A HYBRID APPROACH TO HANDLE MINORITY SAMPLING WITH MACHINE LEARNING MODEL FOR ANALYZING THE DISEASED TREE

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ABSTRACT

Trees are very important to us. It absorbs a lot of metric tons of pollution in a year and cleans the environment. Nowadays many diseases soon make these trees sick and they start getting destroyed. So with the help of machine learning we can do these Diseases are detected and their treatment is possible early.So We have analysis Object Oriented Classification Machine learning model for detecting Diseased Trees. We took a dataset of sick trees which had diseases like Japanese pine wilt, Japanese oak wilt.Trained the machine learning model using that wilt dataset.So our dataset was very unbalanced. So the results were coming by the bias of our classifier. To solve this, we used the Hybrid approach so that our dataset could be balanced. We applied this technique many times over the dataset and when we applied it 8th times, then the results were good. And if it was applied 11th times, the accuracy was even better than that.So some models were performing well in it which is as follows. 8th times technique result J48 76%,Random Tree 76.29%,Random Forest 86.17%,KNN 89.34 %. 9th times technique result J48 88.92%,Random Tree 90.53%,Random Forest 96.08%,KNN 97.27%.The knn classifier performed the best of both the techniques.

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Keywords: Machine Learning, KNN, Random Forest, Random-Tree, Hybrid approach

Introduction

Trees are very beneficial for our environment. They give pure oxygen to our atmosphere. They absorb large amounts of carbon dioxide. But due to the disease of the trees, they start deteriorating quickly. And it is very difficult to find their disease properly. If the disease of a tree is not treated early, then it can infect other trees very quickly. To prevent this, it becomes very important to check infected trees.Which dataset we are using[1]. In that he fragments contain data from the Quickbird multispectral picture groups and surface data from the panchromatic (Pan) picture band. The training dataset in this is 4339 image segments. And there are 500 image segments for testing. Some research has come before which classifies the diseases of plants.

Using a random forest tree, they calculated the power of the hyperspectral method (HI data only), LiDAR (LiDAR data only), and their combination (HI plus LiDAR data) to predict the infection stages.The hyperspectral method along with the UAV system and the lidar sensor produced such power to Pwd that could be detected only in the initial stage[2].With the help of drone remote sensing technology, he detected the disease of the tree along with other trees, in this he took the help of artificial neural network and support vector machine. Due to which he found that the overall accuracy of svm is 6.7% more than ann[3].They demonstrated a combination of deep convolutional neural networks (DCNNs), deep convolutional generative adversarial networks (DCGANs), and an AdaBoost classifier to detect Pinus tree disease. In which the deep learning method removed places, roads, mountains. More the adaboost algorithm removes the background behind the Pinus tree. This method yielded high precision, recall and F1 score, as well as low FP and FN, for diseased Pinus trees[4].Support vector machines and K-Nearest Neighbor and Decision trees were analyzed for classification of leaf disease, which was to isolate color and shape from images and secondly to classify leaf disease[5].To detect foliar disease, which is found inside bananas, the local texture feature was used. Use indentified image enhancement and color segmentation to detect them. In this, he used a ten-fold cross validation procedure[6].To get more spatially and spectrally accurate image segments, a hybrid intensity–hue–saturation smoothing filter-based intensity modulation (IHS-SFIM) pansharpening approach was applied.

Literature review

N. Chawla *et al.*[7] Destroyed takes a preparation test in the minority class and presents new manufactured models in the element space between that preparation test and

at least one of its closest neighbors in include space, and afterward rehashes this interaction for the whole preparing informational index.

B. Johnson *et al.* [8] Utilizing SMOTE in this manner would two-fold the size of the preparation set for the minority class. For this investigation, we utilized the closest 5 neighbors based and set the quantity of new preparing tests to 100% [18].

Pushkara Sharma *et al.* [9]

It has many capacities, for example, picture assortment, picture preprocessing, division and arrangement. The introduced model uses a dataset of in excess of 20,000 pictures with 19 absolute classes. By additional tuning the hyperparameters, by expanding the dataset, more sickness can be distinguished all the more precisely.

Abdul Hafiz Bin Abdul Wahab *et al.* [10]

In this examination paper, illnesses are identified utilizing pictures of leaves of bean stew plant. The proposed arrangement centers around utilizing k-implies bunching calculation for picture division and characterization with svm which gives 90% exactness at various occasions.

M.P Vaishnnavel *et al*. [11]

They have done picture obtaining, picture pre-handling, division, include extraction and classifiers utilizing K Nearest Neighbor (KNN). SVM classifiers have been replaced with KNN classifiers to enhance the performance of existing algorithms. In this paper to classify 4 different diseases they have used KNN classifier algorithm only. The work mainly focused on groundnut crop disease. The have classified only 4 different diseases with efficiency.

B. Rajesh *et al.*[12]

In this research, to detect diseases in the leaves of plants, algorithms are used in image segmentation. Plant infection can be detected at an early stage. Another advantage of this process is that it performs better than the existing system. The expansion will focus on the development of better algorithms for rapid and effective identification of diseased leaves.

Aman Sehgal *et al.*[13]

In this research paper computing classification requires careful fine-tuning of the parameters as well as a significant number of instances to record. This is not just the time to model for

the algorithm, but accurate and correct classification. logically different from the other.

Moumita chanda *et al.* [14]

In the research paper, first for classification, they use back-propagation algorithms to obtain the weights of neural network (NN) connections and then they use particle swarm optimization (PSO) to rule out problems such as local optima and overfitting. Let's optimize these weights using . Which are very common in traditional NN training methods. It gives 96.2% accuracy of Alternaria alternata, Anthracnose, Bacterial blight and Cercospora leaf spot.

Monu Bhagat *et al.* [15]

In this paper, SVMs are used as algorithms to develop plant disease identification and classification systems. The accuracy of the SVM classifier was 80% and when implemented with grid search the hyperparameter tuning accuracy increased to 84%. It may also include a method to assess the level and severity of known diseases in further future work.

Melike Sardogan *et al*. [16]

In this paper, tomato leaf sickness discovery and grouping strategy dependent on convolutional neural organization with learning vector quantization calculation is introduced. Three diverse info frameworks are gotten for R, G and B channels. The reLU enactment capacity and max pooling are contained in the yield network. It is reasoned that the proposed strategy successfully recognizes four distinct kinds of tomato leaf sicknesses.

H. Sabrol *et al*.[17]

They classified healthy and unhealthy tomato plants by extracting the characteristics of color, shape and texture from the image. Finally, disease classification was based on six different types of classes. When six images of tomato were classified together, it got 97.3% accuracy. In this study, supervised learning techniques are used for the purpose of learning to classify tomato plant leaves into six classes.

B. Johnson *et al*.[18]

Train the information utilizing the Synthetic Minority Over-inspecting Technique (SMOTE). Empowered planning illnesses trees utilizing multiscale object-based picture arrangement approach.

Existing machine learning technique

At present, there are many models of machine learning. Which is very helpful. For image classification and for voice recognition and many more. So in the same way in our research system, using the same machine learning model, we will analyze and classify our work.

J48 classifier

The J48 classifier is used on many applications and performs well in this classification.This model delivers a clean and accurate classification.
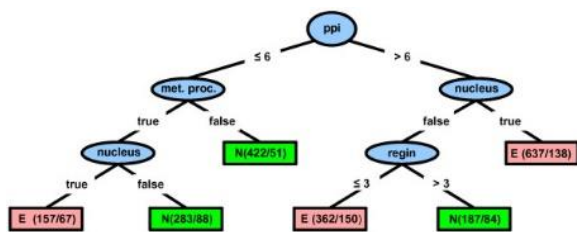

Fig. 1. Diagram of J48 Classifier

Random tree

Random Trees belong to a class of machine learning algorithms which does ensemble classification.It is based on decision tree.
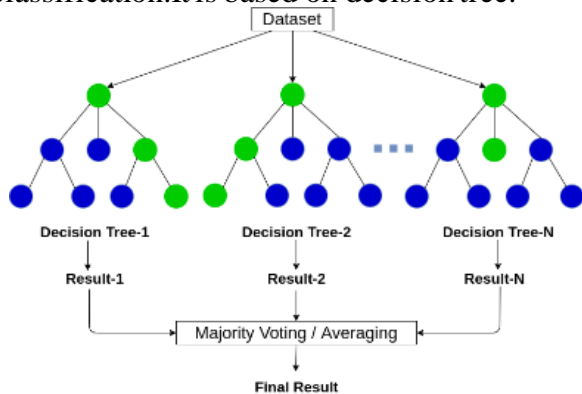

Fig. 2. Diagram of Random Tree

Random forest

It is a supervised learning algorithm mainly used for classification and regression.It works in such a way that it first selects random data from the subset of training.Then it gets votes from different decision trees, after that it decides the final class.
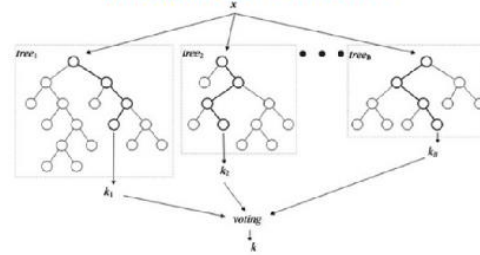

Fig. 3. Diagram of Random Forests

K-nearest neighbours:

The easiest one is the same model that is used in machine learning in regression and classification. KNN uses knowledge and classifies new data points which are similar in measurement.The classification ends when more points are with the neighbor. As the number of neighbors increases, so does the value of k will be increase.
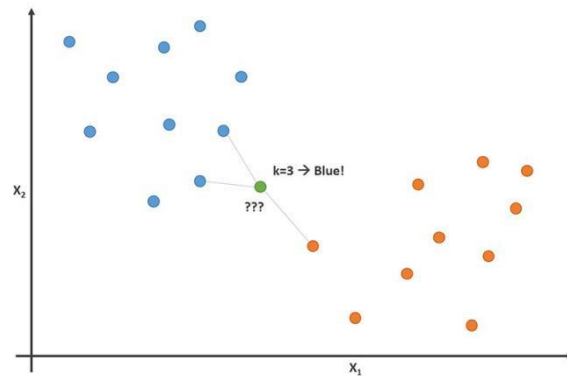

Fig. 4. Diagram of K-Nearest Neighbours

Methodology

Dataset

Both the training and testing data were downloaded from the wilt dataset of the UCI machine learning repository:[1] The said dataset consists of the spectral information from high-resolution images of 165 different areas.

Each data point has a total of 6 attributes or features: the class with 'w' for diseased trees and 'n' for the other land covers the GLCM_Pan, mean texture, the mean green value Mean_G; the mean red value, the Mean NIR value, and the standard deviation.

The working process of diseased classification is as follows

In this, the first dataset is loaded under weka. After that this dataset is converted to numeric to nominal with the help of filter.

After that we used hybrid technique in it till the result is not biased.

This tool is used when there is an imbalance in order to increase the minority group. Can enhance the performance of the classifier. Hybrid approach is a filter, and its use can produce good results by balancing it even with an unbalanced data-set.
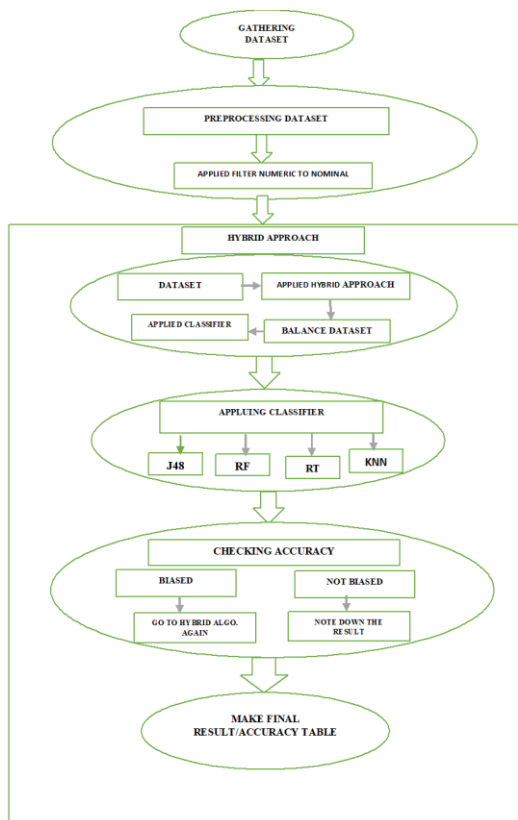

Fig. 6. Process of tree diseases classification

Internal working of hybrid approach to handle minority sampling
A hybrid approach to handle minority sampling

The tests were directed on the dataset. There were 4265 models in the larger part class and 74 models in the minority class initially.

The disease tree count was very low in our dataset. And to equalize more than the rest of the land cover, we used this technique. So that it can be equal and can give the right result. We applied the filter to the Wilt dataset several times, then checked the accuracy across multiple models to get good results. Results that were not good getting before without this approach.

Algorithm of hybrid approach:

For instance, if the quantity of neighbors is set to 10 and the quantity of new preparing tests is set to 100%, the ten closest neighbors to a given preparing test will be recognized.

One new preparing model will be made between in the component space between the first example and one of the ten closest neighbors. Algorithm of hybrid approach under below.

Require: Minority set: $\mathcal{M}$; amount of synthetic data: q; number of nearest neighbours: k;
1: $\mathcal{S} = \emptyset$ {Synthetic data set}
2: **for all** $\mathbf{x} \in \mathcal{M}$ **do**
3:     determine the k-neighbourhood $\mathcal{N}_k(\mathbf{x})$ of $\mathbf{x}$ {Synthetic instances creation}
4:     **for** $i = 1 : q$ **do**
5:         randomly select $\hat{\mathbf{x}}^r \in \mathcal{N}_k(\mathbf{x})$
6:         $\mathbf{s}^i := \mathbf{x} + U_i(0,1) \cdot (\hat{\mathbf{x}}^{r(i)} - \mathbf{x})$
7:         $\mathcal{S} = \mathcal{S} \cup \mathbf{s}^i$
8:     **end for**
9: **end for**
10: **return** $\mathcal{S}$

Step 1: Neighbours = Get KNN(10)
Step 2: N=Random neighbours select for sampling
Step 3: Synthetic feature vector = [(C.FeatN.feat)*random(0,1)] + C.feat
In the initial phase, we select 10 random adjacent ones. Multiply them with random 0's and 1's to generate synthetic vectors that match the property with the previous vector.

Result and discussion

So after trying many times, we found that by increasing the dataset, two terms come where the results are good. Which we have shown bold in the table. After that, if we increase the dataset further then the result will return to the highest accuracy They start giving which indicate the majority classes.

EXTEND DATASET 1 DISEASED TREE =148 ,OTHER LAND COVER =4265		
CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	96.9175%	0.1729
RANDOM TREE	98.5048%	0.1231
RANDOM FOREST	98.4134%	0.1225
KNN	97.7307%	0.1122
EXTEND DATASET 3 DISEASED TREE =592 ,OTHER LAND COVER =4265		
CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	87.9736%	0.1729
RANDOM TREE	98.5641%	0.1231
RANDOM FOREST	98.4134%	0.1225
KNN	98.7307%	0.1122

EXTEND DATASET 5 DISEASED TREE =2368 ,OTHER LAND COVER =4265		
CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	64.1134	0.4797
RANDOM TREE	99.0048	0.2906
RANDOM FOREST	99.2159	0.286
KNN	98.9445	0.2592
EXTEND DATASET 7 DISEASED TREE =4736 ,OTHER LAND COVER =8530		
CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	99.5628%	0.2053
RANDOM TREE	99.4874%	0.207
RANDOM FOREST	99.6382%	0.1981
KNN	99.6532%	0.1401
EXTEND DATASET 8 DISEASED TREE =9472 ,OTHER LAND COVER =8530		
CLASSIFIER	ACCURACY	R.M.S.E
J48	76.0027	0.259
RANDOM TREE	76.2915%	0.2513
RANDOM FOREST	86.1793%	0.2472
KNN	89.3456%	0.1743
EXTEND DATASET 9 DISEASED TREE =9472,OTHER LAND COVER =4265		
CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	99.7512	0.1415
RANDOM TREE	99.7513	0.1333
RANDOM FOREST	99.7814	0.1293
KNN	99.804	0.0719
EXTEND DATASET 10 DISEASED TREE =18944 ,OTHER LAND COVER =17060		
CLASSIFIER	ACCURACY	R.M.S.E
J48	88.929	0.176
RANDOM TREE	90.539	0.1025
RANDOM FOREST	96.0893	0.1625
KNN	97.2725	0.0886
EXTEND DATASET 11 DISEASED TREE =18944 ,OTHER LAND COVER =34120		
CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	99.9058	0.971
RANDOM TREE	99.9058	0.0971
RANDOM FOREST	99.123	0.0962
KNN	99.9133	0.0443

Without use multiple dataset technique DISEASED TREE =74 ,OTHER LAND COVER =4265

More about classifiers recall,precision,f-measure

In this, the terms for which good results were coming, their recall, precision, f-measure have been told. And snapshots have also been included with them

CLASSIFIER	ACCURACY(Biased)	R.M.S.E
J48	98.1097	0.1362
RANDOM TREE	98.0636	0.138
RANDOM FOREST	98.1097	0.1364
KNN	97.9714	0.1403

J48 Classifier

J48 is used to classify many applications, and it is also capable of producing accurate results.The best model is to examine the data of category and continuously.In this, precision and recall have been given about both the cases. In the table given below.

Case 1: It used 8 times applied hybrid technique extended dataset.

Case 2: It used 10 times applied hybrid technique extended dataset.

Where w is denoted to diseased tree.

	Case 1(w)	Case 2(w)
Precision	0.687	0.826
Recall	1.000	1.000
F-Measure	0.814	0.905

2.Random Tree

This is a model based on a decision tree that makes its own classification.Random tree belongs to a group of machine learning models that are involved in classification.

In this, precision and recall have been given about both the cases. In the table given below.

Case 1: It used 8 times applied hybrid technique extended dataset.

Case 2: It used 10 times applied hybrid technique extended dataset.

Where w is denoted to diseased tree.

	Case 1(w)	Case 2(w)
Precision	0.689	0.848
Recall	1.000	1.000
F-Measure	0.816	0.918

Random Forest

It is a supervised learning algorithm mainly used for classification and regression.

Classifier	Correctly classified instance	Incorrectly classified instance	Accuracy	Root mean squared error
J48	16009	1993	88.929 %	0.176
Random Tree	16299	1703	90.5399 %	0.162 8
RandomForest	17298	704	96.0893 %	0.162 5
KNN	17511	491	97.2725 %	0.088 6

In this, precision and recall have been given about both the cases. In the table given below.
Case 1: It used 8 times applied hybrid technique extended dataset.
Case 2: It used 10 times applied hybrid technique extended dataset.
Where w is denoted to diseased tree.

	Case 1(w)	Case 2(w)
Precision	0.792	0.921
Recall	1.000	1.000
F-Measure	0.884	0.964

4.KNN

The easiest one is the same model that is used in machine learning in regression and classification. The classification ends when more points are with the neighbor. As the number of neighbors increases, so does the value of k will be increase.

In this, precision and recall have been given about both the cases. In the table given below.
Case 1: It used 8 times applied hybrid technique extended dataset.
Case 2: It used 10 times applied hybrid technique extended dataset.
Where w is denoted to diseased tree.

Classifier	Correctly classified instance	Incorrectly classified instance	Accuracy	Root mean squared error
J48	6841	2160	76.0027 %	0.259
Random Tree	686	2134	76.2915 %	0.257 3
RandomForest	7754	1244	86.1793 %	0.247 2
KNN	8042	959	89.3451 %	0.174 3

	Case 1(w)	Case 2(w)
Precision	0.832	0.951
Recall	1.000	1.000
F-Measure	0.908	0.975

Result Table:

This is the table which had good results. First is 8 times result table and second is 10 times table.

8-Times applied Hybrid approach dataset Result

10-Times applied Hybrid approach dataset results
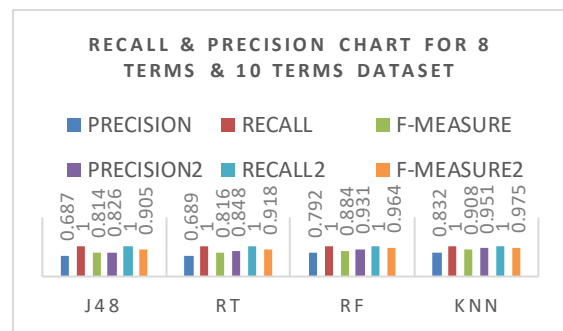
Fig. 7.Recall & Precision Chart for 8 terms & 10 terms datasets
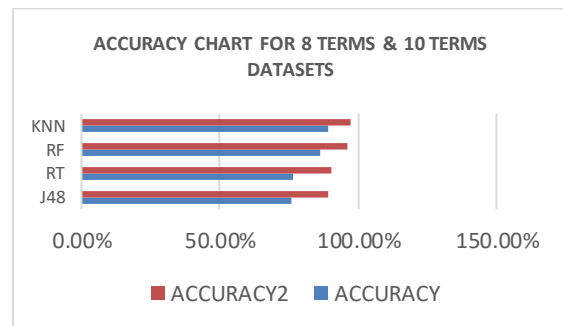
Fig. 8.Accuracy Chart For 8 Terms & 10 Terms Datasets

Conclusion

So after all the dataset was very unbalanced. So without applying the classifier without hybrid technique the results were coming one way.Balanced it by applying hybrid approach many times and kept checking it every time after applying the technique.

So we finally saw that increasing the dataset gives good results over one or two particular terms.Even if we make the dataset smaller, the result is not good and even if we make it bigger, the results are not good.Results are

getting good on 8th terms or 10th term which is not one sided.

After applying 8th times smote technique, the results are good. And we further increased the dataset by smote technique and after applying 11 times, when we see the results, the results which came for the first 8 times were also good results. In this we have used only single filter and have also taken less classifier. This can be used further and better filter and classifier too so that the result can be good and fast.

So the models which were performing well in this are as follows. 8th times smote technique result J48 76%,Random Tree 76.29%,Random Forest 86.17%,KNN 89.34 %.

9th times smote technique result J48 88.92%,Random Tree 90.53%,Random Forest 96.08%,KNN 97.27%.The knn classifier performed the best of both the techniques.

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NUMERICAL SIMULATION OF SHOCK INDUCED MIXING OF FUEL AND AIR IN THE SCRAMJET COMBUSTOR

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ABSTRACT

The combustion behaviour of fuel in the air environment is investigated for a SCRAMJET engine in the present work using commercial software package ANSYS FLUENT. The combustion of such a combination is purely governed by the mixing efficiency of fuel with air in the SCRAMJET engine. The appropriate air fuel mixture enhances the flame stabilization by increasing the flame speed within the combustor. The mixing of fuel with air is numerically simulated with modified DLR SCRAMJET engine combustor in order to study its mixing efficiencies. The numerical simulation of hydrogen fuelled SCRAMJET combustor has been carried out by steady, compressible, and two-dimensional Navier-Stokes equation with SST k-□ turbulence model using commercial CFD software package. The injection of fuel is done at three different velocities such as 100 mm/s, 150 mm/s and 200 mm/s. From the reported results, it has been identified that the formation of oblique shock waves is helpful to increase the mixing efficiency of the air and fuel. The oblique shock helps in modifying the velocity vector direction of the air in the combustor. The turbulent kinetic energy, velocity contour and static pressure clearly illustrate the role played by the oblique shock in enhancing the mixing of fuel with air.

