensile Strength

Table 8: Split Tensile Strength of M20 Concrete

LWAs (%)	Average Split Tensile Strength (N/mm^2)		
	3 days	7 days	28 days
0	0.98	1.49	2.68
10	1.12	1.52	2.36
15	1.13	1.53	2.65
20	0.98	1.43	2.10

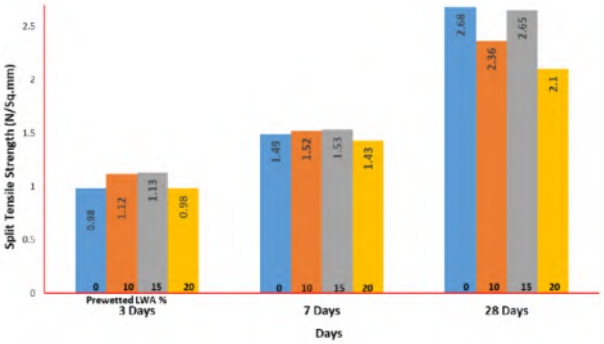

Figure 12: Split Tensile Strength of M20 Concrete

Table 9: Split Tensile Strength of M50 Concrete

LWAs (%)	Average Split Tensile Strength (N/mm^2)		
	3 days	7 days	28 days
0	1.58	2.12	3.27
10	1.31	1.82	3.02
15	1.52	2.06	3.18
20	1.53	1.97	3.00

Table 8 and table 9 clearly show that the split tensile strength values for both the grades almost follow the compressive strength patterns. More the strength in compression; higher the tensile strength value.

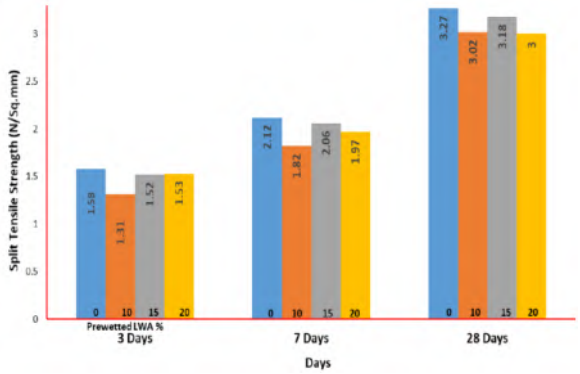

Figure 13: Split Tensile Strength of M50 Concrete

Conventional concrete and 15% LWA concrete exhibited higher values for both the grades.

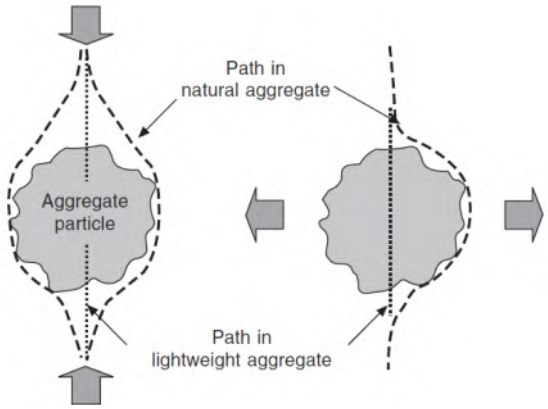

Figure 14: Fracture paths for lightweight aggregates and natural aggregates

Figure 14 shows the comparison of fracture paths through the lightweight aggregates and around the normal weight aggregates. Visual inspection indicated that there was no interfacial bond failure on the failure surface of the specimens. ITZ indicated very good bonding between the aggregates and the cement paste.

8.6 Flexural Strength

Table 10: Flexural Strength of M20 Concrete

LWAs (%)	Average Flexural Strength (N/mm^2)		
	3 days	7 days	28 days
0	1.97	3.58	3.90
10	2.00	3.29	3.57
15	2.06	3.27	3.88
20	1.97	2.98	3.15

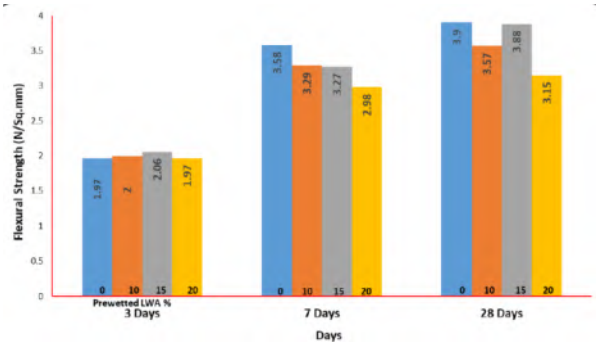

Figure 15: Flexural Strength of M20 Concrete

Table 11: Flexural Strength of M50 Concrete

LWAs (%)	Average Flexural Strength (N/mm^2)		
	3 days	7 days	28 days
0	2.78	3.85	5.62
10	2.69	2.82	3.78
15	2.79	3.81	5.31
20	2.73	3.67	4.09

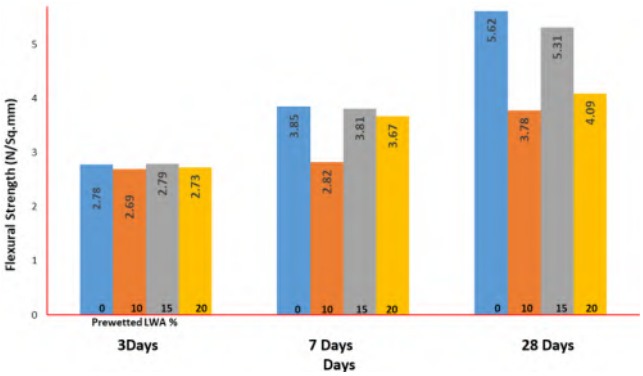

Figure 16: Flexural Strength of M50 Concrete

Referring table 10 and table 11, the flexural strength values for both the grades were observed to follow similar trend as that of compressive strengths. Flexural strength being a function of compressive strength, higher compressive strength led to a greater flexural strength. Conventional concrete and 15% LWAs concrete exhibited greater values of flexural strength at all the ages.

9 Conclusions

1. The mixture proportioning by replacing a part of fine aggregates with prewetted LWAs, on volumetric basis, at different dosages leads to developing an efficient concrete which can self-cure.
2. Slump and slump retention values indicate that apart from acting as Self-Curing agent, prewetted LWAs also contribute significantly in improving the workability by imparting adequate fluidity to the mix. This is a vital consideration for practically placing the concrete under different conditions; especially the pumpable concrete.
3. The prewetted LWAs perform their task of internal curing effectively without reducing the hardened concrete density to a large extent, owing to their additions at relatively smaller fractions of concrete mass.
4. The strength parameters of 15% LWA concrete were observed to be on par with water-cured concrete, thereby indicating that Self-Curing is as efficient as water-curing.

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IMPACT OF MINING ON AGRICULTURE AND FOOD SECURITY : A MICRO LEVEL EVIDENCES FROM ODISHA

R.K. Kumbhar and S. Sahu
Central University of South Bihar, Gaya, Bihar, India
rathikanta@gmail.com, sujatasahu2009@gmail.com

ABSTRACT

The paper examines the impacts of mining on agriculture and food security at the micro level in Odisha. Secondary data on gross cropped area, number and areas of operational holdings and land utilisation pattern are explored to understand the initial conditions with regards to food security. Followed by primary data on agricultural production, productivity, land holdings, agricultural employment and state of food security have been collected from three affected villages (300 households) for pre and post mining period and analysis have been carried on using paired – 't' test and it was found that mining has adversely affected the agriculture and food security conditions at the micro level in the mines surrounding areas. Therefore the paper suggests for a visionary mining led industrialisation.

Keywords: *Agricultural Production and Productivity, Cropping Pattern, Land Holdings, Food security.*

1. Introduction

Odisha is one of the agrarian economies among the Indian states, where her agriculture plays a major role by absorbing about 62 percentage of total workers (Census, 2011) and contributing 21.38 percentage to her gross value addition. With this predominance of agriculture, land and forest are playing an indispensable role in providing livelihood and promoting human development of her people and serving the purpose of collateral, fallback resources and economic and social power through which citizen can claim their rights (Cernea, 1999). But the advent of the neo-liberal strategy of development in the lens of modernization and industrialization has widen the rate of exploitation by the corporate profit seeker capitalist through acquiring land from the SCs/STs with or against their will and forest has been destroyed to extract mineral ores for business purposes (Bebbington et al. 2008; Bhaduri and Patkar 2009; Kumbhar 2012). Thus with the introduction of mining, agricultural sector is badly affected due to loss of agricultural land by land acquisition and by loss of productivity of land due to environmental degradation in terms of pollution of soil, water and air (Das, 2001 and Vijay, 2003). Further, the weather is not suitable for agriculture due to deforestation and hence changing monsoon adds fuel to it. Therefore, present study aims to discuss how the agricultural output, employment and productivity are hampered due to mining and mining led plant establishment leading to food insecurity in the State.

The main objective of the paper is to examine how the agriculture is affected in the pre and post mining period in the three different mining affected villages (Coal affected village – Darlipali, Bauxite affected village – Damanjodi and Limestone affected village – Dunguri from Jharsuguda, Koraput and Bargarh districts of the State respectively) which are selected basing on differentiation of mining and different geographical location of the State. Based on the objective, following null hypotheses are tested:

- Mining led industrialisation has no impact on agricultural production, productivity and food security.
- It has no impact on number and area of land holding and agricultural employment.

The rest of the paper is divided into four sections. First section deals with the methodology applied and second section explains the impact of mining on agricultural production where its core sub-sections are comparative static analysis of production and productivity; and changing cropping pattern with food insecurity. The third section looks into impact of mining on agricultural employment whereas last section concludes the present paper.

2. Methodology

The study has used both primary and secondary data. The primary data on cropping pattern, area and number of land holdings were collected through a scheduled questionnaire from door to door interview method. The secondary data analyses of the above variables are discussed by their respective indexes and shown in tabular form and figures and collected from different issues of Economic Survey and Agricultural Census of Odisha.

Darlipali village was selected from Lakhanpur area of MCL where 26 numbers of villages are affected. The village was selected as the sample village where all types of land (cultivable land, homestead land, forest land and other government land) were now acquired by MCL for Lakhanpur OCP and Belpahar OCP, though possession of all types of land was not taken physically. Belpahar OCP has started its extraction in the village on 23 March 1988 on the basis of notification on 20 May 1983 for 257.94 acre land. Before that, the mine has acquired completely the government forest land of 311.85 acre land on 04 September 1981. The second phase notification was on 07 September 1988 for Lakhanpur OCP for 89.89 acre land and the land possession was taken place by MCL on 22 March 1991. The third phase notification was being carried out on 26 October 1991 for both the mines for 17.25 acre land and physical possession was not completed yet. But the field survey shows that are 102 households staying in that sample village with possession of 114.92 acres of land (both homestead and cultivable), since MCL has not acquired all the land physically.

In the case of bauxite mines of NALCO, no household was being displaced but for the establishment of Alumina Refinery at Damanjodi of Koraput district of the state, thirteen villages were fully displaced. Nalco has made a rehabilitated colony for the displaced households and resettled them in the new colony named Ambedkar Nagar in 1980. Later on two villages (Champapodar and Khoraguda) were displaced for the establishment of ash pond and red mud pond which were resettled in a new rehabilitated colony, Sahid Laxman Nayak Nagar in 2004. 304 households from the two rehabilitated colonies were being taken for field survey.

Dunguri village was mostly affected among all affected villages by Limestone mines for which it was the selected village for Primary Survey. In 1955 ACC cement factory acquired 735 hectares from 1435 hectare of Dunguri village for limestone mining lease (As per village sarpanch). Primary survey works has taken seven years before starting the mines and hence first mining activity was carried on by ACC cement from Dunguri village in 1962. The total population of the said village was about 2619 as per census, 2011 which consists of 581(22.18%), 435 (16.61%) and 1603(61.21%) number of population in SC, ST and Others categories respectively. 152 households of the village were taken for field study comprising of 38, 43 and 71 households from ST, SC and Others category.

Paired t-test is applied (changing cropping pattern with food insecurity) to examine the difference of mean of land holding in the pre and post mining period where the change of number and area of land holding in the selected studied villages is compared. The following equation is applied to find out the 't' value.

$$t = \frac{\bar{X} - \mu}{S/\sqrt{N}}$$

Where, $\bar{X}$ = sample mean
μ = Population mean
S = Standard deviation
N = Sample Size

Given this, the following section examine the relations between mining and agricultural production.

3. Mining and Agricultural Production:

This section examines the impact of mining on agriculture. The sub-sectors of agriculture are crop, livestock, fishery and forestry. The present analysis focuses only to crop sub-sector in terms of agricultural output, changing cropping pattern and productivity of soil after introduction of mining and establishment of mining led plants. As per analysis of agriculture of Odisha by Mishra (2010), it was found that there was declining trend for the area under production and quantity produced for three important produce i.e. rice, potato and onion and also for total pulses and total fibres during 1993-94 to 2003-04. The similar trend is also noticeable for the yield rate of rice, gross cropping area, net shown area and

cropping intensity during the same period. The rising trend of use of fertiliser by an average of 6 per cent per year has created chemicalisation in agriculture sector. But during the similar period, the rising trend of mining NSDP at constant prices by an average of 10 per cent per year discloses the fact that it had badly affected agricultural production and productivity in the state.

3.1 Comparative Static Analysis of Production and Productivity:

The climate and soil play a vital role in Odisha's agricultural economy with rain-fed nature of its agriculture. The tropical climate of the State with high temperature, high humidity, medium rainfall and mild winter, it has raised its agricultural production and productivity by using modern instruments, High Yielding Variety seeds, fertilisers and pesticides with sectoral share of about 20 per cent in total GSDP as per advance estimate of Economic Survey 2017-18.

Table – 1, Agricultural Scenario of Dunguri

Items	Mining Affected Village	
	Pre-Mining	Post-Mining
% of Households involved in Agriculture	46	19
Nature of Cropping Pattern		
Rabi	46	0
Kharif	46	19
Sources of Water		
Rain Water	46	0
Rain & Canal Water	0	19
% of Households		
Households with own cultivated land	46	18
Households with leased land		1
Total	46	19
Kharif Crop		
Rice	46	19
Sugarcane	46	10
Groundnut	46	10
% of Cultivated Land		
Cultivated the agricultural entire land	100 percent	less than 50 percent
Area under cultivation(In Acre)	624.45	154.5
Production in KG	606950	314600

Source: Field Survey

But Mishra (2010) has opposed the gold medal as golden hand-cuff while Odisha was awarded the medal for fastest mover in prosperity. He has stated that mining has highest increase of 11.66 percent declining agriculture and unregistered manufacturing of more than 1 per cent during 1993-94 to 2001-02 keeping 1993-94 NSDP price as constant. Ultimately, agricultural sector was disregarded with take-off state of industrialisation path in early 1990s'. The gross cropped area and the net irrigated area in the state have been declined by an average of 1.20 and 4.45 per cent per year respectively during 1993-94 to 2003-04 though the trend was upward in the country level. Similar declining trend is also visible in case of food grain i.e. increasing trend in country level whereas declining trend in the state with the advent of mining during 1990s'.

MCL has acquired both the Government land including forest land and private land (homestead and cultivable agricultural land) of Darlipali since 1991. Though some areas are left for physical possession till yet, out of which only 30 per cent households have one or more acres of cultivated land now left with them, but these lands are now not used in cultivation due to mining establishment in that

village. Because, after mining excavation, the coal particles are hovering everywhere in the atmosphere in the village and so the cultivable land left with the poor affected are not suitable for cultivation. Moreover, scarcity of water aggravates the situation more since water level in the said village is very low and rain water is rare with the changing monsoon in the state. Therefore, without water, it is unbearable to cultivate for agricultural production. As per view of the poor tribal, The outcomes of these lands in terms of agricultural produce is not satisfied due to loss of productivity of the cultivable agricultural lands. Since MCL has acquired 365.08 acres of private land (both homestead and cultivated) in three phase notifications in addition to 311.85 acre of Government Forest land, the agricultural production and productivity was nil after introduction of mining in that area.

In Damanjodi, since the affected poor were displaced both from their homestead land and cultivated land as well as livelihood and rehabilitated in the new colony with the compensation of only homestead land and some negligible amount of money, no agricultural land remained for cultivation. Like Darlipali, similar situation was observed in Damanjodi also that the agricultural production and productivity was nil after establishment of bauxite mining led plant Alumina Refinery where in the per-mining era, the area was full of greenery with cultivation of paddy, wheat, gram (both black and green) and suan etc. Nalco has acquired 3444 hectares of land (including private land and government land) for its mining project, Alumina Refinery, Township, Ash Pond and Red Mud Pond out of which government land comprised of 2805.49 hectare. The rest 638.51 hectares land were comprising of both homestead and cultivated land now became barren land as the said land has no production and productivity.

Dunguri village is quite different from Darlipali and Damonjodi in terms of displacement. Since the displacement was occurred from agricultural cultivated land i.e.735 acres out of 1437 acre , the rest 700 acres of agricultural cultivated lands are left with the affected poor (Field Survey). The agricultural scenario of the said village can be observed from Table - 1. While 46 per cent of the households were engaged in agricultural activity in pre-mining period that was declined to 19 per cent in post-mining period. Before mining, villagers were completely depending upon rain water where after mining they were depending upon both the uncertain rain water and the supplied canal water. The entire agricultural land was cultivated with not using fertilisers, pesticides and modern instruments and shown 606950 Kilogram of production in pre-mining but the production was decreased to 314600 Kilogram in the post-mining and using modern instruments, fertilisers and pesticides the affected poor cultivated in the less than 50 per cent agricultural land available to them. As per view of the poor villagers the fertility of their land were decreasing gradually and the agricultural lands are not safe from attacks of elephants after establishment of mining. Moreover, the Company was not showing willingness to supply the purified water to the poor villagers since they had a stock of purified water from limestone excavation. Therefore, they were hesitating to cultivate the entire agricultural land available to them. Thus here both the agricultural production and productivity were declining by reduction of cultivated agricultural land to half firstly and the loss of fertility and attacks from wild animals aggravates the situation more.

3.2 Changing Cropping Pattern and Food Insecurity

Cropping pattern means the proportion of area under various crops at a point of time as per literature of agricultural economics. It means both the time and space sequence crops. It includes the identification of the most efficient crops of the region which is considered a homogeneous soil and climatic belt; the rotation in which the crop fits in and the intensity of cropping. The cropping pattern of Odisha has shown a changing trend (Kumbhar, 2003 and Nayak, 2016). The area under food grains as a percentage of gross cropped area has declined from 80.34 per cent in 1980-81 to lowest at 71.55 per cent in 2013-14 and stood at 74.25 per cent in 2016-17 which resulted the decline of area under total cereals which further led to the decline of area under paddy cultivation.

Further, from table – 2, it was observed that the area under non-food grains as a percentage of grossed cropped area has increased from 19.66 per cent during 1980-81 to 25.75 per cent in 2016-17. Similar trend was also realised at the district level cropping pattern of Odisha (Kumbhar, 2003). Since area under food grains has declined this might be leading to decrease of food grain and causing food insecurity in Odisha.