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Keywords: SCRAMJET Engine, Navier Stoke's Equation, SST k-ω turbulence model , Air – Fuel Mixture

Introduction

Supersonic Combustor Ramjet (SCRAMJET) a variant of ramjet where the phenomenon of combustion varies with a higher mach number. The flow of air inside a scram jet engine is generally supersonic which is major reason for the scramjet to perform well in an efficient manner at higher speeds in operation. During World War II, Germans have devoted more of their time and effort in researching towards the technological improvement of high speed rocket powered aircraft. Post to World War II, Americans continued the existing research and attained many potential breakthroughs by adopting various techniques and scientists from Germany. Still now plenty of research is ongoing to improve the mixing of air and fuel in a SCRAM jet engine combustor as the time of mixing takes place in milliseconds. The thorough and proper mixing of air fuel mixture will lead to a better combustion and generates more desired power from the engine. As the problem associated with SCRAMJET engine combustor is more demanding and highly interesting, researchers around the globe have not stopped from conducting research through their untiredless efforts even after crossing many generations. The development of

commercial software packages has facilitated the experimental research for corroboration and also to have visual understanding about the mixing of air and fuel inside the combustor.Obula reddy et.al [1] studied about the effect of wavy strut fuel injector in producing the shock wave inside the combustor inorder to enhance the mixing of fuel and air for a SCRAM jet combustor. The authors have carried out the study at different mach numbers such as M = 2,4,6.Reynold's Averaged Stoke equation has been considered for the present study and the authors have reported that from shock wave generation , it is observed that the wavy wall strut provided has an appreciable effect over the augmentation in air and fuel mixing. Anthony Athithan et.al [2] analyzed the performance of ramps present in the strut based scram jet engine based upon the factors such as wall pressure combustion efficiency and total pressure loss at different locations of the combustor and to attain improvement in the design and development of strut based injection schemes. The authors have made a comparison with the baseline model by solving the problem using RANS equation coupled with SST K-ω model and eddy dissipation model. The authors have reported that the presence of ramps have produced a

considerable increase in total pressure due to the shock interactions with the ramps and higher flame temperature is observed with ramp combustor.Vatsalaya Sharma et.al [3] studied about the overall performance of SCRAM jet engine by varying the fuel jet injection angle and by adopting low-Re SST model on an in house 3-D structured solver. The authors have conducted substantial study about air fuel mixing phenomenon and suggested that the fuel has to be injected in a direction opposite to the incoming flow .The other case which was examined is the injection of fuel in the stream wise direction and it has less significance that the fuel injection in the opposing direction.Hijema et.al [4] conducted research in understanding the effect of hypermixer struts in a supersonic combustion region and reported that by using separation – resistant strut there is a possibility to control the combustion and avoid excessiveness of heat load. The authors have adopted two different types of struts with hydrogen fuel injected at sonic speed from the trailing edge of struts.Huang et.al [5] analyzed the effects of shock waves on turbulent mixing layers in a combustor of supersonic model and reported that the physical mechanism of thickness decrease is caused due to the interaction of shock waves cause density increase .Ye tian et.al [6] studied the effect of air throttling over the stabilization of an combustor fueled by using ethylene. The authors have achieved very good agreement between the numerical and experimental results. The authors have clearly stated about the importance of choosing the location and time sequence as it has shown significant impact over the flame characteristics studied. Mohammed Kamel et.al [7] studied the complicate interacting flow features in a shock wave , boundary layer and shock induced combustion have been studied numerically to investigate the effect of transverse sonic fuel injection. The authors have used several tools such as RANS equation, Zero equation of Baldwin Lomax , Second order Runge – Kutta method for different conducting the study. The results from both experimental and numerical study has shown good agreement. Ryan J Clark [8] presented a review about the numerical simulation and modeling of combustion carried out various researchers in this field. The authors have provided much information about the modeling approach, spatial / temporal

schemes, source of experimental data for validation of the computational work.Sukanta Roga and Pandey [9] have numerically analyzed the scramjet combustor fuelled with hydrogen with a diamond shaped strut injector with a mach number of 4.The authors have studied the flow concept using K-ω turbulence model and identified that the maximum temperature is produced in the recirculation area due to the interaction of wave jet , shock wave expansion and fuel jet losses. Vincent et.al [10] performed both experimental and computational study of LAPCAT II supersonic combustor and sectioned the combustion area in to four different areas. The study is conducted in a dual mode ramjet/scramjet combustor b dividing the combustor into four different sections. Gautam et.al [11] numerically studied about the performance of a scramjet combustor by using an alternating wedge shaped strut injector and three different angle of attack have been studied. The authors have studied about the combustion phenomena and efficiency for different angle of attack . The authors have suggested that negative angle of attack has lowest ignition delay and shows higher performance than other angles of attack considered. Asis Shan et.al [12] conducted study in an axisymmetric scramjet combustor by injecting the fuel in transverse direction and observed that the increase in injection pressure enhances mixing , stagnation pressure loss values. Sankaran and his coworkers [13] performed flow analysis in a modified DLR scramjet engine by providing passages in the wedge shaped strut fuel injector. The analysis shows that the strut with a provision of internal passage has shown higher combustion efficiency than the strut without any passages. Rahul kumar et.al [14] investigated the effect of strut geometry, fuel and jet diameter over the mixing characteristics of fuel and air. The study reveals that the total pressure decay is higher in case of hydrogen and the effectiveness of mixing gets decreasing with increase in jet diameter. Mohammed arif and sangeetha [15] studied the effect of ramp cavity injector in a supersonic combustor. The presence of multiple ramps have not shown much effects over the enhancement in mixing and flame holding characteristics.

From the literature survey carried out, it can be clearly understood that the research in the area of SCRAM jet engine has more importance

under different aspects and the current study involves numerical study of shock induced air fuel mixing in a scramjet combustor.

Mathematical Modelling

Mathematical modelling involves the conversion of a real life problem in to a mathematical equation which may be solved further using the basic principles of mathematics. In case of CFD analysis mathematical modelling leads to a set of differential and integral equation based upon the boundary conditions of the problem. The current study involves analysing the fundamental flow physics of an impinging shock wave interacting with a cavity when the fuel is injected with an upstream transverse injection in to the combustion chamber. Boundary layer formation, shock wave creation, creation and development of streamline vortices are the factors which actually characterizes the scramjet combustion flow dynamics. The current work utilizes the complete set of Navier stokes's equation and in particular SST K--ω model plays the major role in solving the defined problem.

Geometric Design and Mesh Modelling

DLR scramjet combustor model is modified for the cavity combustion as indicated in the figure 1. Here the wedge used to produce shock waves to increase the pressure and the rearward facing step used to create circulation to achieve the efficient mixing. The domain separated from the solid domain and discretized as a structured grid with quadrilateral elements for numerical simulation. Boundary conditions are applied as indicated in the figure 1. Here the inlet air assumed to be at the Mach number of 1.5 and the outlet is assigned as a velocity outlet. The hydrogen fuel is supplied at 100 m/s through the fuel inlet.
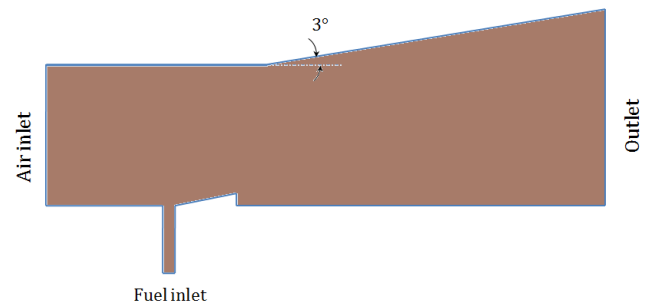
Figure 1 Computational Domain of the Combustor

Table 1 Properties of Air and Hydrogen Fuel

Property	Ambient air	Hydrogen fuel
Mach number	1.5	0.3
Pressure Pa	12000	12000
Temperature K	1200	750
Density kg/m^3	1.002	0.097

The numerical equations are solved using the boundary conditions as indicated in the table-1. The walls of the combustor are defined as a solid wall with no slip boundary conditions. The stability of the solution in controlled by keeping the courant number as 0.5 for the analysis.

Study of Grid Convergence

The selection of grid size strongly affects the solution accuracy and the best grid gives accurate numerical results with minimum numerical error. The size also affect the computation timing, if more number of cells computation time will be more with more accurate result and less number of cell grid gives very poor results in less computation time. Here three grids with cell size of 465300 cells, 597000 cells and 723000 cells are created and solved for the same boundary conditions as indicated in the table 1.

The results of the wall static pressure measured on the bottom wall of the combustor are plotted in the figure 2. From the figure 3 we understood that, the grid size not much affected the results and the grid with size of 465300 cells and above is grid independent. So the grid with the size of 597000 cells utilized for the computation in the present analysis.
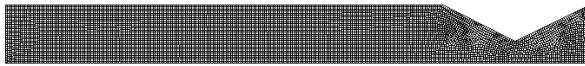

Figure 2 Meshed View of Combustor

Table 2 Solver Properties

Solver Type	Pressure -based solver
Turbulence Model	K-w SST
Material property	**Method of calculation or value**
Density	Ideal gas law (kg/m^3)
Thermal conductivity	0.0242 W/m-K
Molecular weight	28.966 kg/kg mol
Specific heat	1006.43 J/kg-K
Viscosity	Sutherland's formula
Numerical scheme information	
Pressure velocity coupling scheme	Coupled
Gradient evaluation	Least squares cell-based
Flow spatial	2nd order upwind
discretization	
Specific dissipation rate	2nd order upwind
Solution control scheme information	
Courant number	0.5
Under relaxation factors	Default
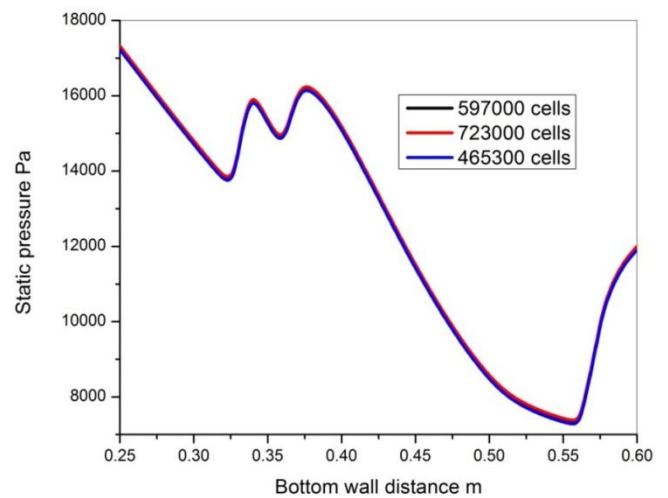
Figure 3 Grid Convergence Study

The properties of the solver adopted in the current analysis is detailed in Table 2.

Results and Discussion

The mixing efficiency of air and fuel greatly affect the combustor performance. The resident time of air in the combustor is in milliseconds, within this short duration the air and fuel must get mixed properly. The turbulence in the supersonic combustor is not sufficient enough to increase the mixing efficiency. By creating more oblique shocks will help to increase the mixing efficiency. Here a wedge and sudden expansion in the combustor will be helpful to create more turbulence and oblique shocks to improve the mixing efficiency.

DLR scramjet combustor geometry modified for the effective mixing and the fuel injected for the velocity of 100 m/s, 150 m/s and 200 m/s to understand the mixing characteristics. The Discretized computational model applied boundary conditions as listed in the table 1 and iterated for the solver conditions indicated in the table 2. The residuals of continuity, x-velocity, y-velocity, energy, specific rate of dissipation, and turbulent kinetic energy were monitored for solution convergence in the order of 10^{-5}. The pressure measured at the top and bottom wall of the combustor are presented in the figure 3 and 4.

From the wall static pressure distribution, it is observed that static pressure increases with the fuel injection velocity initially then no change in the static pressure after crossing the expansion fan the pressure further increases with fuel injection velocity both in the upper and lower wall of the combustor.

Figure 5 Combustor Bottom Wall Temperature

Figure 3 Combustor Bottom Wall Static Pressure
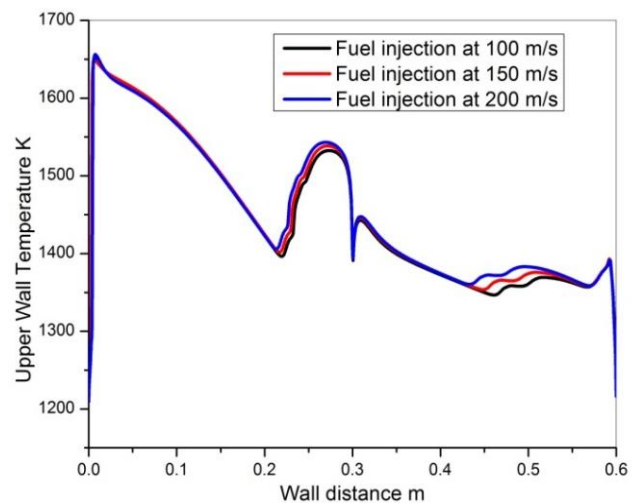
Figure 6 Combustor Upper Wall Temperature

The figure 5 and 6 illustrates the wall static temperature distribution on the upper and lower wall of the combustor. In the bottom wall, the temperature reduces with respect to increase in fuel injection speed. The wall static temperature not subjected to notable changes in the upper wall. The bottom wall temperature decreases mainly due to the fuel supplied at low temperature and the mass flow rate increases with velocity. High mass flow reduces the wall temperature of the combustor.

Figure 4 Combustor Upper Wall Static Pressure
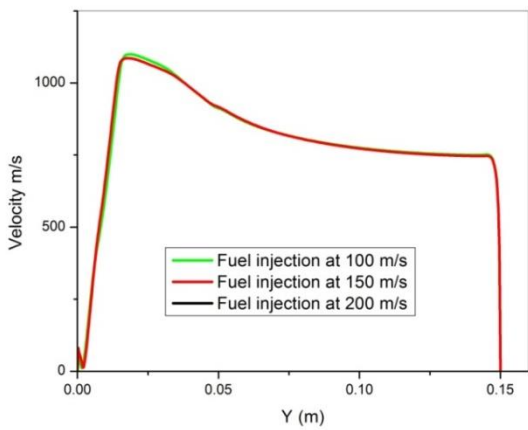
Figure 7 Velocity Profile At X=108 mm
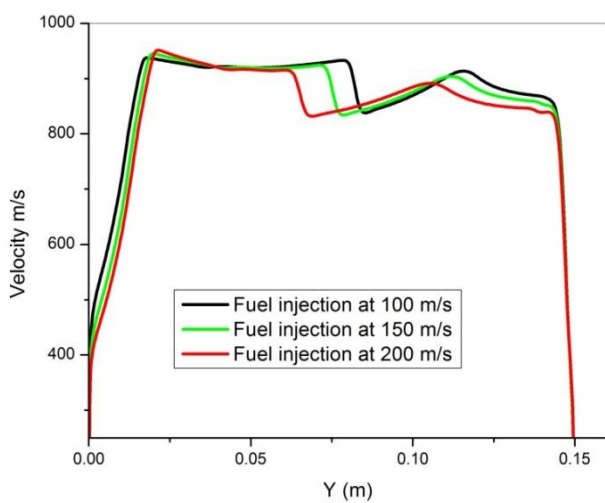
Figure 8 Velocity Profile At X=275 mm
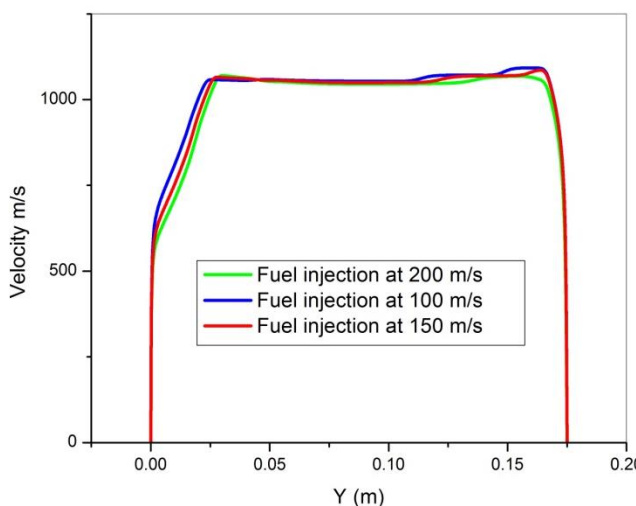
Figure 9 Velocity Profile At X=450 mm

The velocity profile at X=108 mm illustrated in the figure 7 indicates the drop in the velocity

will increase the air resident time in the combustor to ensure the proper mixing of air and fuel. Similar trend also absorbed at X=275 mm as indicated in the figure 8. At X=450mm the velocity almost constant for all the cases and it is for away from the combustion zone and it is shown in figure 9

The pressure distribution shown in figure 10 indicates the favourable condition for the effective mixing in the combustor. The turbulence kinetic energy, X-velocity and Y-velocity distribution indicated in the figure 10 (a) , (b) and (c) are all having favourable results for the efficient mixing of the fuel and air.
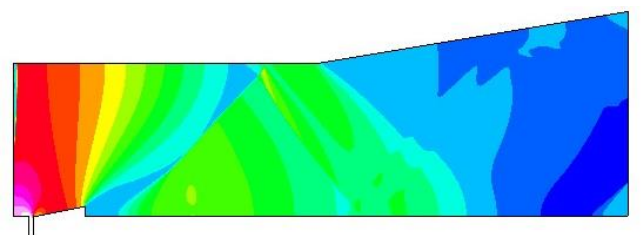
(a)
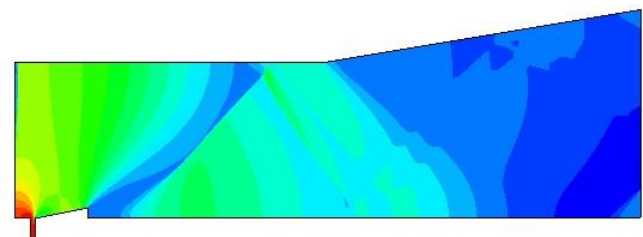
(b)
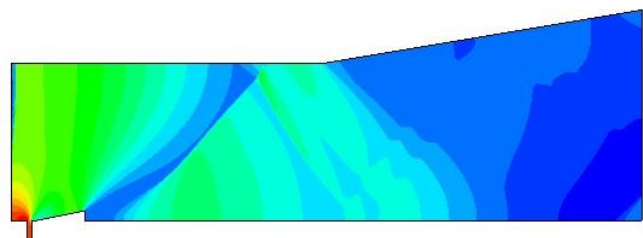
(c)

Figure- 10 Pressure Distribution Inside the Combustor at Different Fuel Injections (A) FI = 100 mm/s (B) FI = 150mm/s And (C) FI= 200 mm/s

The other parameters such as turbulent kinetic energy , X velocity distribution and Y velocity distribution also shows favourable mixing at different fuel injection at different velocities in the transverse direction to the air flow

Turbulent Kinetic Energy Distribution

Turbulence kinetic energy (TKE) is the mean kinetic energy per unit mass associated with eddies in turbulent flow. Figure 11 (a), (b) and (c) represents the turbulent kinetic energy distribution inside the combustor at different fuel injection scenarios.

(a)

(a)

(b)

(b)

(c)

(c)
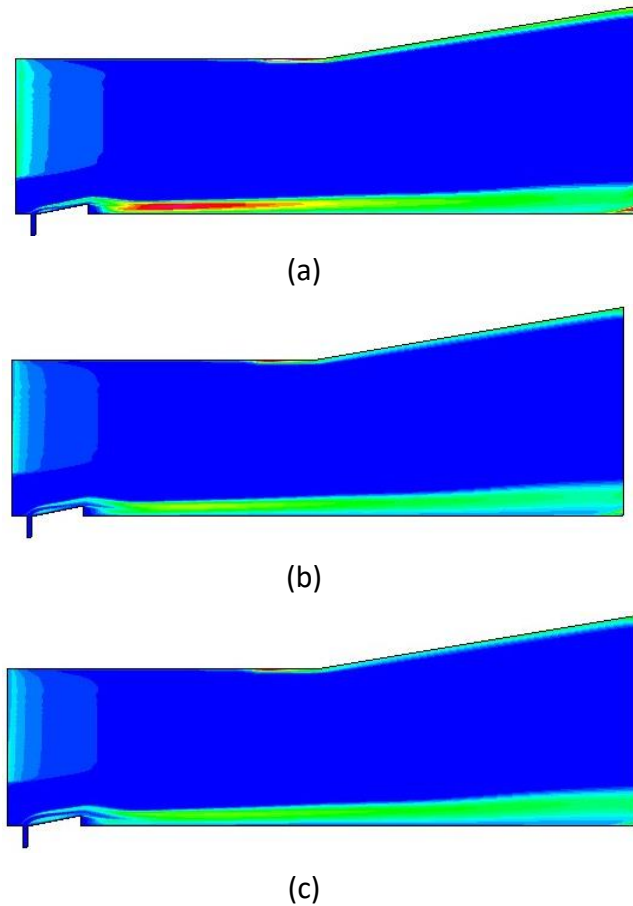
Figure 11 Turbulent Kinetic Energy Distribution in the Combustor at Different FI (A) FI = 100 mm/s (B) FI = 100 mm/s (B) FI = 150 mm/s and (C) FI = 200 mm/s

Figure- 12 X-Velocity Distribution In The Combustor At Different FI (A) FI = 100 mm/s (B) FI = 150mm/s and (C) FI = 200 mm/s

X Velocity Distribution

X velocity distributions of fuel injection at different speeds have been studied in the combustor and the plots have been created.

The values of X velocity distribution ranges between -100 to 1100 mm/s for different fuel injections inside the combustor at transverse direction and the mixing of air fuel takes place. Figure 12 (a), (b) and (c) shows the X velocity distribution at different values of fuel injection

Y Velocity Distribution

The Y velocity distribution of fuel injection at different speeds have been studied in the combustor and the plots have been created.

(a)

(b)

(c)
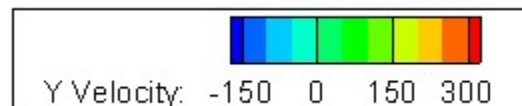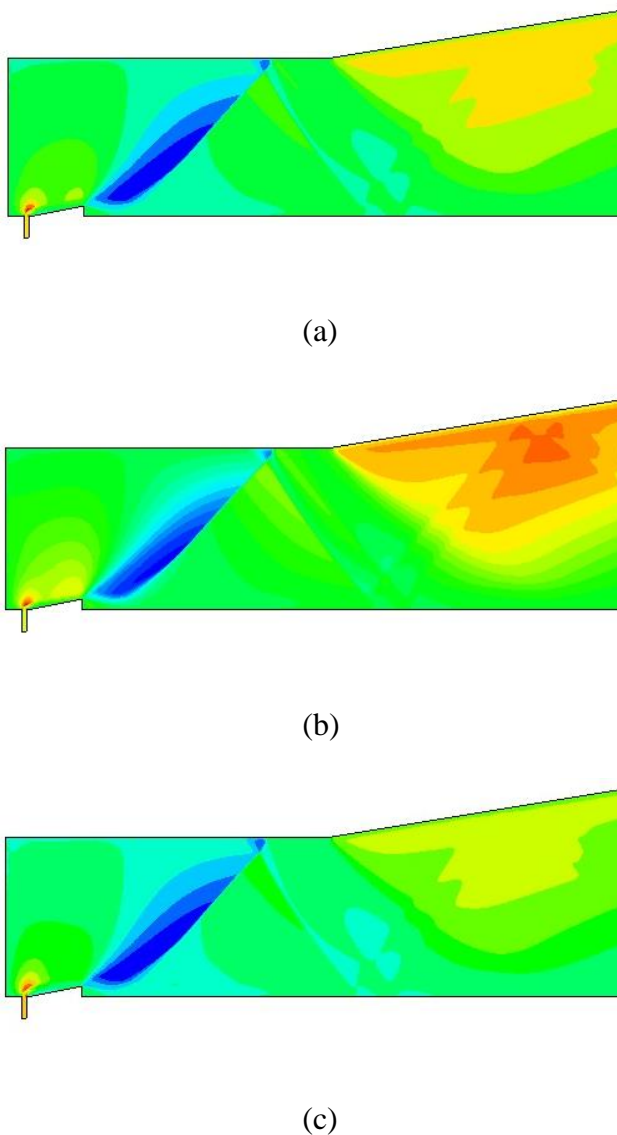
Figure- 13 Y-Velocity Distribution in the Combustor at Different FI (A) FI = 100 mm/s (B) FI = 150mm/s and (C) FI = 200 mm/s

Figure 13 (a), (b) and (c) shows the Y velocity distribution at different values of fuel injection

Conclusion

The concluding remarks of the present study has been detailed with

➢ The simulation of air and hydrogen fuel mixture is carried out in SCRAMJET Combustor at different lengths and different velocities of fuel injections in the transverse direction.

➢ The grid with the size of 597000 cells utilized for the computation in the present analysis and the through convergence study it is observed that the grid size has very less effect over the analysis results.

➢ The static pressure shows a strong increase with increase in fuel injection speed at both bottom and top wall.

➢ The bottom wall temperature decreases with increase in injection speed as the fuel is supplied at lower temperature.

➢ The plots such as velocity profile for different fuel injection speeds shows that the drop in velocity increases the resident time of fuel and allows for better mixing between the air and fuel supplied.

The plots of turbulent kinetic energy , X and Y velocity distribution also shows favourable mixing of air and fuel at different fuel injection speeds.

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SELF-ORDERING RESTAURANT SERVICE TERMINALS AND THEIR ACCEPTANCE AMONG CONSUMERS FROM THE Y AND X GENERATIONS

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ABSTRACT

The rapid growth of technology encourages businesses to incorporate cutting-edge technology in order to improve their performance, particularly among millennial consumers. The millennial generation is characterized by their technical sophistication. Self-ordering machines are one of the methods used by the company's fast-food restaurant. The self-ordering machine is a new addition to the company's operations. Customers will appreciate the convenience of being able to order menus and make payments on their own. The purpose of this study is to compare the preparedness of the millennial generation to embrace Self Ordering Machine technology to that of the X generation. The Unified Theory of Acceptance and Use of Technology is used to determine readiness to adopt technology (UTAUT). The study's findings revealed that there are no differences in millennials' preparedness to adopt technology compared to previous generations.

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Keywords: Self ordering terminals, QSR, Millennials, Generation X, Consumer behavior.

Introduction

Millennials also known as Generation Y, are people born between 1980 and 2000 who grew up with access to social media, smartphones, tablets, and all other forms of digital technology available today. Studies show that by 2020, Millennials will account for half of the Indian workforce, and by 2025, they will account for more than seventy percent (Raina, 2020). Millennials have taken the lead in all consumer marketplaces around the world. This generation, which accounts for almost 27% of the world's 7.4 billion people, is a primary motivator inside consumer markets, driving them toward rapid expansion and development. The contribution of millennials to the Indian consumer sector is particularly remarkable. Nearly 34% of the Indian population belongs to this social category (Anil Talreja, 2018). Because Millennials are known as the "technology generation," technology is obviously visible in their purchasing behavior. Everything from online shopping to supermarket purchases to restaurant selection appears to be influenced by technology and social media. With their in-house technological assistance and marketing infrastructure, international food chains may readily infiltrate the market with appealing products & packages.

As a generation, millennials rely on technology to make purchasing decisions and collect feedback from previous customers. As a result, they become more difficult to comprehend because, with technology, they consider advice and suggestions from their peers and family members, making it more difficult for businesses to assess and tab their purchasing behaviour. Branding, social acceptance, and the image of a product are all important factors. (Flor Madrigal Moreno J. G., 2017).

Similarly, in the fast food restaurant industry. Fast food businesses strive to use technology to allow consumers to order food on their own using a gadget known as a self-ordering machine. Customers can now order meals using a self-ordering system, which is a new innovation in the food ordering procedure. Customers can order food online using the self-ordering machine. Customers can also tailor their orders by viewing the calorie count of the item they want to order on a personalized machine display. Customers can select items based on their medical conditions. (Worldlink Integration Group, 2018).

Fast food restaurants' digital menu innovations will have an impact on the company's performance. Many studies have shown that innovation improves company performance. The influence of innovation on a company's profitability and growth is favorable. The

stronger the company's ability to innovate, the higher the company's profitability. However, it is feasible that innovation will also have a negative impact. If the environment does not support the change.

When a firm adopts a new invention, it may be possible for the corporation to force employees, suppliers, and even consumers to use it, and occasionally the linked parties are unaware of the value of innovation for them, and hence refuse to utilise it. (Shouyu, 2017). Despite the fact that the corporation had invested a significant amount of money, the existence of this refusal resulted in no rise in profits. According to the above statement, the goal of this research is to see how ready the millennial generation is to adopt self-ordering devices in fast food restaurants compared to generation X.