Table – 2, Gross Areas under Major Crops of the State, 1980-81 to 2016-17

Gross Areas Under Major Crops (in million Hectares)											
Name of Major Crops	**1980-81**	**1990-91**	**2000-01**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Food Grains	126.7	127.8	121	121.3	126.7	124.8	120.8	125	124.3	123.2	128
Oil Seeds	17.6	24.1	22.8	26	27.2	26.3	26.5	28.1	25.6	26.1	26.2
Sugarcane	2.7	3.7	4.3	4.2	4.9	5	5	5	5.1	4.9	4.4
Cotton	7.8	7.4	8.6	10.1	11.2	12.2	12	12	12.8	12.3	10.8
Jute & Mesta	1.3	1	1	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8
Plantation Crop	0.9	1.2	1.4	1.7	1.7	0.7	0.7	1.8	1.8	1.8	NA
Potato	0.7	0.9	1.2	1.8	1.9	1.9	1.9	2	2.1	2.1	2.2
Total	**157.7**	**166.1**	**160.3**	**166**	**174.5**	**171.8**	**167.8**	**174.7**	**172.5**	**171.2**	**172.4**
AFGGCA	**80.34**	**76.94**	**75.48**	**73.07**	**72.61**	**72.64**	**71.99**	**71.55**	**72.06**	**71.96**	**74.25**
TANF	31.00	38.30	39.30	44.70	47.80	47.00	47.00	49.70	48.20	48.00	44.40
ANFGGCA	**19.66**	**23.06**	**24.52**	**26.93**	**27.39**	**27.36**	**28.01**	**28.45**	**27.94**	**28.04**	**25.75**

Source: Economic Survey 2017-18

From different Agricultural census of the State, it was observed that although the number of Operational Holdings has increased from 34.07 lakh in 1970-71 to 46.67 lakh in 2010-11, the operated area was observed a declining trend with slow pace over the years except in 1990-91. The increase in number of operational holding was only because of growth of population and fragmentation of holdings due to breaking of Joint Family System. Table – 3 revealed that the total operated area of 64.49 lakh hectares in 1970-71 has reduced to 52.61 lakh hectares in 1985-86 which was 82 per cent of total operated area during 1970-71. In 1990-91 Agricultural Census, the operated area was witnessed by an increase of 0.66 per cent over the previous Census i.e. 1985-86. However in the subsequent census periods, the operated area observed a declining trend with slow pace. The average growth of percentage change in operated area has registered a negative growth of 3.42 per cent.

Table – 3, Number and Area of Operational Holdings in different Agricultural Census

Year	**1970-71**	**1976-77**	**1980-81**	**1985-86**	**1990-91**	**1995-96**	**2000-01**	**2005-06**	**2010-11**	**Average Growth**
Number of Holdings (In Lakh)	34.07	35.76	33.28	35.86	39.48	39.66	40.67	43.56	46.67	
Percentage change of Holdings		4.96	-6.94	7.75	10.09	0.46	2.55	7.11	7.14	4.14
Area Operated (In lakh Ha)	64.49	57.31	52.78	52.61	52.96	51.44	50.81	50.19	48.52	
Percentage change of Area Operated		-11.13	-7.90	-0.32	0.67	-2.87	-1.22	-1.22	-3.33	-3.42
Size of Holdings	1.89	1.60	1.59	1.47	1.34	1.30	1.25	1.15	1.04	

Source: Agricultural Census, 2010-11

In the micro level study for three sample villages, Paired T-test is applied to examine the difference of mean of land holding in the pre and post mining period. The outcomes of three studied villages' i. e. Darlipali, Damanjodi and Dunguri are presented in table 4, 5 and 6 respectively.

In all the studied villages as presented in table 6.4, 6.5 and 6.6, the t-statistics show high values explaining significant result. This implies there is significant decline of land holding in all the mining affected villages in the post displacement period compared to pre-displacement period. The adverse impact of declining land holding in the affected villages is the definite cause of reduction of agricultural production and hence endangers food security. This implies mining led industrialisation does

not satisfy the development in the local affected areas as well as the State.

Table – 4, Paired T-test for Darlipali

	Land before displacement	Land after displacement
Mean	2.96	0.70
Variance	20.15	2.08
Observations	102	102
Pearson Correlation	0.63	
Hypothesized Mean Difference	0	
df	101	
t Stat	6.08	
P(T<=t) one-tail	1.09	
t Critical one-tail	1.66	
P(T<=t) two-tail	2.17	
t Critical two-tail	1.98	

Table - 5, Paired T-test for Damanjodi

	Land before displacement	Land after displacement
Mean	2.85	0.004
Variance	5.45	7.47
Observations	304	304
Pearson Correlation	0.5	
Hypothesized Mean Difference	0	
df	303	
t Stat	21.25	
P(T<=t) one-tail	2.77	
t Critical one-tail	1.65	
P(T<=t) two-tail	5.54	
t Critical two-tail	1.97	

The different types of land use pattern in Odisha were picturised in Table – 7 where Net Area Shown as a percentage of total area and that of Current Fallow lands have taken together as Net Cultivated Area as percentage of total area. The other components like Other Uncultivated land excluding fallow land and Land not available for cultivation are also shown as a percentage of total area in the aforesaid table. From the table, the net area sown during 2010-11 constitutes 95.68 per cent of Net Area Shown whereas 3.06 per cent of land remains under current fallow. Both Net Area Shown as well as the Current Fallow Land increased from 87 and 1.23 per cent during 1970-71 to 95.68 and 3.06 per cent during 2010-11 respectively. Therefore, the trends in land use pattern shows that during 1970-71, the proportion of net cultivated area was 88.23% which rises to 98.74% during 2010-11 whereas the proportion of other uncultivated area was declined from 3.44% in 1970-71 to 1.01% in 2010-11 and the proportion of land not available for cultivation sharply declined from 8.33% in 1970-71 to 0.25% in 2010-11.

Table – 6, Paired T-test for Dunguri

	Land before displacement	Land after displacement
Mean	3.68	1.01
Variance	34.28	2.62
Observations	152	152
Pearson Correlation	0.67	
Hypothesized Mean Difference	0	
df	151	
t Stat	6.67	
P(T<=t) one-tail	2.23	
t Critical one-tail	1.66	
P(T<=t) two-tail	4.45	
t Critical two-tail	1.98	

The micro level study revealed that in Darlipali, the affected poor were maintained a happy, peaceful agrarian life with primary source of livelihood as cultivation of Paddy before the entering of Mahanadi Coal Fields Ltd to their area. As per secondary data collected from MCL that it has acquired 365.08 acres of private land including Homestead and Cultivated land with 311.85 acres of government land which were also used by the poor tribal. Though MCL has not physically possessed the entire acquired land, some poor villagers were doing cultivation in the said land. But gradually the fertility of the soil were so damaged that there was no satisfaction of agricultural production after use of HYV seeds and fertilisers due to acute shortage of water. So the cropping pattern changed in Darlipali from paddy cultivation and production to nil produce since the gross cropped area became nil.

Table – 7, Different types of Land Use in Odisha from 1971-71 to 2010-11

Land Use	1970-71	1976-77	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11
Net Area Shown	87	96.62	99.02	99.7	99.55	95.83	95.3	95.78	95.68
Current Fallow	1.23	2.95	0.18	0.99	0.21	2.14	3.21	2.71	3.06
Net Cultivated Area	88.23	98.57	99.19	99.79	99.75	97.97	98.51	98.49	98.74
Other Uncultivated Land	3.44	1.16	0.2	0.01	0.17	1.59	1.27	1.33	1.01
Land not available for cultivation	8.33	0.27	0.6	0.1	0.09	0.44	0.22	0.18	0.25

Source: Agricultural Census, 2010-11

Similarly, the entire acquired land by Nalco at Damanjodi was used in establishment of Alumina Refinery, Ash Pond, Red Mud pond and creating Township for Nalco's Regular Employee. There was no agricultural land left for the affected poor. Moreover, all the displaced households were not availed sufficient land in the resettled area for homestead purpose. In the pre-mining period, their cropping pattern includes cultivation of paddy, cereals and coarse cereals etc. which have no existence in the post-mining period as the gross cropping area was came to zero.

ACC Cement factory had acquired about half of the total land of village Dunguri. In the pre-mining period, the affected poor were engaged in production of Paddy, Wheat, Maize, Sugarcane, Groundnut and all types of vegetables. But after mining there was acute shortage of water and wild animals' attack made hindrance of doing cultivation by the poor villagers. The cultivation and production of Wheat, Maize and Sugarcane were almost stopped. The production of Paddy, Groundnut and vegetables were reduced to half or less than compared to pre-mining period as the gross cropping area was reduced to half.

4. Mining and Agricultural Employment

After the introduction of mining, no such improvement was noticeable in the mining employment but it badly affects the agricultural employment (Das, 2015). From demographic analysis of Odisha by Mishra (2010), it was observed that the number of agricultural labourers as a percentage of total workers in the mining districts has increased not because of increase of cultivators and agricultural labour but due to shrinking base of work force. Further, the increase in workers in household industries as a percentage of total workers was not inspiring in the mining districts which implied that mining has not essentially stimulated ancillarisation. In fact, the number of agricultural workers has been shown as the highest per cent decline in the mining district than non-mining district (Mishra and Padhi, 2009).

In Darlipali, before mining, the important source of livelihood was cultivation (i.e. 58 percent of the total surveyed households were depending mostly on cultivation for their livelihood) but after the mining activity has started, itis reduced to 15 percent. This reduction is due to decline in agricultural land, which has further resulted decline in agricultural production and productivity. Employment in mining industry has increased from 4 percent in pre mining period to 37 percent in post mining period. This increase is substantially lower than the falling percentages in cultivation.

The percentage of employment in mining industry might have increases more, had the displaced people have more education of skill. But there is no such skill development programme or awareness campaign for their better education was initiated for the poor illiterate so that they could get a job in the mining industry. Thus the affected poor are suffered with loss of employment both in agriculture sector as well as mining sector after the introduction of mining who were living on agriculture in the pre-mining era.

Similarly, in Damanjodi, before the establishment of Alumina Refinery (Mining Led Plant) the principal source of livelihood was cultivation (100 per cent) but now it comes to nil (0 per cent) causing decrease of

agricultural production and productivity in one hand. On the other hand, employment in mining led plant was created for 165 household i.e. 54.3 per cent based on one member in affected one family ignoring whatever the family size might be. Therefore, 139 households (45.7 per cent) out of 304 households in the study area were being unemployed both from agriculture and from service sectors. Further, there was no such awareness campaign or skill development programmes introduced for the local affected poor increase their willingness to do jobs. Accordingly, in the mining area there was reduction of agricultural employment without enhancement of service sector employment.

Employment scenario in all the studied villages was similar. In Dunguri, as against 46 per cent households were employed in agriculture, 1 per cent in service sector and 15 per cent in labour class in the pre-mining period, the percentage of agricultural employment in the post-mining has decreased to 19 and the employment in the form of service provided by mining industry was increased to 24 out of which 20 per cent households were getting employment in mines. But the labour class percent had shown a sharp increase to 42 after establishment of mining. Thus in Dunguri, the reduction of agricultural employment was not leading to increase in mining employment but increasing labour class in the society.

5. Conclusion

After the introduction of mineral extractive industrialisation in Odisha, which has hardly any vision, the state exchequer has acquired both the public as well as private land (including forest, agricultural and homestead land) and handed over it to the private international capitalist for extraction of the minerals. The process has not only directly displaced thousand of households but it has also destroyed their permanent sources of livelihood by snatching thousand acres of land and pushed the displaced people into the state of food insecurity. Mining has not only created adverse impact on land holdings in terms of number and area, which led to reduction of agricultural production and productivity in the selected sample villages, but the worse impact of mining and mining led plant found in terms of polluted effluents made the fertile agricultural land into barren. Since in the mining areas, the common feature was acute shortage of water and hence shortages of water with loss of land productivity due to adverse environment add fuel to agricultural production and productivity. Hence, mining led industrialisation was being the cause of reduction of agricultural production and productivity with changing cropping pattern endangers food security. Land was the only means of source of living for the tribal families, who were displaced by mining. Loss of this resource gradually led to a state of impoverishment which was carried over to the succeeding generations, as they lost their access to a sustainable and consistent source of living. For the poor tribal, who have no other skills; this was like throwing them out of their livelihood system. Land is an asset for future generation where compensation in lieu of land in terms of employment is provided to present generation only. There is no such guarantee provided by the company to give employment for the successive generation. Thus, mining led industrialisation in Odisha seriously hampers agricultural production, productivity and agricultural employment of the State.

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STRESS MANAGEMENT IN: SPORTS COMPETATIONS FOR INJURED PLAYERS

M. Jayalakshmi[1], R. Muthu Eleckuvan[2] and M. Elamaran[3]
Division of Sports Psychology, Annamalai University, Tamil Nadu, India

ABSTRACT

All athletic trainers should be worried about their athletes' reactions to stress. On a daily basis, many sportsmen battle with stress. Each athlete reacts to stress and anxiety in their own unique way. When you compete, you're bound to feel a little anxious. And that can be beneficial; a little stress can assist the body in dealing with a difficult situation. However, too much tension can detract from a sport's enjoyment and make it difficult to participate. Stress-related disorders are exceedingly frequent in professional sports, and they are getting more so as athletes' workloads rise. The expectations are high, and people can't always handle it," says the author. Mental health issues such as anxiety, depression, and bipolar affect competitive athletes in unique ways. Despite the stigma, professional athletes continue to open up about their mental health difficulties in order to assist others. The goal of this study is to look into how sports coaches deal with stressful conditions during sporting events. This paper will also look into the topic of stress management in injured athletes and how these conditions influence athletes.

Keywords: *Techniques, Causes, Stressors, Effects of stress, symptoms.*

Introduction

Stress is the body's and brain's response to a challenge or threat, as well as positive or negative events. When your body is agitated, it reacts by releasing chemicals into your bloodstream. In recent years, the problem of stress in professional sports has gotten a lot of attention, and rightfully so. An athlete must deal with the pressures of competing at the highest level on a regular basis, as well as high expectations, injuries, and all of the other difficulties that come with it. One of the issues with stress is that it can impair performance, which is why coaches and athletes should keep track of their stress levels. Of course, some stress can be beneficial, as we've all heard about athletes who "thrive under pressure," but the problem is that when stress levels reach dangerously high levels, they have a negative impact on performance. **(Hunter et al., 2012)** A professional athlete's life is difficult. Athletes experience severe psychological pressure during competition in addition to physical challenges that are beyond the capabilities of most individuals.

Following her resignation from Wimbledon, Emma Raducanu, an 18-year-old British tennis player, posted on social media about this. Despite her success in the event, the young player began to have trouble controlling her breathing and pulse rate during a match, which she subsequently attributed to "the accumulation of the excitement and the buzz. **(Eze 2015**) She isn't the only athlete to suffer from the physical effects of stress, with Marcus Rushford of the English football team admitting to have had a similar experience. There are a variety of reasons why stress might elicit such strong physical responses**. (Preh 2007).** This response, however, can be modified through training such that a person reacts positively under pressure. An athlete can deal with stress in a variety of ways.

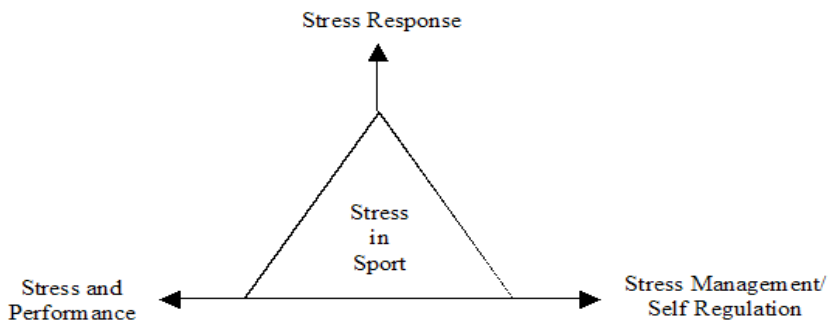


Fig No 1

Athletes frequently struggle to manage with stress or don't know how to do so, necessitating the need for outside assistance. Participating in pleasurable pastimes, dealing with one's body, keeping an inspirational perspective, grinning, rehearsing unwinding procedures, conversing with others, and getting proficient assistance are largely powerful stress management for athletes. **(Knight 1992)** .Many athletes are unable to cope with their stress and seek treatment on a frequent basis in this area. As a result, when an athlete has a question, they normally go to their athletic trainer or coach for advice. Both the coach and the sports trainer must be aware of the available resources and processes to follow in order to provide the athlete with the necessary assistance. Athletes are more probable than non-athletes to be impacted by stress because of the measure of adjusting they should do between school, practices, and games, just as family pressures and day to day existence **(Eze 2015).**

Methodology

To collect and analyse primary data, a number of qualitative and quantitative tools were used. Information was gathered through interviews and online questionnaires. Press and online interviews, as well as table discussion videos, were used to gather secondary data.

Research Problem

How can professional players in sports organisations better manage their stress. This work addressing the research problem.

Objectives of Research

To arrive at this end, the research has three fundamental destinations. An audit of logical exploration on pressure the management in elite athletics, a field analysis of stress the board dependent on proficient athletes' and coaches' perspectives, and suggestions for how to oversee stress in sports associations are among the points covered

Signs and Symptoms of Stress

Everybody is extraordinary, one athlete's side effect or pointer might be not the same as another's. Athletes can be worried in an assortment of ways, including emotional, conduct, organic/physiological, intellectual, imaginal, relational, and sensory stress. Each group has its own set of warning signals and symptoms. Anxiety, rage, remorse, despair, shame, and self-pity are examples of affective disorders' signs and symptoms. Sulking, weeping, poor performance, absenteeism, and clenched fists are all signs of a behavioural disorder. **(Prescott et al., 1999)** Muscle pressure, a raised pulse, heartburn, stomach fits, torment, and migraines are organic or physiological markers and manifestations. Dissatisfaction, stress, distortion, elite execution norms, pointless explanations, and self-disabling are generally markers and manifestations of intellectual brokenness. A portion of the imaginal signs and manifestations incorporate dreams of disappointment, pictures of reinjury, and recollections of being harmed, just as feelings of weakness and shame**. (Cornwell 1983)** Withdrawal, manipulation, and argumentation are examples of interpersonal indications and symptoms. Tension, nausea, chilly sweat, clammy hands, discomfort, and stomach butterflies are all sensory reactions. Not everyone will experience all of the signs and symptoms of stress, and each person's mix of signs and symptoms will be different.

Three types of psychological stress

Organizational Stressors: According to organisational stressors, which include training challenges, "an on-going transaction between a person and the environmental demands linked principally and directly with the organisation within which the athlete is performing." On a personal level, there is conflict with teammates/coaches. Concerns about travel and accommodations, as well as a perception of a lack of support from the organisation. **(Davis 1991).**

The coaching and organisational structure that surrounds a team can be linked to, and thus solved by, organisational pressures. Because of circumstances such as tight travel schedules and organisational decisions beyond your control, organisational pressures don't always have a remedy. Knowing which players are struggling with certain scenarios, on the other hand, helps you to address the problem and, maybe, develop a solution that benefits both them and the team. Players who cited teammates as a source of stress had "a larger

risk of sustaining an acute injury," whereas "players mentioning a coach as a source of stress had a greater risk of sustaining an overuse injury," according to a 2018 study. **(Davis 1991)**

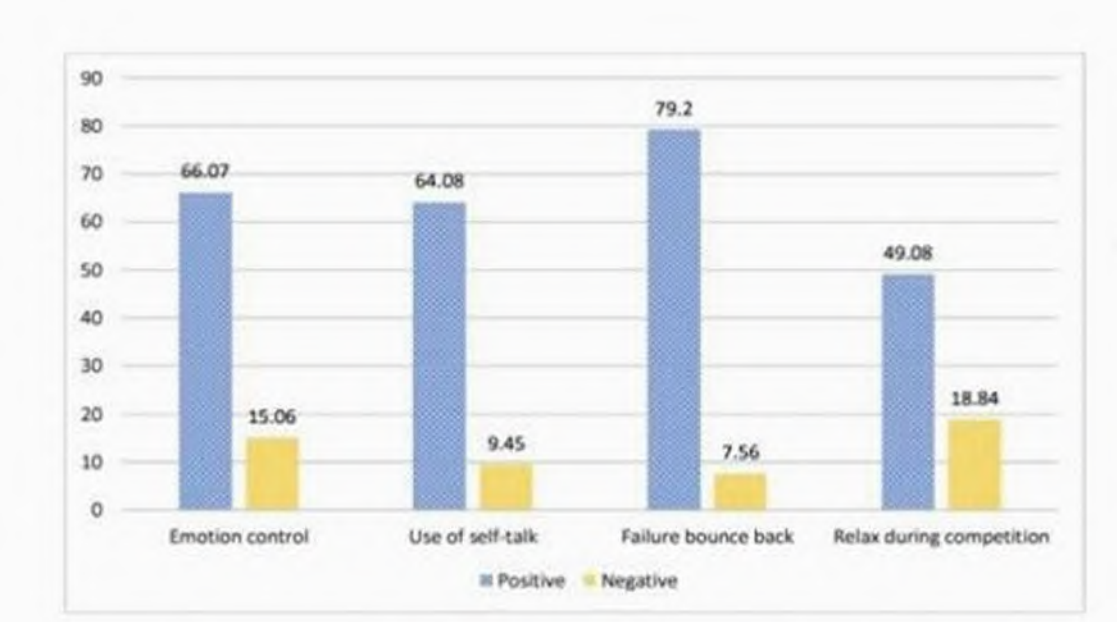


Fig: 2 athletes Somatic & Cogitative Responses During Stress

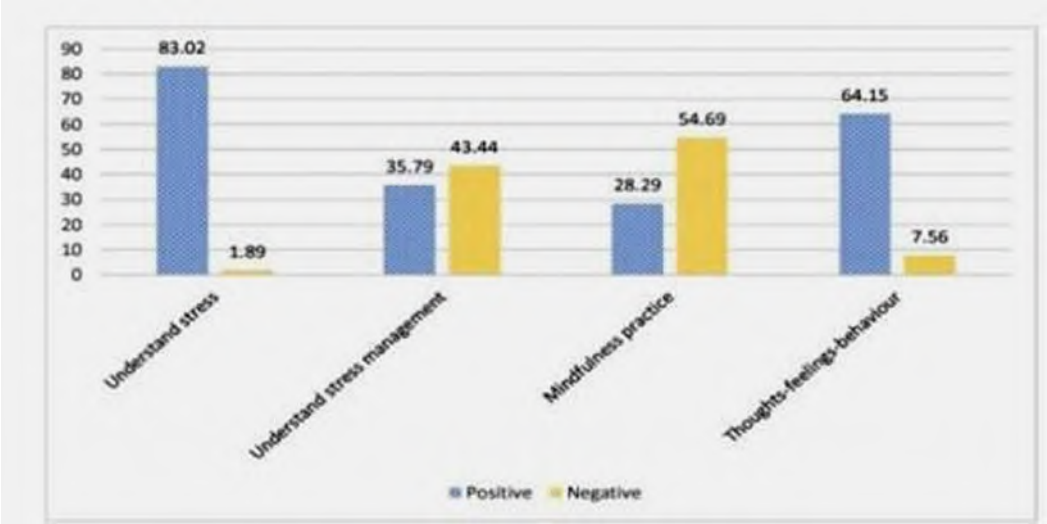


Fig 3: Athletes Familiarity with Stress management responses

Competitive Stressors

Competitiveness stressors are those special to a competitor's present sports circumstance. They're the clearest stressors, and they're the ones most firmly connected to what exactly occurs during training or a game. Injury, rebound from injury, pressures moving toward game day, tensions to perform during a key game, the adversary, contest for spaces, and structure and additionally specialized worries **(Scott 2010)** are generally instances of competitive stressors. The responses of every competitor to contending pressures are interesting a valuable device for forestalling future issues.

Personal Stressors

The physical and psychological pressures that an athlete encounters as a result of his or her personal circumstances are known as personal strains. Personal stress is frequently caused by concerns about/changes in one's lifestyle (alcohol, sleep), financial difficulties, painful life experiences, and external commitments. Personal pressures **(Scott 2010)** are hard to detect by their very nature. Personal issues or baggage may be brought to training and

competition by athletes. As a result, it's critical to establish a positive, trustworthy relationship with your athletes so that they may confide in you about any personal issues they may be experiencing**.**

Levels of stress

In all human endeavors and occupations, a certain level of stress is required to motivate an individual to take action. There are three different types of stress in competitive sports: low, moderate, and high. (**Byron 2021**) When there is a lack of interest and attention in any endeavor, poor performance is the result **(Eze 2015).** Excessive stress, on the other hand, tends to overload the cortical region of the brain, causing the central nervous system to malfunction and misinterpret information due to the inability to coordinate all of the necessary data. People/athletes are supposed to perform at their best when they are under the most stress. **(Chrysi 2021).**

Professional athletes views on mental health in support organizations

Percentage of Responses related to Mental Health	**Positive**	**Negative**
Access to Mental Health Support through organization	**35.09%**	**41.71%**
Previous visit to Therapist	**38.72%**	**61.65%**
Importance of Mental Health in Sports	**95.23%**	**1.98%**

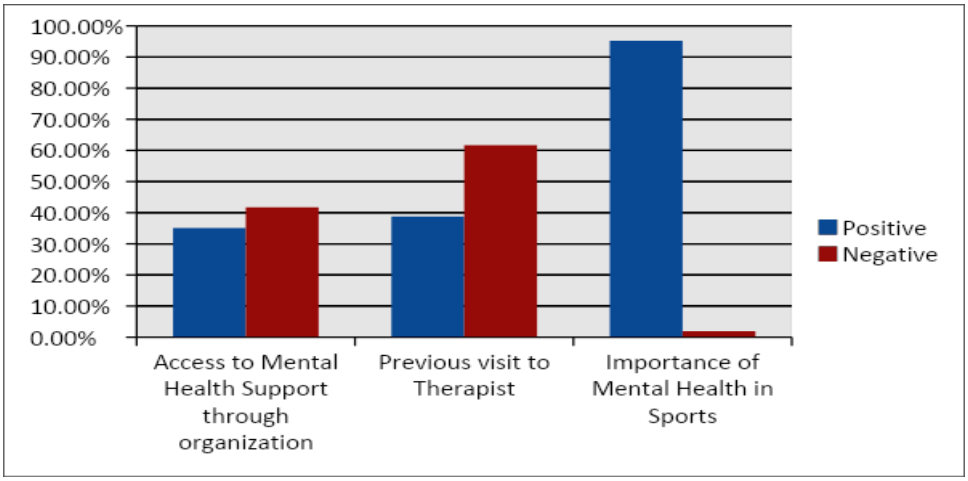


Fig 4

Results if Poorly Managed

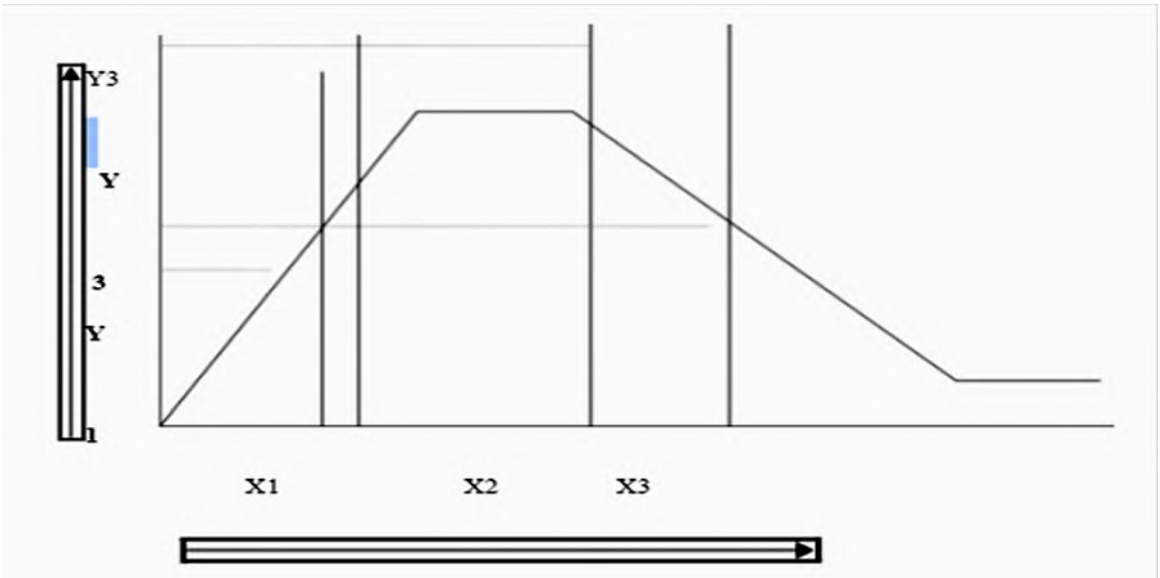
Overload, burnout, dropout, and maladaptive fatigue syndrome are just a few of the outcomes that sports trainers don't want to see happen to their athletes when they're anxious or nervous. Burnout is caused by "high or contradictory expectations, which results in overload, low social support, low autonomy, low incentives, low demands, which leads to boredom," according to Hack fort and Spiel Berger (1989Exhaust and burnout are normal among athletes, particularly those at the most elevated levels of game, like athletes competitors. "At the zenith of their vocations, uncommon athletes have left sports, professing to have "wore out" and that support has become too horrendous to even consider continuing. “Maladaptive weakness condition creates when an athlete doesn't get backing to manage their stress or concern, and the manifestations don't disappear**.(Martens 1970)** Outrage, animosity, stress, bewilderment, discouragement, despairing, absence of energy and lack of care are instances of versatile and maladaptive fatigue condition feelings. This is something Han is certain of. When an athlete begins to exhibit symptoms of maladaptive fatigue syndrome, he or she should stop participating in sports and seek medical assistance. Certain athletes with maladaptive fatigue syndrome (Barker 2008) must be admitted to a psychotherapy clinic in order to receive the optimum treatment. Burnout, overload, dropout, and maladaptive fatigue syndrome are all things that an athletic trainer does not want to happen to his or her players. Even if it's just

directing the player to a counselling centre, the sports trainer should intervene before the player's health deteriorates.

Coping Mechanisms of Stress

Athletes who are experiencing stress might use a variety of coping mechanisms. Each athlete must choose which mechanism is most successful for them, which may take some time because each mechanism must be tested **(Killman 2010)** over a length of time to determine if it is effective. "Hypnosis, progressive relaxation, visualisation, biofeedback, autogenic training, mediation, negative thinking cessation, and confidence enhancement" are only few of the techniques accessible. "Physical requests, mental requests, environmental requests, assumptions and strain, relationship issues, life course concerns, and uncategorized stress sources" are among the seven interest classes that an athlete may have to change to diminish their stress levels, as per (**Reilly and Williams 2003).** Reilly and Williams distinguished an assortment of adapting strategies for competitors to embrace in every class to help decline stress. They recommend "logical thinking, pre-competition mental preparation, transitioning to healthy acting attitudes and behaviour, and training hard and intelligently" for physical demands. They recommended "pre-competition mental preparation, management, positive focus and orientation, and training hard and smart" for psychological demands. There were few coping techniques for environmental pressures, but Reilly and Williams recommend "time management and priority, as well as seclusion from the stressor and deflection." "Positive focus and orientation, training hard and smart, rational thinking, positive self-talk, social support, pre-contemplation mental preparation, and **(Grass Board 2009)** a stress management programme" are some of the ways athletes can cope with the stress of high expectations and pressure to perform at their best." To overcome these barriers, the athlete could employ "positive focus and orientation, social support, striving for a positive working relationship, seclusion and deflection, reasonable thinking, and positive self-talk." Concerns about life direction affect everyone, not just athletes. "Time management and prioritisation," "logical thinking," and "positive self-talk" are some ways for dealing with life direction issues.

Fig 5: U Shaped Curve Between Stress And Performance.



Source: Motor Performance under Stress in Journal of Personality and Social Psychology

"Reactive behaviours, social support, isolation, and deflection" can all aid in the management of stress caused by unrelated factors **(Reilly and Williams, 2003).** The tactics listed above can be used by athletes to cope with stress and anxiety in a number of situations. "Self-regulation training that helps cope with stress and increases the likelihood of peak

performance," **Graham-Jones and Hardy advise (1990)**. In order to effectively treat stress and anxiety disorders, **Graham-Jones and Hardy (1990)** recommend adopting "goal planning, imagery, and attention management." Athletes can adopt a number of stress-relieving techniques. For the athlete, figuring out what works best for them is typically a case of trial and error.

Results

The study found that while players and coaches were aware of stress, they lacked expertise of how to use stress management techniques. Coaches emphasised the need for a mental health professional in sports organisations, and athletes agreed that mental health care was necessary. In terms of leadership and the relationship with injured athletes, some expressed worries about compensation and feedback, while the majority stated that they had a positive working relationship with them. Injury-related stress necessitates the implementation of a 360-degree mental health model to replace fragmented, monomodal treatments that, in some cases, rely on the coach's initiative rather than a comprehensive stress management approach orchestrated by the sports organization's leadership.

Conclusion

Athletes who do not learn to control their stress symptoms may develop problems that affect their performance. High levels of worry during competition have long been thought to be detrimental, lowering performance and even contributing to dropout, according to sports psychologists. "For athletes who haven't managed their tension adequately, dropout is a negative result. Everyone is affected by stress on a daily basis, but a recent study found that many athletes are more vulnerable to it than the overall population. “Despite the well-documented mental health benefits of exercise and sports engagement, some athletes will encounter psychological, emotional, and behavioural problems at times." "A performer's psychological state can be influenced by a variety of factors, causing it to diverge from the optimal required for their performance. Many athletes struggle to balance the stress of a full course load, their sport's obligations, and their family and friends' duties. Athletic trainers must make certain that their athletes have access to a counselling centre as well as other stress-reduction options. There is little doubt that an athlete's ability to control their emotions in a competition environment improves their performance, even in the face of adversity. Participants should be grouped together in order to reduce excessive stress levels, and they should concentrate and filter out stressful thoughts. Before the real physical performance, athletes need observe mental rehearsal. Activities should be tailored to the athlete's ability and requirements.

Conflict of interest

Nil

Funding

Nil

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ADMINISTRATIVE DEVELOPMENTS UNDER DOGR AS WITH SPECIAL REFERENCE TO MAHARAJA PRATAP SINGH FROM 1885 TO 1925

A. Y. Rather[1] and M.C. RAJA[2]
Department of History, Annamalai University, Tamil Nadu, India.
[1]ratheraaqib800@gmail.com

ABSTRACT

*Jammu and Kashmir is frequently alluded to as "**Paradise on the Planet**." If there is paradise on the planet, it is this, this, and this, says the principal couplet (**Amir Khusrau**). Many rulers' eyes were attracted to Kashmir because of the couplet. The Dogra territory in Kashmir started in 1846 A.D., making it a stand-out model ever. In Jammu and Kashmir, the Dogra rule was conveyed down through a few rulers or Maharajas. In Jammu and Kashmir, everybody applied their advancement systems. Jammu and Kashmir fell under the ward of the Third Dogra ruler, Maharaja Pratap Singh, who executed a few administrative measures to support the valley. The study centres around Dogra managerial turns of events, with specific consideration paid to Maharaja Pratap Singh, who represented Kashmir from 1885 until 1925.*

Keywords: *Dogras, Development, Administration, Begar system and Land settlement.*

Introduction

On September 12th, 1885, Pratap Singh was crowned King of Jammu and Kashmir. Maharaja Pratab Singh's reign, which lasted from 1885 to 1925, was unquestionably the most important in the history of Jammu and Kashmir, as it represented the transition from the mediaeval to the modern era. From 1885 to 1925,the third Dogra emperor, Maharaja Pratap Singh, ruled Jammu and Kashmir for 40 years, the longest reign of any Dogra ruler. He was a visionary, a modernizer, and a naturally generous man. For Kashmiris, Maharaja Pratap Singh's reign was the most affluent of the four Dogra emperors. He made important contributions to the establishment of local self-government entities, democratic procedures, educational systems, health care and sanitation, and infrastructure during his reign. Kashmir, especially Srinagar, has seen considerable social and cultural transformations by 1925.

During the last few years of Ranbir Singh's reign, the state of Jammu and Kashmir's administration deteriorated. The poor masses have suffered unimaginable hardships as a result of the land revenue system, which is predicated on the ruling class exploiting the peasantry. During the 1877-79 famine, one of the worst in Kashmir's history, things deteriorated even further. The disaster impacted nearly one-third of Kashmir's population. Despite this, the state levied crippling land taxes on the peasantry.

The Shawl industry which was a main source of revenue to the State in the earlier phase of the Dogra rule in Kashmir had totally declined by the end of Ranbir Singh's reign; the oppressive taxation policy followed by Gulab Singh and Ranbir Singh was the main cause for its decline. As a result, thousands of people suffered terribly. The State Imposed high taxes on all trades and professions and in the words of Sir Walter Lawrence, 'everything save air and water was brought under taxation. An important event which took place immediately after Pratap Singh 's accession to throne, and which made a great impact on the State administration was the appointment of the British Resident in Kashmir. The State of Jammu and Kashmir since its formation constituted one of the most important places in the British Imperial Defense System.

Administrative developmental steps taken by Maharaja Pratap Singh

The reign of Maharaja Pratap Singh was a period of awakening for his subjects, particularly Kashmiris. He made major contributions to the construction of local self-governing bodies, democratic procedures, educational systems, health care and sanitation, and infrastructure development during his reign. The Jhelum Valley Cart Route, dubbed "the most beautiful mountain route in the world," was completed between Kohala and Baramulla during Pratap Singh's reign. In 1897, it was extended to Srinagar. The Banihal

Cart Road, which connects Srinagar, the state's summer capital, and Jammu, the state's winter capital, was opened to the public in 1922.

The first land settlement was completed by the state government in 1887. As a result, agriculturists' rights were specified precisely, and the state's demand was extended for another ten years.Forced labour, often known as "begar," was declared illegal in its most heinous form. Pratap ordered the Shri Pratap Singh Museum in Srinagar to be built in 1898. By 1912, almost every tehsil and district had been formed a second or third time. The land settlement provided the growers with much-needed security, and it became known as the source of their expanding wealth. Revenue for the state climbed by more than a hundred percent as well. In Srinagar, a model agricultural farm was built to share information about scientific farming techniques. The establishment of the Department of Agriculture and the foundation of Cooperative Societies were two more initiatives taken to help producers improve their situation. Forests cover much of Jammu & Kashmir. However, until Pratap Singh's arrival, little had been done to harness these scientifically.

The Forest Department was established by the state in 1891, and it swiftly rose to prominence. It made a quarter-million rupees in surplus revenue in its first year. Efforts were undertaken to increase the popularity of education. Many changes to the educational system were implemented in response to the 1916 report's recommendations.

There have also been a handful of new schools built for both boys and girls. In primary schools, education is currently available for free. Both Jammu (Prince of Wales College, founded in 1907) and Srinagar (Sri Pratap College, founded in 1905) had one degree college, as well as Amar Singh Technical Institute in the latter (1914) and Sri Pratap Technical School in the former (1924) to meet the need for higher education. Sri Pratap Institution became the second largest college affiliated with Punjab University in 1938, with 1187 students on its rolls. Modern hospitals for men and women have been constructed in both Srinagar and Jammu. In a number of cities and villages, medical dispensaries staffed by qualified doctors have been established. These institutions made a significant contribution to people's health.

Agriculture, sericulture, viticulture, and horticulture, in particular, were given a lot of support, and they progressed quickly to become thriving state enterprises. Srinagar's silk factory is the "world's largest of its sort." When Pratap Singh died on September 23, 1925, he left no issue of his own, but his nephew Hari Singh, son of Raja Amar Singh, took over as his heir.