Self-Ordering Terminals

As a result of restaurant automation and technology, the way restaurants run and function is rapidly changing. Self-Ordering Kiosks, which are connected with the restaurant's POS system, are rapidly altering the way orders are placed at high-traffic quick-service restaurants. Customers may place orders at the self-ordering kiosk, which also functions as a self-service food ordering system. Customers may select from the whole menu at the kiosk, which is a tiny self-contained physical building.

Orders are placed directly at the POS without the aid of a cashier or waitress. Self-ordering kiosks are suitable for high-traffic fast food restaurants, quick service restaurants, and casual dining venues. McDonald's in Singapore, for example, has dual point technology, which enables customers to buy meals at one location and pick it up at another. Customers may also customize the meal at the kiosks to their liking.

Picture 1 Self-ordering Terminal with attached Point of Sale (POS)

Image Source: The restaurant Times

Today's customer places a high value on convenience. According to recent National Retail Federation study, 97 percent of customers have backed out of a transaction just because it was inconvenient. According to studies, long lines in fast food restaurants are equally unappealing: nearly three out of every four diners said they would leave if there were seven people in line. More than nine out of 10 people said they'd go somewhere else. Fast

food restaurants are already embracing touch-screen self-service kiosks, following in the footsteps of supermarkets, which have effectively cut queues by using self-service checkouts.

As more individuals realize the benefits of these kiosks, their use is fast increasing. When they were originally launched in 2017, the objective was to improve the user experience by speeding up the purchasing process,

reducing human error, and making order modifications easier. Over three years later, McDonald's is still live proof of the effectiveness of self-service kiosks. Self-service kiosks, interestingly, are not only meeting consumers' need for maximum convenience, but they are also influencing behaviour. Self-ordering has been found to improve profits by increasing the average order amount per client, while also lowering restaurant expenses by increasing efficiency.

Picture 2 Touch Screen self-ordering terminal
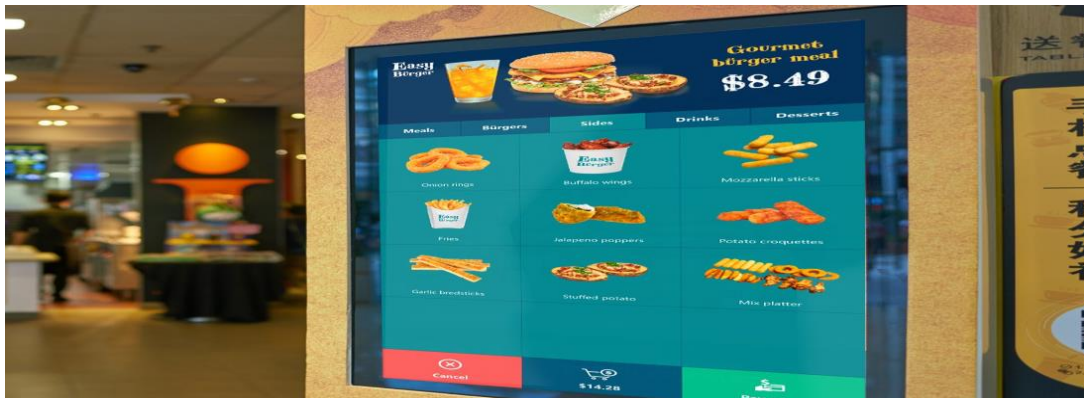
Image Source: Micros automation solution

Self-Ordering Terminals – Usage & Benefits
Reduced Ordering Time - Long lineups at QSRs make placing an order difficult, especially during busy business hours. A self-ordering kiosk diverts some customers away from the counter, lowering order processing time. It also makes navigating the menu and making quick purchases easier for customers. When the meal is ready, the bill generated by the kiosk and the food from the counter may be collected. As a result of eliminating overall service time delays, implementing a self-ordering kiosk allows you to serve more customers and accept more orders.

Reduced Labor Cost - If your QSR does not have a kiosk, you will need to hire extra people to accept orders at the counter. By altering the front-of-house structure, kiosks minimize labor costs. Make sure that the directions for using a kiosk are prominently displayed next to it. If you don't, you'll have to hire additional employees to help your clients with technical issues. Kiosks, unlike employee salaries, are a one-time expenditure because they are not need to be paid on a monthly basis. Installing a kiosk allows you to reassign restaurant employees to places where they can be more productive, such as the kitchen.

Order Accuracy - When taking orders, the usual way, there is a possibility of human error. Even while servers are trained to repeat orders to guests, human error is unavoidable. The odds of making an error while placing an order are rather significant, especially in high-traffic areas during rush hours. Customers can place orders at their own pace using a self-service meal ordering system. It allows them to go over the menu options and decide which ones to order. When you have a configurable menu, kiosks come in useful. Customers can personalize their meals and confirm accuracy before paying and submitting their order.

Promotes Upselling - A meal ordering system for self-service enables restaurants to display a range of messages based on client purchase behavior. Kiosks enhance the appearance and probability of food items by the user, so you may show images of food products that make the dish more attractive. Orders have no space restrictions, so customers have more space to buy more lucrative items via graphs and enticing item descriptions. This improves the average total inspection amount to improve the sales of the most lucrative products.

Improves Customer Satisfaction - Fast food establishments are recognized for their

lightning-fast service. Consider the following scenario: your customer must wait fifteen minutes to make an order. Your QSR's reputation will definitely suffer as a result of this. Fast eateries are well-known for their rapid service, therefore installing a self-service kiosk is a good idea. Consider the following scenario: your customer must wait fifteen minutes to make an order. Your QSR's reputation will definitely suffer as a result of this. Installing a self-ordering kiosk cuts down on order processing time and allows consumers to make orders fast, especially during busy times. Self-ordering kiosks offer a variety of benefits. They make ordering for your customers simple by placing the whole menu at their fingertips. Those who seek information about the meal will also receive it via the kiosk. Customers like the convenience and efficiency that kiosks provide, resulting in a great customer experience that leaves them satisfied. The self-service food ordering system was born out of the restaurant industry's demand for speedier and more efficient service. Self-ordering kiosks are ideal for QSRs since they are quick, versatile, and give a good customer experience.

Literature Review

The Millennial Consumer

The Millennial Generation is defined as those who were born between the early 1980s and the early 1990s. Others believe that the millennial generation includes youngsters born in the early 2000s as well. Because the millennial generation follows Generation X (Main, 2017). With the advancement of digital technology, millennials are growing up together. Millennials, unlike the X generation, are adept at socialising and actively utilise technology, and they have a strong reliance on it. (Margianto, 2020) It is sometimes referred to as Generation Y. Millennials, as a generation, rely on technology to make purchasing decisions and collect feedback from previous users. As a result, they have become more difficult to understand because, with technology, they do consider advice and suggestions from their peers and family members, making it more difficult for organizations to assess and tabulate their purchasing behavior. Branding, social

acceptance, and the appearance of a product are equally important to millennials. (Flor Madrigal Moreno J. G., 2017).

The decision-making of Millennials is tricky; they are well-connected to technology and use devices to search for information about any product or service; at the same time, they consult their peers and family members before coming to a conclusion, making the job more difficult for marketers. Another thing to note is their loyalty to brands. (Flor Madrigal Moreno J. G., 2017). Millennials are good at communicating and finding information; they grew up with technology and now use it in every way possible, including searching for restaurants. According to a report by NRD (USA),

Millennials with children increased their visits to restaurants by 5% in 2018 over 2017, with 7.3 billion visits to limited dining restaurants made by Millennia in the United States. (Kelso, 2019). The dining behavior is also directly influenced by the location of the restaurant, factors like accessibility, visibility, locality, nearby attractions and facilities plays equally important role, while planning a restaurant consideration like visibility, population, economic conditions, and accessibility should be taken care of for better flow of client (Hanaysha, 2016).

While targeting young consumers, factors such as service quality, guest's privacy, branding & innovation in technology will have significant relationships with the overall selection of the restaurant for dining. (Scott Taylor Jr, 2017). Those born between the 1960s and 1980s are known as Generation X. This generation was born during the beginning of the growth of information technology in terms of technology utilisation. Personal computers, video games, cable television, and the internet had not yet evolved at the time. This new technology requires Generation X to adapt (Wisnubrata, 2021).

Self-Ordering Restaurant Service Terminals

Customers in the restaurant industry today and in the future are mostly millennials who are digital savvy. Fast food businesss must thus be able to capitalise on these chances. To develop an appealing future restaurant, businesses must be able to understand their

consumers via the use of digital technologies and analytics. The usage of a Self-Ordering Machine in a restaurant is an example of digital technology innovation. (Feinberg, 2016). A creative method for generating new ideas is known as innovation. Product, process, and business idea innovation, as well as a mix of the three, are all examples of business innovation. This novel concept has now become a realistic reality. In a changing corporate environment, innovation also entails a value system to fulfil client requirements. New ideas must be executed in order to provide beneficial results (Frey, 2020).

Self-Ordering Machines are interactive computer terminals that provide consumers with information such as the availability of various types of food to be ordered, menus, queue data, and more. Because the use of technology typically entails high expenses, the firm must undertake a cost-benefit analysis prior to implementing the technology. The advantage of consumers' own ordering devices is the reduction in waiting times. Once an order is placed, the information is promptly transferred to the kitchen via the self-ordering system. Moreover, customers actively determine the correct menu options to match their demands. Customers can test new goods which are not usually purchased. Self-ordering devices can also provide a list of dietary supplements in the meal menu and make modifications to the ordinary menu possible. (Touch Dynamic, 2019).

Impact of Self Ordering service method on Restaurants Performance

The installation of the Self-Ordering Machine in fast food restaurants has resulted in an annual rise of about 7% in users. According to Tilster (2019), 65 percent of consumers think that if a restaurant installs a self-ordering system, the frequency of their visits would rise. Customers prefer ordering from a kiosk over ordering from a cashier, according to the findings, since it saves time. (Kelso, 2019). McDonald's CEO Steve Easterbrook, stated that with the self-ordering machine, the company received an increase in revenue.

Self-ordering devices make it simple for consumers to select food simply glancing at the menus shown on the machine, making them feel more at ease. Customers will be allowed to pick a broader menu or be creative with an existing menu without anybody judging their decision. The operator can also use this technology to see whether a new menu is available. Operators can immediately determine whether or not the client enjoys the new menu. The new menu does not need to be replicated if the product is disliked. Customers' experiences can be improved and changed by using self-ordering devices. (Kelso, 2019).

Acceptance & Inclination of Generation Y & X towards self-ordering restaurant terminals

When it comes to predicting customer behavior, performance expectations are crucial. Customers must have trust in technology's ability to bring advantages to users. When utilizing this technology, users might feel more productive and at ease. Customers want technology to be simple to use, which is what business expectations are. As a result, the usage of Technology can help people obtain what they want faster and with less effort (Seo, 2020).

In general, the millennial generation evolves with the advancement of digital technology, making them more flexible than prior generations. The preceding generation was the X generation, who were digital immigrants, because they were born at the early phases of technology's introduction, which meant they had to learn something entirely new and alien. When it comes to purchasing and financial decisions, this generation X communication technique favours face-to-face interactions (Linnes & Metcalf, 2017).

The degree of personal trust that is organisational and technological infrastructure to enable the usage of the system are facilitating circumstances. Customers are worried about a variety of facilities, such as the resources and technology utilised in system implementation. The system that is built must be capable of removing the barriers that users encounter. Facilities that allow consumers to adopt a system, such as a feature to readily access the screen, are required in self-ordering devices. (Seo, 2020).

Unlike the X generation, the millennial generation is smarter in socializing and

actively uses technology. Technology acceptance readiness can be seen from various factors based on the theory of the Unified Theory of Acceptance and Use of Technology (UTAUT). The theory states that there are 4 factors that support the readiness of technology adoption, namely, performance expectations (PE), business expectations (EE), social influence (SI), and facilitating conditions (FC). The social influence factor describes how technology adoption may be facilitated if someone in a position of authority, such as a family member or coworker, utilizes it. The use of technology by influential individuals instills confidence in users that they will be able to get the same advantages and values as other users. Customer behavior will be influenced by social influence. Customers who have no prior experience with a product or service typically rely on information from family or coworkers so that they can eventually accept new technologies (Seo, 2020).

Research methodology

The comparative research technique was employed in this study to examine the preparedness of millennial and generation X customers to embrace self-ordering devices. The study was carried out in a McDonald's fast food outlet in Dehradun, the capital of Indian state Uttarakhand. During 2020, questionnaires were distributed to customers as part of the research. The UTAUT theory was utilized in this study to determine the preparedness to adopt self-ordering machines, which includes:

Performance expectations
Self-ordering machines can provide convenience and provide a sense of comfort in transactions

Business expectations
Self-ordering machines can provide fast and precise service, because it reduces ordering errors.

Social Influence
Consumers will use self-ordering machines if there are recommendations from people around them such as family and colleagues.

Facilitating conditions
Self-service ordering devices can give accurate menu descriptions with specific information, such as food components. Furthermore, these computers give information on prices, discounts, and methods for creating new menus.

Results and Discussion

The purpose of this study is to see if there is a difference in the adoption of self-ordering machines between the millennial and non-millennial generations. The independent t test was used for the tests, and the results are presented in table 1.

Table1 Independent Samples T test

Particular		Levene's Test for Equality of Variances		t-test for Equality of Means		
		f.	Sign.	t.	df	Sig. (2-tailed)
	Equal variances assumed	3.715	0.062	-1.427	34	0.159
Performance Expectancy	Equal variances not assumed			-1.399	31.295	0.167
	Equal variances assumed	1.262	0.245	-1.254	34	0.202
Effort Expectancy	Equal variances not assumed			-1.262	32.45	0.211
	Equal variances assumed	0.006	0.896	-1.137	33	0.222
Social Influence	Equal variances not assumed			-1.129	32.459	0.217

	Equal variances assumed	0.509	0.438	-1.265	34	0.203
Facilitating Conditions	Equal variances not assumed			-1.301	32.112	0.209

For all components investigated, the independent t test results reveal a significance value greater than 0.05. These findings suggest that there is no difference in the readiness of the millennial and X generations to use self-ordering devices. Performance expectations are the first component of UTAUT. There was no difference in performance expectations between the X generation and the millennial generation, according to the findings. Both generations say that the usage of self-ordering devices may give convenience to their users since clients feel confidence in their advantages when they utilise these machines. There was also no change in organizational policies, according to the findings. Both generation X and millennials claim that self-service ordering devices may save time and prevent ordering mistakes. When it comes to making orders through self-service machines, all generations share the same characteristics: they pay heed to ideas and recommendations from individuals in their immediate surroundings, such as family and coworkers.

The features discovered in self-ordering machines also indicate a willingness to embrace self-ordering machines. Both generations claim that the acceptance of this machine is the result of appropriate amenities such as a menu display. explains full and accurate food facts, as well as price and discount information. Self-service ordering Customers may also use the devices to create new menu items. The differences between generation X and the millennial generation will have an influence on

Conclusion

The generation born at the start of the growth of information technology, must adjust to these new changes. Millennials, as opposed to the X generation, this generation was born simultaneously with the advancement of information technology, therefore it is tech-savvy. smart qualities They have a strong grasp of technology.

In fast food restaurants, technology is also used to produce a technical innovation on how to order food using self-ordering devices. Customers may place orders and make payments independently using a self-service ordering machine. There is no discernible difference between generation X and the millennial generation in terms of preparedness to accept new technologies. Both generations claim that using self-ordering devices would simplify the ordering procedure and offer a sense of ease because the ordering process is fast and exact. Furthermore, these devices allow consumers to build their own menus.

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ANALYTICAL INVESTIGATION OF THE PSYCHOLOGICAL ENVIRONMENT CREATED BY INTANGIBLE SERVICE OFFERINGS AND ITS IMPACT ON MILLENNIALS DINING EXPERIENCE.

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ABSTRACT

Modern day restaurants offer multiple service offerings which are tangible as well as intangible in nature, this research work is dedicated towards analysing the impact of both the components in achieving millennials satisfaction while dining out. For the research millennials falling under the age bracket of 22 to 42 were chosen from selected casual dining restaurants of Uttarakhand, India. A questionnaire based on five point Likert scale was utilized to get the data pertaining to consumer perception, further secondary data was abstracted from existing literature in the form of research work and reports. The research outcomes communicate the importance of psychological environment created by intangible service offerings and present a model for achieving guest satisfaction specific to the millennial consumer.

Keywords: Intangible service components, Psychological environment, Physical overview, Guest satisfaction, Millennial consumer

Introduction

The restaurant industry's primary focus is no longer on the type and quality of food served to customers. It's also about the overall dining experience and service quality, which is largely intangible but highly visible. A variety of factors influence a customer's decision to eat at a particular restaurant. These factors are divided into two categories: tangible and intangible factors. [1] Customer service, staff behaviour, and high customer convenience are some of the non-quantifiable factors that influence customer experience and retention. [2] The gap between a customer's expectations and what a restaurant can provide him is an area where a restaurant can capitalize. On the other hand, it is a challenge. [3] Restaurants are no longer just places where people go to eat; they have evolved into a lifestyle necessity as well as a platform for socializing and entertainment. As a result, the physical as well as psychological environment offered by the restaurant should be able to resonate with respective brand's vibe.

The country's food services market is worth Rs 3,09,110 crore, according to the NRAI India Food Services Report, and is expected to grow at a compounded annual rate of 10% to close to Rs 5,00,000 crore by 2021.The fine and casual dining segments are expected to grow by more than 18 percent to 20% and 15 percent to 17 percent, respectively. This expansion is powered by a young, technologically advance young middle class that is ready for new dining experiences. Millennials account for 443 million people in India, while Generation Z accounts for 393 million. A higher proportion of a young population, as well as growth in the dual economy households with a fixed income and nuclear families has resulted in a shift in consumption patterns, longer travel time from work, and the need to socialize and have a lot of money to spend has resulted in a demand for eating out options. [4] The food service industry is estimated to be worth USD 48 billion, with a 10% annual growth rate. There is less time to prepare meals at home. increasing accessibility and affordability Growth has been fueled by disposable income. Quick Service Restaurants (QSR) and Fast Casual Restaurants (FCR) between 2016 and 2020, there was a 22% CAGR in casual dining. According to a report published by FICCI, 60 percent of restaurants close their doors within the first year of operation, and up to 80 percent close within the first five years. Running a restaurant business, no matter how lucrative it appears from afar, is a difficult task. [5] These figures may force us to wonder, 'Why Restaurants Fail?' on a regular basis. Restaurants fail as a result of a lack of proper knowledge about what consumer wants? The key area to concentrate on in this scenario is to understand all the factors involved in

generating satisfaction among restaurant users. Most restaurateurs are unaware about what they are performing incorrectly until it is too late. The restaurants managers fail to understand the resources need to employ in different segments of the restaurant, this leads to mismanagement and losses. The key to attain profit is always through guest satisfaction, understanding the factors involved in desired dining experience is the basis of success in restaurant industry. Restaurants offer a mix of service components characterized as tangible components and intangible components;

Tangible Components of restaurant service – Restaurants offer multiple tangible service components like Physical overview, the location of restaurant, parking space, Restaurant waiting area, Seating arrangements, wash room, Lighting arrangements, temperature control and provision of recorded or live music. All these above listed components can be seen or experienced and are critical towards providing desired dining experience. [6] The served food and beverage also represent the tangible service component specific to restaurant business in combination with few of the service gears like crockery, cutlery, glass ware and other essential equipment's involved in service or consumption of prepared food and beverage. Restaurant often use above listed tangible components to showcase their theme and core values, further the tangible components builds the repo and helps in positioning of the restaurant brand among targeted market.

Intangible Components of restaurant service – Modern day restaurant try their level best to offer certain very critical service elements that are intangible in nature but without these the restaurant service becomes an affection less transaction in which you pay for food/beverage and in return get served the same. [7] Following are some of the special service components which are fused in the overall restaurant experience, components which are intangible cannot be seen or tasted but play a vital role in creating desired dining experience.

Warm Welcome – The way guests are received at the reception desk plays a crucial role in setting up the tempo for upcoming dining experience. [8] A warm welcome received at the entrance helps in building positive image of the restaurant and helps in providing the feel of being special to the guest. Making the guest feel special is critical for any service outlets and when it comes to restaurants it is of utmost importance. [9]

Belongingness - The feel of belongingness among the guests is critical towards providing guest satisfaction and retaining guests in restaurant business. [10] Small but very important service traits like – Calling the guests with their names, remembering their preferred sitting space, favorite food item and specific requirements makes the guest feel recognized and this in return gives the restaurant a chance to satisfy the guest which leads to guest retention.

Empathy and genuine care – One of the very important characteristic of restaurant service is being genuinely careful about guest's requirement and needs. [11] The guest who is comfortable in the restaurant environment due to empathy and care showcased by service staff are more likely to enjoy the overall restaurant experience, service with care and affection is a real key behind gaining guest confidence, genuine care makes the guest believe in brand philosophy and values, guests with full confidence in restaurant products and service are the real image builders, their word of mouth is critical in gaining business out of cut throat competition.

Attitude and Behaviour of Service Staff – The attitude and behaviour of service staff starting from the attendant at parking lot to the steward who does the food service and takes care of the billing procedure, matters a lot. [12] Restaurants are prone to human errors, issues related to food quality and service can be recovered and service recovery can be performed with positive attitude showcased by service staff. [13] Politeness, ability to communicate and empathy elevates the overall service standards. [14]

Found Farewell – Restaurant business unlike other businesses depends highly on guest experiences, once the guest checks out of the restaurant, all the derive value remains with them in the form of Good/bad experiences. [15] Found farewell received while departure from the restaurant creates memories and positive memories creates unforgettable

experiences which is a must for all the modern day restaurants.

The Millennial Consumer - Millennials are people born between 1980 and 2000 who grew up with access to social media, smartphones, tablets, and all other forms of digital technology available today. Studies show that by 2020 [16], Millennials will account for half of the Indian workforce, and by 2025, they will account for seventy percent. [17] Millennials have taken the lead in all consumer markets around the world. This generation, which accounts for nearly 27% of the world's 7.4 billion people, is a major motivator within consumer markets, driving them toward rapid growth and development. The contribution of millennials to the Indian consumer market is particularly noteworthy. In India, this social group accounts for nearly 34% of the population, and unlike in other developed countries, this generation is one of the primary wage earners in households. As a result, Millennials are one of India's most important target markets for consumer goods companies and retailers. [18]

According to a CBRE survey, the majority of Indian Millennials in cities, including Delhi, dine out at least three times per month. A survey of over 1,200 restaurants in key areas of Delhi/NCR, Mumbai, and Bengaluru was conducted. It was discovered that 60% of Indian Millennials eat out at least three times per month. [19] There are two takes from above mentioned facts, number one the food and beverage industry have a great impact on Indian economy, and it is poised to be one of the great contributor both in the terms of finance and employment generation, further we can see the potential impact of Millennials in the consumer market with their numbers as well as ability to spend.

Millennials being socially active, [20] give weightage to human qualities and attributes, such intangible service features play a critical role in achieving millennial satisfaction while dining out. [21] The psychological atmosphere of restaurant observed due to intangible service components deals with millennials urge to be understood in all possible means. While making dining out decisions, millennials with their dependence on technology towards making most of their choices still give regards to personal experiences and word of mouth from friends and family members. [22] The Indian subcontinent's population dynamics add to the intrigue; the Indian population is led by the youth, who have the greatest presence and purchasing power. Indian youth constitute a sizable proportion of the working population, requiring all businesses to be aware of their specific needs and desires. They are more interested in technology and value behavioural aspects over physical traits, [23] their desire to stay socially active drives businesses to seek out new and more personal business solutions.

In light of the foregoing, the research is aimed at determining the value created by modern day restaurants in India. The study looks into the major factors that contribute to customer satisfaction while dining out, as well as how customers perceive the intangible service efforts in restaurants and how it enhances their dining experience. To achieve the objective a well monitored questionnaire based on 5 point Likert scale was used, the survey was conducted among consumers falling in the millennial cohort and specifically those who regularly dine out in the selected casual dining restaurants in Uttarakhand, India. The study is structured in 5 section, section 01 discusses the concept of tangible and intangible service features, specific to restaurant industry, further it sets the tempo for following research work, section 02 is dedicated towards reviewing already existing literature that talks about components involved in guest satisfaction in restaurants, section 03 discusses research methodology, objectives and need of conducting this research, section 04 displays and interprets collected data, section 05 looks into the discussion and future scope, the research ends with the managerial implication.

Literature Review

Food and Service Quality - The Guest satisfaction is influenced by food quality, perceived environmental quality, and service quality. However, the quality of interpersonal interactions has a negligible impact on satisfaction. [24] It was noticed that the food quality in restaurants derive the guest satisfaction majorly, other components that have significant impact on guest satisfaction is being the quality of service and dining

environment. [25] The millennial consumer depicts different set of characteristics, what matters to them most is the quality of interaction they receive in the restaurants, the way service staff deals with the query and complaints and fluency in service flow makes it suitable for them. [26] Millennials pay attention to the value created by the quality of food and service, while dining out they don't mind paying a little extra in return of quality dining experience. [26]

Food quality can be assessed through some of these critical features like Presentation, Eye Appeal in the served meal, freshness in the ingredients, authentic taste and texture, use of organic ingredients further improves the level of dining experience. [27] While understanding the eating out pattern of Indian millennials it was noticed that their perception towards healthy meals and menu options is setting up the tempo for a new sector in the restaurant industry, the health driven dining out options create value through up to date healthy menu options which adds on to the overall food quality. [28] Millennials now have sufficient disposable income [29], this makes them to choose best of the dining outlets, there preference has been switched to comfort and quality, with good amount to spent on dining out this cohort is looking for quality experience [30]. Timely delivery of food, smooth billing process and overall flawless restaurant service enhances the quality of dining experience, this in return builds the re visit intention which is a must have proposition for modern day restaurants all over the world. Following hypothesis can be planned looking at the studied literature

H1: Food and Service quality positively impact millennials dining experience.

Restaurants Physical Environment – Restaurants offer multiple physical features starting from the parking space, reception/hostess desk, seating arrangements and décor [31], restaurant ambience, color theme, lighting, temperature control and provision of live/recorded music all contribute towards the physical environment offered to the consumer [32]. Restrooms, smoking rooms, separate kids zone and other physical features offered by restaurants have a positive impact on customer perception [33]. Millennial consumer is noticed

to be value driven, physical overview is a necessity but fails to create value in lack of quality experience [34]. Millennials pay special attention to the tangible components of restaurant service, parking space, Seating arrangements, condition of washrooms plays a crucial role in attracting millennials restaurant patronage [35]. Millennials are particular about the restaurant aesthetics, features like the color theme of the restaurant, quality of seating arrangements and provision of music adds on to their dining experience [36]. The quality of service equipment's used by the restaurant like Table ware, linen, Crockery, Cutlery and glassware positively impact guest satisfaction [37], it was noticed that millennial do give weightage to the restaurant aesthetics but derive value through features like food quality, Service quality and interaction quality [38]. Following hypothesis can be planned looking at the studied literature

*H2: Restaurants Physical Environment positively impact millennials dining experience.*

Intangible components and Psychological Environment – As discussed earlier restaurants offer multiple intangible features, these service features when combined together forms the psychological environment [39], features like warm welcoming, the feel of belongingness, empathy and genuine care showcased by service staff, behaviour of service staff and found farewell received by the guest plays a crucial role in generating satisfaction and retention [40]. Millennials want to be connected and recognized in a social setting, recognizing them and calling them by their names creates a very positive impact [41], Millennials when feel comfortable in a restaurant setting, tend to relax and feel free to interact with the service staff more easily, this in return helps the service staff to recognize guest needs in detail and further creates ideal dining atmosphere [42]. Millennials are looking for true experience, the extra care received while dining out creates positive memories [43], the way service staff makes the guest feel special makes the real difference, knowing what guest needs, understanding their preferences, and making the necessary arrangements in advance creates positive psychological environment and makes the

guest feel taken care of [44]. Following hypothesis can be planned looking at the studied literature

H3: Restaurants Physical Environment positively impact millennials dining experience.

For now, we know that service features like Food and Service quality, Physical Overview and Psychological environment of the restaurant has some significant impact on millennial dining out experience, now it becomes crucial to evaluate the level of impact of all these aspects individually. For restaurant owners it is very critical to understand the factors that matter the most, initially the

investment can be curtailed by spending on the assets that are very crucial towards generating guest satisfaction. Restaurants tend to invest heavily on physical features but lack in providing desirable intangible components of service, this study will help the restaurant owners and managers in managing their resources specifically towards what guest actually needs. Salient service feature that doesn't require much of monitory inputs can be significant in achieving guest satisfaction, the better understanding of such components will empower the restaurant managers in planning restaurant SOP's for better guest handling and delivering value in limited budget.
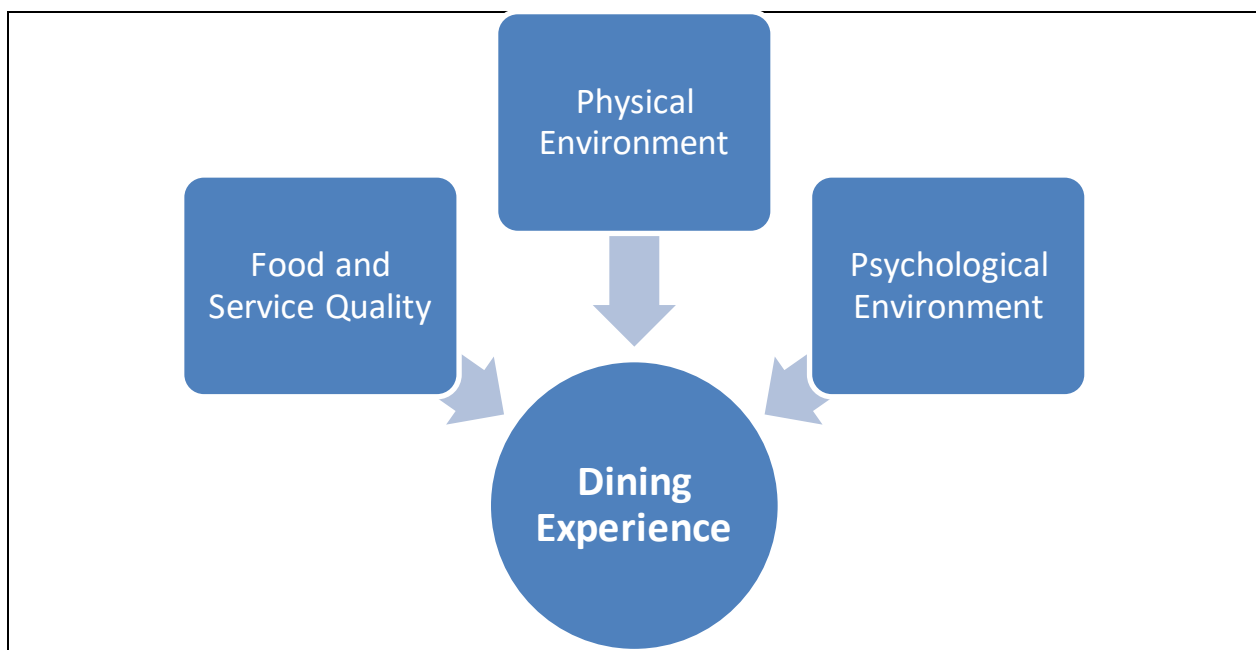
Figure 1. Research Model

Research Methodology

Sample and Data Collection

The study was carried out in five major cities of Uttarakhand - Dehradun, Mussoorie, Rishikesh, Haridwar, Haldwani and Nainital. The above listed cities were chosen because they host good number of casual dining restaurants and these accommodate maximum percentage of millennial consumers in the form of local residents, students and tourists from other part of country. Customers who frequently dine out in the selected casual dining restaurants and fall under the age

bracket of 22 to 42 years were requested to participate in the study. 344 questionnaires were distributed out of which 320 questionnaires were received back. The questionnaire was divided into three sections: Section A (independent variable), Section B (demographic profile), and Section C (dependent variable). The questionnaire's used the Likert scale and a semantic scale to assess the degree of agreement of the respondents with the statement. The survey was conducted Within two months; the information was gathered between February to March 21.

Table 1. Selected restaurants for the study

S.No	Name of The City	Names of the selected Restaurants
1.	Dehradun	Kalsang Ama café, Orchard, Café De Picolo, Salt & Cravings, Town Table
2.	Mussoorie	Little Lama Café, Urban Turban, Café Ivy, Café De Tavern
3.	Haridwar	Ganga Lahri, Captains Cavalry, Ksheer Sagar, Freedom Ganga Café
4.	Rishikesh	The Sitting Elephant, Ira's Kitchen & Tea Room, Chatsang Café The 60's Café, Little Buddha Cafe
5.	Haldwani	Pots & Stones, Himalayan Roots, Urikao
6.	Nainital	Zooby's Kitchen, Café Chica, Café Lake Side, Moti Mahal

Data Representation and results

Demographic Information- Table 2 shows the demographic information and demographic profile of the 320 customers who responded to the survey.

Table 2. Demographic profile

Demographic Variables	Categories	Frequency	Percentage
Gender	Male	170	53.12
	Female	150	46.87
Age	20 - 25	45	14.06
	25-30	78	24.37
	30 - 40	149	46.56
	35 - 42	48	15
Marital Status	Single	148	46.25
	Married	172	53.75
Income/Annum	Under 200000	48	15
	Under 400000	176	55
	Under 500000	78	24.37
	Above 500000	18	5.62
Occupation	Student	45	14.06
	Private Sector	181	56.56
	Government	82	25.62
	Self- Employed	12	3.75
Frequency of Visit	More than twice per Week	160	50
	Once Per Week	120	37.5
	More than twice per Month	25	7.81
	Once Per Month	15	4.68

Hypothesis Testing and Findings

The research hypothesis was tested using a Partial Least Square (PLS) based on structural equation modeling. The significance levels for loading, weights, and path coefficients were determined using Smart PLS 3.0 and a bootstrapping technique. The validity and goodness of the measurement model were tested first, followed by an examination of the relationships outlined by the structural model,

according to the two-stage analytical procedure proposed by [45].

Measurement and model estimation

The measurement model of all constructs was checked for reliability, convergent validity, and discriminant validity before testing the hypothesized model. The values obtained from the measurement model analysis are shown in Table 3. All of the loadings in Table 2 are greater than 0.70. For all constructs, the

average variance extracted (AVE) was greater than 0.5, and the composite reliability scores (CR) were greater than 0.7. As a result of this, we can conclude that there is convergent validity.

Table 3. Measurement Model

Construct	Item		Loading	AVE	CR
Food & Service quality	FQSQ1	Quality & taste of served food adds on to the dining experience	0.841	0.702	0.912
	FQSQ2	Effective restaurant Service elevates the restaurants image	0.822		
	FQSQ3	Freshness of ingredients used represent food quality & is necessary for desired dining experience	0.844		
	FQSQ4	Proper Order taking and timely delivery of food & beverage items is crucial towards gaining satisfaction while dining out	0.798		
	FQSQ5	Restaurants Food & Service quality is the most crucial factor behind my patronage	0.799		
Physical overview	PO1	Restaurants design, layout & amenities (Wash room, waiting area) contributes toward overall restaurant experience.	0.771	0.618	0.861
	PO2	Seating arrangement & availability of different sitting space choices positively impact my overall restaurant experience.	0.856		
	PO3	Restaurant Theme, Lighting and Temperature Control contributes positively towards restaurant experience	0.802		
	PO4	Restaurants location, parking space & accessibility is critical towards choosing the restaurant for dining out.	0.812		
	PO5	Restaurants physical environment has a positive impact on derived satisfaction while dining out.	0.798		
Psychological Environment	PE1	Warm welcome received while entering a restaurant builds a positive outlook towards the upcoming dining experience.	0.812	0.68	0.822
	PE2	Acts like remembering your name, your favorite dish, preferred dining area & other specific requirements make you feel special & adds on to the overall dining experience.	0.821		
	PE3	The way service staff makes you feel special will overcome any issue pertaining to food quality or service error	0.878		
	PE4	Sense of urgency towards your requests & needs creates a positive impact on the dining experience.	0.888		
	PE6	Positive psychological environment adds to the overall restaurant experience that results in enhanced satisfaction while dining out.	0.879		
Guest Satisfaction	GS1	I will prefer the restaurant due to its Food & Service quality	0.799	0.789	0.912
	GS2	Restaurants physical features are critical towards ideal dining experience	0.884		
	GS3	The intangible efforts from service staff has created memories	0.886		
	GS4	I will for sure re visit this restaurant	0.788		

GS5	I will further promote this restaurant among my friends and relatives	0.789

FQSQ = Food & Service quality, **PO =** Physical overview, **PE** = Psychological Environment, **GS** = Guest Satisfaction

Table 4 shows the results of the discriminant validity test. Each construct's AVE was found to be greater than the model's correlation with any other structures. The Heterotrait-Monotrait (HTMT) ratio of correlations was proposed by Henseler, Ringle, and Sarstedt as an alternative approach to evaluating discriminant validity. This criterion is met by all constructs, as shown in Table 4. This means the constructs have discriminant validity. Value of less than 0.85 indicated that there was a sufficient discriminant validity.

Table 4. Discriminant validity

	Food & Service Quality	Physical Overview	Psychological Environment	Guest Satisfaction
Food & Service Quality	■			
Physical Overview	0.601	■		
Psychological Environment	0.599	0.619	■	
Guest Satisfaction	0.545	5.456	0.535	■

Table 5 shows the loadings of all constructs that meet this criterion. As a result, we can conclude that discriminant validity has been achieved.

Table 5. Cross Loading

	Food & Service quality	Physical overview	Psychological Environment	Guest Satisfaction
FQSQ1	**0.841**	0.422	0.451	0.511
FQSQ2	**0.822**	0.511	0.525	0.402
FQSQ3	**0.844**	0.585	0.511	0.371
FQSQ4	**0.798**	0.484	0.402	0.511
FQSQ5	**0.799**	0.425	0.371	0.585
PO1	0.451	**0.771**	0.398	0.484
PO2	0.525	**0.856**	0.471	0.425
PO3	0.511	**0.802**	0.511	0.398
PO4	0.321	**0.812**	0.389	0.471
PO5	0.412	**0.798**	0.333	0.521
PE1	0.398	0.532	**0.812**	0.511
PE2	0.551	0.417	**0.821**	0.321
PE3	0.402	0.454	**0.878**	0.412
PE4	0.371	0.365	**0.888**	0.398
PE5	0.398	0.316	**0.795**	0.551
PE6	0.471	0.511	**0.879**	0.565
GS1	0.521	0.585	0.511	**0.799**
GS2	0.511	0.484	0.585	**0.884**
GS3	0.389	0.456	0.511	**0.886**
GS4	0.333	0.469	0.585	**0.788**
GS5	0.421	0.354	0.484	**0.789**

FQSQ = Food & Service quality, **PO =** Physical overview, **PE** = Psychological Environment, **GS** = Guest Satisfaction

Structural Model Estimation

The t-values were generated using a bootstrapping procedure with 5000 resamples to estimate the structural model. The structural model is shown in Figure 2, and the hypothesis test results are shown in Table 6. As shown in Table 6, there is a positive association between Food & Service quality and guest satisfaction (β= 0.252, p < 0.01). Guest Satisfaction is also positively related to Physical Overview (β= 0.222, p < 0.01). The psychological environment of restaurants and guest satisfaction are also linked (β= 0.221, p < 0.01). As a result, H1, H2, and H3 were found to be true.

Figure 2. Structural Model
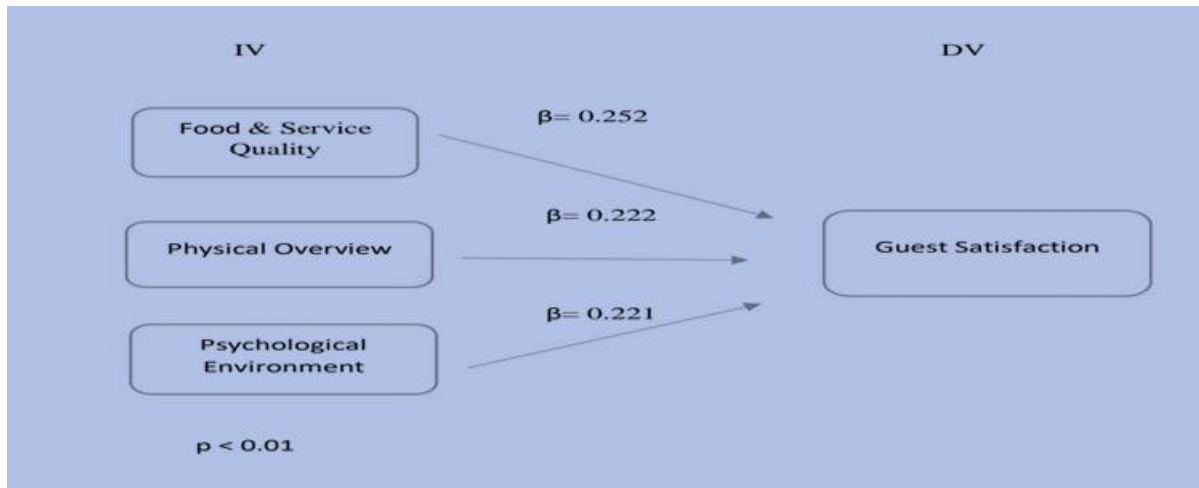
Table 5. Hypothesis testing outcomes

Hypothesis	Relationship	Std Beta	Std Error	T-Values	LL	UL	Interpretation
H1	Food & Service quality -> Guest Satisfaction	0.249	0.055	4.268	0.151	0.349	Supported
H2	Physical Overview -> Guest Satisfaction	0.222	0.058	3.872	0.133	0.319	Supported
H3	Psychological Environment -> Guest Satisfaction	0.226	0.051	4.108	0.139	0.311	Supported

Std = Standard, LL = Lower Level, UL= Upper Level

Discussion and future scope

The current study's findings revealed that all of the factors examined have a positive impact on millennials' dining habits. This result is in line with previous empirical studies and the literature. The study, which measured the perceived impact of employee conduct on customer quality perceptions and overall satisfaction, as well as other restaurant-related stimuli, also demonstrated the impact of service staff behaviour. There are few interesting outcomes also, the impact of intangible service features in the form of psychological environment was found to be one of the major contributor towards millennial satisfaction while dining out, in presence of quality food and service the humanly touch provided by the service staff plays a very important role in deriving ideal dining atmosphere, the guests are very much influenced by the physical overview of the restaurant but they do give importance to the psychological environment created by service staff by using intangible service traits.

Chart.1 Millennial's perception towards Intangible Service Component.

THE WAY SERVICE STAFF MAKES YOU FEEL SPECIAL WILL OVERCOME ANY ISSUE PERTAINING TO FOOD QUALITY OR SERVICE ERROR

- Disagree 4%
- Strongly Disagree 4%
- Can't say 6%
- Agree 18%
- Strongly Agree 68%
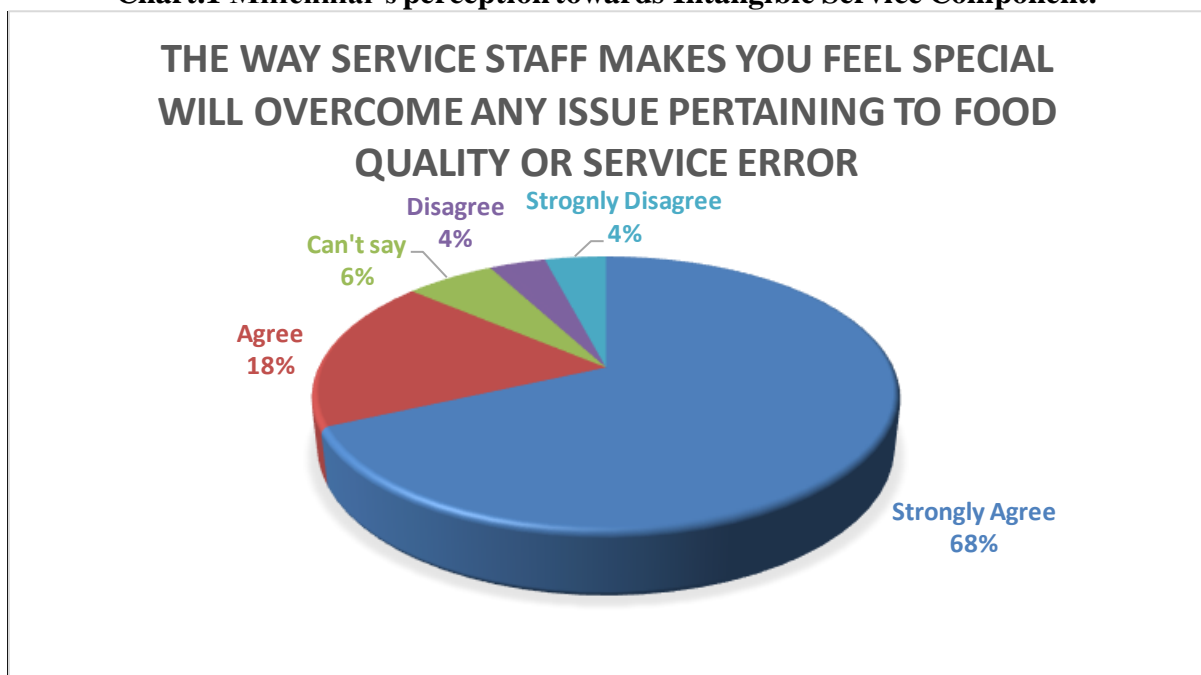
When it was asked that the personalized behaviour and intangible service offering can resolve the issues pertaining to food quality and service errors, most of the millennial respondents were found to be positive regarding this. It can further be concluded with the assessment of psychological environment as a critical aspect in creating ideal dining atmosphere for millennial population.

Scope of future research

As a scope for future research, the impact of intangible service components can be analyzed on consumers from different age brackets, consumers from generation Z now hold the second position in the market in terms of numbers and capacity to pay, this makes them a good study area, Further the impact of psychological environment can be studied in the field of retail sector as it also involves lot of service interaction and personal touch is deemed to be critical in achieving customer satisfaction.

Managerial Implications

As discussed in the introduction part, running a restaurant is not at all an easy task, running a restaurant profitably is all about using the available resources effectively. Setting up the physical aspect of restaurant is a very costly affair, keeping the initial investment low is the key in restaurant business for the same manager can train their service staff to enhance the psychological environment of the restaurant

with the help of intangible service features, this will work as shield in case of any service error the service recovery can be performed and guest can be retained. Managers can work forward towards creating a balance in Physical aspect, Food and service quality and most importantly the psychological environment that is driven by the intangible service features, this will help in keeping the initial investment low and will provide better personalized service solutions to the end consumers.

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RECRUITMENT METRICS AND ITS ATTAINMENT: A STUDY ON INDIAN PHARMACEUTICAL INDUSTRY

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ABSTRACT

In this research article, the author focuses on application of recruitment metrics to complement the recruitment results. In recruitment metrics we combine the sources like recruiter, referral, campus hiring, LinkedIn, twitter, Facebook (social media sites), WhatsApp to instantly share job description, digital brochures to share relevant information via mobile to understand the basics of job details as an analysis of seniority, position, salary, experience level, company website, required skills and quality of hires was applied to the hiring process. The quality of the recruitment was measured based on the results of the employee performance appraisal system which assessed it at regular intervals during the employee's tenure. To measure the quality of hiring, the six independent variables are i) Knowledge on the job, ii) Skill level, iii) Execution of work, iv) Initiative of an employee, v) Customer orientation, vi) Low performance score. The authors also presented analysis of recruitment outcomes and found significant differences in recruitment outcomes. Data was collected using convenience sampling or availability sampling, a non-probabilistic sampling of various Pharmaceutical sales company (n = 34) with a sample size of (n = 1027). The authors presented an analysis of candidate survey scores using a five-point Likert-type scale, and a similar scale was used to measure the quality of recruitment using the performance appraisal system.

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Keywords: Recruitment, Recruitment metrics, Social media, Pharmaceutical Industry, sales force

Introduction

Recruiting is a process of hiring new staff, the best of job applications received from internal or external sources in a timely and cost-effective manner. The recruitment process includes analyzing job requirements, notifying positions and filling out the application, selecting and selecting the application, and, after hiring, integrating new employees in the institution. In general, certain hiring metrics will be followed during the hiring process to select the most suitable candidate for the position in question. However, recruiting metrics and hiring outcomes differ from organization to organization, from position to position, and are strongly related to an organization / industry's vision and mission. Raghavi, Gopinathan (2013) defined that recruiting consists of finding a diverse candidate survey with the required qualifications, potential job opportunities and communicating with candidates. The hiring and selection process are two different concepts in HR practice (Taylor 2006). The hiring process begins with identifying the needs of new employees and ends when a candidate applies for the vacancy. Furthermore, the selection process will decide which of the candidates is the most suitable for the position in question (Armstrong, 2014). Requirements definition, recruitment planning and candidate attraction and selection are the stages of recruitment (Armstrong, 2006). Armstrong (2009, 2006, 2014) proposed a two-step recruitment process. Some organizations use evidence-based and data-based decision making in hiring, which is an efficient way to move from IT to healthcare, medication and education (Baba and Hakeem Zadeh, 2012; Mandinach 2012). In the recent past, due to technological innovations and fierce business competition, there have been rapid changes in hiring strategies and the shift from supporting role to central role in various organizations

Therefore, organizations use recruitment metrics to make the recruitment process more efficient. Organizations are taking a more strategic and analytical approach to recruiting to create more efficient staff and enjoyable, long-lasting employees. An organization needs greater efficiency, effectiveness in hiring, and the metrics used must be aligned with the organization's business, vision, mission and goals.

Some organizations develop an Application Tracking System (ATS) to provide the

information needed to improve the hiring process and have pointed out that the technology does not allow recruiters to collect all relevant information and required data from one place and all data are not available in ATS (Pritha Sen, 2019) Manpower Group Solutions has proposed transactional-to-transformational recruiting strategy metrics for efficient recruiting (MGSD, 2015). This framework emphasizes the practical realities of bargaining with visionary and actionable metrics that meet current business standards. Transactional metrics allow business units to establish a baseline and represent an opportunity to define successful measures for the smooth running of operations. Most traditional metrics have resulted in missed opportunities to raise the bar for various reasons. The transformational model of contractual models is based on three concepts: consolidate, optimize and transform while maintaining the vision of the future

Recruitment metrics

The basic idea of recruitment metrics is to establish a standard form of measurement. Recruitment metrics is tools which are used to make better hiring decisions to receive the better return on investment. Using metrics, information it will be compiled, analyzed and effective hiring decision. Recruitment metrics are quantifiable and can compare the benchmark established by focusing on the candidate quality. Recruitment metrics are the standards of measurement that HR professionals to collect, analyze and present valuables information during the hiring process, but the organization varies to the organization. These statistics can be used to improve make recruiting / hiring decisions to receive the best performance investment. The characteristics of the recruitment used the metrics are: the metrics must be actionable and predictive, consistent, provide a benchmark for internal performance, open to comparison between peers Importance of Recruitment Metrics

Provide critical information to the management team e provide information on corporate strategies; improve the HR standards to align your business goals; Development aid strategies for focusing on what is important and what is expected. Allow effective and efficient use of the limited available resources with a high corporate impact and continuous improvement of the recruitment process. Recruitment Metrics are used to improve the hiring process, which helps align the right goals, vision and mission of a organization. Metrics also provide credibility as well consistency with the recruiter, who pushes the organization a pursue aggressive hiring strategies responsibly.

Review of Literature

The hiring process varies from organization to organization and totally depends on mission and vision of the organization / institute. The society for human resource management (SHRM) one of the largest the professional company has developed the acquisition of personalized talent and benchmarking guide for procurement and recruitment. This process can be used for all sectors and of all staff size (SHRM, 2017). Solutions connected to talent proposed metrics to measure the impact of hiring for small and medium-sized enterprises (contractors Metrics reference sheet, 2012). A new and proactive approach using metrics to build an effective hiring process, what to measure and how to measure.

Management was developed by David Earle (2012). Dutta et al.(2015) critically reviewed and presented the results of their case study on improving the quality of recruiting through metric. Davenport et al. (2010) emphasized the idea of talent analysis and recruiting competition. Recruitment quality was measured by the studying the measured performance appraisal system using multinomial logistic regression analysis.