Research Objectives:

1. To unearth the origin of Dogra rule in Jammu and Kashmir.
2. To identify the administrative development of Maharaja Pratap Singh from 1885 to 1925 in Jammu and Kashmir.

Methodology

The study attempts to examine the **"Administrative Developments under Dogras with Special Reference to Pratap Singh 1885-1925".** It is primarily a fact-finding undertaking based on exploratory method. Thus, this study is based on descriptive and historical approach. Furthermore primary as well as secondary data were collected and analyzed for the study, secondary data includes books, journals and web sources had also been collected for the study.

Literature review

Review of literature is a critical piece of any research. It assists with securing information regarding what has been done in the field of study, get together to-date information about past researches nearby and acquire information on the subject of investigation. An experience with accessible literature in the space of research is needed for making new grounds and the appropriate planning of the study. Review of related studies further avoids duplication of the work that has effectively been done around there. It likewise helps the investigator to study the different parts of the idea in its multi-dimensional point of view. Recently led work by different researchers and scholars on the proposed theme most certainly gives a strong base to the new researchers.

S.No	Authors Name	Papeer Title
01	Robert A Huttenback (1961)	Gulab Singh and creation of dogra state of Jammu and Kashmir
02	Suhail Lone (2012)	Bagar (Forced Labor) in Kashmir during the Dogra period
03	John Bray and Gonkatsang (2020)	Two Ladakhi accounts of the Enthronement of Maharaja Pratap Singh of Kashmir
04	P. Singh (1893)	His highness Maharaja
05	Saleem Khan (2015)	Kashmir administration under Pratap Singh 1885-1925
06	Kamran Khan (2013)	Oriental manuscripts in Shri Pratap Singh Library, Srinagar Kashmir

Conclusion

We examined the evolution of many facets of administration during Maharaja Pratap Singh's reign in this work. His accession to the throne in 1885 was a watershed moment in Kashmir's modern history. The pivotal events of his rule left an indelible mark on the history of Jammu and Kashmir. The state was given a new administrative structure, the majority of which is still in use today. Until 1889, the traditional administrative structure was in place. The state's supreme power was the maharaja, while the administration was controlled by a group of Dogra officers. The Durbar remained a hotbed of intrigues between 1885 and 1925, and the maharaja's brothers fought tooth and nail for increased political control in the realm. As a result, a variety of entrenched interests entered the political arena, contributing significantly to the state's developing political instability. During the first four years of the maharaja's rule, he established four ministries, none of which were able to provide the state with a stable administration. After ousting the maharaja from power, the British supreme power stepped forward to establish a stable government in the state

Acknowledgement

I would like to express my heartfelt gratitude to everyone who helped me finish this paper. I owe a great debt of gratitude to my mentor, **Dr. M. C. RAJA**, for his thoughtfulness and support in assisting me in organising my essay in a period-appropriate manner...

Apart from that, I should express my gratitude for the basic contribution of all those researchers and writers who had successfully produced their papers on a similar topic; their references and citations aided me tremendously in finishing my article in a timely manner.

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PARENTING ADOLESCENTS AMID SUDDEN SPIKE OF ONLINE LEARNING AND EDUCATIONAL TECHNOLOGY APPS IN INDIA DUE TO COVID-19

K. Bhatia and A. Sangwan
[1,2]Department of Journalism and Mass Communication, Chaudhary Devi Lal University, Sirsa, India
[1]kapilbhatia13@gmail.com, [2]procdlu@gmail.com

ABSTRACT

The COVID-19 pandemic outbreak has directly or indirectly impacted the entire human beings around the world. The rapid transmission of the virus from almost anything to any person has enforced implementation of social distancing as a preventive method. Such situation has introduced unprecedented challenges in education sector for every stakeholder e.g. educational institutes, teachers, children and parents. Earlier to the pandemic the Information Communication and Technology revolution has introduced various new synchronous or asynchronous online learning techniques. However, many educational institutes have set up such kind of learning techniques which were not completely accepted over traditional face-to-face learning technique in India. The pandemic has left no other option than online pedagogical approach for the entire education sector. This situation has given a boom to the already available Educational Technology (EdTech) industry who sees this situation as a great opportunity for their business expansions. Meanwhile, parents who were already worried about the impact of the internet technologies on their children are struggling without even a clue. This article focuses on the scenario of Indian EdTech industry beyond the pandemic and how parents of an adolescent child can deal with the challenges associated in terms of maintaining the balance between the online and offline life.

Keywords: *Online Learning, EdTech, COVID-19, Adolescents, Parent*

Introduction

Since December 2019, the initial outbreak of SARS-CoV-2, the virus that causes COVID-19 disease from People's Republic of China's Wuhan city and its afterward expansion in the world has been continuously putting many challenges for the human health infrastructure globally. The proliferation in virus infected population immediately after the outbreak urged the Emergency Committee of World Health Organization (WHO), regarding the outbreak of novel corona virus (2019-nCoV), to declare Public Health Emergency of International Concern (PHEIC) on January, 30, 2020. A year later the pandemic is still spreading beyond the borders and unfortunately with multiple moderated variants such as SARS-CoV-2 VUI 202012/01 and 501Y.V2 etc. declared by United Kingdom and South Africa respectively.

In India, at the initial stage of COVID-19 outbreak the Ministry of Health and Family Welfare intervened and issue advisory on social distancing that proposed closure of all educational establishments (schools, universities etc.), gyms, museums, cultural and social centers, swimming pools and theatres, students were advised to stay at home and online education should be promoted.

Online Learning or Online Education

Online learning can be defined as learning experiences in synchronous or asynchronous environments through different media devices and instruments (e.g., mobile phones, tablets, laptops) connected with internet, where students can learn anytime anywhere at their convenient and can easily interact with instructors and share their ideas with colleagues (Singh & Thurman, 2019). Synchronous learning makes online learning possible collectively among both teachers and students irrespective to their geographical distance and allow instant encoding and decoding of the educational content in terms of required feedback to make education effective, while asynchronous learning lacks teacher-student live interaction as it relies heavily either on audio visual recorded medium or any documented medium uploaded on any online forum such as blogs, email etc. (Littlefield, 2018). E-learning also offers unlimited access to unlimited students with unlimited interactions, effectively, at lower cost with higher flexitime, easy-going pace of learning and importantly at comfortable place of the students (Khurana, 2016; Tsai-Hung Chen, 2010). In order to maintain social distancing due to pandemic, worldwide educational institutes dramatically migrated to online

platforms from conventional face to face education structure. Platforms like Zoom and Google Meet assisted in promoting synchronous environment of online learning (De' et al., 2020) whereas edX, Coursera, Future Learn, Federica etc. platforms are more likely demanded for asynchronous learning environment (Shah, 2020). Amid COVID-19 crisis online education has emerged as an only panacea for the educational sector. Institutions that were strict to sustain with the conventional pedagogical approach in pre-COVID-19 era, reluctantly shifted to online education without any delay (Dhawan, 2020). Around 90 per cent student population from over 130 countries who were cut off from their schools can connect itself via screens. In India closure of schools due to pandemic has disrupted school lives of over 240 million children.

Switching over online learning from conventional teacher-student classroom learning approach has already been widely promoted by educational institutes, government agencies and worldwide corporations (Aldhafeeri & Khan, 2016). Top Universities like Harvard and Stanford Universities are offering online courses in various streams. Various literatures have accepted that online learning with its animated and audio visual characteristics assist students in understanding the abstract concepts more deeply than traditional form of learning (Plowman & Stephen, 2003; Sarama & Clements, 2003). Collaboration and interdependence between learners and time to time rapid advancement of digital technologies are capable in creating authentic learning ecology (Aldhafeeri & Khan, 2016).

Internet Addiction or IA

With limitless texting and social media, the internet technology provides virtual limitless options, capable enough to engulf us in their powerful grip by satisfying our psychological needs which drive our behaviour (Brooks Mike & Lasser John, 2018). Drs. Richard M. Ryan and Edward L. Deci in their Self-Determination theory pointed out that relatedness, competence and autonomy are the three basic psychological needs of human beings. Relatedness fills our need of social connections, Competence plugs our need of effectiveness and mastery and Autonomy satisfies our need to self-regulate our experiences and actions. Meeting all these three needs drive one's psychological health and well-being and facilitates our survival (Di Domenico & Ryan, 2017; Ryan & Deci, 2017). Being digitally connected one can easily meet all these three psychological needs instantly. The instant feedback features of the internet may respond to our brain reward center as addictive drugs, if not controlled. This reward system is composed with *Supernormal stimuli*- an artificial stimulus that produces in an animal a response that is stronger than would be evoked by the natural stimulus it resembles, *Variable Reinforcement Schedules*- inherently cause reward prediction error that instinct our anticipation of what will happens next that expect awards and *Classical Conditioning mechanism* activated either by the chimes of our smartphone or just with its mere silence presence that induce compulsive checking behaviour to satisfy the expected rewards which sometimes remain empty (Brooks Mike & Lasser John, 2018). Such situation disconnects us with our evolutionary brain systems which require both connections as well as associations in real world and grab us in casual connections and associations of virtual world. Long lasting healthy social relationships intensify physical and psychological well-being in contrast with poor social relationships and isolations (Umberson et al., 2010). Online addiction with social media, social gaming etc. isolates children, particularly adolescents from the real world and push them towards sedentary jobs against evolutionary requirement of physical activities resulting stress, anxiety, depression, poor relationships etc. (Jiang & Monk, 2015; Radesky et. al., 2016).

Social isolation promoted stay home stay safe precautionary measure and put challenges for people of all ages but adolescents who heavily rely on their peer connections for social development and emotional support at this development stage are facing the troubles caused due to isolation (Ellis & Zarbatany, 2017). Instead of having panic about the virus they are struggling more with the COVID-19 restrictions causing increased anxiety and depressive symptoms and decreased life

satisfaction (Magson et al., 2021). Apart from this struggle researchers have mentioned the challenges and difficulties existing with the online education structure. Forming online learning community with a high degree of social presence and engagement is the biggest challenge for online education next to its quality (O'doherty et al., 2018; Tsai-Hung Chen, 2010). Asynchronous or insubstantial feedback, deficiency between encoder-decoder interaction and participation, social isolation etc. are also major troubles in making online learning more effective (Khurana, 2016). The corona virus pandemic has led to an unprecedented rise in screen time particularly of children, consequently increasing the risk of online harm. The mandatory online duration for education has enhanced online hours of the adolescents which may lead them towards IA.

Parental Perception

More access to the technology due to online education situation is rising screen hours and reducing real life tasks of the children. The consequence for this sudden rise online access can indulge children in any sort of cyber-crime. "Union Minister Smriti Irani in her address to the Rajya Sabha confirmed that over 13000 criminal cases of child pornography, rape and gang rape have been reported between March 01 and September 18 on National Cyber Crime portal." Parents who were already worried about the consequences of digital technology on their children are now compelled to provide highly configured personal digital device to them. In India, own smartphone access among the children going to government schools fluctuated up to 56 per cent against 30 per cent of 2018 which is 74 percent against 50 per cent of 2018 in case of private school students (ASER Center New Delhi, 2021). This personal device access to internet rewards autonomy among the children, particularly in adolescence, relying more on peers for their own development. According to World Health Organization, children age 10 to 19 years fall in the category of adolescents. It's a stage, where he/she is stepping towards adulthood, becoming independent and shapes his/her future. Today's adolescents have grown up by rapidly exercising their fingers sliding on the tiny glass screen or mouse. They are quick to explore the features of various available and upcoming gadgets with sharp focused eyes and mind. Adolescents are not fully capable of understanding complex concepts, the relationship between behavior and consequences, or the degree of control they have or can have including that related to sexual behaviour. The earlier discussed brain reward centers can activate addictive nature for the smartphone or other media device among the adolescents if not monitored by the parents. Digital platforms like Facebook, Instagram, WhatsApp, social gaming etc. offers individual autonomy to the adolescents that can control their privacy with self-centered impression which needs to be monitored as prevention from online risks (Hayman Suzie & Coleman John, 2016).

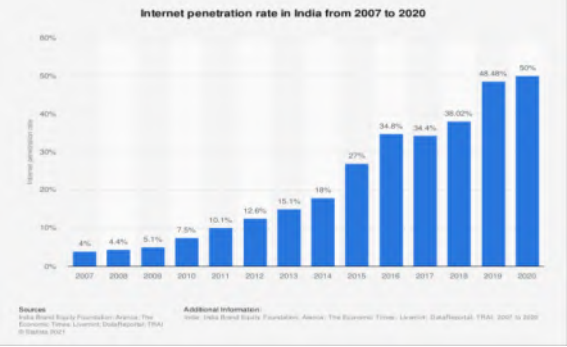
Objectives of the Study

- To explore the growth of Educational Technology (EdTech) beyond the COVID-19 pandemic in India
- To analyze the impact of online learning on adolescents and their parents amid pandemic

Research Methodology

In this descriptive study the researchers tried to understand the situation of online learning in COVID-19 and post COVID-19 situation. In addition the study also identifies the impact of online learning on adolescents and how parents in this situation can deal with their adolescent child/ren. This study is completely based on the secondary data. A systematic review was done from the collected literature. Secondary sources of data are used such as reports, scholarly articles, journals and other academic publications.

Internet Penetration in India



Source: -
https://www.statista.com/statistics/792074/india-internet-penetration-rate/
The above graph shows the rise of the internet penetration in India from 2007 to 2020. During this period the internet reforms created an Information Communication and Technology (ICT) revolution in the country that has provided boom in every sector, making India global hub of Information and Technology (IT) sector. In 2020 internet penetration rate in India has approached to the 50 percent of the population of the country. With 723 million internet subscribers and nearly 400 million smartphone India's tele-density covers 89 percent of the households of the country(E&Y Report, 2020). Still the Government of India is aiming to strengthen digital infrastructure in the nation to make internet reach possible in the remote zones of the nation. According to FICCI and Earnest & Young Report – Media & Entertainment Sector, March 2020 the Government of India is targeting to achieve 80 % internet penetration from its current level of 40% in the country. The Government is also eyeing on the launch of 5G internet technology that will fuel industry growth and innovation, harnessing the power of emerging digital technologies, such as IoT, cloud etc. Providing internet reach in remote by enhancing nation's tele-density from 89% to 100% will provide access of online world to the remote areas as well.

EdTech ecosystem in India – Public Sector

With the expansion of broadcasting technology many learning platforms have been created in the nation to promote education particularly in remote areas. The journey began with the introduction of one year Satellite Instructional Television Experiment (SITE) in the year 1975-76 followed by the launch of DD Gyan Darshan, a 24 hour education channel, and DD Gyan Vani, an FM radio educational network for local communities, in the year 2000 and 2001 respectively. Both these broadcasting networks of Delhi Doordarshan, under the umbrella of India's largest public broadcasting agency Prasar Bharti, are still fulfilling the need of open distance learning system from, primary to higher education level. After the launch of the internet technology in the year 1995 by Videsh Sanchar Nigam Limited, the Government of India formulated nation's Broadband Policy in 2004 with an objective of providing internet at higher speed in the country. Education through Internet Communication and Technology (ICT) was promoted and a one stop educational portal called 'SAKSHAT' (Mahat & Nalawade, 2013) was launched in 2006 by the Government of India to cater the educational needs of the students. The portal consists over 20 various web platforms such as Swayam Prabha, VIDWAN, Baadal, Samarath, NEAT-AICTE, Electronics and ICT Academy, Virtual Labs, DIKSHA, e-yantra, Spoken Tutorials, National Digital Library of India etc. These platforms are facilitating educational contents from class I to post graduate and academic research studies as well. The portals for higher studies cover all academic streams such as science, arts, literature, law and management etc. making SAKSHAT hub of online education.

EdTech ecosystem in India – Private Players

The second decade of the 21st century has seen many EdTech's startups in India. These EdTechs generated vast EdTech ecosystem in India by quickly picking up the nerves of learning requirements and began to offer their services as per the specific needs of the learners.

EdTech ecosystem in India- Private Players

Source:https://miro.medium.com/max/1000/1*lZeY39hh2198qPzqd7U1iw.png
From the above image it can be observed that EdTech ecosystem has adopted demassification approach by offering their services as per the

specific learning requirements of the learners such as kindergarten to class 12, test preparation, broad online learning, language learning etc. With latest aided technologies such as audio-video, innovative 2d and 3d visual effects, graphical and animated presentation, blend of gamifications, live interactions with the teachers having great communication skills, personalized performance with graphical effects etc. these apps are making learning easy with higher active involvement of the students. Such features are assisting students to learn abstract concepts with absolute clarity which boost up their self-confidence and motivation. Major reason of sudden spike in EdTech sector can be that instead of attending class sessions through different WhatsApp chat boxes or You tube channels created by different teachers these apps offer one account one platform for learning to the learners. Also, these apps reduce the parental involvement in terms of receiving and sending academic contents particularly in case of primary students.

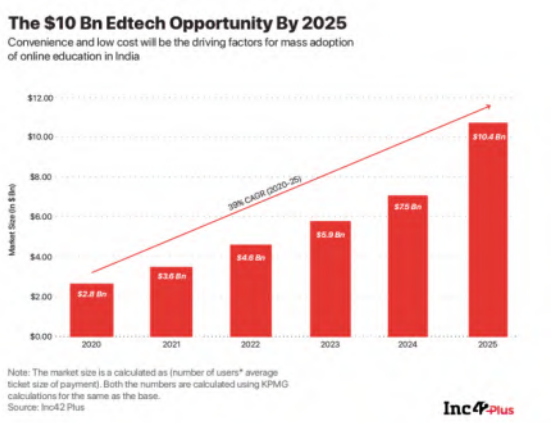
Future of Online Education in India

Being capable of sorting out the existing technical issues amid the pandemic such as audio-video streaming, uploading or downloading heavy e-contents, delayed feedback etc. the launch of 5G internet technology can revolutionize synchronous online learning by making live participatory teaching sessions possible in effective manner for both students and teachers. Moreover, making IT accessible in remote areas the online educational services will be approaching to the people still depriving not only from the internet but also from schools, school staff or books as well. Such students can easily interact with highly skilled teachers from various parts of the country. Sequel to this the literacy rate among the children will rise that will make them capable in boosting up the economic development of their region. Their economic development drive will also ignite atamnirbharta movement aiming India to become a self-reliant country.

Apart from the digital infrastructures the Government of India, during the COVID-19 pandemic, announced New Education Policy emphasizing on access, equity, affordability and accountability and the implementation of the NEP will enhance coding, digital libraries, multilingualism, virtual labs and online assessments for K-12 students. Such a situation will give boom to the online learning in result educational technology (EdTech) ecosystem will be reformed. As per the NEP providing technical trainings to the teachers will also made them friendly with the technology and they will be able to organize two-way online classes, in result instant clarity about the concepts will become comprehensive for students. Teachers will have to enhance their own advanced technological skills and come out with new e-pedagogical approach according to the needs of online learning. This challenge for teachers may take education to a new level as teachers will have to prepare themselves for their online ratings. Every e-content uploaded on the online platform will be accessible by anyone from anywhere whose number of views and likes can cater popularity to the teachers. The government under the NEP is aiming to setup an autonomous body, the National Educational Technology Forum (NTFT) with an objective of getting new ideas on the use of e-resources to enhance online education from learning to assessment level. Teachers' involvement in sharing their ideas in this regard on NTFT platform can assist the administration to forum new student-teacher friendly e-pedagogical approach of education which can fill the gap of offline education. The e-pedagogical approach can vary from region to region as India is a land of diversity. This diversify policy will be able to fulfill the need of the diversified students with common objectives of education.

Market Perspective

The market perspective of the EdTech companies in India can be easily understand with the statistics that by having largest population in the age bracket of 5 to 24 year i.e. 500 million the online education industry seeks great opportunity in Indian market. From the graph shown below it can easily recognized that the market value of EdTech sector is estimated to grow by 3.7 percent from US $ 2.8 billion of 2020 to US $ 10.4 billion in 2025.



Source:- https://inc42.com/datalab/the-future-of-education-indian-startups-chase-10-bn-EdTech-market/

According to KPMG & Google report of the year 2017 EdTech business is expected to reach at US $ 1.96 billion by 2021 from the level of US $ 0.25 billion of 2016 (*A Study by KPMG in India and Google*, 2017). The stay home stay safe preventive measure form the novel corona virus has fuelled up drastically and now it is forecasted to reach up to US $ 8.6 million by 2026. Therefore the EdTech companies in India such as Byju's, Unacademy, Doubtnut, Vedantu, Toppr, Cuemath, shiksha, simplelearn etc. seek opportunities in flourishing their business. Apart from this India's leading private EdTech giant Byju's US $ 300 million deal with WhiteHat Jr, can take online education to new dimensions. With this deal Byju's will introduce "Coding skills" necessary for educational subjects and it will be accessible to the students. Byju's CEO Byju Raveendran has also announced that Byju's is planning for Initial Public Offering (IPO). This massive increase of investment in the EdTech sector will assist the EdTechies to approach small cities of the country from where EdTechs can hunt existing and experienced teachers who can cope up with the demands of online learning from the nook and corner of the nation. The rise of EdTech will be an opportunity for the teachers who have stuck in the under paid private education sector who can switch over to EdTech companies for handsome packages. From student's aspect students who have to move in metro cities for better education will be getting two-way online education at their door steps. They need not to move to metros and that may become helpful in reducing migrated population density in the metros. Moreover, homely atmosphere will reduce the cost of staying in other cities and homely food will help them in maintaining both physical as well as psychological wellbeing. In future the EdTechies may create their online contents in such a way that don't create IA among their students.

Adolescence, Online Education and Parents

The advent of rapid Information, Communication and Technology revolution has generated two types of digital population in family structure i.e. Digital Natives and Digital Immigrants. Digital Natives – who are born and brought up with the internet connected digital devices around them, i.e. children of net generation. On the other side Digital Immigrants – who were born and brought up in pre-digital or analogue world, but at any lateral stage of their life adopted the technology due to their professional requirements, family connections or due to fascination. These digital immigrants will always compare their analogue life with the digital natives (Prensky, 2001)

Adolescence is a stage in which a child steps in by experiencing social and biological experiences such as hormonal changes and puberty, decisional independency, self-monetary deals, identity development etc. It's a stage where adolescents begin to fly with their own wings and begin to get himself involve in the society at his own. But at this point of age they are not fully mature. Whether knowingly or unknowingly an adolescent may indulge in any malpractice that can create prolong or lifelong effects.

Platforms like Facebook, Instagram, Twitter, Tinder, FAU-G, etc. allow users to create their own accounts by which users can attain their own autonomy. On these platforms users can choose with whom to connect, reject or eliminate from his/her account. Holding a social media or social gaming account is just like creating your own kingdom. Whereas, holding multiple social media or gaming accounts metaphorically creates an entire empire of kingdom. People, specifically digital natives, can easily operate and play on these empires in comparison with digital immigrants. Adolescents generally want to remain connected with their age group peers. Social

media and social gaming platforms both give them opportunity to not only remain connected but also to relish with their peers after school hours and in holiday/s as well.

In pre-COVID-19 era parents were already worried about the net habits of their wards. A sudden and huge unplanned spike in online duration of their ward/s due to online education system has introduced new challenges for parents. On one side the mandatory stay home stay safe has restricted adolescents' physical movements whereas on other side online education has enhanced their sedentary activities. Both situations together can make them lethargic and increases the probability of internet or smartphone addiction among them. The high-resolution screens are also putting stress on the eyes of the students that may cause eye sight problem among the adolescents. Instead of classroom learning environment, home-schooling lacks student-teacher direct interaction and sometimes due to technical problems like slow internet speed, power cuts etc. students couldn't meet the required concentration level to understand the concepts of the academic lessons taught by their teacher. This further creates ripple effects in their concept learning and recalling skills that affects competitiveness and then on their motivational skills if they perform less than the required or desired results. The Azeem Premji Foundation Research group in its recent study found that language and mathematical skills that were learned by the school students in previous classes have been lost among 92% and 82% average children respectively in India. Consequently these skills would have very serious impact on all further learning (Field Studies in Education Research Group, 2021).

The chimes of notification can also pull anyone's attraction towards online world. Adolescents may get diverted towards the chimes of notifications just as Pavlov's dog experiment in which he used to salivate for meat in response to bell. Pavlov termed it as classical conditioning and defined as learning by association, whereby a neutral stimulus, by virtue of its occurrence in close time and space with a natural stimulus that gives rise to a natural response, becomes capable of eliciting that natural response, even in absence of the natural stimulus. Classical conditioning is not applicable for voluntary responses rather it is applicable only for reflexive and spontaneous responses. Once a mobile user gets associated with chime of notification may develop compulsive device checking behaviour that may lead to multiple distractions from his work. Adolescents who are curious by nature to explore can develop such kind of behaviour due to which they may get distracted and by minimizing the browser they can easily get on to other internet activity. This situation can also lead towards checking all the contents received and forward to the other people. The instant gratification characteristic of internet also attracts them to perform immediate action on the received online content which probably activates brain reward system and play crucial role in creating IA (Brooks Mike & Lasser John, 2018). The IA further creates compulsive phone checking behaviour, enhance login frequency, Fear of Missing Out (FoMO) i.e. the person can't miss any fun, chat, video etc., reduce sleep hours, poor family and social relationships etc. These sorts of behavioural developments among adolescents can further develop irritation, indiscipline, weight gain, reduces concentration effecting self-study etc. Parents have also reported that children get annoy when they demand their smartphone from them("60.42 Percent Parents Said - Children Have Become More Irritable than before Due to Lockdown. - Dainik Bhaskar Survey," 2020.)

Being highly skilled in operating media gadgets adolescents can easily manage the information flow about them to their parents. They may create their secret friends, relationships, gossips etc. which is easily manageable with social media and social gaming platforms. They can easily control their privacy with self-centered impression. The sudden spike in the screen hours of adolescents has also increased the chances to manipulate what they are doing on the screen. Minimizing the browser of online class and getting involved in any other online activity such as social media or social gaming is easier for the adolescents. Being more tech-savvy than their parents they can hide their online tasks with full confidence. For instance: - a teenage boy from Kharar (Punjab) accessed famous online social game, PlayerUnknown's Battlegrounds

(PUBG). The boy allegedly spent nearly Rs. 16 lakh from his parental and own bank accounts to upgrade his game profile and for his teammates by purchasing virtual ammunition, passes and artillery of this game. According to his parents the boy told them that due to online classes amid pandemic he had to spend excessive time on mobile phone. They came to know about the situations through their bank statements ironically, they kept this money for their son's future.

Due to biological changes taking place in the body an adolescent develops inquisitiveness about sex and can easily search about it on the internet. On internet such kind of information is available with vulgarity with which an adolescent may set wrong paradigm about it. Sexting with peers, one may share his/her body part images with sexual expressions with trust which other side may break by uploading those images on the internet. Once such content go viral it's almost impossible to eliminate it from the web world. Being unaware their probability to access or becoming a victim of any sort of online malpractice increases in the web world. Amid pandemic Bois Locker Room an Instagram scandal was highlighted where teenage boys from Delhi were allegedly sharing morphed and obscene images of their female friends. The group chat also revealed the gang rape planning of their female friend.

No doubt, the COVID-19 time period has put new challenges for parents. Being digital immigrant, their first challenge is how to create balance between their suddenly raised necessary online hours and reduced offline hours. Traditionally Indian parents follow authoritarian style of parenting with a belief that parents are always right as they are elder and have their own life experiences. Parental stress act as a moderator for harsh parenting in result it disturbs parent-child relationship. COVID-19 pandemic stress among the parents negatively impacts on parenting consequently it increases the probability of harsh parenting which further degrade parent-child relationship (Chung et al., 2020). Contrary to this researchers have proved that authoritative style of parenting strengthens parent-child relationships and play a pivotal role in the academic achievements of the adolescents (Kim et al., 2018; Steinberg et al., 1992). In authoritative style of parenting preferences are more according to the child's characteristics rather than their own expectations from him (Hayman Suzie & Coleman John, 2016). Such style of parenting consists high warmth with high control instead of low warmth and high control. Authoritative style of parenting revolves around parent-child positive communication where relationship with the child is prioritized over any parental control or expectations(Brooks Mike & Lasser John, 2018). Rules and regulations are meant with mutual understanding which changes as per the maturity of the child. Parents with authoritative parenting style also punish their child whose cause is justified by his parents. Parents first of all must learn and give respect to the individuality of their child. They need to teach their children how to use freedom in a best possible way (Brooks Mike & Lasser John, 2018). Instead of monitoring about what they do parents must interact with the adolescents about how they do. Home-schooling situation has given an opportunity for both parents and adolescents to spend more time together. Parental perception during the pandemic plays major role as positive parenting comes out with positivity of any situation. During lockdown situation to reduce screen hours and stress parents involved their children in various domestic works like cooking, cleaning, playing indoor games such as chess, ludo etc. Spending time together with positivity and happily strengthen parent-child relationship. Such activities create a platform where parent-child can not only interact with each other but also find solutions of many problems and in the end, it builds trust from both sides which lacks in harsh or authoritarian parenting. During these interactions parent may discuss about the online activities of their adolescent child which helps in monitoring his/her online activities rather than creating a hover of helicopter parenting. Children today don't obey rather they follow. Parental own internet habits also motivate their children about how they should use the internet. Saying no to smartphones during meal time, sleep hours, face to face conversation with fellows by the parents automatically motivates the adolescents to do the same. In an atmosphere of online education once in a while parents can practice digital

detoxification, i.e. say no to all media gadgets, for a day on any holiday. By organizing offline recreational activities at home on this day can serve their purposes such as reducing screen hours, enhance interactions with them; create lifelong memories with their children and so on.

Conclusion

The COVID-19 situation has put people in an unprecedented isolation where tiny screens of smartphone, laptops, etc. are acting as an only tiny window to remain connected with the world. Without ICT situations would, perhaps, have left more dangerous impact on human minds. An upsurge of EdTech apps amid pandemic has generated opportunities for many educators who have launched their own You tube channels or any other online portals to widen their teaching approach. The NEP 2020 also focuses motivates all stakeholders to go beyond the classrooms and interact with the students and teachers from all around the world. In addition, the launch of 5G internet technology will be able to move out existing online learning barriers to make it more interactive and effective. On the other side online learning is enforcing adolescents to spend limitless hours on the screen which can cause IA among them. This addiction further reduces their human interactions resulting in poor social connections causing depression and anxiety. On positive aspect the pandemic situation has given a fair opportunity for strengthening parent-child relationship for both the stakeholder. Authoritative style of parenting enhances trust among both which is the basic element of healthy parent-child relationships. Focusing on relationship over controlling the children, enhancing offline interactions by saying no to digital devices, practicing digital detoxification can help parents in maintaining balance between the online and offline world.

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SOCIAL MEDIA LITERACY AMONG UNIVERSITY STUDENTS IN INDIA

Dr. Surender[1] and A. Vaishnav[2],
[1]Department of Journalism & Mass Communication, Central University of Haryana
[2]Central University of Punjab
[1]sbargujar@gmail.com, [2]vaishnav.ankit188@gmail.com

ABSTRACT

News that are false by intention and whose aim is to mislead reader are called fake news. Social media play a significant role in the dissemination of fake news among the young population of India, and that results in misinformed citizens ,frauds, and serious deaths caused by mob lynchings. Here the role of media literacy becomes very prominent as it is the only way to protect Indian citizens from the monster of fake news. However, it is doubtful as to what level students in India are aware of the idea of fake news being camouflaged as actual news and disseminated on social media. It is also critical to identify the dangers that phoney news bring to students in India in terms of their education, and the progress of the whole country since they the future of the country rely on them. This study was intended to study the perceptions of Indian students on the propagation of news on social media, and it's an inquiry into the media literacy skills of these students. The objectives of this study were accomplished by using a descriptive design and quantitative methodology to collect and analyze data. Questionnaires were sent using the google form due to the pandemic physical mode was the least option. The analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The results demonstrated that students use social media as a major source of their daily news acquisition. The social media competency was found low, and no significant efforts were found in educating students about media literacy in Indian Universities. The Fake news detection and sharing skills were found very low among university students.

Keywords: *Media Literacy, Social Media, University Students, Fake News, Informed Citizens, Media Literacy Education.*

1. Introduction

Information is a powerful tool, and it has made the world more advanced and developed. In today's informational age, it's most important to understand its vital power, as the power of information is in everyone's hands. The democratization of media gave freedom of autonomous production and dissemination. Social media have created a novel world full of autonomously created information, and there is hard to tell which source is credible and which is not. Social media is defined as"internet-based channels that enable users to interact opportunistically and selectively self-present, either in real-time or asynchronously, with broad and narrow audiences who derive value from user-generated content and the perception of interaction with others"(Carr & Hayes, 2015). As Spiderman's dead uncle told him that with great power comes great responsibility, we've been enjoying the great power without fully understanding it. Social media is being used as a weapon to propagate hatred and misleading content for economic and political gains. As there is none to check whether the news is accurate or not, it's the receiver's sole responsibility to review the news. Here emerged fake news as a tool for tempting communal hatred, which eventually led to public lynchings (Arun, 2019). In the Covid-19 pandemic, much fake news is being disseminated too (Naseem & Bhatti, 2020) and, there is only one strong weapon we have: media literacy. Media literacy is like a vaccine to this infodemic. Media literacy immunizes our system from the hazardous virus of fake news.

Growing digitalization programmes by the government and low internet prices enabled Indian citizens to use the internet actively all across India. According to Statistica, there will be 440 million active social media users in India in January 2021 (Statistica, 2021). Approx 54% of the Internet users in India was between 20 to 39 years old (Statistica, 2019). This implicates that the young population in India is more active on social media.

In the word of Sonia Livingstone, Media literacy is defined as "the ability to access, analyze,evaluate and create message across a variety a context." In her research, the authorargues that media literacy is having these skills and enhancing them. Using themto receive, perceive and create good media content(Livingstone, 2003). Media literacy skills are life skills that help us sustain in this

mediated world, which clearly states that in the new media scenario, these skills become as essential as cooking and health skills(Hobbs, 2010).

This research is an inquiry into the media literacy level of students of Indian universities.This research also evaluates students' social media skills and how they dealwith fake news on social media.

2. Literature Review

Defining social media Carr and Hayes pointed out that there is no universal definition of social media due to its changing behaviour rapidly. Yet, they tried to define social media, which they think will sustain till 2035. The definition describes the forthcoming developments in the character, consumers and wide usage of social media along with the time (Carr & Hayes, 2015). Investigating through social media, Siddiqi and Singh argued that social media have various positive and negative impacts on society. They have argued that whether social media has positive influences on the education and participation of people in the system. Still, the user-generated content can't be trusted and which creates atrocities all over the world (Siddiqi & Singh, 2016). Similarly, Boyd has observed that social media attract youth and it creates awareness among youth about recent trends (Boyd, 2006).

The long unanswered question that occurs every time a new medium emerges is the reason behind the people's consumption or usage of a particular medium. We still accurately don't know why people use media. The emergence of the usage and gratification paradigm helps understand the gratifications people get when they use media. Katz, Gurevitch and Hass have identified five groups of needs that media gratifies, which are cognitive needs, affective needs, personal integrative needs, integrative social needs, and tension free needs. The paradigm shifted the narrative from what media do to people to what people do with media (Katz, Gurevitch, & Hass, 1973). Ruggerio argued that with the emergence of computer-generated communication, the uses and gratification research should expand their techniques to understand the uses and gratification of the medium. He also suggested that uses and gratification research has always helped analyze and understand a new medium of communication (Ruggiero, 2000). Similarly, Whiting and William have analyzed the uses and gratification patterns of users on social media and identified ten uses and gratifications; it helped us in understanding gratifications through social media (Whiting & Williams, 2013). Social media gratifies the cognitive, emotional, habitual and social needs of college-going students (Wang, Tchernev, & Solloway, 2012). Research on social media competency has defined a set of elements that can measure it. Social media competency is skills required to operate social media effectively (Rad, Balas, Lile, Demeter, Dughi, & Rad, 2020).

It has been observed that social media is used for news sharing using sharable links of any online news content. This feature has been very useful in increasing web traffic (Kümpel, Karnowski, & Keyling, 2015). This way, social media is being used for sharing misinformation and fake news (Bali & Desai, 2019). It has been observed that propaganda becomes more effective if tailored information is generated assuming affective reactions and disseminated through social media (Berduygina, Vladimirova, & Chernyaeva, 2019).Fake news and misinformation travel fast and farther than the actual news and truthful information, and this happens due to the hatred, panic, surprise, and misery are the main contents of fake news, and audiences are more reactive to these values (Vosoughi, Roy, & Aral, 2018).

Media literacy is a set of skills that can be generated among learners through training. Media literacy enables people to become informed citizens (Ferrington & Anderson-Inman, 1996). Media literacy empowers a person to think critically about the consistency and integrity of news reports, whatever the medium is (Barclay, 2017). It’s the ability to access, analyze, evaluate and create a message across various contexts (Livingstone, 2003). Thus media literacy can be defined as an essential life skill in the mediated system (Hobbs, 2010).

Indian youth face fake news often, and they face difficulty in identifying fake and real information. The reason behind that is lack of media literacy is observed (Sachdeva &

Tripathi, 2019). Silverblatt argued that educating media literacy to students and teachers should focus on thinking rather than what to think (Silverblatt, 2018).

It has been observed that media literacy skills among users help to identify fake news and misinformation. High media literate people find it easy to distinguish fake news and take proper action against it (Jones-Jang, Mortensen, & Liu, 2021). University students faced difficulty in identifying fake news due to low levels of media literacy, which concludes that the role of media literacy is very critical in the battle against fake news (Syam & Nurrahmi, 2020).Social media information literacy (SMIL) skills are the set of attributes that helps in searching, obtaining, understanding, evaluating, creating, communicating and re-evaluating information and those users who have high skills of these attributes are more able to detect fake news and take action against it (Bühler, Murawski, Darvish, & Bick, 2020).

2.1 Research Gap

Despite the profuse literature on media literacy among students, there was a lack of significant research on media literacy levels of university students in India and their fake news knowledge and dealing patterns. This study examines the social media literacy skills of students.

2.2 Research Questions

This paper targets to study social media literacy among university students in India in terms of fake news. This research aims to answer the following questions:

1. How and why is social media used by university students?
2. What is the level of social media competency among university students?
3. What is the status of media literacy training and education in Indian universities?
4. How do students respond to fake news?

2.3 Research Objectives

This study aims to find answers to the questions described above, with the objectives as follows:

1. To study the use of social media among university students.
2. To study the level of social media competency.
3. To analyze media literacy training among university students.
4. To identify students' responses to fake news.

3. Research Methodology

This research is conducted using the exploratory design, as there was a lack of significant research on the particular problem. The study employed a quantitative approach aiming to set up a demonstration of respondents' viewpoints. Due to the empirical nature of the study, the quantitative technique is found suitable to record their viewpoints. The sample size of 150 students was determined using Glenn D. Israel's scale (Israel, 2013). The population taken understudy is PG level students of two central universities, Central university of Rajasthan and Central university of Haryana. The sampling method was convenient sampling due to the covid-19 pandemic. The questionnaire was sent to respondents using personal messaging applications such as WhatsApp, Facebook and Instagram etc. The questionnaire was made using google forms. Internet technology helped the researcher maintaining social distancing while conducting the research.