Methodology

Hypothesis

Ho: There is no significant relationship with recruitment metrics and quality of hire.
H1: There is significant relationship with recruitment metrics and quality of hire

Sample Size and Sampling Methodology

Data collected based on the recruitment / hiring requirements of 32 companies and candidates for a total of 1027. We used convenience sampling (or availability sampling) a specific type of non-probabilistic sampling method that

is based on the collection of data from members of the population who are conveniently available to participate in the study. The demographics of the sample are 84% male and 16% female.

Identifying Vacant Position and Hiring Needs Recruitment starts with identifying the hiring needs of an organization. The vacant positions can come from backfilling of left employees, expansion, acquiring of new infrastructure, machinery, software, to enhance the current team and acquiring of new technology etc. Employee turnover rate, time to hire and time to fill can help the hiring managers and organization management. The vacancies foreseen are estimated from the turnover rate and HR can collect the positions across the organizations. The organizations historic data of last 2-3 years formed a basis for estimating the hiring needs. Time to hire a specific position is also useful for recruitment process and this measure also used in our study.

Identifying Job Vacancies and Hiring Needs Recruiting begins with identifying an organization's hiring needs. Vacancies can result from the replacement of abandoned employees, expansion, acquisition of new infrastructure, machinery, software, to improve current equipment and the acquisition of new technologies, etc. Employee turnover rate, hiring time, and fill time can help hiring managers and organization management. Expected vacancies are estimated by the turnover rate and HR can pick up the positions in all organizations. Historical data from organizations over the past 2-3 years provided a basis for estimating hiring needs. The time to take a specific position is also useful for the hiring process and we also use this measure in our study

Recruitment Planning

The recruiting team will plan the necessary recruiting actions, including schedule, jobs, to be hired at the right time. The recruitment plan includes the responsibilities of each team involved, the job description, the interview process. The Candidate Pipeline Conversion Rate gives management an idea of how many applications must be received to achieve a successful hiring. The process also includes pre-selection discussions, product-based interview, technical and final interview.

Job Advertisement and Channel Selection

Detailed job advertisements will be developed and channels for advertising will be selected. Care must be taken that the ad reaches the right group of candidates. Candidates' comments, references, source of candidates, job board and response rate will be taken into consideration during the internship.

Interviewing and Hiring

The interview stage where qualified candidates will be interviewed using certain metrics, interviews can be face-to-face, written, oral, technical, hands-on, group and position based. After the interview, recruitment will take place once the suitable candidates have been identified. This includes making an offer to the candidate and also to the candidate who accepts the offer. Sometimes the candidate may reject the offer and the organization must find reasons to reject the offer.

Recruitment Metrics used for this Study

The bottom line of a good hiring process is to keep the metrics simple rather than including too many factors in planning the metrics. This process can be overwhelming and dilute the decisive results. We have identified a baseline and proposed to measure these measures. The combination of sources consists of recruiter, referrals, campus hiring, connected RPO, contract coverage, aging analysis, and candidate satisfaction score.

Measurement of Candidates Satisfaction Survey Sore

A five-point Likert-type scale is used, where Strongly Disagree is 0 and Strongly Agree 5. Thirty questions have been prepared, covering six factors for candidate satisfaction survey scores, ie information for the candidate, interviewer, interviewer preparation, recruiter information, timely responses, met and an excellent, recommended model, and the questionnaire was distributed. The results are presented in the Table given below. Measuring the quality of recruitment using the performance appraisal system The quality of recruitment was an outcome score measured using the performance appraisal system. A

five-point Likert-type scale is used where Strongly Disagree is 0 and Strongly Agree 5. Thirty-five questions, based on six independent variables Job knowledge, skill level, job execution, employee initiative, orientation to the client Teamwork, practice a variable result depending on the Performance Score / Qualification of the Performance Evaluation System. The score was measured as Outstanding, Excellent good, Satisfactory and Needs improvement. The performance appraisal system varies from one organization to another and from one institution to another. Therefore, before conducting the analysis, the variables of the standardized performance evaluation system and the most common variables in the whole performance are evaluated and were considered following the procedure of Prasad (2019). The results presented in Table 2 indicate the outcome of different combinations of sources such as recruiters, referrals, campus recruitment, LinkedIn. The recruiter and referral from market are the most dominant hiring strategies and outcomes.

Results

The results presented in Table 2 indicate the outcome of different source mixes like recruiter, referral from market, campus hire, LinkedIn. The Referral and Recruiter are the most dominant hiring strategies and accomplishments

Table-2

Source Mix	2018	2019	2020
Recruiter	41 (20%)	49(29%)	58(30%)
Referral from market	122 (59%)	94(55%)	88(47%)
Campus Hire	25 (12.07%)	13(0.77%)	25(13.2%)
LinkedIN	16 (0.77%)	12(0.71%)	18(0.95%)
Contract Convert	3 (0.14%)		
Grand Total	207	168	189
Referrals from Market are the Sales person who are performing well in competitors companies and referral from manager/retailer/distributor the candidates to be considered for job opportunity in the organization Recruiter is internal/external agency Campus hire is directly hired from the university /colleges			

Table - 3

Role	Sourced	Screen Rejects	Interview Rejects	Selects
PSR/ TM	42	3	15	25
Area Manager/ Area sales manager	17	3	6	8
Zonal manager	6	2	2	2

Selection Framework

1. Product knowledge, selling skills and communication skills
2. Technical Interviews focused on IQ & Capabilities.

Quality of Hire

Qualify of hire was measured using the performance appraisal system score/rating using six independent factors and 1 dependent factors. The quality of hire was measured on five point rating score Outstanding, Excellent, Good, Satisfactory and Needs Improvement.

The results are given in Table 4. About 25% of the staff fall under Satisfactory and needs improvement category. These staff needs additional training and technology improvement courses before deploying into the projects. Therefore, we conclude that H1: There is significant relationship with recruitment metrics and quality of hire.

Recruitment metrics: Quality of Hire (in percentage points)

Table 4 :

Score	2018	2019	2020
Outstanding	37	34	30
Excellent	28	23	28
Good	10	19	14
Satisfactory	15	13	16
Needs Improvement	10	11	12

Findings & Conclusion

The authors made a sincere attempt to present the results of the data collected by various pharmaceutical companies; culture is very sensitive in nature. The objective of the study is to verify whether there is a significant relationship with the quality of recruitment and hiring. The results presented are in line with a study conducted on recruitment and selection.

The main idea of this study is whether it is possible to standardize take on metrics in the pharmaceutical industry for at least some positions such as Medical representatives, territory manager, field manager etc. as the assignments for these positions were more or less similar across the industry. From what has been collected the information the authors reviewed across various pharmaceutical industries follows the different hiring methods, strategies, and metrics based on your institution's vision and mission. There is an urgent need to standardize recruiting methods for similar positions in the pharmaceutical sales to saving time and resources and reducing recruiting / hiring and on boarding times are fast. Standardization also helps to compare salaries jobs in the industry and pave the way by reducing edition. The authors also later noted too keep advancing in technology and using more of it advanced metrics and hiring methods, the time needed there are still high and expensive staff and the process still requires to some worldly processes. The authors also hope that this study will open the eyes of the pharmaceutical industry to think get together under one roof to do some recruiting procedures / manual across the board.

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ARTICULATION OF KAUTILYA'S VEDIC BASED SPIRITUALLY DRIVEN PRINCIPLES OF CORPORATE GOVERNANCE

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ABSTRACT

Corporate Governance (CG) is the backbone of every organization's success. This paper outlines the CG principles given in Kautilya's Arthashastra. Kautilya's lessons are still applicable today and it can be used to current corporate management to achieve corporate governance's ultimate goal of providing value to shareholders and stakeholders. Based on the past studies, it was observed that there is a need to re-look at the ancient literatures based on the Vedic wisdom to provide an intelligent interpretation of the principles given in the ancient texts. The re-interpretation of the principles can be applied effectively in modern corporate management. The authors have employed Hermeneutics and Content analysis research methodology for exploring the principles given in the Kautilya Arthashastra. Future research could look at the implications of analyzing Kautilya's Arthashastra in other areas of corporate management, such as change management, theories of leadership, and project management.

Keywords: Corporate Governance (CG), Vedic Wisdom, Kautilya Arthashastra, Vedas, Ancient India.

Introduction

The corporate sector's confidence and credibility have been diminishing in today's competitive globe. As a result, CG has become increasingly important. Good governance is crucial because it provides stakeholders with a source of confidence and credibility (Ismail et al., 2017). Corporate failures and scandals have emphasised the fragility of firms, particularly those with governance flaws. A series of corporate scams done in India is very vast starting from Harshad Mehta to Mehul Choksi, Nirav Modi, Chanda Kochhar, and many other corporate scams which impacted the economy of the country as a whole. The moral, value, and ethical frameworks within which an organization makes business decisions are referred to as CG. To differentiate governance from CG, we can consider what the government undertakes to be public governance. CG is the "process and structure that an organization uses to run its business to achieve profitability and accountability to meet the expectations of shareholders and other stakeholders" (Muniapan & Shaikh, 2007).

CG measures primarily strive to increase investor commitment by ensuring that management is committed to selecting efficient projects, revealing important information, and eventually offering an acceptable return to investors, hence reducing the danger of fraud or deception (Mertzanis, 2011). According to

the Organisation for Economic Cooperation and Development (2004), "an appropriate and efficient legal, regulatory, and institutional foundation must be established upon which all market participants can rely in establishing their private contractual relationships to ensure effective CG". The majority of recent business scandals have been attributed to "poor" CG, it seems like a daily occurrence to hear about corporate scandals. The ramifications of a company's collapse are enormous, and they can be felt in every facet of society. For example, an investor's capital could be wiped out overnight, and job losses could ensue, among other things (Kyere & Ausloos, 2021). Understanding and using management principles and procedures efficiently and effectively is one of the cornerstones to successful CG. To manage effectively, managers must gain a thorough understanding of historical and current models, theories, and processes. Within all sorts of businesses, contemporary management practice is widespread in every element of human existence. The poor quality of public governance, according to Mr. Narayana Murthy, Chief Mentor of Infosys Technologies, is India's biggest concern today. Effective public governance is essential for a country's overall development (Das & Bharati, 2012). India has a rich history of governance. There are various studies related to good governance based on ancient Indian texts like Vedas (A. K.

Sharma & Talwar, 2007) (Jaiswal, 2018), Bhagavad Gita (Alok, 2011) (Khanna & Katyal, 2017), and Kautilya Arthashastra (Chatterjee & Vyas, 2017) (Debnath, 2019) (Muniapan & Shaikh, 2007) but very few had touched the topic of CG given in the ancient Indian texts. This study explores the principles of CG given in Kautilya's Arthashastra which helps in dealing with controlling the corporate scams. The structure for the paper is as follows: Section second portrays the objective and methodology used in the study. The third section showcases the CG teachings from Kautilya's Arthashastra and in the last fourth section shows the conclusion and scope for future research as well.

Objective and Methodology

Few studies look at ancient texts like Kautilya's Arthashastra from the perspective of modern management practices, particularly CG. The purpose of this study is to raise awareness among management readers about the existence of various ancient Indian literature, such as the Arthashastra, that include many significant lessons in efficient and effective corporate administration. The CG concepts from Kautilya's Arthashastra are specifically explored and explained in this study. The ideas of CG outlined in Kautilya's Arthashastra are explored in this conceptual study using the hermeneutics and content analysis methodology of qualitative research. A hermeneutic is a specific system or method of interpretation, as well as a specific interpretation theory. Hermeneutics encompasses not just the study and interpretation of historical texts, but also human behavior in general, including language and speech patterns, social structures, and ritual behaviors (Muniapan & Satpathy, 2010).

Teachings from Kautilya's Arthashastra on CG

Kautilya was a great teacher, philosopher and he uphold many qualities of administrator in self. In Arthashastra, he detailed his life's effort. For centuries, rulers all across the world have turned to the Arthashastra to help them construct a society based on strong economics and spiritual ideals. The ideals outlined in this text are said to have helped Emperor Ashoka

build and expand his realm. This book is also reported to have been studied by Shivaji, Maharashtra's ruler, in order to plan and destroy the Mughals. The Rig Veda is where the Arthashastra gets its start (Muniapan & Shaikh, 2007). The Arthashastra of Kautilya examines all aspects of management and CG in the following manner.

As per Kautilya's Sutra three "Sukhasya mūlaṁ dharmaḥ" (V. Sharma, 2013) states that the root of happiness is Dharma here Dharma means ethics or righteousness for doing any work. Ethics is the base of happiness. The purpose of management of an organization is to spread happiness through performance of every work with ethical manner or we can say through proper code of conduct. Kautilya states that a leader need to clearly mention all the code of conduct of the organization, so that every employee of the organization follows the rule. Kautilya sutra four "Dharmasya mūlaṁ arthaḥ" (V. Sharma, 2013) states that the root of Dharma is Artha that is resources or money. Resources includes food, clothing, shelter. If one gets the resources or money in return of ethical behaviour, he must possess this as a habit which results in controlling the scams of the CG in the organization as in the Harshad Mehta scam ethical practices plays a major role. Further in sutra five "Arthasya mūlaṁ rājyam" (V. Sharma, 2013) Kautilya states that enterprise (Rajyam) is the basic source of money or resources. A leader has control over the resources of the enterprise. Sutra six "Rājyasya mūlaṁ indriya jayaḥ" (V. Sharma, 2013) states the root of right governance that is victorious inner-restraint. Here mantra talks about the management of organization like management of self. If a leader manages organizational activities like management of the self-body organs, then the organization will lead to success. Here body organs are related to a leader's perception, actions, and application of laws in the organization. Sutra seven "Indriyājayasya mūlaṁ vinayaḥ" (V. Sharma, 2013) states that the key to mastering the organs is training. One needs to train/discipline himself for controlling the organs that are perception, actions, and application of laws. Further sutra eight "Vinayasya mūlaṁ vṛd'dhōpasēvā" (V. Sharma, 2013) Kautilya talks about the root of humility that is serving

the elders. True humility and self-mastery can only be developed by learning from those who are more knowledgeable than oneself in one's field of interest. As per Kautilya's viewpoint, if a leader has these principles of governing the organization based on the spirituality, then they will able to manage the organization in a sustainable manner.

Good governance is the combination of management, accountability, and leadership. Arthashastra discusses a king's self-discipline and the six adversaries he must overcome: lust, temper, greed, conceit, arrogance, and foolhardiness. In today's world, this refers to the ethical aspects of businesses as well as the personal ethics of corporate executives (Bijalwan & Shah, 2012). As per shloka 1.14.7 of Kautilya's Arthashastra "Tēṣāṁ muṇḍajaṭilavyañjanairyō yadbhaktiḥ kṛtyapakṣīyastaṁ tēnōpajāpayēt" a leader has to see the things with an eagle eye approach. If a leader has the insightful eyes/keen eyes to see things in such a manner, then the organizations will not bear losses anymore.

As per (Sihag, 2004) (Muniapan & Shaikh, 2007) there are three measures to deal with the corporate frauds given in Kautilya's Arthashastra.

- To give proper information about the law to the people of the organization.
- To make proper records of accounts.
- To provide proper information about the punishment for cheating the organization.

Board member plays a vital role in the CG of an organization. Kautilya mentioned the duties of board members as Raksha, Vriddhi, Palana, and Yogakshema (Bijalwan & Shah, 2012).

- **Raksha:** It means "protection," and in a corporate context, it might be likened to "risk management."

- **Vriddhi:** It means "growth". In today's scenario, growth can be linked to increased stakeholder value.
- **Palana:** It means maintenance. In today's context, maintenance/compliance can be equated to following the law in letter and spirit.
- **Yogakshema:** It means "well-being," and here it is employed in the context of a social security system in Kautilya's Arthashastra. In today's world, it's comparable to corporate social responsibility.

Discussion and Conclusion

A lack of commitment on the part of boards of directors, a lack of adherence to the regulatory framework, inadequate enforcement, and monitoring systems, and a lack of transparency and disclosure are all examples of weak or non-existent law enforcement procedures (Okpara, 2011). Kautilya has given all the aspects related to controlling corporate scams and he also provides the best governance principles. If an organization uses the measures given by Kautilya's Arthashatra for leadership and controlling scams, then the organization will surely get better results. Many themes from Kautilya's Arthashastra are still relevant in business management today. A closer examination of the book will reveal numerous novel management concepts that have yet to be discovered and implemented in current management. Apart from CG, Kautilya's Arthashastra covers a wide range of issues including politics, economics, sociology, ethics, and more. Further, more studies have been done in near future related to management of the organization.

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MAPPING WEB ADVERTISING EXPERIENCE OF OMNICHANNANNEL CUSTOMER

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ABSTRACT

This study focuses on how web advertisements have affected the online and offline purchase spending for omnichannel customers and mapping omnichannel experiences across different countries. This study is primary as the survey was conducted through questionnaire mode with a sample size of 154 respondents using stratified random sampling to know if online and offline purchase spending has changed due to web advertising. Here findings were: web advertising has impacted both omni-online and omni-offline purchase spending but it had more impact on online purchase Spending for electronic products. There is a significant increase in online spending of electronic products after viewing web advertisements.

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Keywords: Omnichannel, Web advertisement, purchase behavior, offline purchase, online purchase

Introduction

Digital technology is important step that transforms the customer's purchase journey and inspires them to go digital. As we look into the future year, technology will act as a propulsion to provide huge momentum to the advertising and marketing industry in the coming years (McStay, A. J., 2016). Digital advertising is a collection of various media and strategies, including web, mobile, tablet, and social media, that contribute to the advertising experience. Digital advertisement has also transformed the economy by bringing customers and businesses closer, thus enabling continuous interaction. With the advent of web 3.0 businesses are trying to deliver maximum customer value, and digitalisation plays a vital role in it. The growth of digital advertisement and the availability of fast internet connection to more people has transformed the way they shop, act, and be entertained. It was reported by Times of India. (20th May 2020) IAMAI, Nielsen that 21% of total spends in India in 2019 is directed towards digital medium, which is an increase of 3% from last year. A new "buying route" has been created known as Omni-route. 'Omni' is a Latin word that means 'all'. (Juaneda-Ayensa et al., 2016). In Big Commerce report (2018) Offline retail can still rule and digitisation plays a significant role in the offline purchasing decisions taken by customers. When asked about their buying behaviour before buying in physical stores, 39% of customers visited the brand's website, 36% of customers read reviews, 33% of

customers try to match products online, and 32% of customers found a brand on e-commerce platforms. ". In addition, author Kazancoglu et al., (2018) researched to explore the factors of Purchase Spending in an omnichannel market where focus group of students from universities were formed and concluded that purchasing spending towards omni-channel shopping is depended upon various situational factors like product groups, urgency After reviewing past literature following hypothesis was defined

H_{01}: There is no significant difference in omni-offline purchase spending of electronic products before and after watching web advertisements.

H_{02}: There is no significant difference in omni-online purchase spending of electronic products before and after watching web advertisements.

Methods

The quantitative research approach was used for this study. A structured questionnaire was developed and survey was conducted from the respondents via online questionnaire mode.

Materials

Using SPSS version 21, this section is divided into two parts, i.e., descriptive and intrinsic. Wilcoxon Signed Ranks Test was used as a statistical tool to analyse the hypothesis. Data were collected using stratified random sampling by making strata according to educational status in which Graduate, Post-

Graduate, Research Scholars participated. 154   respondents had participated in this survey.

Result

Table 1 Descriptive part (Demographic profile of respondents)

Variables	Frequency	% percentage
Gender		
Male	83	53.89
Female	71	46.10
Age		
18 – 25	56	0.363636364
26 – 35	38	0.246753247
36 – 45	36	0.233766234
Above 45	24	0.155844156
Educational status		
Intermediate scholar	21	0.136363636
Graduate	43	0.279220779
Post-graduate	66	0.428571429
Research- scholar	24	0.155844156

Intrinsic part

Table 2 Descriptive statistics of Wilcoxon Signed Ranks Test

	N	Mean	Std. Deviation	Minimum	Maximum
Present spending Omni-Offline purchase spending	154	19.1039	7.64333	9.00	37.00
Amount of increase in Omni-Offline purchase spending	154	26.4805	5.47987	6.00	35.00
Present spending Omni-Online purchase spending	154	32.1299	6.01599	10.00	41.00
Amount of increase in Omni-Online purchase spending	154	50.1948	19.61994	26.00	99.00

Table 3 Wilcoxon Signed Ranks Test

Ranks				
		N	Mean Rank	Sum of Ranks
Amount of increase in Omni-Offline purchase spending- Present spending Omni-Offline purchase spending	Negative Ranks	42[a]	48.88	2053.00
	Positive Ranks	110[b]	87.05	9575.00
	Ties	2[c]		
	Total	154		
Amount of increase in Omni-Online purchase spending- Present spending	Negative Ranks	24[d]	47.25	1134.00
	Positive Ranks	130[e]	83.08	10801.00

| Omni-Online purchase spending | Ties | 0[f] | | |
| | Total | 154 | | |

Table 4 Test statistics

	Amount of increase in Omni-Offline purchase spending - Present spending Omni-Offline purchase spending	Amount of increase in Omni-Online purchase spending - Present spending Omni-Online purchase spending
Z	-6.924[b]	-8.723[b]
Assump. Sig. (2-tailed)	.000	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Interpretation for table 2

In the descriptive table of Wilcoxon Signed Ranks Test, it can be analysed that there is more change in omni-online purchase spending than omni-offline purchase spending as an effect of web advertisements. As according to the mean there is almost 56% change in mean spending of omni-online purchase and 36% change in mean Spending of omni-offline Purchase

Interpretation for table 3

Out of 154 sample size 110 people admitted that due to web advertisements their omni-offline spending has been increased after watching web ads while 42 people reported that there is no increase in spending of omni-offline purchase intention. Since most people responded that there is an increase on omni-offline expenditure, our first null hypothesis is rejected.

Similarly, 130 respondents out of 154 admitted that their omni-online purchase intention has increased as an impact of web advertising. In comparison, only 24 respondents disagreed with the increased omni-online spending as an effect of web advertising. Therefore, our second null hypothesis is also rejected

Interpretation for table 4

In order to evaluate if there is any change in purchase spending for omni-offline purchase spending and omni-online purchase spending as a result of web advertisements a Wilcoxon Signed Ranks Test revealed a statistically significant positive change in spending following watching web advertisements for both omni-offline purchase spending ($z=-6.924$, $p<.05$) and omni-online purchase spending ($z=-8.723$, $p<.05$)

Table 5 Mapping omni-channel experience across different countries.

Author	Year	Country	Findings
(hickman et al., 2020)	2020	United kingdom	Highlighted in this paper are multiple touchpoints are required to have a holistic approach to omnichannel retail and integration between multiple touchpoints is required. They have followed a mixed method approach in the same paper and proposed a conceptual framework between factors affecting omnichannel ad mode of omnichannel for final purchase
(silva et al., 2020)	2020	portugal	This paper highlights the importance of the degree of integration between fashion and apparel brands and pointed out some major benefits of different brands segmented according to prices like "click and reserve" option might be given that will allow the customer to pay at the time of collection.

(ye et al., 2018)	2020	China	The article proposes the categorisation of barriers by major brands adopting omnichannel namely: conflict regarding the heterogeneity of price between the physical store and online stores and contradictory image of the brand.it has also highlighted drivers to adopt omnichannel namely: enhance market share, improve customer services
(hajdas et al., 2020)	2020	Portugal	highlighted different types of obstacles that a company implementing omnichannel retailing will come across. Namely, customers' attitude towards omnichannel and personalised marketing techniques.
(shi et al., 2020)	2020	China	Proposed a framework integrating holistic view of customer omnichannel experience and believes i.e. Risk and compatibility with the shopping spending in an omnichannel environment
(jocevski et al., 2019)	2019	Italy	They have highlighted different retailers, including electronics, bookstores, and fashion and apparel. Proved by their study that electronic and bookstore retailers have adopted omnichannel retailing in a better aspect than fashion and apparel retailers. Results also indicate that a legal it system is for different channels strife to implement an omnichannel system.
(lee et al., 2019)	2019	United kingdom, china	Investigation of customer engagement in both high and low involvement products in omnichannel retailing and specified that search and evaluation alternative is an important factor for the purchase of high involvement brands while "click and collect in-store" facilities are important for low involvement brands
(hüseyinoğlu, 2019)	2019	Turkey	Acknowledges that the key issue in the omni-sector is how consumers access products. The author has discussed that social media and push notification i.e. Customised promotion are major touchpoints in omnichannel
(pagani et al., 2019)	2019	France and italy	Results indicate that there is a much higher level of personal engagement when the experiment was conducted with only touch application of the product was available to the consumers as compared when both touch and voice campaign was available.
(barwitz & maas, 2018)	2018	Germany, australia, switzerland	the research found that utilitarian customer uses a lot of channels while searching for the product and get highly affected information aspect of the product whereas hedonic customers get highly influenced by the enjoyment they get from product shopping and by discounts and various promotional offers

(weber & badenhorst-weiss, 2018)	2018	South africa	Acknowledges challenges hampering the adeptness of omnichannel grocery retail and pointed out the fact that delivery is the only physical touchpoint between retailer and consumer and the fulfillment of the same is important to customers as well. This study has highlighted the stock-out of their order as a major frustration issue in omnichannel retail.
(mosquera et al., 2018)	2018	France	Identifies that touchpoints of shopping value when purchased offline are the main factor contributing to the shopping values of omnichannel, followed by product availability and also concluded that there is seamless customer experience when there is consistency between retailing mix but vice versa is not true
(kazancoglu & aydin, 2018)	2018	Izmir, turkey,	Applying the utaut2 model. Situational factors, privacy concern, personalised campaign, and perceived risk are among those factors which affect the purchase of customer in omnichannel.
(blom, lange and hess, 2017)	2017	Sweden, usa	this research posits that savings, efficiency, entertainment, and enjoyment elucidates the positive effects on retailer brand attitude and this study takes into account promotion by tracing digital shopping and its effect through in-store shopping in an omnichannel environment
(saghiri et al., 2017)	2017	United kingdom	Proposed a framework of key antecedents for implementing omnichannel retail and highlighted the fact that connectivity increases interdependence and ultimately require better integration between promotion, transaction fulfillment, and centralised information system

Discussion and finding

Omnichannel has taken over all marketing strategy around the world and India is also not behind. Through our research it is clear that omnichannel customer is affected more by web advertisement when electronic goods are bought online and less when the same product is bought showroom. Through our findings it is clear that web advertisements have more effect on purchase of electronic product through online mode as compared to offline mode. And both null hypothesis are rejected and alternate hypothesis are accepted. One of the main feature of omnichannel marketing is to provide same experience to customers and to offer them good at same price. So, companies need to work upon their strategy to fully implement omnichannel marketing for their goods. This paper also analyses omnichannel experience across various countries and concludes that countries like Spain, Romania, Tunisian, USA UK that have already identified the significance of the importance of omnichannel branding and marketing

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ISOLATION AND CHARACTERIZATION OF MUCILAGE FROM Mimosa pudica Linn. SEEDS

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ABSTRACT

The prospects of herbal polymers are brighter as synthetic polymers but synthetic polymers have certain disadvantages such as high cost, toxicity, environmental pollution during synthesis, non-renewable sources, side effects, less patient compliance, etc. Mucilages are polysaccharide complexes formed from sugar and uronic acid units. Mucilages form slimy masses in water, are typically heterogeneous in composition. The seeds of Mimosa Pudica Linn. contain a high proportion of mucilage and it also being used for different therapeutic purposes. The present study was planned to isolate and characterize for its morphological characteristics, identification by chemical tests, Solubility, melting range, pH, Swelling index, Ash values, presence of foreign organic matter, test for lead and arsenic, Loss on drying, Density, compressibility index and angle of repose etc.