The research was followed by ethical principles, and prior consent of the respondents was noted. Anonymity and confidentiality were promised to the respondents and so was protected.

The data analysis of the data recorded was done using SPSS(Statistical Package for Social Science). The technique used for analysis was Z-test.

3.1 Hypothesis

The study proposes to test the following hypothesis:

H1 Students use social media for information, Entertainment and Relations.

H2 Students use social media at a competent level.

H3 Students can detect fake news on social media.

H4 Students take action on fake news on social media.

H5 Universities provide media literacy training to their students.

4. Data Analysis

The reliability of the questionnaire was tested using the Cronbach alpha test. The Cronbach alpha value of the questionnaire was found 0.891, which determines that the instrument is reliable.

Table 4.1 Reliability Statistics

Cronbach's Alpha	N of Items
.828	16

Table 4.2 Demographic Profile

Demographic	Category	Frequency	Percentage
Gender	Male	86	57.3
	Female	64	42.7
Age (Years)	15-20	16	10.7
	20-25	101	67.3
	25-30	32	21.3
	30-35	1	0.7
	Above 35	0	0
Institution	Central University of Haryana	74	49.3
	Central University of Rajasthan	76	50.7
Stream of Education	Science	50	33.33
	Non-science	61	40.7
	Professional	39	26

Table 4.2 shows the demographic profiles of the respondents. There were 86 (57.3%) males and 64 (42.7%) female respondents. The age group 20-25 years was most dominant as they covered 67.3% of all the respondents. There was almost equal participation from both universities. Respondents who represented different streams of education were also similar in numbers. The respondents represented almost every state and UT in India. Therefore it can be concluded that this study has respondents from all over India.

4.1 Uses and Gratification

H1: Students use social media for entertainment, information and Relations.

Table 4.3Descriptive statistics for the Construct of"Uses and Gratification"

Variable	Sample Mean	Z Value	DF	P-Value
Entertainment	4.160	17.87	149	.000
Information.	3.907	13.50	149	.000
Relations	4.067	17.68	149	.000

Establishing the uses and gratifications of social media, the researcher found that online media and social media are the dominant sources for news acquisition. Whatsapp, Facebook and Instagram were found most used social media by the respondents.

Table 4.3 shows that the respondents of the selected universities were using social media for entertainment, information and relations. The z value for Entertainment, Information, and Relations is 17.872, 13.508, and 17.682, respectively. In contrast, the p-value for different aspects of uses and gratifications is 0.00, at a 5 percent level of significance. It means there the students use social media for entertainment, information and relations. The sample means are 4.160, 3.907, 4.067, respectively for entertainment, information and relations, which shows a higher level of agreement on the construct.

4.2 Social Media Competency

Table 4.4 Descriptive statistics for the construct of social media competency

Variable	Sample Mean	Z Value	DF	P-Value
Find information	3.747	11.142	149	.000
Understand Posts	3.687	9.135	149	.000
Comprehend Relative Information	3.820	13.694	149	.000
Use all the features	4.173	22.014	149	.000

H2: Students use social media at a competent level.

Table 4.4 shows that the respondents of the selected universities were incompetent in using social media. This is evident that from the fact that z statistics is significant as the z value is 11.142, 9.135, 13.694, 22.014, respectively, for the variables of the construct. The P-value is 0.00 for all the variables of the construct, at a 5 percent level of significance. It means the students are unable to use social media at a competent level as data shows a higher agreement to the inability to use social media at a competent level.

4.3 Fake News Detection

H3: Students can detect fake news on social media.

Table 4.5 Descriptive statistics for the Construct of Fake news detection

Variable	Sample Mean	Z Value	DF	P-Value
Familiarity	3.853	12.584	149	.000
Differentiate	4.173	21.042	149	.000
cross-check information	4.220	23.597	149	.000
Trust information	4.153	20.115	149	.000
Blue Tick	4.080	19.719	149	.000

Table 4.5 shows that respondents of the selected universities were unable to detect fake news on social media. This is evident from the z statistics is significant as the value is 12.584, 21.042, 23.597, 20.115, 19.719, respectively. In contrast, the P-value is 0.00 for all the variables, at a 5 percent level of significance. The sample means are 3.853, 4.173, 4.220, 4.153, 4.080, respectively, which shows a higher agreement to the inability to detect fake news on social media.

4.4 Action on Fake News

H4: Students take action on fake news on social media.

Table 4.6Descriptive statistics for the Construct of Fake News

Variable	Sample Mean	Z Value	DF	P-Value
Report fake news	4.260	23.759	149	.000
Confrontation on fake news	4.173	20.746	149	.000

Table 4.6 shows that respondents of the selected universities were not taking any action on fake news if they received any. This is evident from the z statistics as the z values are 23.759 and 20.746, respectively. In contrast, the P-values are 0.00 for all the variables, at a 5 percent level of significance. It means the students don't take action on fake news when they encounter any. The sample means are 4.260 and 4.173, respectively, which are shows a higher level of agreement on the construct that students don't take action on fake news.

4.5 Media literacy Training

H5: Universitiesprovide media literacy training to students.

Table 4.7 Descriptive statistics for the Construct of Media literacy Training

Variable	Sample Mean	Z Value	DF	P Value
Media literacy awareness	4.113	19.210	149	.000
Media literacy training.	4.167	20.437	149	.000

Table 4.7 shows that the respondents of the selected universities didn't get any kind of media literacy training. This is evident from the z statistics is significant as the z values are 19.210 and 20.437, respectively. In contrast, the value for all the variables is 0.00, at a 5 percent level of significance. The sample means are 4.113 and 4.167, respectively, which shows a higher agreement on the construct that students did not receive any media literacy training.

5. Findings and Suggestion

5.1 Findings

The following findings were observed:

- Social media is an essential part of the lives of students as they use social media for entertainment, information and relations. This is to gratify their cognitive, affective, personal integrative, social integrative and tension release needs.
- The social media competency level of Indian students was found low as students were unable to find information, understand posts, comprehend relative information, use all the features of social media.
- The students agree that they were unable to detect fake news on social media as they were not familiar with fake news, couldn't differentiate between fake and real news, didn't cross-verify the information, trust any information on social media and didn't even check the blue tick of social media pages before considering the news. This shows the incompetency in detecting fake news on social media.
- Students didn't take any actions to reduce the impact of fake news, such as reporting the fake news and confronting people who share fake news on social media if they find any fake news.
- The essential media literacy training given by universities were found very negligible as students reported that they didn’t receive any media literacy training from the university.

5.2 Suggestions

- It’s recommended that universities take initiatives to scale up the media literacy education, and media literacy should not be limited to media students only; every student should learn and be trained regarding media literacy. For that, universities must establish media literacy courses at every undergraduate and postgraduate programme level, and the course must be mandatory to study.
- The government should initiate programmes to enhance the media literacy skills of students. For that, the government should make policies implementing mandatory media literacy training from kindergarten to higher education levels. The government must also implement fake-news related education policies for general citizens.
- Preventive measures must be taken from social media platforms in order to curb the effects of fake news. Media literacy campaigns must be designed for the users, and mass awareness programmes must be initiated about fake news.
- Further research should be conducted on the new methods of teaching media literacy as fake news is all around us. Fake news sharing and effects patterns also should be studied in further research.

6. Conclusion

This research identified that the social media literacy skills of students of selected universities were very low, and universities don't understand the criticality of media literacy. The low level of social media competency, fake news detection skills and confidence in action on fake news are because of the less existence of media literacy training in universities.

Fake news is a big monster that we have to get rid of, and it's impossible without the right information skills and media literacy training. Social media has become an essential part of human lives, and citizens should be information smart. The governments should make media literacy training and education the mandatory part of the curriculum. Educational institutions must take action on media literacy on a serious note because we can't curb every fake news on social media on the platform level. They should be irradicated on the user level only by making the user information smart.

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SMART PACKAGING'S FUNCTION IN THE FOOD SUPPLY CHAIN

N. Singh[1] and K. Sharma[2]
[1]School of Engineering Technology, Department of Printing and Packaging Technology, Central University of Haryana, Mahendergarh , Haryana, India
[2]Printing and Packaging, IMCMT, Kurukshetra University, Kurukshetra, Haryana, India
[1]nishan@cuh.ac.in

ABSTRACT

The food supply chain is increasing rapidly expanding interconnected sector that encompasses every facets of the food supply chain from farm to fork, including manufacturing, packaging, distribution, storage, and further processing or cooking for consumption. Smart packaging could have an effect on food quality, protection, and sustainability along this chain. With the convergence of appearing electronics, wireless networking, cloud data solutions and packaging systems have become smarter. While there are several factors that contribute to food loss and waste across the entire food supply chain, there are various articles which highlights the recent developments and breakthroughs in the development of smart packaging systems. This analysis is the combination of these conceptual concepts and technical implementations, mainly focusing on how creative smart packaging solutions improve food supply quality and safety by improving product accountability and reducing further loss of food and waste. We begin by discussing the concept of integrated food supply chain management, which is essential in tactical and operational components that can improve product accountability across the chain. The impact of smart packaging in decreasing food loss and waste is then highlighted. The lists of the most important facts have been compiled for about common printing techniques for smart packaging systems. Then we go through the possible challenges of smart packaging device manufacturing and implementation, as well as their cost-related demerits and next steps in the food supply chain.

Keywords *- food protection, food waste, printing technology, smart packaging, supply chain management.*

The Food Supply Chain: An Introduction

In general, a supply chain can be thought of as the relationship between different organizations involved in the flow of goods and services to their end users (Mentzer et al., 2001). The increase in supply chain management as a discipline acknowledges the parallel change away from individual companies and toward larger networks, with a focus on the benefits that network wide cooperation can offer (Carter, Rogers, & Choi, 2015; J uttner & Maklan, 2011; Lambert, Cooper, & Pagh, 1998). Adopting these broader, holistic views has the disadvantage of making managing and understanding such organizations more difficult than managing and understanding business units of an individual. As a result, a supply chain can be thought of as a complex adaptive system in which interactions and deformations among specialized components (one echelon or business unit) can affect overall behaviour of the system (Levin, 1998).

As a result of it, the supply chain activities (and research) can be divided into organizational, tactical, and strategic perspectives (Stevens, 1989), which are often characterized by the scope of temporal planning and the decision-making processes that result (Schmidt &Wilhelm, 2000). Goals and metrics must be integrated in all systems for a supply chain to be converted to enjoy the advantages of a comprehensive integrative model (Jaradat, Adams, Abuta benjeh, & Keating, 2017). Inherently supply chains struggle with instability (Flynn, Koufteros, & Lu, 2016), and the impact of the uncertainty on different echelons of a supply network, both upstream toward manufacturers (Lee, Padmanabhan, & Whang, 1997) and downstream toward consumers (Ivanov, Sokolov & Dolgui, 2014). As a result, small delays or failures can trigger widespread supply chain volatility; thus, managers must be able to precisely assess the effects of various risks on supply chain operations (Fiksel, 2015; Sheffi & Rice Jr, 2005).

While the supply chain literature contains discussion of specific methods for coping with confusion, their relevance to the food supply chain (FSC) is unclear (Kamalahmadi & Parast, 2016; Sheffi & Rice Jr, 2005). For example, due to the difficulty of commodity depreciation, the traditional technique of safety stock—holding additional products to satisfy demand fluctuations is not eagerly transferable to FSCs (Ahumada & Villalobos, 2009;

Chaturvedi & Martinez-de-Albeniz, 2016). FSCs are discrete in that, in addition to the general concerns of supply chain management. FSCs have to deal with problems relating to perish ability, commodity degradation, and waste (Aliakbarian, 2019; Amorim, Gunther, & Almada-Lobo, 2012; Gobel, Nina, Antonia, Petra, & Guido, 2015). The goods in these chains can be defined as depreciating in value and quality after they are manufactured (Govindan, Jafarian, Khodaverdi, & Devika, 2014). As a result, specific categories of food items (for example, fresh products) vary beyond their trivial shelf-life, or the "rate at which the commodity loses its value over the period of time in the supply chain," as elaborated by Blackburn and Scudder (2009). In relation to the concept of supply chain uncertainty, problems such as stock delays and elevated inventories may result in widespread wastage of perishable goods. The causes of product degradation in FSCs are numerous; however, they can frequently be divided into two categories: temporal and environmental influences. Since goods within FSCs are subject to the marginal value of time, they must move downstream as efficiently as possible within the FSCs. This seems to be almost paradoxical, given that one of the main challenges of FSCs is their long processing time (Lowe & Preckel, 2004). Second, environmental factors such as temperature and humidity affect food quality as a result, the possibility of product degradation (van der Vorst et al., 2009). The effect of product degradation within FSCs is twofold: first, there is a reduction in consistency as food products deteriorate, but there is also an increased chance of tainted goods affecting food safety (Akkerman, Farahani, & Grunow, 2010). FSCs face threats not only from commodity degradation, but also from increased regulation and environmental demand. Increased regulatory demands force specific FSC tactics, such as traceability, to become mandatory components of operating in some areas (Bosona & Gebresenbet, 2013). The ultimate difficulty stems from the fact that laws are not uniform and are often selectively applied (Aruoma, 2006), posing an additional obstacle to FSCs that work across international borders. Furthermore, environmental demand necessitates the need to ensure that FSC elements (such as packaging) solve different sustainability concerns, such as waste avoidance and packing recycling (Vanderroost, Ra-gaert, Devlieghere, & De Meulenaer, 2014). These sustainability challenges have a consequence on FSCs through both environmental and stakeholder (i.e., societal) considerations that influence corporate social responsibility (CSR) initiatives (Akkerman et al., 2010). Wastage is a final problem that has an effect on FSCS results. While reducing waste is a common issue in any supply chain, especially those who have adopted incline philosophies, food waste is often hard to quantify through FSCs and pervades all actors within a supply network (Devin & Richards 2018; Gobel et al., 2015; Mason-Jones, Naylor, & Towill, 2000; Naylor, Mohamed, & Danny, 1999). Food waste has a variety of causes; however, wastage occurs mainly at the closing stages of the SC since the finished product may become degraded or deteriorate at this stage (Liljestrand, 2017; Verghese, Helen, Simon, & Hel en, 2015). While packaging is often associated with waste in industrial supply chains, improved packaging strategies have been viewed as a method to mitigate food waste due to reduced product degradation in the sense of FSCs (Verghese et al., 2015).

Food Waste And Loss

With the continuous increase of the world population, food loss and pollution has been a major issue that has gotten a lot of attention. Per year, it is estimated that about 30% and 40% of the global food supply as well as of the food supply in the United States was missing or discarded respectively (Hall, Guo, Dore, & Chow, 2009). According to the Food and Agriculture Organization (FAO), 1.3 billion tonnes of food are omitted or exhausted per year, and these loses or wastes will occur at every point in the supply chain, from farm to fork (FAO, 2011). Food loss and waste will have an effect on global sustainability, environmental and human health, and natural resources (Pham, Kaushik, Parshetti, Mahmood, & Balasubramanian, 2015; Xue et al., 2017). The United Nations plans to "reduce 50 percent of global food waste at market and market levels and decline post-harvest food

loss by 2030" as part of the Sustainable Development Goals (SDG) (United Nations, 2018b).

Figure 1 depicts the potential loss/waste produced at various stages of the FSC for some delegate food items. In the final consumption step, for example, consumer behaviour has a direct effect on food waste production. Many people enjoy preparing oversized meals but then throw away the leftovers; however, few are mindful of the detrimental effects of food waste on human health and the environment (Gunders, 2012). Contamination and losses caused by insufficient quality measures, overstocking goods in stores/homes, improper labelling, and lost product details are among the leading causes of food loss and waste in the supply chain (Broad Leib et al., 2013; Kummuet al., 2012; Parfitt, Barthel, & Macnaughton, 2010; Waste & Resources Action Program (WRAP), 2011). Previous research has shown that fresh baking goods and perishables contribute the majority of food waste, which has a knock-on effect on the rest of the supply chain (Griffin, Sobal, & Lyson, 2009; Kantor, Lipton, Manchester, & Oliveira, 1997; Mena, Adenso-Diaz, & Yurt, 2011). The main cause of this issue is typically an over prepared excess quantity that exceeds demand, a minimal shelf-life of the goods, or inadequate storage and promotion calculations (Kaipia, Dukovska-Popovska, & Loikkanen, 2013; Mena et al., 2011). It should also be remembered that the fundamental causes of food loss and waste may fluctuate between developed and developing countries. For example, in developing countries, approximately 40% of food is lost all through the manufacturing process, while 40% of food waste is produced during the delivery, marketing, and consumption steps in developed countries (Gustavsson, Cederberg, Sonesson, van Otterdijk, & Meybeck, 2011; Wunderlich & Martinez, 2018). Food loss/waste intersects with public health concerns such as food quality, food safety, and obesity (Neff, Kanter, & Vandevijvere, 2015), and has a negative impact on social growth and environmental conditions (Shafiee-Jood & Cai, 2016; Wunderlich &Martinez, 2018). For example, the socioeconomic effects of food waste can lead to higher food costs, lower wages, and worse poverty (Gills, Sharma, & Bhardwaj, 2015), and unsustainable activities can destroy the land, freshwater, fisheries, forests, and biodiversity (United Nations, 2018a).

Different cutting-edge solutions and developments must be proposed depending on the relevant circumstances appropriate for the local, international, and global context, and it is critical that the approaches adopted be unique by taking into account energy and infrastructure limitations, embattled food loss in developing countries, and food waste in developed countries (Lipinski, Han-son, & Lomax, 2013; Mourad, 2016; Neff et al., 2015; Shafiee-Jood & Cai, 2016; Wunderlich & Martinez, 2018). However, in order to execute these initiatives, different players (for example, donors, institutions, states, and the private sector) must take a number of steps in response to the problems they face (Lipinskiet al., 2013; Neff et al., 2015; Wunderlich & Martinez, 2018).

Efforts have also been made to produce energy from food waste using diverse methods such as anaerobic digestion, ethanol fermentation, incineration, pyrolysis, gasification, and hydrothermal carbonization (Casazza et al., 2016; Pham et al., 2015; Sannita, Aliakbarian, Casazza, Perego, & Busca, 2012). Food wastes produced during food processing have also been identified as natural sources of high-added-value compounds with properties of antioxidant (Aliakbarian et al., 2018; Aliakbarian, Casazza, & Perego, 2011; Aliakbarian, Fathi, Perego, & Dehghani, 2012; Aliakbarian, Paini, Adami, Perego, & Rever-chon, 2017; Lopresto et al., 2014; Casazza, Aliakbarian, Mantegna, Cravotto, & Perego, 2010). Furthermore, international bodies such as the FAO, World Food Program (WFP), and the United Nations Environment Program (UNEP) have made important contributions.

Table 1: Shows the Food Losses at each stage of the supply chain.

Losses in Production	Post-harvest/Transport/Storage Losses	Processing and packaging losses	Retail and distribution losses	Consumers Suffer Losses (Include out of Home consumption)
Grain goods (2 percent) Seafood (11 percent) Fruits and vegetables (20 percent) Meat (3 percent) Milk (0.35 percent)	Grain goods (2 percent) Seafood (5 percent) Fruits and vegetables (3 percent) Meat (2 percent) Milk (0.25 percent)	Grain goods (10 percent) Seafood (5 percent) Fruits and vegetables (1 percent) Meat (4 percent) Milk (0.5 percent)	Grain goods (2 percent) Seafood (0.5 percent) Fruits and vegetables (12 percent) Meat (4 percent) Milk (0.25 percent)	Grain goods (27 percent) Seafood (33 percent) Fruits and vegetables (28 percent) Meat (12 percent) Milk (17 percent)

Table 2: IKEA'S Strategy used in "Food is precious'' Food waste initiative, Retrieved from http://flow protocol.org/case-studies/ikea-food-food-precious-food waste-initiative/

The monitoring of the amount of food refused at various activities in the supermarket by using "Smart sales"	To determine the cause of the waste, the co-workers use the scale so as to measure the amount of food thrown away and sort it out.	The waste's cost is being computed by the machine.