Keywords: Mimosa pudica, mucilage, isolation, characterization

Introduction

Plants have played a significant role in maintaining human health and improving the quality of human life for thousands of years and have served humans well as valuable components of medicines, seasonings, beverages, cosmetics and dye.

The use of natural gums and mucilage as important part of formulation is with the development of pharmacy and different dosage forms. As general excipients for oral use, eg. In tablets and capsules etc. the options are limited [1]. The prospects of natural polymers are brighter but even here extensive testing will be required. The synthetic polymers have certain disadvantages such as high cost, toxicity, environmental pollution during synthesis, non-renewable sources, side effects, less patient compliance, etc [2]. While the advantages of natural plant based materials include low cost, natural origin, free from side effects, bioacceptable, renewable source, environmental-friendly processing, local availability (especially in developing countries), better patient tolerance as well as public acceptance, from edible sources, etc [3]. Mucilage upon hydrolysis gives arabinose, galactose, glucose, mannose, xylose and various uronic acids. Mucilages are obtained mainly from seeds or other plant parts. Some are obtained from marine algae, and from selected microorganisms [4]. In present study the seeds of Mimosa pudica Linn. were selected for the isolation of mucilage.

Pharmacognosy of plant

Common Names -
Marathi- Lajalu
Hindi- Lajwanti / chui-mui
English- Sensitive Plant / bashful mimosa
Family- Fabaceae / mimosaceae
Geographical Source- America, Asia.

Materials and Methods

Isolation of Mucilage:
The mucilage of plant Mimosa pudica Linn. was collected from seeds. Mimosa pudica Linn. was procured form local market in the form of very small brown seeds. Mucilage was extracted by soaking the seeds of Mimosa pudica with 10 times it's weight of distilled water and kept for 24 Hrs. The viscous solution obtained was passed through the muslin cloth.

The mucilage was precipitated out by addition of 95% ethanol in the ratio of 1:1 by continuous stirring. The coagulated mass was dried in oven at 40 – 45 0C, powdered by passing through sieve and stored in airtight container (yield – 14% w/w).

Characterization of Mucilage:

The separated mucilage was evaluated for its physicochemical characteristics such as its morphological characteristics, identification by chemical tests, Solubility, melting range, pH, Swelling index, Ash values, presence of foreign organic matter, test for lead and arsenic, Loss on drying, Density, compressibility index and angle of repose etc.[5-12].

Results

Table.01 Physicochemical characteristics of mucilage:

Sr. no.	Tests	Observations
1	Description	Brownish white powder
2	Solubility	Forms colloidal solution
3	Smell & appearance	Characteristic &lustrous
4	Identification with rhudenium red	Stains red
5	Melting range	Decomposes above 200°c
6	pH	Neutral
7	Loss on drying	7%
8	Ash value	4.5%
9	Acid insoluble ash	0%
10	Sulphated ash	0.95%
11	Foreign matter	NMT 0.1%
12	Test for heavy metal as lead	20-25 ppm
13	Test for arsenic	less than 1 ppm
14	Test for sulphates	Absent
15	Test for tannins	Absent
16	Test for chloride	Absent
17	Test for carbohydrates	Present
18	Test for uronic acid	Present
19	Swelling index	18
20	Angle of repose	32°
21	Bulk density	0.58 gm/cc
22	Tapped density	0.69gm/cc

Discussion

Mucilage of the plant Mimosa pudica Linn has been reported to have gel forming potential for topical application. In view of the easy availability of the plant, the Mucilage from the seeds of the plant Mimosa pudica Linn was investigated for its application as suspending agent in pharmaceutical formulations.

The mucilage is isolated by dissolving in water and precipitating in 90% alcohol and dried at room temperature, total yield of mucilage by alcohol precipitation was found to be 14gm % W/W.

The morphological and physical evaluatory study of isolated mucilage shows, it is brownish white powder, with characteristic odour and lustrous in nature. When dissolved in water, it gives neutral, colloidal solution; it is soluble in luck warm water, practically insoluble in ethanol, acetone, ether and chloroform. Moisture content of mucilage was found to be 7 % was found to be within official limit.. Mucilage decomposes above 2000c, which is a characteristic of most of the polysaccharide. The foreign matter in this mucilage was found to be not more than 0.1 and the heavy metal as lead were found to be20-25 ppm Arsenic was found to be Less than 1 ppm. The swelling index was found to be 18. And ash values as total ash, acid insoluble ash and sulphated ash 4.5, 0 and 0.95% respectively, the 0% of acid insoluble ash value indicate the absence of sandy material.

The isolated mucilage was studied for its physicochemical parameters such as angle of repose, density. The angle of repose indicated that the powder was having good flow. The bulk density and tapped density of mucilage was found to be 0.58 and 0.69 gm/cc. The result of chemical test shows presence of carbohydrate, uronic acid which is general constituent of mucilage. While the absence of Tannins, chloride and sulphate shows the purity of mucilage.

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ESTIMATION OF REFRACTIVE ERROR AMONG SENIOR SECONDARY SCHOOL CHILDREN OF RURAL AND URBAN COMMUNITIES AT DISTRICT ETAWAH

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ABSTRACT

Objective: *To estimate the prevalence of refractive error among senior secondary school students of urban and rural areas of district Etawah Distract U.P Introduction: Refractive error is a state in which the eye's optical system fails to adjust to bring parallel light rays to focus on the retina(fovea). According to WHO, it is seen that 285 million people are estimated to be visually impaired globally along with 39 million blinds, and about 246 million have low vision.* ***Material & Method-*** *A community based cross-sectional study was done among senior secondary school children from 9th to 12th standard in the working days from the rural and urban areas of district Etawah U.P.* ***Result & Discussion-*** *Out of 2322 children screened, 1161 children examined were from the urban area while 1161 belongs to the rural communities. (52.2%) of the children were males and (47.8%) were females. The median age of the study group was found to be 15 years with an interquartile range of 2.0 between the age group 12 -18 years. Refractive error was more prevalent in females (6.8%) than males (6.4%). In contrast, Myopia was seen more in females (4.5%) of <15 years (66.6%) from the urban areas (6.1%). Hypermetropic cases were seen more in females (0.5%) of <15 years (8.33%) from the rural community (0.1%). Astigmatism was found to more in males (2.8%) in the age group <15 years (43.0%) from urban area (3.9%). The results were statistically analysed using Pearson's chi -square test to determine the statistical difference among the 95% confidence level (P<0.05).* ***Conclusion:*** *The study concluded that the prevalence of refractive error, particularly in urban areas, is lower than in neighboring urban areas of district Etawah. In rural areas, refractive error was found to be extremely low. Female students in senior secondary school had a higher prevalence of Myopia. The most common causes of high prevalence and barriers to refractive errors may be family history or frequent indoor activities without wearing glasses. Proper screening is highly recommended.*

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Keywords*: Estimation, Refractive Error, senior secondary school children's, Rural & Urban areas.*

Introduction

Refractive error is a visual disorder intrinsic to the eye that prevents light from being brought to a single point focus on the retina, thus reducing normal vision and visual distortion.[1] Three types of refractive errors can affect the vision: Myopia (near-sightedness), in which the parallel rays coming from infinity are brought to focus in front of the retina; Hypermetropia (far-sightedness), in which the parallel rays coming from infinity are brought to focus behind the retina, and Astigmatism in which a distorted vision appears resulting from an irregularly curved cornea. Or lenticular changes [2] Refractive errors affect a significant percentage of the global population, regardless of age, gender, or ethnic group, with 180 million people are visibly disabled, of whom nearly 45 million are blind, and four out of five of them live in developing countries.[1] Childhood visual deficiency due to refractive errors is a major cause in school-aged children, profoundly affecting their overall development, most importantly on the educational and psychosocial development.[3,4] In India, the prevalence rate varied for Myopia and Hypermetropia in children's.[5] This is because children are rarely concerned with their vision problems, and even they may be unaware of them. They can compensate for their impaired vision by changing their classrooms, arranging objects closer together, and avoiding activities that need more visual attention.[6] The accessibility of eye care services in India varies by area. Because of these disparities, school-based vision screening services are thought to be cost-effective in determining correctable causes of impaired vision.[7] As a part of the National Program for the Control of Blindness, school vision screening is used throughout the country regularly.[8] Hence, it is necessary to estimate the prevalence of refractive error among senior secondary school children of rural and urban communities at district Etawah even like other part of the country.

Material and Methods

Aims and Objective: To estimate the prevalence of refractive error among senior secondary school children of rural and urban communities at district Etawah.

Enrolment and Ethical approval

A community-based cross-sectional study was done by randomly selected senior secondary schools' children's from (9th-12th) standard of rural and urban areas of district Etawah UP. The study got its ethical clearance from the institutional ethical committee with the ethical number NIMSUNI/IEC/2019/PhD/137.

Subject Recruitment

Before eye examination, student was asked to give his/her informed consent along with Permission was taken from the senior secondary school from the authorities where the data has collected. All the examinations were conducted in the presence of the schoolteacher during school hours in the working days (Monday-Saturday). Both male and female children present on the day of screening from 9th to 12th standard and those already using glasses or those prescribed but not using them regularly were selected for the eye examination. Those who were not willing or absent on that day, or below 9th standard, or with dry eye, accommodative conditions, amblyopia, squint, or any organic defects were excluded from the study.

Procedure

The collected data was recorded in the Eye Examination Sheet (EES). The children's prior screening was given a bilingual questionnaire to examine the associated factors related to refractive error. To examine the vision, Snellen's English chart at a 6-meter distance was used. Children having the visual acuity of $< (6/12)$ in either eye or both eyes were examined for subjective refractive error. The objective refraction, especially in Hypermetropes, was carried out in the department of optometry, UPUMS, Saifai with the help of Retinoscope under cycloplegic refraction (Tropicamide Eye-drops) followed by subjective refraction. The children already wearing spectacles were also examined and suggested for power change. (If required) Myopia of $\geq (0.5D)$ was considered as a refractive error in either one or both eyes. Hypermetropia as, if the refractive error in either (subjective/objective) is $\geq (+2.00D)$ Astigmatism was visually significant if $\geq (1.00D)$. The severity of the visual impairment was categorized according to the International statistical classification of diseases and related health problems (ICD) 11 (2018). Mild- Visual acuity worse than 6/12 to 6/18; Moderate- Visual acuity worse than 6/18-6/60; severe-Visual acuity is worse than 6/60-3/60, and Blindness visual acuity worse than 3/60.

Statistical analysis

The data was entered in a Microsoft excel sheet, and analysis was done using R version 4.0.4 (2021-02-15), stats package version 3.6.2.

Table 1 Demographic characteristics among rural and urban region n=2322

Area	Gender		Age	
	Male	Female	<15 Year	≥15 year
Rural	620(51.2)	541(48.7)	353(39.7)	808(56.4)
Urban	591(48.8)	570(513)	537(60.3)	624(43.6)
Total	1211	1111	1161	1161
Chi-square statistics	63.13			
P value	<0.00001			
Significance	p < 0.05			

Table-2 Prevalence of Refractive Error among participants under study (n=2322)

Refractive Error	Either one or both eye	Right Eye	Left Eye
Ametropia	152(6.5)	132(5.7)	121(5.2)
Myopia	97(4.2)	74(3.2)	69(3.0)
Hypermetropia	11(0.5)	10(0.4)	9(0.4)
Astigmatism	66(2.8)	49(2.1)	43(1.9)

Table-3a) Association of Gender with Ametropia and types of Refractive error n=2322

Variables	Types of Refractive error						
	Ametropia (Overall)	Myopia	Hypermetropia	Astigmatism	Chi-square statistics	P value	Significance
Male	77(6.4)	47(3.9)	5(0.4)	60(2.8)	35.69	< 0.0000	P<0.05
Female	75(6.8)	50(4.5)	6(0.5)	6(3.4)			
Total	174	97	11	66			

Table-3b) Association of Area, Age with Refractive error

Variable	Myopia	Hypermetropia	Astigmatism	Chi-square statistics	P value	Significance
Urban	71(6.1)	10 (0.9)	45(3.9)			
Rural	26(2.2%)	1(0.1%)	21(1.8%)	34.44	<0.00001	P<0.05
<15 year	52 (66.64)	6 (8.33)	60 (43.04)			
>15 year	45 (29.93)	5 (3.74)	3 (19.33)			

Graph-1 Gender distribution among rural and urban areas n=2322
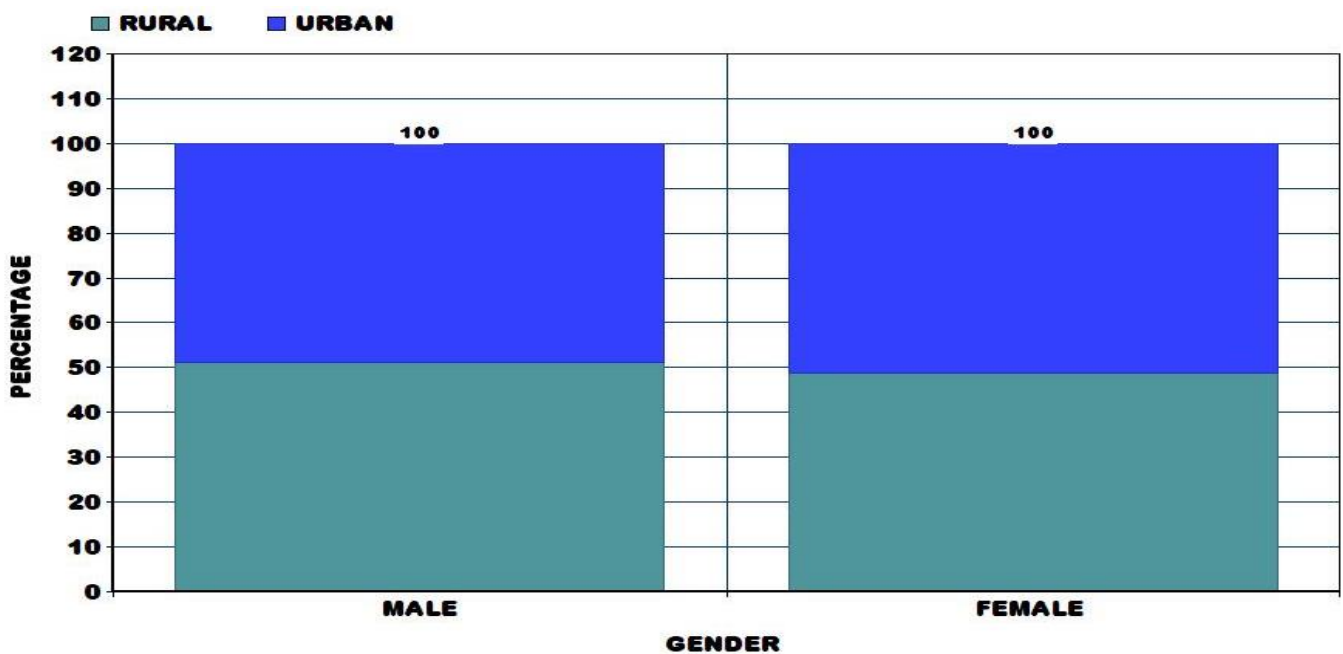
Graph-2 Population Distribution by class in Rural and Urban areas n =2322

**Graph-4 Estimation of refractive error among
Studied population n=2322**

Graph-3 Age distribution among rural and urban areas n=2322

Result

Pearson's Chi-square test assessed the baseline demographic data at a p<0.05 level of significance. (Table-1) The age of the study group was expressed as Median and was found to be 15 years with an interquar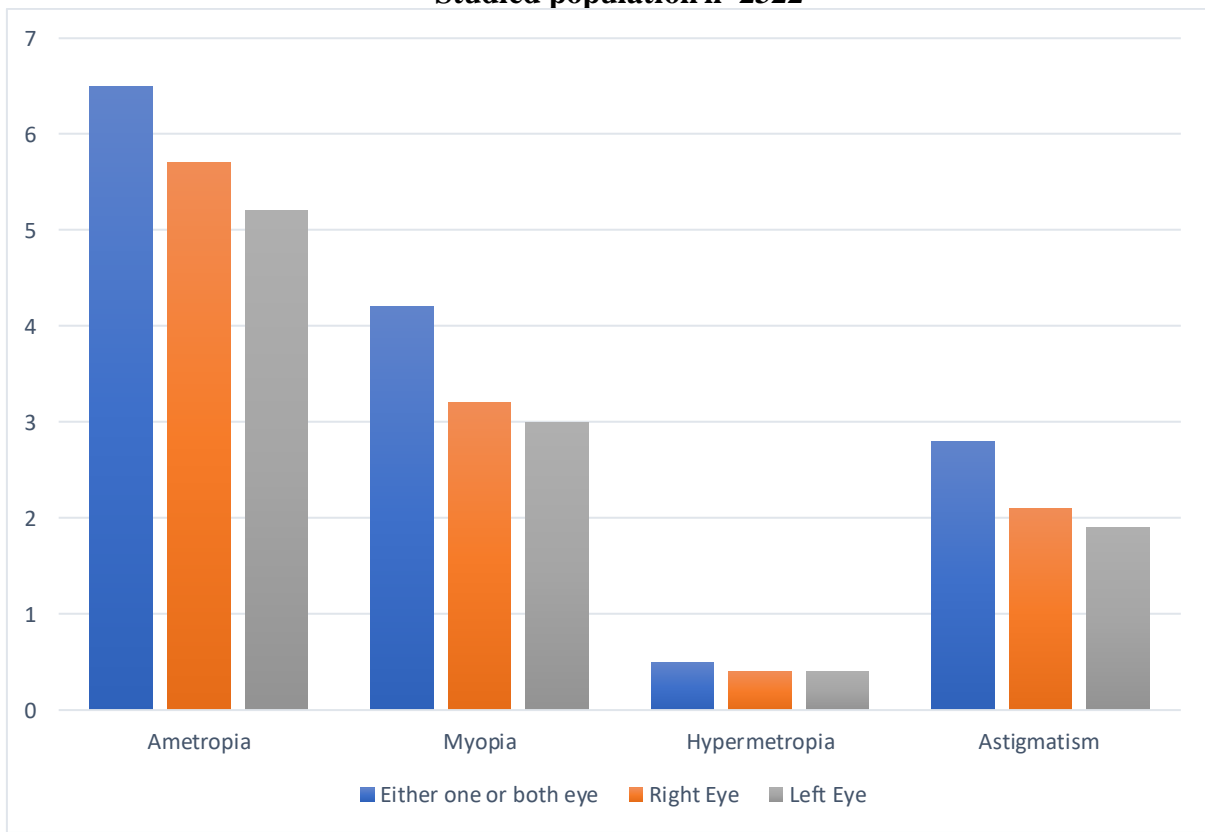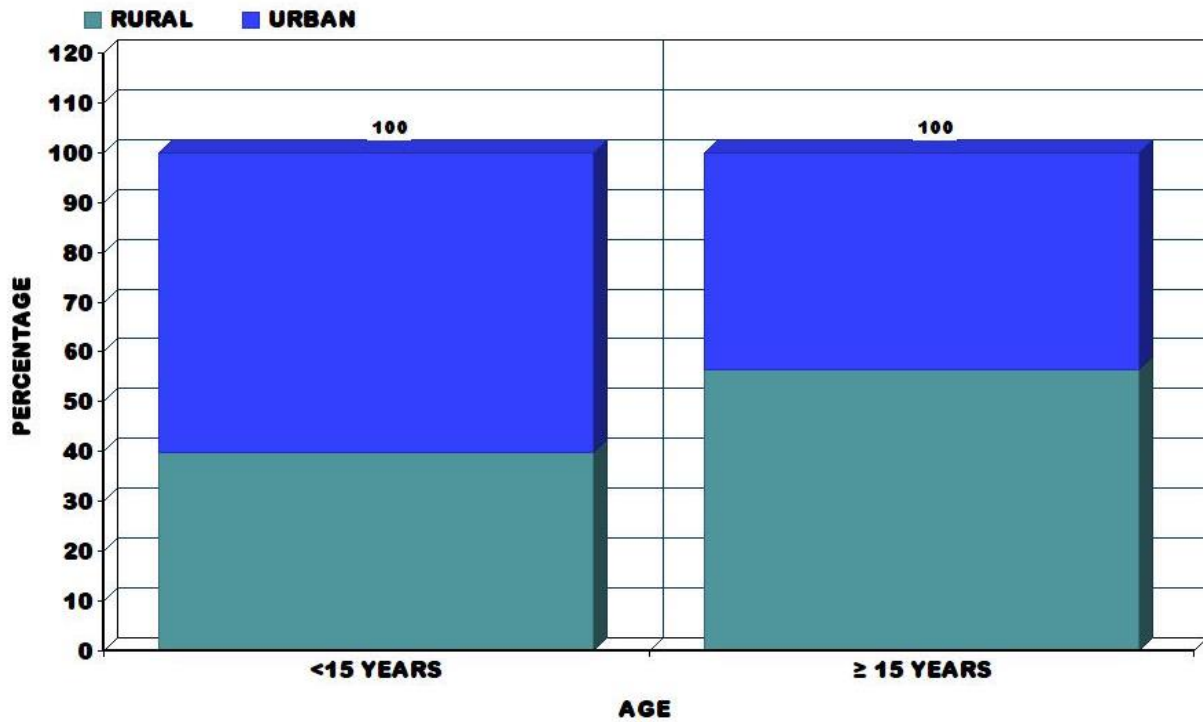tile range of 2.0. The study population comprised 2322 children from rural and urban areas of district Etawah. Out of which (1161) belongs to urban and (1161) from the rural communities. The study group had (52.2%) male and (47.8%) female students. Of whom (51.2%) and (48.8%) male, and 48.7% and 51.3% female belong to rural and urban areas respectively. (Graph-1) The study group (20.5%), (23.0%), (30.1%), and (26.4%) belonged to the classes 9th, 10th, 11th, and 12th respectively. (Graph-2) Participants aged ≥15 years come from rural areas (56.4%) and urban areas (43.6%), whereas (39.7%) come from rural and (60.3%) from urban areas aged less than 15 years (Graph-3) The prevalence of overall refractive error among the studied population was found to be (6.5%), of which (5.7%) & (5.2%) cases reported in the right and left eye respectively. (Table-2). The overall Myopia was estimated to be (4.2%) Hypermetropia (0.5%), and Astigmatism (2.8%) among senior secondary school children, respectively. (Graph-4)

Refractive error was more prevalent in females (6.8%) than males (6.4%). In contrast, Myopia was seen more in females (4.5%) of <15 years (66.6%) from the urban areas (6.1%). Hypermetropic cases were seen more in females (0.5%) of <15 years (8.33%) from the rural community (0.1%). Astigmatism was found to more in males (2.8%) in the age group <15 years (43.0%) from urban area (3.9%). The results were statistically analysed using Pearson's chi-square test to determine the statistical difference among the 95% confidence level (P<0.05). (Table-3a and b).

Discussion

India is a developing country with the world's second-largest population. School health services are essentially non-existent in India, as they are in other underdeveloped nations, due to a lack of financing and inadequate facilities.[9]Refractive services provided as part of the school health program were unsatisfactory in both urban and rural settings. The eye care services must work on the roots of childhood blindness, specifically refractive error, for the better tomorrow. In our study, the overall prevalence of refractive error was found to be (6.5%) which was like the prevalence observed by GVS Murthy et al. (2002)

(6.4%).[10] while Kumar et al. (1992) in Lucknow reported (7.4%) [11] prevalence of refractive error. However, this is lower than the prevalence recorded by Seema S et al.(2009) in Haryana (13.65%).[12] Similar studies from throughout the world found an incidence of (8.2%) in Baltimore (USA) [13], (12.8%) in China's [14], and (15.8%) in Chile [15]. These disparities in prevalence data from studies conducted in different regions of the world are due to varied operational definitions used by analysts and disparities in the demographic characteristics. The examined demographic reveals that urban areas account for (60.3 %) under the age of <15, while rural communities account for (56.4 %) over the age of ≥15. Overall, refractive error prevalence was higher in children aged <15 years (9.2%) than in those aged ≥15 years (4.9 %), which was consistent with the findings of a study conducted in Bangalore, where refractive error prevalence was highest among 13-15-year-old children.[16] and S Matta reported a high estimate of refractive error in the 10–14-year age group.[17] The prevalence of overall refractive error was more in females (6.8%) than males (6.4%). Similar results were found by Pavithra et al. in their study where refractive errors were found to be (9%) in females and (5.3%) in male school-going children of Bengaluru.[16] Kumar Naveen et al. also reported a higher refractive error estimation in females than males children of urban and rural areas of Ludhiana.[18] Seema et al.[12], Tay MT et al.[19] discovered similar findings in their research where the prevalence seemed to be higher in females than males. Myopia was the commonest type of refractive error which was found more in female children (4.5%) as compared to males (3.9%), followed by astigmatism (3.4%) female and (2.8%) male, and Hypermetropia (0.5%) female and (0.4%) in male children. A similar pattern was observed by Sethi et al. among school-going children of Ahmadabad. [20] and in S Matta study; New Delhi.[17] This difference might be because of the rapidly occurring developmental hormonal changes associated with females as compared to males. The prevalence of refractive error was more (9.6%) among urban school children than in rural areas schools (3.5%), which is like the study done by Dandona et al. among rural and urban schools of Andhra Pradesh.[21] Vivek et al. in their population-based study in Gujarat.[22] Afroz A khan study among school children of Srinagar.[23] Amrutha S Padhye et al. study among school children of Pune.[24]

Conclusion

The study concluded that the prevalence of refractive error (myopia), particularly in urban areas, is lower than in neighboring urban areas of district Etawah. This might be attributed to the fact that the population under study is still in the early stages of development. In rural areas, refractive error was found to be extremely low. Female students in senior secondary school had a higher prevalence of Myopia. This might be because girls reach puberty and achieve their ultimate body weight earlier than boys. A comprehensive vision screening program must be conducted annually to detect, manage, and reduce refractive error burden among school students, followed by an awareness campaign and e-learning programs. Additionally, it is indicated that students who already had glasses but did not wear them regularly may contribute to a high prevalence rate of refractive error. In this regard, it is strongly suggested that parents and teachers receive appropriate counselling and guidance. A government should take the initiative to make eye care services mandatory to prevent long-term vision impairments among school-going children.

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MACHINE LEARNING BASED DETECTION OF DEPRESSION AND ANIXIETY USING VOICE RECOGNITION

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ABSTRACT

A substantial number of individuals suffering from depressive disorders are not diagnosed effectively and a more objective evaluation is needed to help them to get a quicker and more accurate diagnosis of depression. Speech data is clinically easy to get, their relationship with depression has been researched even if the actual predictive impact of speech characteristics has not been examined. Therefore, we do not know in general how much vocal characteristics contribute to the diagnosis of depression.

Each person at some time in his/her life experiences anxiety. Anxiety is a phrase used in daily circumstances to express discomforts and bad sensations experienced by a person when they are tense or scared. In order to achieve a certain range of performances, machine learning methods enable computers to prepare data that are used for factual research. In developing the models for the test data, it promotes computer frameworks to automate decision-making based on data inputs. This article provides a paradigm for predicting anxiety and sadness. As input to this framework, there is a set of voice data. This data set has been preprocessed in order to eliminate noise from the data and make the input data set consistent. The input data set is then subjected to different machine learning methods such as Nave Bayes, Random Forest, and SVM. Data classification is carried out. The classification results of several methods are compared.
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Keywords: Anxiety, Depression, Prediction, Machine Learning, Classification, Speech data

Introduction

Every person has anxiety [1] at some time in his or her life. Anxiety is a phrase used in daily contexts to express the uncomfortable and unpleasant sensations that an individual has when confronted with stressful or scary events. Anxiety can be caused by a variety of factors. However, most of the time it is the result of stress. In the case of college students, the most common reason for seeking treatment is stress-related anxiety. Approximately one out of every eight undergraduate students seeks counseling for stress-related concerns while in college. Anxiety is described as an inner fear triggered by a strong desire to commit. It is a set of symptoms caused by poor adaptation to life's stressors and demands. Anxiety is one of the most prevalent issues that college students encounter. Some may get overwhelmed by the additional expectations that individuals have to be in a new area, away from family and the stress of trying to do well at school. Amongst the most frequent and common mental illnesses are anxiety disorders. Differences in mood, thinking, comportement and physiology are characteristic for anxiety disorder. They can be seen in a number of ways among college students including adjustment disorders, anxiety testing, social phobia and anxiety disorders caused by substances. [2] [3]

Anxiety symptoms [4] [5] can manifest as psychological, bodily, or environmental difficulties. Anxiety manifests itself in a variety of ways, including excessive worrying, fear, restlessness, excessively emotional responses, and negative thinking. Some individuals look calm while they are nervous, but the brain never stops thinking, interfering with their quality of life. Anxious persons frequently experience chest tightness, a racing or pounding heart, and a pit in their stomach. Anxiety causes some people to experience headaches, perspiration, and even the desire to pee. Anxiety symptoms include being worried, panicked, going blank during an exam, feeling powerless when performing tasks, and losing interest in a tough topic.

Depression [6] has bad mood and reluctance to activity and may affect the ideas, conduct, feelings and fitness of a person. Depressed individuals may feel unhappy, anxious, hesitant, powerless, unworthy, guilty, irritable or restless. They may lose interest in things that was once pleasurable, lose appetite or excessive, have trouble in focusing, recall information, and take choices and may ponder suicide or try it. For students, college is a challenging time, and melancholy is prevalent. Campus life may be stressful, and melancholy is typical for university students.

Millions of individuals suffer with depression [7], a strong sensation of hopelessness, gloom, and unhappiness. It's more than simply a "dark mood," but a continuous sensation that a person can't control and that interferes with daily functioning. According to projections, depression will be the main cause of mortality by 2023.

Depression [8] is shown in various degrees, from general to clinical. Depression is a common condition. The symptoms occur in four basic areas of human work: emotional, cognitive, physical, and behavioral, with the most obvious mood disturbances. Changes in diet or weight, sleep and psychosis, decreased energy, sense and guilt, disorderly thinking, concentrating, and decision-making, recurrent death thoughts and contemplation of suicide are all frequent indications of depression. Depression. Social disengagement is supported by anhedonia or lack of interest in activities that were previously fun. There are a number of adverse health effects linked with depression, including decreased immunological performance and poor restoration.

Machine learning [9] [10] is an IT industry that varies from standard computer approaches. Algorithms are sets of instructions expressly programmed, according to traditional thinking, utilized by the computer to identify or solve a problem. In a specific field, machine learning approaches allow computers to prepare data inputs for factual enquiry. It encourages the creation of computer frameworks for test data models so that decision-making based on data data is automated.

Machine learning is an ever-changing discipline. Two key types include: supervised training and uncontrolled learning. Machine learning methods. Similarly, the nearest K-algorithm, decision-making and deep learning are typical techniques of algorithm in machine learning. Investigate the most widely used programming languages in machine learning by presenting some of the positive and negative characteristics. In addition, machine learning algorithms that keep these biases avoid throughout algorithms development.

Machine Learning Techniques

Real values (housing costs, number of calls, total sales etc.) are measured depending on variable via a linear regression (s). In this connection, the relationship between independent and dependent variables is formed using the best possible line. This best fit line is called a regression line and the linear equation $Y = a*X + b$ is shown. This is known to be the Y-regression line on X and there is another X-regression line, and it is represented by $X = c*Y + d$. The best way to understand linear regression is to recall your child's experience. Allow us to declare that we want a fourth-grade youngster to instruct understudies in his class by growing weight requests without asking them their loads! What can we anticipate the child doing? He/she would almost definitely look (outwardly dissect) people's stature and job and mastermind them using a combination of these distinct factors. In fact, this is linear regression! The child has truly comprehended that height and construct would be related to the burden by a relationship that resembles the equation above. [11]

A pattern recognition model may apply to both classification and regression, the closest neighbor approach. The k in the closest area is a positive, typically tiny, integer and is occasionally shortened as k-NN. The inspection or regression inside the space will be the k nearest training examples. The main objective of categorizing k-NN is: This role has resulted in the membership of the class. This creates a new object in the class which has the most of its nearest neighboring members. If k = 1, the object is classified by the nearest neighbor of the object. [12]

Outwardly, decision trees should speak to options and appear or counsel decision making. Decision trees are used as a predictive model in machine learning and data mining. These models outline information in order to make choices on the data's objective worth. The goal of decision tree learning is to create a model that predicts the estimation of an objective based on input data. The branches in the prescient model speak to the information's qualities that are resolved by perception, however the leaves speak to the choices about the objective esteem of the facts While "learning" a tree, raw data is separated into

subsets based on attribute esteem tests, which are then re-run on each of the inferred subgroups recursively. The recursion method will be completed when the subset at a node has the same proportional incentive as its desired output. We may look at a variety of circumstances that can determine whether or not someone should go angling. Climate conditions, as well as barometric weight conditions, are included. The decision rules are often expressed as if-then-else expressions. The more complicated the rules, the deeper the tree. [13]

Deep learning seeks to imitate the processing of light and sound in the human brain into vision and hearing. The deep learning engineering system comprises of many layers of a hardware-built neural artificial network, and is driven by biological neural networks. Deep learning is used to identify or change the highlights of data in a number of nonlinear preparation layers (or representations). The outcome of one layer is the contribution of the progressive layer. Deep learning algorithms can be monitored and utilized for data categorisation, or unattended for pattern analysis. Now, algorithms are utilized for machine learning and deep learning retains the most data and is capable of overperforming people on some subjective tasks. As a result of these features, deep learning emerged as the most viable technique for the artificial intelligence business.[14]

The Support Vector Machine is a binary linear classification method that is not probabilistic. It creates a training model that categorizes the data into one or more target classes. The data items are represented in space as points. A visible gap separates the objects of different categories, causing its breadth to spread. The target classes of the new instances are determined by which side of the gap they come on. When the input datasets are not labeled, non-linear classification is also achievable using the support vector machine.

Because there are no goal classes to which the instances may be assigned, the support vector machine categorizes data via unsupervised learning. New instances are added to clusters depending on functions once they have been formed. The author describes a powerful model-based recommendation system based on the non-linear support vector machine. Non-linear support vector machine methods are the most frequently used methodology for dealing with unlabeled data, and they are used in a broad variety of industrial applications. [15]

In his paper, author [16] presented Random Forest as an ensemble learning technique for classification and regression operations. During the training phase, it produces a large number of decision trees and predicts the outcomes of the individual trees using regression techniques. It has a low variance and quickly links the many aspects of the supplied data for prediction. The reason behind this methodology's initial lack of enthusiasm is because random forest classification techniques are difficult to understand.

Machine Learning Based Framework for Anxiety and Depression Prediction

Figure following depicts a framework for predicting anxiety and sadness. As input to this framework, there is a set of voice data. There are 600 records in the input data set. 340 records are connected to depression sufferers, while the remaining 260 records are related to normal persons. This data set has been preprocessed in order to eliminate noise from the data and make the input data set consistent. The input data set is then subjected to different machine learning methods such as Nave Bayes, Random Forest, and SVM. Data classification is carried out. The classification results of several methods are compared. Table 1 displays these findings.
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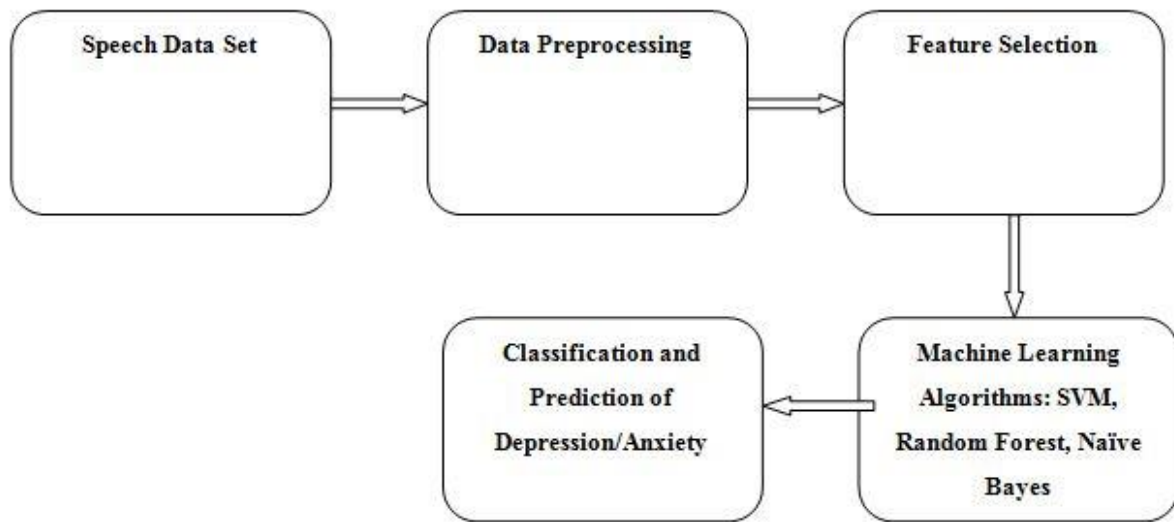
Fig.1: A Framework to Predict Depression/Anxiety

Accuracy of Machine Learning Algorithms	
Algorithm name	**Accuracy (%)**
SVM	90
Random Forest	69
Naïve Bayes	67

Table1: Accuracy of Machine Learning algorithms

Conclusion

Every person has anxiety at some time in his or her life. Anxiety is a phrase used in daily contexts to express the uncomfortable and unpleasant sensations that an individual has when confronted with stressful or scary events. Machine learning methods enable computers to prepare on data inputs for factual inquiry in order to provide results within a certain range. It promotes computer frameworks to create models for test data in order to automate decision-making based on data inputs. This article presents a paradigm for predicting anxiety and sadness. As input to this framework, there is a set of voice data. This data set has been preprocessed in order to eliminate noise from the data and make the input data set consistent. The input data set is then subjected to different machine learning methods such as Nave Bayes, Random Forest, and SVM. Data classification is carried out. The classification results of several methods are compared.

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AN EMPIRICAL INVESTIGATION OF ENGINEERING STUDENTS' ATTITUTE TOWARDS SPORTS AND PHYSICAL EDUCATION, CULTURAL ACTIVITIES AND STRESS MANAGEMENT

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ABSTRACT

This study gives an empirical perspective regarding engineering students towards sports and physical education, cultural activities and stress management. This research examines various motives for participation and non-participation in various activities. College students involved in lot of stress due to academic work, competition, daily hassles, parental expectations etc. Total sample of 270 respondents who were pursuing Bachelor of Engineering was selected. The students chosen for the study were from departments of Electronics and Telecommunication (E&TC), Computer Science (CSE), Mechanical Engineering (ME), Information Technology (IT) and Electrical Engineering (EE). Chi-square testing was used to taste the stated hypothesis in Research Methodology. This research concludes that students perusing engineering are actively involved in various activities because they are aware of benefit of active participation in sports, physical education and cultural events. At the same time they are also aware about stress management and what are most important causing factors of stress. Result of Hypothesis testing proves that Stress Management is directly proportional to Educational Performance & Parental Expectation. Sports activities found significant impact on Physical Fitness whereas participation in cultural events if directly related to Stress Management.

Keywords: Stress Management, Physical Education, Cultural Events wellbeing, Sports Events

Introduction

For most of the adolescents college life is most memorable and sparkling experience of their life. College is the span of life where they enjoy company of friends, vigorous environment, academic and extracurricular activities. In most of the countries, academic performance is a top most parameter to measure achievement of their ward. Most of the parents gives less importance to Sport, Cultural and Stress related educations. College life platform is considered to be the best to learn all these activities and become a successful human being.

Sports and Physical Education: There are numerous benefits of sports and Physical Education in participating these activities which impacts positively but Parental support is always tented towards the academic most rather than the physical fitness and health or all other physical and cultural activities. The children's of today's generation are unaware of the true benefit and importance of participation in sports and physical education activities or cultural activities. So these study is basically focused on what are the main reasons of students for not participating in cultural or sports event activities after completing their schooling and joining the bachelor course. From the medical perspective, it can be said that Physical activity is not the best way to combat the stress, but it is accepted that it helps to improve its symptoms. Another benefit of Sports, Physical activity or cultural events can reduce the depression level to an extent. It is because in these activities, people are staying with Team, participating in Sports, and it helps to reduce the depression level.

Due to stress the students are not able to continue their daily routine which results to get affected by other disease. It helps the youth to be aware of the leading a physical active lifestyle. The healthy and physical fitness helps the students as well as elders to be healthy, motivated. Along with the Sports, Physical Education Cultural Event also directly impact positively on health. As participation of students in the cultural programs makes them to work with Team, as a result it enhances the leadership, Team efforts, and social responsibilities. In India, importance is given to Sports, Physical Education and Cultural Event. As we can see regarding the sports, Tournaments are organized and the students participate in sports activities.

Stress – It is very common experience in every student's life. Normally stress is a part of

everyone's life and it's unavoidable. Stress is a representation of feeling of emotional and physical tension. In general there are only two types of stress, eustress and distress. Eustress is a good stress which motivates the person to reach the goals, which leading towards happiness and success. Distress is a bad stress where person feel helplessness because they don't have control over what happening. So the stress in student's life leads them towards physical and mental problems.

Many factors such as Academic factors, Social Factors, Family Factors, Emotional Factors and Financial Factors etc. are directly proportional to the leading of Stress among Students [1].

The recent research on stress shows that female students were affected more stress than male students since the female students were managed their stress emotionally by expressing feelings, seeking emotional support, denial, acceptance etc., and the male students are occasionally consumed drugs to manage their stress this is alarm for the society [2, 3]. Stress factors always affect student's academic work.

Stress Management - For every human being, it has to undergo through Adolescence stage which occurs between childhood and adulthood. Most of the students feels unsuitability of their mental development with their physiological changes or with the social environment and then suffer from problems arising from scarce adaptations because of rapid mental development.

For college students there most of the stress comes from academic results, personal relations, physical changes, interpersonal relations, social expectations, career exploration, and parent's expectations.

Cultural Events - Now days, in India cultural events are organized large number. They are celebrated in school, collages, but the important thing is students and their attitude towards cultural events; as the students can be called as backbone of India. The events are celebrated for social service and the students are the key indicators for the Events.

Now days, it is observed that students have shown a great enthusiasm about cultural activities because this gives them a chance to show their hidden talent beyond the classroom experience. Because they are inspired by the contributions of artists, scholars, and professionals who serve as role models for them. The students should participate in such events as it increases their self-confidence and motivate them to achieve their Goals.

Need for the study

In Today's Scenario Stress is very important and affecting phenomenon in student's life, so this research focused on identifying the factors which affects or increase students stress level directly or indirectly. In students life stress level is so high and no one is accepting that its cause's physical and mental problems so it's very important to know which factors leads student's towards stress and distract them from their academic commitments. There is need to aware everyone about what factors of stress are and how to manage and face the situations which leads students towards stress. Secondly not many students participates in sports and physical activities in engineering course so to this study is designed to know the participation and non-participation of students in sports and physical education activities before and after joining engineering course. So from this survey we come to know the reasons for participation and non- participation in sports in engineering course. Likewise from this study we identify the reasons for participation of students in cultural events in engineering course. From this survey based on their responses we can identify the reasons and provide necessary facilities for their participation in sports and cultural activities.

Objectives of the study

I. To measure the percentage of students who participate in sports and physical education.
II. To identify the reasons for engineering students to participating or not participating in sports and physical education.
III. To assess the stress level among the students.
IV. To find out effect and sources of the stress and give suggestions to overcome the stress.
V. To understand the most important reasons for engineering students to participation in cultural events.

Scope of the study

This research is intended to understand Engineering Students' attitude towards Sports

& Physical Education, Cultural Activities and Stress Management. This research is carried in Vidya Pratishthan's Kamalnayan Bajaj Institute of Engineering and Technology, Baramati.

Research methodology

To fulfill the purpose of study, we have selected the students pursuing Bachelor of Engineering (B.E) in the departments Electronics and Telecommunication (E & TC), Computer Science Engineering (CSE), Mechanical Engineering (ME), Information Technology (I.T) and Electrical Engineering (EE), First, Second and Third Year of their four year course. They were educated about objectives and purpose of the study and agreed to participating in survey on their own willingness. Stress management, Cultural event and sports and physical education participation related questionnaire consisted of 50 questions to assess five major aspects namely factors which affects stress, present participation in sports, reasons for participation and reasons for non- participation in sports, and reasons for participation in cultural activities. Later the data was analysed to fulfilled or meet the defined objectives.

Data collection

This is an Empirical type of Research. Primary and Secondary data sources were used to collect the required data; which is furthermore used to test the stated Hypothesis of the study.

Primary Data: The primary data of **270** sample respondents is collected from VPKBIET, Baramati. For this purpose discussion and questionnaire method was used. The collected data analysed by simple statistics method and represented in the forms of Graphs and tables.

Secondary Data: To study key concepts which is relevant to this research, we have used secondary data sources such as Research papers, Websites, Journals, Internet, Government Reports, and Magazines etc.

Hypothesis of the study

Hypothesis 1:
H_0: There is no association between stress management and educational performance among Engineering Students.

H_1: There is association between stress management and educational performance among Engineering Students.

Hypothesis 2:
H_0: Sports activities doesn't have a significant impact on Physical Fitness among Engineering Students.

H_1: Sports activities has a significant impact on Physical Fitness among Engineering Students.

Hypothesis 3:
H_0: Participation in Cultural events doesn't have a significant impact on Stress Management among Engineering Students.

H_1: Participation in Cultural events has a significant impact on Stress Management among Engineering Students.

Hypothesis 4:
H_0: There is a no correlation between Stress Management and Parental Expectation among Engineering Students.

H_1: There is a strong correlation between Stress Management and Parental Expectation among Engineering Students.

Data analysis

Analysis of data involves number of closely related operations that are performed with purpose of summarizing the collected data. This Data is further used to draw conclusion which is used for giving the suggestions if necessary. A structured questionnaire is used and the type of question is Likert scale. The data is analysed through simple statistics technique. Graph, Table and MS-Excel used for data collection.

Likert scale and weightage used for Questionnaire:

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Student's participation in sports before and after admission into B.E course

The Previous and present participation of students was first analysed by using simple statistics where the respondents answered with Yes or No for their participation previously during school education and also for current

participation in Sports and physical education activities. The results are as follows:

Table No: 1 – Student's participation in sports before and after admission into B.E course

Gender	Total Numbers	Previous Active Participation		Current Active Participation	
		Count	%	Count	%
Boys	189	183	96.8	92	48.6
Girls	81	73	90.0	31	38.2
Total	270	256	-	123	-

**Graph No: 1 - Student's participation in sports before and after admission into B.E course**
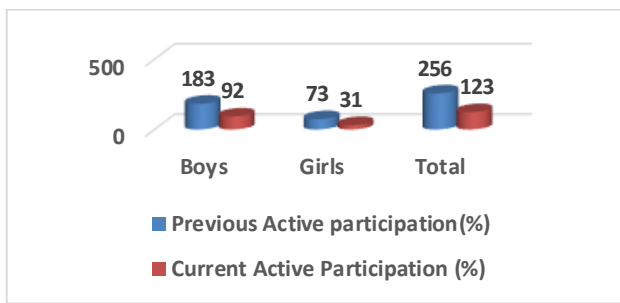
Demographic Classification of Students -
Demographic Classification of Students was analysed by simple statistics which shows how much students from rural area and how much students from urban areas, and results are as follows:

Table No: 2 - Classification of students according to rural and urban area

Gender	Total Numbers	Urban Area		Rural Area	
		Count	%	Count	%
Boys	189	59	32.5	130	72.9
Girls	81	26	32.09	55	67.9
Total	270	85	-	195	-

Graph No: 2 - Classification of students according to rural and urban area
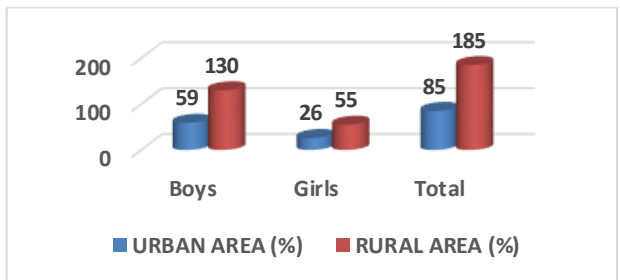

Responses of student towards reasons for participation in Sports

In the given questionnaire, the responses options given for the subject was between 1 to 5 where 1 is Strongly Disagree, 2 is Disagree, 3 is for Neutral , 4 is for Agree and 5 stands for Strongly agree which will be highest score that can be given by individual for any reason. The Respondents accordingly give their inputs and likewise questionnaire filled by respondents.

The second approach towards the data was to analyse different reasons for which the student participates in the sports. In questionnaire there were 17 reasons listed with options to give responses. According to the responses collected from students data were analysed.