Effort to increase public consciousness of food safety in order to fulfil the aim of "zero food loss or waste" in the "Zero Hunger Challenge" (Alamar et al., 2018). The World Resource Institute (WRI) has already established loss of food and waste and protocols to resolve the problems that must be overcome in order to compute food loss and waste globally. WRI stands for World Resources Institute (2018). In one IKEA case study (Ingvar Kamprad Elmtaryd Agunnaryd), they identified a basic technique for identifying the prevalent factor causing food waste and providing solutions to tackle the issue (Figure 2). We will illustrate the mainly innovative smart sensor-enabled packaging
technologies that can minimise loss of food and waste along the FSC, their most exciting manufacturing processes, and the issues associated with each process in the following session.

Smart Packaging (Sp) and It's Effect On Food Loss and Waste

When addressing packaging schemes, the expressions "intelligent packaging" and "smart packaging" are often used interchangeably or misinterpreted. SP is regarded as a broad term that encompasses both intelligent and active packaging, which can track internal and external changes in a product (intelligent) and then react (active) by interacting with an external (Electrical or optical) interface (Vanderroost et al., 2014). The ultimate goal of using SP is to increase the shelf-life and freshness of the product, share quality information with customers, improve product protection and improve traceability of the product as it moves through the supply chain. Active packaging, which is the predominant solution to conventional packaging, seeks to promote and preserve high quality while still extending food product freshness. To do this, various components capable of releasing/absorbing compounds from/into the prepared food to prevent spoilage may be embedded into the device (Arvanitoyannis & Stratakos, 2012; Prasad and Kochhar, 2014). In contrast, intelligent packaging is mainly used to track and record the conditions of packaged foods, as well as to collect and provide data on the product's status during the storage and

shipping phases (Kerry, O'grady, & Hogan, 2006). As a result, intelligent packaging solutions typically include hardware components such as gas alarms, freshness and ripening indicators, time versus temperature indicators (TTI), and radio frequency identification (RFID) sensors (Kerry et al., 2006). There are also “application carriers” networks that may be used for data collection and transmission in order to view the information later (Muller & Schmid, 2019). Unless otherwise mentioned, “SP” is used as a synonym for “intelligent packaging” in this analysis.

A scientific advancement related to food safety is one of the most important steps in avoiding loss of food and waste (Vilari no, Franco, & Quarrington, 2017). Temperature-controlled and energy-efficient containment devices, innovative packaging materials and designs, and smart tracking systems are only a few examples Bahadur, Haque, Legwegoh, and Fraser (2016); Foscaches, Sproesser, Quevedo-Silva, and de Lima-Filho (2012); HLPE (2014). Advanced packaging techniques, especially active pack-aging and SP, have been investigated and shown to be an important tool for reducing food waste while ensuring food safety and meeting customer demands (Lipinski et al., 2013; Ols-mats & Wallteg, 2009; Poyatos-Racionero, Ros-Lis, Vivancos, & Mart nez-M a nez, 2018; Pradeep, Junho, & Sanghoo, 2012). Despite major advancements in SP electronics, such as electrochemical sensors, E-Tongues, and E-Noses, existing devices are typically complex and costly, and are not yet ready for integration with real-world packages (Poyatos-Racionero et al., 2018;Zou, Wan, Zhang, Ha, & Wang, 2015). Nowadays, the “best before” and “sell by" or “use by” dates have become the standard in the food industry; however, they do not include details on the status of food within the container, so “dynamic shelf-life systems" should be adopted for easy understanding (Poyatos-Racionero et al., 2018). The environmental performance of packaging materials is a consideration in this regard; therefore, research on mapping the packaging performance evaluation of the environment is critical to provide direction to packaging design engineers (Heller,Selke, & Keoleian, 2018).

There is an urgent need for emerging technology to ensure food sustainability. Advanced technology developments of SP systems are evolving and have recently been embraced by the pharmaceutical and food industry not only to supplement traditional packaging functions but also as a method or approach to prolong the shelf life of food products, making it easier for the manufacturing process, reducing food loss and pollution, eliminating preservatives, and, most notably, ensuring good quality and choice to ensure customer protection and satisfaction (Janjarasskul & Suppakul, 2018;Poyatos-Racionero et al., 2018). The major obstacle in designing innovative packaging technologies for food products remains the identification of particular chemical or biological markers in food. The decision to use a target marker is based on previous knowledge of the related microbial agents and their occurrence under different conditions in various types of food products, as well as the release of reaction substances generated during the spoilage process (Aliakbarian et al., 2015).

Food spoilage is a complex mechanism that can be triggered by a variety of human, chemical, or enzymatic, as well as microbiological activities.Bacterial growth and metabolism can also cause pH changes and the production of poisonous compounds, off-odours, methane, and slime. Chemical processes such as oxidation, irradiation, and lipolysis can produce unpleasant flavours and adverse effects. Extrinsic factors (pH, temperature and humidity) can influence chemical, physical, and biological food spoilage in addition to intrinsic parameters (physicochemical and structural). Integrity indicators, food spoilage indicators, ripeness indicators, rancidity indicators, microwave doneness indicators, and RFIDs are only a few of the technologies used to help reduce food spoilage (Han, Ruiz-Garcia, Qian, & Yang, 2018; Janjarasskul & Suppakul, 2018).

Based on the incorporation of sensing components, smart RFID tags attempt to determine the content of the stored object. Via chemical elements such as a sensitive coating, an optical mark, litmus paper, and pH or

conductivity electrodes, these sensor-enabled RFID tags can detect changes in the properties of food such as pH, conductivity, dielectric constant, viscosity, food volatiles, and gases Abad et al. (2007); Kim et al. (2009); Sample, Yeager, Powledge, Mamishev, and Smith (2008). Using different food volatile receptive films on the RF structure and detect the change in reaction by colour changes of specific dyes caused by volatiles from specific food or due to change in the food pH for colorimetric sensing, measuring the variance of the dielectric constant of food as it spoils are some examples (Potyrailo et al., 2012; Occhi-uzzi, Rida, Marrocco, & Tentzeris, 2011). Meat emits volatile compounds as byproducts of decay (Ordonez, De Pablo, Perez de Castro, Asensio, & Sanz, 1991). Molecules such as dimethylamine, trimethylamine, ammonia, histamine, carbon, sulfuric compounds, and ethanol are examples of byproducts of bacterial metabolism that can be used as various types of markers for food spoilage (Bibi, Guillaume, Gontard, & Sorli, 2017). Solid-phase micro extraction in conjunction with gas chromatography-mass spectrometry (Mik-Krajnik, Yoon, Ukuku, & Yuk, 2016), UV-VIS spectroscopy (Aliakbar-ian, Bagnasco, Perego, Leardi, & Casale, 2016), and near infrared spectroscopy (Aliakbar-ian, Bagnasco, Perego, Leardi, & Casa (Aliakbarian et al., 2015) have been employed in the identification and quantification of volatile compounds in fruit. However, most of these strategies are costly, difficult, and labour intensive as opposed to smart sensor-enabled RFIDs that have been regarded as a cost-effective, non-obtrusive, and user-friendly technique for the packaging of food (Badia-Melis, Mc Carthy, Ruiz-Garcia, Garcia-Hierro, & Villalba, 2018; Fidders & Yan, 2013). Furthermore, since these packaging systems contain markers that can interfere with food additives and metabolites in the head space as well as extrinsic environmental factors, they can become powerful instruments for reducing food waste.

Chromogenic chemosensors are another of the most promising easy-to-handle disposable devices, not just because they are less costly, versatile, and conveniently printed on the box, but also because their colour shifts over time can be easily detectable by the naked eye by trans-parent films. The lack of accuracy is one of these sensors' limitations (Poyatos-Racionero et al., 2018). TTIs provide a complete visual summary of a product's entire temperature profile (or a portion of it) by recording both time and temperature effects (Janjarasskul & Suppakul, 2018). TTIs of various forms have been developed based on their operating mechanisms (chemical, enzymatic, microbiological, and mechanical) (Kim, Kim, &Lee, 2012) However, most TTIs do not include the metabolic modifications that exist in food. Rokugawa and Fujikawa (2015), for example, created a new time temperature integrator based on the Maillard reaction in 2015. These integrators can track and control food temperatures ranging from 4 to 32°C. The colour shift was observed as a function of time and temperature, and the Arrhenius model was used to express the rate constant for the colour change. They checked the sensor's capability as an indicator of the development of food microorganisms at various temperatures. Kulchan, Boonsupthip, Jinkarn, and Suppakul (2016) created a colorimetric indicator to track the rancidity of oxygen-sensitive instantaneous milk powder. The indication labels included a mixture of two pH-sensitive chemicals, bromothymol blue and methyl red dyes, which could respond to volatile compounds emitted during storage due to oxidation. Bromothymol blue changed from base to acidic with a change in colour from blue to yellow and a pH change from 7.6 to 5.8, while methyl red's pH decreased from 6.2 to4.5 with a colour change from yellow to red. The colour transition from light green to orange may be interpreted as an alert or denial signal.

According to a Boston Consulting Group (BCG) study published last year, there has been poor progress in reducing food waste in the supply chain due to inadequate infrastructure, a lack of initiative, policies, and coordination around the value chain. It is estimated that simply enhancing supply chain logistics and production could reduce food waste by $270 billion (in value), or $1.5 trillion, by 2050. SP networks may play an important role in this regard by reducing waste and enable a more sustainable supply chain (Han et al., 2018; Jan-jarasskul & Suppakul, 2018; Poyatos-Racionero et al., 2018). For

example, data carriers can assist with connecting information across the supply chain and make the operation more reliable by ensuring traceability, automation, fraud, or counterfeit security (Mc-Farlane & Sheffi, 2003). RFIDs can benefit the entire supply chain by assisting in product control and traceability, thus facilitating food security and protection (Kumaret al., 2009). Similarly, TTIs can aid in the control of a proper temperature profile or a cold chain across an overall supply chain (Fang, Zhao, Warner, & Johnson, 2017). Thus, SP will not only mitigate food waste and loss by improving supply chain delivery quality and efficiently detecting food spoilage, but will also solve food safety concerns. Furthermore, not only are the time and labour expenses for analysing processed goods reduced, but costs can be reduced as SP reduces food waste (Muller & Schmid, 2019; Vanderroost et al., 2014). It is anticipated that novel bioactive SP will be a future development, with the potential to broaden applications, raise consumer demand, and be embraced by more food industries Lopez-Rubio et al. (2004) and Majid et al. (2018). Furthermore, ongoing advances in food waste data collection are greatly desired in order to lead to policy making as well as the promotion of these designs of packaging (Heller et al., 2018; Sohail, Sun, & Zhu, 2018). Furthermore, new manufacturing innovations are needed to reduce the cost of mass production and the difficulty of integrating smart devices into existing packaging lines. More research is needed on the safety issues, as well as the viability and potential of incorporating them into a wide variety of applications. Finally, consumers should be well-informed of these innovative packaging schemes, and their related costs and advantages, as well as their ability to pay (Fuertes et al., 2016).

SP Manufacturing Technology and Cost

As previously mentioned, SP plays an important role in the FSC by optimizing distribution quality to minimize food waste and loss, identifying food spoilage to resolve safety issues which results in saving time and money. However, there is a trade-off between the possible risk of food waste and loss, as well as safety concerns (without SP), and the additional cost of implementing smart packages, including the production cost of SP. Sensors or smart labels are critical components of an SP device for monitoring food safety or storage conditions, as well as determining the external atmosphere of a packaged product (for both vendor and customer needs) (Jiang et al., 2014; Neethirajan & Jayas, 2011; Wyser et al., 2016). Suitable techniques for fabricating these smart elements that are compliant with existing packaging requirements must be established and enhanced in order to minimize associated production costs while also broadening their variety of applications for different food items. Among current manufacturing techniques, printable electronics methods have gained considerable interest not only from academics but also from industrial manufacturing communities due to their exceptional ability to directly deposit electronics (for example, sensors, batteries, RFID tags, and displays) on flexible substrates (for example, polyimide, polyethylene terephthalate, polyether ether ketone, elastomer, and even paper) on a wide scale and efficiently (Kraft, Berger, & Lupo, 2017; Leenen, Arning, Thiem, Steiger, & Anselmann, 2009; Semple, Georgiadou, Wyatt-Moon, Gelinck, & Anthopoulos, 2017), as well as other properties like lightweight, Portability, bend ability, fold ability, and a wide active area are all advantages. To cut prices, manufacturers have increasingly used printing processes to make certain traditional electronic products over the last decade (Jiang et al., 2014; Neethirajan & Jayas, 2011; Wyser et al., 2016). Thin Film Electronics ASA, for example, has successfully demonstrated a printable, battery-powered temperature-tracking sensor device appropriate for controlling fresh foods (Thin-Film, 2013). Xerox proposed a highly stable, handwritten mark (Xerox Printed Memory) that can be used to verify the authenticity of a product and monitor its treatment during shipping (Xerox, 2015). To gain a clearer understanding of the role of printable electronics in the supply chain, we will briefly review the various printing processes, their advantages, disadvantages, and overall expense, which will aid SP decision making in the early stages of FSC.

Printing methods widely used in the fabrication of printable electronics include gravure,

flexography, slide, inkjet, and aerosol jet printings (AJPs) (Chu, Qian, Chahal, & Cao, 2018; Grau et al., 2016). In the case of gravure printing, the pattern is etched or loaded onto a cylindrical roller, and friction is used to pass the ink directly to rolls of substrate. This approach is thought to manufacture low-cost smart labels at a larger rate of production level. Roll-to-roll (R2R) gravure printing, for example, has been used to create SP stickers (Jung et al., 2014). It also has a high level of scalability and strategic resolution (Grauet al., 2016). When paired with an R2R printing configuration, this method of printing is ideal for mass manufacturing (Khan, Lorenzelli, & Dahiya, 2015). Flexography, which is also compared to rotogravure, is primarily used for packaging applications, especially in the production of electronic devices with high-speed printing capabilities, SP, and RFID (Maksud, Yusof, & Abdul Jamil, 2012). The printing plate is made of a softer plastic, and the print machine includes an ink source, an anilox roller, a plate cylinder, and an impression cylinder. It can be applied to almost any non-absorbent material. Gravure image carriers are normally much more expensive than flexography, but they have a longer press running time. According to CI-Flexo-Tech info, the flexographic plate has the average cost of approximately USD 0.030.045 per square centimetre. Screen printing, like inkjet printing, creates dense and patterned layers of extremely viscous materials, allowing for high throughput and resolution (Pardo, Jabbour, & Peyghambarian, 2000). Screen printing is appropriate for both inorganic and organic materials of varying viscosities, regardless of layer function and substrate flexibility. Screen printing, as well as the conditions for printing ink compositions containing nano particles, were analysed and addressed for SP (Hrytsenko, Shvalagin, Grodziuk, & Granchak, 2017). The ink droplets are injected through a nozzle onto either a solid or fluid layer in inkjet printing (Calvert, 2001; Singh, Haverinen, Dhagat, & Jabbour, 2010; Songet al., 2008). Inkjet printing creates a balance between printing precision and scalability, and it can be used to create reasonably precise patterning without the use of a mask (Singh et al., 2010). In comparison to other printing methods, inkjet printing has a low cost.

Table 3: Shows a comparison of the main printing fabrication methods for smart packaging systems

Method of Printing	The degree of Viscosity (Pas)	Layer Thickness (µm)	Feature size (µm)	Registration (µm)	The rate of Throughput (m2/s)	Citations
Gravure Printing	0.01 to 0.2	>0.1 to 8	75	> 20	3 to 60	Grau et al. (2016); Khan et al. (2015)
Flexo Printing	0.05 to 0.5	0.04 to 2.5	80	<25	3 to 30	Maksud et al. (2012)
Screen Printing	0.5 to 50	0.015 to 100	20 to 100	>25	2 to 3	Khan et al. (2015); Pardo et al. (2000)
Inkjet Printing	0.004 to 0.04	0.05 to 20	20 to 50	5 to 20	0.01 to 0.5	Calvert (2001); De Gans et al. (2004); Secor et al. (2013); Singh et al (2010); Tortorich and Choi (2013)
Aerosol jet Printing	0.001 to 2.5	0.1 to 5	10 to 200	5	0.01 to 0.5	Cao et al. (2011); Onses et al. (2015)

Difficulties in Integrating Spin FSC

Since the choice of printing methods is made early in the supply chain, it has an impact on the remaining phases, including cost allocation among manufacturing, development, storage, transportation, and demand, quality and safety related to reliability of SP (fabrication process characteristics), and creative interactions among customer, commodity, and manufacturer. The need to overcome the issues

within FSCs is critical, as the effects can often be serious, as misalignment or insufficient product management often results in
waste, with damaging financially to supply chain companies as a result (Wang & Li, 2012). FSC architecture, like all supply chains, does not have a one-size-fits-all solution (Blackburn& Scudder, 2009). The division of SCM into three viewpoints (operational, tactical, and strategic) results in a variety of methods for addressing SC problems
within these perspectives (vander Vorst et al., 2009).

From a functional standpoint, streamlined supply chain processes refer to a set of operations that coordinate corporate strategies against shared interests through internal, retailer, and consumer classifications (Flynn, Huo, & Zhao, 2010). Integration has long been viewed as a critical aspect of supply chain management, serving as a way of both generating consumer satisfaction (Mentzer et al., 2001) and eliminating volatility (Flynn et al., 2016), (Mentzer et al., 2001; Stauffer, 2003). Integration has been linked to improved efficiency, particularly in the area of quality (Flynn et al., 2010; Vander Vaart & van Donk, 2008). (Leuschner et al., 2013; Rogers et al., 2013; Charvet et al., 2013). As a result, its interest in FSC research is clear, as improved convergence permeates organisational and tactical decision-making processes within a supply chain.

From a logistical and organisational standpoint, the problems associated with FSCs are often discussed by processes involved in the delivery process. Temperature regulation systems, for example, may be applied to eliminate both accelerated deterioration and bacterial infection (van der Vorst et al., 2009). Temperature management is often manifested in three categories of supply chains: frozen, cooled, and atmospheric (Akkermanet al., 2010). Intelligent packaging is another emerging technical approach that helps to share truthful knowledge about a product's quality and packaging integrity in the FSC (Vanderroost et al., 2014). Indeed, improved packaging techniques can aid in raising the shelf-life of specific food products (van der Vorst et al., 2009). Vanderroost et al. (2014) offer an important analysis of emerging technical developments in intelligent food packaging, especially sensors, nose systems, indicators, and RFID as key advances within FSC packaging systems. Another critical feature of an integrated FSC is for the improvement of product traceability in day-to-day operations. Traceability generally refers to the ability to give reliable knowledge about the geo-location of the commodity at any time and place along the supply chain (Kelepourist, Pra-matari, & Doukidis, 2007). Traceability is often divided into two categories: backward traceability (or tracing) and forward traceability (or tracking), based on the expected direction of the product (Bosona & Gebresenbet, 2013).

The abundance of SCM techniques from various viewpoints offers a rich repository of literature that is often transferable to FSCs. The particular problem of FSCs, however, namely commodity degradation, has a variety of implications for FSCs strategies. Integration is often viewed as an optimal strategic focus in SCM, and it can express itself in very unusual forms at the organizational and organizational levels. Emerging technologies are increasingly relevant at these stages, since they are often the organizational portion used to improve product traceability within an integrated FSC. More joint research and industrial activities are required to further explain both tactical and organizational levels of FSC components that could be affected by the incorporation of new technologies such as SP solutions (Aliak-barian, 2019).

Conclusion and the Prospect

FSC, as one of the fastest-growing manufacturing sectors, prioritises efficiency, protection, ethics, and sustainability. Such characteristics may be enhanced by incorporating SP solutions. As we discussed in the manuscript, SP systems have the potential to bring many advantages to the system by allowing real-time identification and traceability of goods as they move across the supply chain. These skills, which are focused on the introduction of cutting-edge technology, will provide reliable data on the state of the product, thus preventing fraud, protecting brand and enforcement, and reducing loss of food and waste. The integration of emerging technology into current and conventional

packaging is complicated and necessitates a multidisciplinary partnership of professionals from various engineering, research, communication, and industry backgrounds. We agree that supply chain management practises should be used as a possible method to promote cross-collaboration and efficiency in the integration of emerging technology into the existing framework.

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IDENTIFICATION OF CRASH CLUSTERS AND ITS CHARACTERISTICS USING GIS ON NATIONAL HIGHWAY 48 IN GURUGRAM DISTRICT

S. Tawar[1], Shaheem S.[2] and Ebin Sam S.[3]
[1]Central University of Haryana, Mahendergarh Haryana, INDIA
[2,3]KSCSTE-National Transportation Planning and Research Centre, Thiruvananthapuram- Kerala, India
[1]sunnytawar@cuh.ac.in, [2]shaheems@yahoo.co.in, [3]ebin.natpac@gmail.com

ABSTRACT

In India, National Highways constitutes approximately only 2% of the total road network of the country, but accounts for 30.4% of total road crashes and 36% of fatalities in 2017. This paper deals with the identification and analysis of crash clusters on NH-48 from Ambience Mall to Kapdiwas in Bilaspur Kalan in Gurugram district of Haryana with the help of GIS software. Crash prone locations were identified by performing a clustering technique in GIS and were grouped into three orders of priority. A total of 11 Crash Prone Locations were identified and prioritized from the crash clusters in a GIS platform. Crash characteristics of the crash clusters were extracted by conducting a series of geo-spatial analysis in GIS. The crash characteristics of the clusters will help to identify possible reasons for crash occurrence, which further helps to rectify and mitigate crashes. It was found that around 80% of fatal and grievous injury crashes were of the type 'Hit Pedestrian' and 'Read end collisions' contributing 40% each at the identified Crash Prone Locations.

***Keywords**: Crash Analysis, crash prone locations, crash severity index, crash clusters*

Introduction

The economic growth of India has accelerated increased urbanization, sprawling of cities and vehicle ownership, while transport infrastructure and its maintenance have not been able to keep pace with this rapid growth. This leads to more number of trips and more vehicles on limited road space. In India, more than 150,000 people are killed every year in road crashes, which is far higher than developed auto markets like the US (about 40,000 fatalities). Rapidly increasing road crashes in India have an adverse impact on the social and economic development of the country.

As per the crash report compiled by MORTH [1] in 2018 with the help of Police Departments from all States/Union Territories, India has recorded around 4.65 lakh crashes, resulting in the 1.50 lakh fatalities and 4.71 lakh people with injuries. An occurrence of crash results in monetary and non-monetary losses to the victims, family and society. Crash occurrences can be minimized through seven E's comprising of Engineering, Enforcement, Education, Encouragement, Emergency care, Evaluation and Enactment of laws. Fatalities and injuries can be brought down through coordinated efforts and application of the above measures, which will evolve roads safe to drive.

Haryana is the first state in India, which adopted a vision zero approach in the direction of road safety and partnership with WRI (World Resources Institute) and NASSCOM (National Association of Software and Services Companies).

Literature Review

Niloofar Haji Mirza Aghasi [2] has talked about the importance of ArcGIS software for obtaining meaningful information and analysis results from urban traffic accidents in an observational time span including micro or macro analysis of urban traffic accidents patterns.

Apparao. G, P. Mallikarjunareddy and Dr. SSSV Gopala Raju [3] discussed the present state of traffic accident information on NH-58 from Meerut to Muzaffarnagar in Uttarakhand State. It shall also discuss the Identification of high rate accident Locations by using GIS Software and safety deficient areas on the highway. So, implement the remedial measures to those accidental locations (Black Spots) and provisions for traffic safety.

Sachin Dass, Saurabh Jaglan, Praveen Aggarwal and Dhirendra Singhal [4] identified the accident trends on seven stretches on NH-73A according to year, month, time of the day, type of hitting vehicle, primary causes of accidents and black-spots. The results show that, the existing number of major access

points without traffic lights, road marking, road furniture and proper road signs, rise in speed, increasing number of Annual Average Daily Traffic (AADT), heterogeneous nature of traffic, lack of proper road lighting conditions, poor shoulder design and maintenance, bad road conditions and design are the potential contributors of incremental accident rates on the given roadway. The measures for improvement based on identified causes include construction of road features such as paved shoulders, pedestrian crossing, strict implementation of speed limits and traffic lights, proper road markings and signs, speed breakers and traffic lights to be provided.

Rajiv Gupta and Manpreet Singh [5] studied the roadway conditions play a major role in occurrence of accidents and therefore has to be sufficiently studied and improved upon and hence can be a prime indicator in improvement prioritization. The analytical process validates the results of hot spot analysis by comparing them with areas having significant accident rates; termed as black spots which require urgent attention corresponding to the relevant parameters like roadway conditions, design characteristics, surface conditions etc. In this study, the accident data from Chandigarh has been used. Geographical Information Software (Arc GIS 10.1) is used for accident mapping of the entire city.

R. Oulha., K. Brahimi., A. Boumediene, F. Dali, and M.A. Madouche [6] presented two approaches by which hot spots can be identified. The Wilaya of Mascara in Algeria was chosen as the study area. The first approach is based on mobility analysis of persons and goods. This approach allows a comprehensive analysis of factors driving risk and different types of vehicles on the roads studied, but it does not allow the exact location of black spots which the interest in using Geographical Information System (GIS) and spatial analysis. The second approach consists on the use of Kernel estimation approach with ArcGis tool, to improve the analysis and to identify high-risk areas in order to bring specific solutions in planning.

Prof.Jessy Paul, Anu Jo Mariya, Gopika Viswanath ,Jyothish Kumar K, Punyo Robin [7] studies to find the major accident black spots in Kothamangalam and to identify various traffic parameters and road factors causing accidents. The capability of GIS to link attributes data with spatial data facilitates prioritization of accident occurrence on roads.

Romi Satria and María Castrob [8] examined several GIS tools used to model accidents. The understanding of these tools will help the analyst to make a better decision about which tool could be applied in each particular condition and context.

Anitha SD Selvasofia and Prince G Arulraj [9] analyzed the present state of traffic accident information on three highway namely NH 47 Gandhipuram to Avinashi, NH-209 from Gandhipuram to Annur and NH 67 Gandipuram to Mettupalayam, Coimbatore District. It also discusses the Identification of high accident rate locations suggested using an ArcGIS Software and safety deficient areas on the highways. As the remedial measures are implemented in those accidental locations (Black Spots) the incidents of accident may be reduced.

Reshma E.K and Sheikh Umar Sharif [10] did the accident analysis includes prioritization of some major accident spots generally referred to as Black spots by the use of ARCGIS 10 software package. The study area includes some major accident spots in south Bangalore, Karnataka. The study includes visiting these accident prone sites, collecting required data for analysis and cross-checking the data with Bangalore traffic police records.

Kyaw Zin Htut et al. [11] has done accident study on the Naypyitaw-Mandalay Expressway in Myanmar. It will be useful for the responsible authorities to find out the hazardous locations on other roads with the use of accident analysis methods.

Amin Naboureh et al. [12] has done research in the appropriateness of existing RESs in the Khuzestan province, Iran, was assessed using an integrated fuzzy analytical hierarchy process (FAHP) and geographic information system (GIS) approach.

Nikhil.T.R, Harish J Kulkarni and Sarvada H [13] has identified various black spots (accident prone locations) in Bangalore city. The causes of accidents are studied and suggested different remedial measures to reduce number of accidents.

Abdulla Ali, Nishantha Bandara and Susan Henson [14] has studied the present traffic accident information on 18 freeways in Michigan. It will also discuss the identification of high rate accident locations (black-spots) by using the Geographic Information System (GIS) Software and safety deficient areas on the highway.

Maen Ghadi, Árpád Török and Zsolt Szalay [15] provided an efficient methodology for identifying the major factors contributing to road accidents considering both their spatial and environmental attributes.

Liyamol Isen, Shibu A and Saran M. S [16] identified the most vulnerable accident black spots in these two districts using Geographic Information System. The evaluation of six identified black spots in Alappuzha district and ten in Ernakulam were done using ARCGIS 10.1 software package by incorporating field survey data.

Scope and Objectives

The scope of the study is limited to road stretch from Ambience Mall to Kapdiwas in Bilaspur Kalan of NH-48 in Gurugram district of length 45kms.

The major objectives of the study are given below:

- Identification and Prioritization of crash clusters
- Identification of characteristics of crash clusters

Study Area

Gurugram, a district of Haryana, is an emerging cyber city situated in the National Capital Region (NCR). The city has witnessed remarkable growth in the past two decades due to public-private participation in land development, automobile industries, IT and BPO industries. The stretch taken under study originates from Ambience Mall to Kapdiwas in Bilaspur Kalan of NH-48. The road chainage of the selected stretch starts from km 23+950 to km 69+900, which is approximately 45 km in length. Fig. 1 shows the road stretch considered for the study.

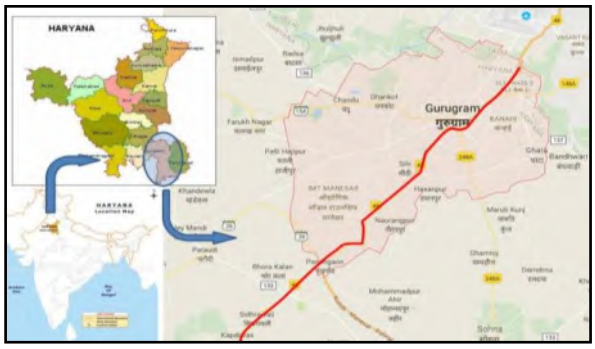


Fig.1: Road stretch considered for the study

Methodology and Data Collection

In order to achieve the objectives, the following broad steps have been adopted for the conduct of the study.

- Collection of Secondary data
- Mapping of crash spots
- Identification of crash clusters
- Prioritization of crash clusters

Fig. 2 shows the methodology adopted for the identification of crash-prone locations on NH-48 in Gurugram district.

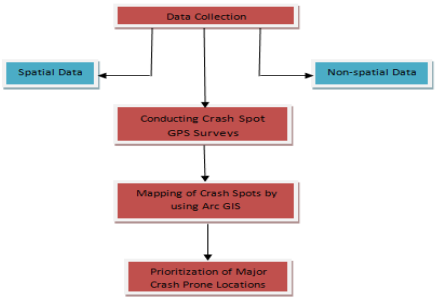


Fig. 2: The methodology adopted for the study

Collection of Secondary Data

- Secondary data have been collected from various sources, and are given below.
- Collection of detailed FIR level crash data from Superintendent of Police office, Gurugram
- Collection of road network map for the study stretch
- FIR data have been collected for the past three years from 2015 to 2017 from the Police Department.

Compilation of Collected Data

Data collected from secondary sources have been compiled and coded for creating crash attributes in a GIS platform. Data collected comprises of spatial and non-spatial data, which was segregated.

Mapping of Crash Reports

Crashes involving fatalities and grievous injuries were identified and crash spots were located. A total of 447 crash spots involving fatal and grievous injury crashes were identified and were attributed to crash characteristics for further analysis in a GIS platform.

Fig.3: Map showing fatal and grievous accident crash spots on the study stretch

Identification of Crash Clusters

Crash Prone Locations were identified by clustering the crashes on the study stretch. Crash clusters for every 500m were identified by performing a series of geo-spatial analysis using GIS software. Crash clusters with more than 5 road crashes involving fatalities/grievous injuries or 10 fatalities [2] were extracted for the prioritization and identification of the crash accumulation of particular type and to analyze any similarities, if exists.

Prioritization of Crash Clusters

The identified crash clusters on the road stretch were ranked and prioritized into three orders based on Crash Severity Index (CSI) values computed using analytical tools in Arc GIS Software.

$$CSI=7*FA+3*GA \quad (1)$$

Where,
CSI = Crash Severity Index;
FA = Number of Fatal Crashes;
GA = Number of Grievous Crashes.

Crash Severity Index for each crash cluster was calculated by using Equation (1). For estimation of CSI, the weight age to fatal crash was assigned as 7 and to grievous injury crash as 3, as per Terms of Reference for the appointment of Safety Consultants on DBFO basis, National Highways Authority of India (NHAI). Minor injury and non-injury crashes were not considered in the analysis as they are either not reported or under-reported.

Threshold values of Crash Severity Index adopted for prioritizing clusters are given in Table-1. Crash clusters are prioritized into first-order, second-order and third-order priority clusters. Higher the threshold value, more severe is the location on the study stretch.

Table - 1: Threshold Values of Crash Severity Index

Sl. No.	Order of Crash clusters	Computation Formula	Threshold value
1	First-order Crash Clusters	Average Severity + 1.5*Standard Deviation	171
2	Second-order Crash Clusters	Average Severity + Standard Deviation	144
3	Third-order Crash Clusters	Average Severity	89

A total of 11 Crash Prone Locations were identified and prioritized from the crash clusters in GIS platform and are listed in Table-2.

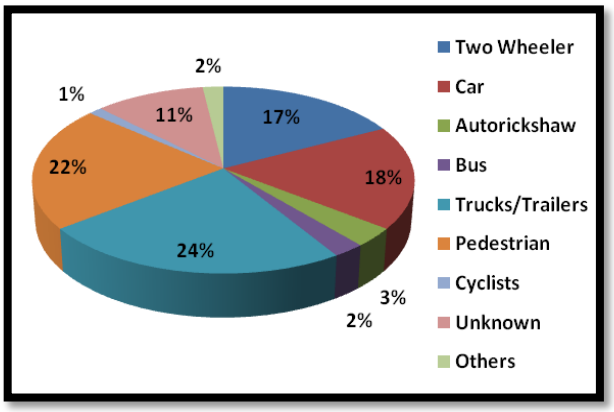
Table - 2: Crash Clusters in Priority Order

Sl. No.	Crash Clusters	Priority Order	Crash Severity Index (ASI)
1	Narsinghpur Chowk	I	195
2	Shankar Chowk	II	160
3	IFFCO Chowk	II	160
4	KMP Intersection	II	152
5	Bilaspur Chowk	II	148
6	Sindhrawali Village	III	135
7	Manesar Village	III	107
8	Binola Village	III	104
9	Hero Honda Chowk	III	101
10	Kherki Daula Toll	III	97
11	Rajiv Chowk	III	92

Fig. 4 shows the map CSI values of crash clusters on the study stretch.

Fig. 4 indicates the percentage share of road users involved in fatal or grievous injury crashes at crash-prone locations on the study stretch.

Fig.4: Map showing CSI values of crash clusters on the study stretch



Share of road users involved in fatal or grievous injury crashes at Crash Prone Locations. Crash scenario and characteristics at crash-prone locations were identified using Arc GIS software followed by Table 3. Table 3 shows the crash statistics during 2015-17 at the Crash Prone Locations

Characteristics of road crashes within each crash clusters will give an insight to the road safety issues at the particular location and will aid appropriate selection of road safety measures.

Table - 3: Crash Scenario and Characteristics

Sl. No.	Crash Prone Locations/ CPLs	Number of		Total Fatal and Grievous injury crashes
		Fatal Crashes	Grievous Injury Crashes	
1	Narsinghpur Chowk	27	2	29
2	Shanker Chowk	22	2	24
3	IFFCO Chowk	19	9	28
4	KMP Intersection	20	4	24
5	Bilaspur Chowk	19	5	24
6	Sindhrawali Village	18	3	21
7	Manesar Village	14	3	17
8	Binola Village	14	2	16
9	Hero Honda Chowk	14	1	15
10	Kherki Daula Toll	13	2	15
11	Rajiv Chowk	11	5	16
Grand Total		191	38	229
Total crashes involving fatal and grievous crashes on NH-48		376	71	447
Percentage Share		51%	54%	51%

At Narsinghpur Chowk, the majority of fatal and grievous injury crashes occurred during nighttime (72%) and occurred on the main carriageway (62%) of NH-48. The major share of the victim road users at Narsinghpur Chowk were Pedestrians (52%) and Two Wheelers (28%), whereas those road users accused were Trucks (34%) and Cars (28%). 41% of collisions were of the type of 'Hit Pedestrians', followed by 'Rear-End Collisions' type (28%).

Results and Discussions

Crash cluster analysis was carried out and crash-prone locations were identified by conducting a series of geo-spatial analysis using Arc GIS software. Some of the major inferences derived are as follows:-

- Eleven crash-prone locations of total length 5.5km, which is only 12% of the total length of the study stretch were identified and found to be most vulnerable as compared to other locations on the stretch.
- Narsinghpur Chowk, Shankar Chowk, IFFCO Chowk, KMP Intersection and Bilaspur Chowk are the top five crash-prone locations, as per severity index [Table 2].
- A total of 229 fatal and grievous injury crashes occurred on the identified crash-prone locations, which accounts for 51% of crashes on the entire study corridor during the last three years (2015-2017). In other words, more than half of total fatal and grievous injury crashes on the study stretch occur on 12% of the total road length of study stretch.
- Around 24% of the road users involved in fatal and grievous injury crashes at the crash

prone locations were found to be trucks /canters/trailers.

- Trucks/Canters/Trailers category followed by Pedestrians (22%), Cars (18%) and Two Wheelers (17%). Unknown vehicles were involved in around 11% of fatal and grievous injury crashes at Crash Prone Locations.
- 80% of fatal and grievous injury crashes are of the type 'Hit Pedestrian' and 'Rear end collisions' contributing 40% each at the identified Crash Prone Locations.

Conclusions

Crash clusters and their characteristics were identified with the help of crash data and geospatial analysis in GIS software. A total of 11 crash-prone clusters were identified and were classified into three orders of priority based on average severity. It was found that more than half of the crashes (51%) on the study corridor occurred at the identified clusters, which is only around one-eighth of the total length of the study corridor. Characteristics of individual clusters have been established to identify common deficiency with respect to other locations. Around 80% of collisions at these individual crash clusters are either Rear-End Collisions or Hit Pedestrian Collisions, which highlight the necessity of speed calming measures and adequate pedestrian infrastructure at these clusters. The combination of the geospatial and statistical approach using GIS software adopted in this study helps in identifying the exact probable reason behind the crashes on the road stretches, thereby aiding the selection of appropriate focused rectification measures so that crashes can be reduced in the upcoming years to a certain extent.

Acknowledgement

The authors acknowledge Dr. Mahesh Chand (Retired Scientist-G, KSCSTE-NATPAC) for his valuable guidance. The authors also thank Arun Chandran (Scientist-C), B. Anish Kini (Scientist-B), A. Jegan Bharath Kumar (Scientist-B), T. Ramakrishnan (Technical Officer, Grade-5) and other staff members from KSCSTE-NATPAC for their timely support and assistance in data collection. The authors are humbly thankful to Gurugram police also for providing crash data and other information related to it. The authors also acknowledge the support and facilities rendered by Maruti Suzuki India Limited.

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