Table No: 3 - Responses of student towards reasons for participation in sports

Sr. No	Reasons For Sports Participation	Mean Score
1	Health and Fitness	4.8
2	Stress Relief	4.5
3	Well- being	4.2
4	Accompanying Friends	2.1
5	Physical Ability	4.52
6	Travel	3.5
7	Meet New People	3.7
8	Interest in Competition	3.62
9	Financial benefits	2.32
10	Personal Publicity	2.13
11	Educational Benefits	3.54
12	Rewards	3.92
13	Childhood Practice	3.87
14	Passion	4.21
15	Hobby	3.65
16	Good Coaches	3.45
17	Fame	2.12

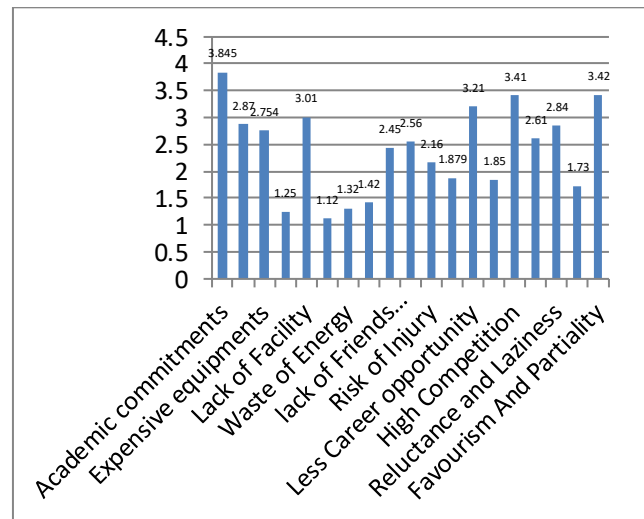**Graph No: 3 Responses of student towards reasons for Participation in Sports**
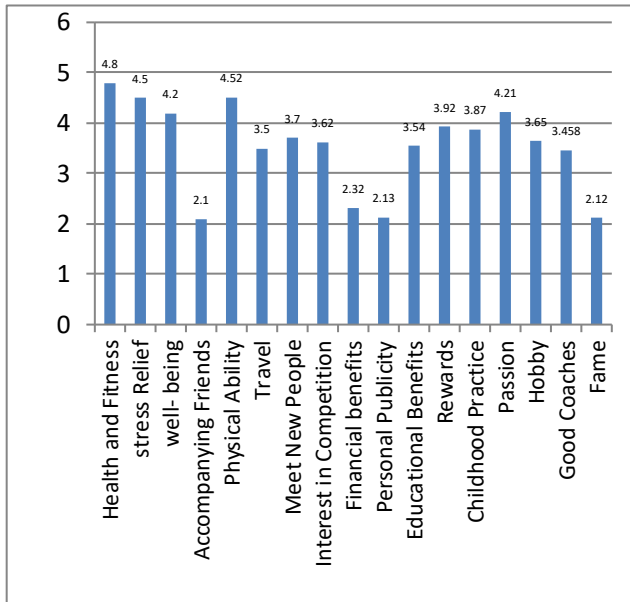
4	Waste of Time	1.25
5	Lack of Facility	3.01
6	Meant For Children Only	1.12
7	Waste of Energy	1.32
8	Religious Restrictions	1.42
9	Lack of Friends participation	2.45
10	Ill Health	2.56
11	Risk of Injury	2.16
12	Exposes of Body	1.879
13	Less Career Opportunity	3.21
14	More Opportunity for Male	1.85
15	High Competition	3.41
16	Difficulty in Getting Selected	2.61
17	Reluctance and Laziness	2.84
18	Friends Don't Want Me To participate	1.73
19	Favourism And Partiality	3.42

Graph No 4: Responses of student towards reasons for non-participation in sports

Responses of student towards reasons for Non-Participation in Sports

There were two categories of respondents who participated in the study. The first category were the students who still have interest in sports or participate in spots after taking admission to B.E course after their school and second category were the ones who stopped participating in sports and physical education activities after joining B.E course. To survive the objective of identifying the reasons for non-participating in sports and physical activities the below data was obtained and analysed. The questionnaire contained 19 various reasons listed with options to give responses. All the 19 statements were reasons for non- participating in sports and physical educational activities. All the responses given by students were analysed.

Responses of student towards the factors of Stress

To attain the objective of identifying the factors this leads students towards stress, the data was analysed. In below table there were listed 19 factors which cause stress to students with the responses.

Table No: 4 Responses of student towards reasons for non-participation in Sports

| Sr. No	Reasons For Non-Participation in Sports	Mean Score
1	Academic Commitments	3.845
2	No Childhood Practices	2.87
3	Expensive Equipment's	2.754

Table No: 5 Responses of students towards the factors of Stress.

Sr. No	Factors of Stress	Mean Score
1	Examination	4.42
2	Deadlines	4.24
3	Pressure of combining paid work & study	3.12
4	Returning to study	2.45
5	Difficulty in organizing work	3.21
6	Poor time management	3.56
7	Out of control debts	2.1
8	Leaving assignments to last minutes	3.82
9	Unhealthy Competition	3.17
10	Parental expectations and style	4.32
11	Homesickness	2.54
12	Social anxiety	3.87
13	Financial Burden	3.41
14	Lack of self Confidence	3.57
15	Relationship Failure	3.98
16	Social Life and status	4.32
17	Personal Issues	3.21
18	Career Exploration	3.98
19	interpersonal relations	3.52

Graph No: 5 Responses of students towards the factors of Stress.
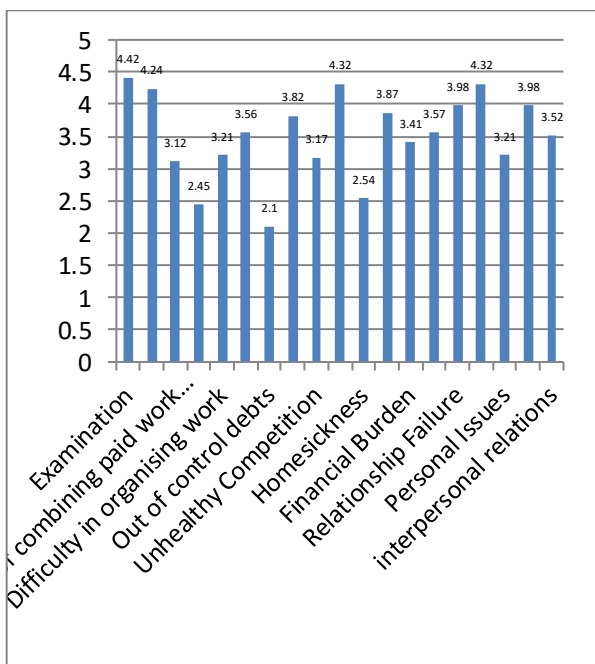
Responses of student towards the reasons of participation in Cultural Events

To achieve objective that to know the reasons of participation in cultural activities below 16 reasons is listed with responses. All the responses were collected and analysed.

Table No: 6 Responses of students towards the reasons of participation in Cultural Events

Sr. No	Reasons For Participating in Cultural Activities	Mean Score
1	Relief stress	4.01
2	To know hidden talent	3.54
3	For Change	2.98
4	Celebrate Heritage	3.1
5	Break From routine Life	3.24
6	Like cultural events(excitements)	3.55
7	Interest and hobbies	3.67
8	Improve Leadership	3.98
9	Overcome stage fright	3.52
10	Popularity and fame	2.54
11	To build social image	2.98
12	Support Community	3.21
13	Introduce to New Things	3.47
14	Learn about New Culture	3.21
15	Time With Friends	4.12
16	Entertainment and Enjoyment	4.81

Graph No: 6 Responses of students towards the reasons of participation in Cultural Events
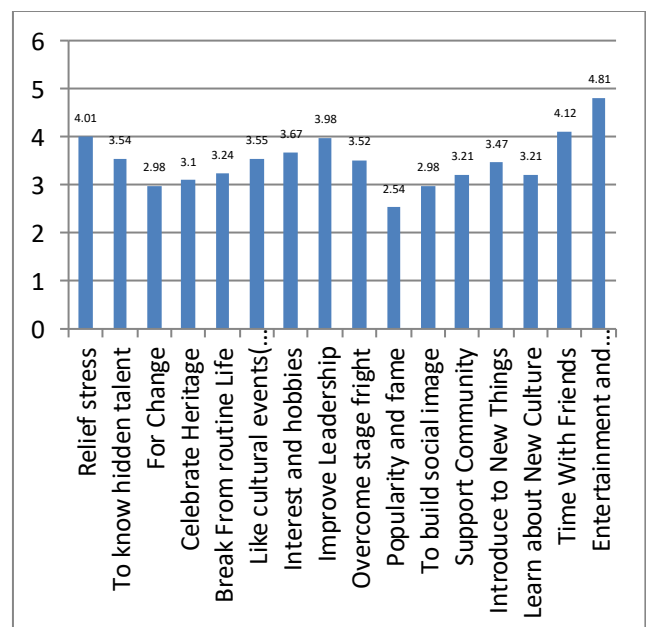
Hypothesis testing

In this section we have tested the stated hypothesis using Chi Square Test for testing significant effect is the parametric test for testing the difference between more than three categories of the testing variable.

Table No 7: Results of Pearson Chi-Square Tests				
Parameters	**Calculated Value**	**Degree of Freedom**	**Asymptotic Significance (2-sided)**	**Result**
Stress Management and Educational Performance	52.05	4	0.000	Null Rejected
Sports activities and Physical Fitness	68.34	4	0.000	Null Rejected
Participation in Cultural Events and Stress Management	49.78	4	0.000	Null Rejected
Stress Management and Parental Expectation	56.97	4	0.000	Null Rejected

Hypothesis 1: (Null Rejected)

H_0: There is no association between stress management and educational performance among Engineering Students.

H_1: There is association between stress management and educational performance among Engineering Students.

These results indicates that there is statistically relationship (Association) between Stress Management and Educational Performance (chi – square with 4 degree of freedom = 52.05, p = 0.000). Here expected table value is 19.453 however actual calculated value is more than table value. Hence Null Hypothesis is rejected.

Hypothesis 2: (Null Rejected)

H_0: Sports activities doesn't have a significant impact on Physical Fitness among Engineering Students.

H_1: Sports activities has a significant impact on Physical Fitness among Engineering Students.

These results indicates that there is a Statistical impact of participation in the sports activities on Physical Fitness (chi – square with 4 degree of freedom = 68.34, p = 0.000). Here expected table value is 24.485 however actual calculated value is more than table value. Hence Null Hypothesis is rejected.

Hypothesis 3: (Null Rejected)

H_0: Participation in Cultural events doesn't have a significant impact on Stress Management among Engineering Students.

H_1: Participation in Cultural events has a significant impact on Stress Management among Engineering Students.

These results indicates that there is statistically relationship (Association) between Participation in Cultural events and Stress Management (chi – square with 4 degree of freedom = 49.78, p = 0.000). Here expected table value is 14.144 however actual calculated value is more than table value. Hence Null Hypothesis is rejected.

Hypothesis 4: (Null Rejected)

H_0: There is a no correlation between Stress Management and Parental Expectation among Engineering Students.

H_1: There is a strong correlation between Stress Management and Parental Expectation among Engineering Students.

These results indicates that there is statistically correlation between Stress Management and Parental Expectation (chi – square with 4 degree of freedom = 556.97, p = 0.000). Here expected table value is 29.997 however actual calculated value is more than table value. Hence Null Hypothesis is rejected.

Discussion

Students Participation in Sports: The statistics from Table 1and Graph 1 shows those out of 189 male students who have taken part in survey 181 student's i.e.96.8% were active in sports and physical education activities earlier during their schooling and now after joining engineering only 92 boys i.e. 48.6% of total male population are active in sports and physical education activities which shows that participation of boys has come down by 48.2% after joining Engineering course. Similarly out of 81 female students who have taken the survey 73 students i.e. 90% were active in sports and physical education activities earlier during their schooling and now after joining engineering only 31 girls i.e. 38.2% of total female population are active in sports and

physical education which shows that participation of girls has come down by 51.8% after joining engineering course. On an Average the statistics reflects that percentage of engineering students participating in sports prior to joining the engineering was 93.4% and after joining the course it has come down to 43.4% due to various reasons. The values obtained from the analysis of data which are mentioned in Table 1 and represents by Graph 1 shows that students are more active in sports and physical education activities before they get in to professional engineering courses and their participation is cut down to various reasons after joining the engineering course.

Reasons for Sports Participation: Students have expressed their reasons for participation in sports and physical education activities by filling the questionnaire with values 1 to 5 in relation to various reasons which were listed in questionnaire. The data analyzed in present Table 3. It shows that the top three reasons (scores >4.5) for which engineering students participating in sports to maintain physical fitness and health (Score-4.8/5), to improve physical ability (Score- 4.52/5) and to get relief from stress (Score- 4.5/5). The second level of reasons (Scores- 3.5 to 4.5) Express by the participants were for passion (Score-4.2/5), to Well-Being (Score- 4.2/5), for rewards which they get (Score-3.92/5), to meet new peoples (Score-3.7/5), as a hobby (Score-3.65/5), due to childhood practices (Score-3.87/5), for educational benefits (Score-3.54/5), love to travel (Score-3.5/5), Interest in competition (Score-3.62/5). The third level of reasons (Score<3.5) expressed by the participants were to gain personal publicity (Score-2.13/5), For accompanying friends (Score-2.1/5), For getting financial benefits (Score-2.32/5), because of good coaches (Score-3.458), for getting Fame (Score-2.12/5).

This analysis shows that the students pursuing the Bachelor of Engineering who have passion towards the sports, know the importance of fitness and physical health continue their participation in sports as they aware of the mental , physical and social benefits that they gain through sports and physical activities. In addition regular childhood practices, getting rewards, joy of travelling and getting connected with new peoples across the world,

interest in competing are some other reasons expressed by the subjects. Students lastly active in sports because of getting financial benefits, due to their association with good coaches, for getting social fame and personal publicity. All these reasons contribute in participation of students in sports and physical activities.

Reasons for Non- Participation in Sports: The another part of questionnaire consist of 19 reasons for which the students did not participate in sports and physical related activities and the subjects gave their responses to each reason with grading 1 to 5. The data obtained was analyzed and represented in Table 4 and graphically presented in Graph 4.

The main reason for non-participation in sports as expressed by engineering students was Academic Commitments (Score-3.845/5) followed by the second level of reasons (Score 2.5 to 3.5) were Favourism and partiality (Score-3.42/5), High Competition (Score-3.41/5), Reluctance and Laziness (Score-2.84/5), Less Career Opportunity (Score-3.21/5), Difficulty in getting Selected (Score-2.61/5), Ill health (score-2.56/5), Lack of Facility (Score-3.01/5), expensive equipment's (Score-2.754/5), No childhood Practices (Score-2.87/5). The third Level of reasons (Score 2 to 2.5) were lack of friends participation (Score-2.45/5), Risk of Injury (Score-2.16/5). The finally the other reasons (Score<2) express were Waste of time (Score-1.25/5), Meant for children's only (Score-1.12/5), Waste of energy (Score-1.32/5), Religious restrictions (1.42/5), Exposes of body (Score-1.879)/5), More opportunities for male (score-1.85/5) and Friends don't want me to play (Score-1.75/5).

According to the above statistics it was understood that students perusing there Engineering course have academic commitment as a barrier in participation in sports and physical activity. The expectation from parents is the major reason why student are liable to academic commitments and are aimed at working hard to achieve their goals. This parental expectation does not allow them to deviate from academics towards sports and physical activity. Reluctance and Laziness in also an impacting factor on youngsters for not participation in sport. Experience of Favourism

or partiality affects students moral and that also affect participation in sports. In today's generation youngsters want everything easily available without any efforts and that not possible so without working hard selection will not happen so this is also reason for non-participation. Some other reasons for non-participation in sports are illness, waste of time and energy, Risk of Injury, Religious restrictions, Lack of friend's participation. It was also observed that the facilities and infrastructure of engineering institution was not fulfilling the need of students which is one reason for non-participation. Expensive equipment's were also a reason in which students cannot afford the equipment's and that's why they want to participate but they don't. Another common reason that reduces the interest of students in sports is lack of childhood participation. Some students have express that the dress they need to wear while playing exposes their body makes them feel uncomfortable.

Factors of Stress: Next part of questionnaire consists of 19 factors by which students of engineering feel stress and the subject gave their responses to each factors with grading 1 to 5. The data obtained was analyzed and presented in Table No 5 and graphically presented in Graph No 5.

Students have expressed the reasons of stress by filling the questionnaire with values 1 to 5 in relation to various factors which were listed in questionnaire. The data analyzed in present Table 5. It shows that the top Five reasons (scores >4.0) which leads students towards stress is first and most common factor Examination (Score-4.42/5) , Parental expectations and style (Score-4.32/5), Social Life and status (Score-4.32/5) and Deadlines (Score-4.24/5).The second level of Factors of stress is (Score-3.5 to 4) express by the participants were Career Exploration (Score-3.98/5), Interpersonal relations (Score- 3.52/5), Relationship Failure (Score- 3.98/5), Lack of Self Confidence (Score- 3.57/5), Social anxiety (Score-3.87/5), Leaving Assignment to last moment (Score- 3.82) and Poor time management (Score3.56/5). Third level of Factors of stress is (Score-2.5 to 3.5) express by the participants were Homesickness (Score-2.54/5), Pressure of combining paid work and

study (Score- 3.12/5), Difficulty in organizing work (Score- 3.21/5), Financial Burden (Score 3.41/5), Personal Issues (Score- 3.21/5). Last level of factors of stress (Score<2.5) were Returning to study is also a factor (Score2.45/5), Out of debts (Score-2.1/5).

In the analysis of data it observed that the main factor of stress in students who perusing their engineering degree is Examination which held by colleges. Mostly student feel stress during their examination and along with that parental expectation is also one of the factor which leads students towards stress. Parents have more expectations from their children's so to fulfill parent's expectation students have to perform well in academics. In today's generation youngsters are most affected by their social status and life so it becomes more important in their life. Social life affects student's mental health. There are other factors like deadlines, career exploration, interpersonal relation which directly and indirectly affect student's life and leads them towards stress. Now days in youngster life personal relationships get more importance than other things and if they get failure in that then they feel very depressed so this is also a major factor among engineering students for stress. Some other factor like lack of self-confidence, leaving assignment for last movement, poor time management, social anxiety, homesickness, difficulty in organizing work are affect students life which impact their academic performance. Financial burden and out of debts is also some factors which cause stress to students.

Reasons for participating in Cultural events: Last part of questionnaire consists of 16 reasons for which the students participate in cultural events and the subjects gave their responses to each reason with grading 1 to 5. The data obtained was analyzed and represented in Table 6 and graphically presented in Graph 6.

There were main three reasons for student's participation in cultural events (Score>4) first is Entertainment and Enjoyment (Score-4.81/5), spending more and more time with friends (Score-4.12/5), to relief their stress (Score-4.01/5). The second levels of reasons for participation in cultural events are (Score-3.5 to 4) Improve Leadership skills (Score-

3.98/5), to overcome stage fright (Score-3.52/5), Just for interest and hobbies (Score-3.67/5), Like cultural events (Score-3.55/5), To know the hidden talent (Score-3.54/5). The third level of reasons for participation in cultural events is (score- 3 to 3.5) to celebrate heritage (Score-3.1/5), Break from a daily routine (Score-3.24/5), to support community (Score-3.21/5), Like to learn about new culture (Scope- 3.21/5). And lastly level of reasons (Score<3) consist of other reasons like for change (Score-2.98/5), for getting popularity and fame (Score-2.54/5), to build a social image (Score-2.98/5).

This analysis shows that Entertainment and enjoyment is most common reason among students in participation in cultural events. To get Relief from stress students participate in cultural activities and enjoy the events. From Stressful life students get some break from daily routine that is also one reason students participate in cultural events. Some students want to improve their leadership skills and to overcome stage fright. Some other reasons are also there by which they participate in cultural events like to celebrate heritage, to support community, to know more about our culture and also to know and understand others culture. To know hidden talent cultural events are the best way. Some students participate in cultural events for change. These are some different reasons for students to participate in cultural events. Everyone wants some popularity and fame in college so cultural events help students to show their talent and get popularity and build social image.

Conclusion

The Following conclusions are drawn from this Research:

- Students are actively participating in Sports and Physical education activities during their schooling and pre-college education.
- Students who previously participating in Sports and Physical education activities are found strongly aware about physical, mental and social benefits and importance in career planning.
- After joining an Engineering course participation of students in Sports and Physical activities come down due to Academic commitments.
- One of the reasons of students not participating in Sports and Physical activities is lack of proper infrastructure and facilities.
- Good coaches and awareness about the physical and mental health are some reasons that some students active in sports and physical education.
- Examination and Parental expectations are some major factors of stress which affects students most.
- Social life and personal relationships and failure in relationship are some other factors which affect or distract students focus from their study or academics and its leads them towards the stress.
- The reasons for stress cannot be limited; it varies according to students and their psychology.
- Entertainment and enjoyment and relief from stress are most common reasons for students to participate in cultural events activities.
- Students also participate in cultural activities to show their hidden talents, to improve their leadership skills.
- To get break from daily routine life and for sake of change students participates in cultural activities.
- In this study it shows that Participation in sports and physical education activities or participation in cultural events directly impact on stress. So Stress management, Participation in sports and physical activities and cultural activities are directly or indirectly impact each other.
- Student's perception towards participation in sports and participation in cultural events as a stress buster.
- Result of Hypothesis Testing concludes that there is an association between Stress Management and Education Performance.
- Sports activities has a significant impact on Physical fitness.
- Participation in Cultural events has a significant impact on Stress Management.
- There is a strong correlation between Parental expectation and Stress Management.

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LEARNING MANAGEMENT SYSTEMS (LMSS) USAGE IN INDIAN EDUCATION DUE TO COVID-19 PANDEMIC

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ABSTRACT

Covid-19 pandemic have impacted educational institutes across India, as well as across the world, in terms of education, interactions and physical classrooms. This pandemic has forced educational institutes to shift to online teaching-learning modes. In India, particularly, this transition is smooth for most of private institutes, but the public schools and colleges with little or no infrastructure to offer online education are suffering and/or some of them are still adopting this transition. There is a wide range of Learning Management Systems (LMSs) available freely over the internet but there are also difficulties on the nature of classes, examination and evaluation of courses. While open source LMSs like Moodle LMS are available to everyone to conduct online courses, its assessment and evaluation. There are also other such applications available over the internet including Google Classrooms, YouTube, Facebook, Cisco Webex, Microsoft Teams, Google Meet, Zoom Meetings, etc. This paper documents the need and usage of LMSs like Moodle along with other such applications available in Indian Education in case of state of emergency like Covid-19 pandemic.

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Keywords: Open Source, Open Source Software, eLearning, Open Source Learning Management System, Moodle

Introduction

The Learning Management Systems (LMS) software development model has given us new opportunities in order to work Online and in blended teaching modes in situations like Covid-19 pandemic or in other similar state of emergencies. What are the challenges and opportunities faced by the Learning Management Systems in the institutions and other organizations in their adoption, usage, assessment and evaluation is highlighted in this paper. This paper begins with a description of LMS Software concepts, followed by a discussion of the benefits and issues associated with the LMSs and Online Education in the present scenario of COVID Pandemic along with challenges involved from a teacher's point of view. The paper concludes with a discussion about the factors associated with the successful implementation of LMS, like Moodle. Moodle is built by the Moodle project led and managed by Moodle HQ, funded by a network of more than 80 companies that work with Moodle Partner worldwide.

Education in covid-19 pandemice

Covid-19 Pandemic has made a global impact on different sectors and has affected the education sector too. Technology has provided a solution for teaching and learning and allowed classes to continue as "normal". Education has seen a paradigm shift from the traditional classroom teaching to online teaching. Online teaching has proved to be innovative in keep the learning process going on even in this unavoidable situation. It definitely has been a challenging phase to shift completely from classroom to online within a short span.

Initially all the educational institutions were busy trying to figure out the most suitable platform that would allow teachers and students to connect smoothly. Teachers and facilitators are trying their best to make optimum utilisation of the resources in an attempt to deliver their knowledge and make the concepts more clear. This has also given an opportunity to the teachers to explore different resources in order to make their sessions more interesting. Keeping in mind that the attention span decreases as technology increases, teachers are taking maximum efforts to provide quality education with utmost dedication and selfless service. This change in the education sector has had its own negative and positive sides.

The overall experience has been more beneficial from a student's perspective.

- Students have become more responsible, self-organised and need to take ownership of learning.
- It has given a student an overall different experience of learning with ease of access and that which is self-paced.

Teachers have also faced major concerns while addressing the students of lower classes in comparison with that of higher classes.

The students from the lower classes have had a negative impact due to this shift of learning to virtual mode.

- They lose out on their overall aspect of learning from experience through this transformation. The classroom mode of teaching has had its own benefits of helping students grow with participative learning which involves activities like dealing with friends, learning values of sharing, leadership qualities apart from the bookish knowledge they gain.
- Instructions given virtually may not always be clearly understood by children who then need to take the assistance of their parents or guardians. Many a times, it is the parents who have to spend more time in completing the home assignments of the kids as compared to the times when they were sent to school physically. Parents also face a major issue in finding time to tackle the problems along with their busy work schedules.
- Along with the above mentioned problems connectivity still remains a major concern.

Houses where there are siblings also find it difficult to attend sessions due to clashes in timings especially with limited devices and resources

Information Technology and Computer Science industry are changing the way traditional education can be conducted and understood as compared to the modern way of teaching and learning. This is commonly terms as E-learning in modern education systems. E-learning is basically learning through Information and Communication Technology as well as through online platforms, LMSs, Websites, Video Conferencing, YouTube, Google Classrooms, Mobile Applications, and by using hundreds of such types of freely available platforms for blended teaching and learning tools. Currently, E-learning is helping students and teachers to enhance their knowledge, skills and learning experience.

Many of the companies now started to skill their employees, universities to skill their students and staff through the internet based educations and skill development activities. Most of the universities have already started to provide online courses for their students within and off campuses.

Open source software

Open Source has an access to the end product along with the source material, blueprint and the documentation available at no cost to the public. This increases the communication and the interactions with different domains and thus helps in the self-enhancement. Open source software for Open Source LMS Tools is the good example of open source development. Open source LMS tools are available in the source code form. These are provided under a Open GNU General Public License that allows users to read, modify and improve the source code based tools. Open source licenses generally meet the requirements for open source definition. Some open source tools are available on the web. The [1] has reported the use of open-source tools and its savings of about $ 60 billion a year for consumers. [1].

Learning management systems

A Learning Management System (LMS) is software that helps automates the task of training. The LMS could serve as a platform to deliver eLearning to the students. [2] It has the combination of administration, tracking, documentation, training, online events etc. LMS is made to be robust in nature by having the facility of self-servicing and self-guiding, and also able to personalize contents and reusable. This system helps to enrich and encourage classroom teaching among the masses. Along with the commercial packages, LMS has many open source solutions available. Some open source and other LMS tools available are listed in the table I. [3]

Table. 1. Open Source and Other LMS Tools

Open Source LMS Tools and Link to them	
LMS Tools	**Link to the Tool**
Openolat	https://www.openolat.com/
Ilias	https://www.ilias.de/en/
Effectus	https://www.effectuslms.com/

Forma	https://www.formalms.org/
Totara Learn	https://www.totaralearning.com/en
Open edx	https://open.edx.org/
Chamilo	https://chamilo.org/en/
Moodle	http://www.moodle.org
Bodington	http://www.bodington.org
Claroline	http://www.claroline.org
Dokeos	http://www.dokeos.com
.LRN	http://www.dotlrn.com
ATutor	http://www.atutor.ca
OLAT	http://www.olat.org
Sakai	http://www.sakaiproject.org
Upgrad	http://www.upgrad.com
Google Classroom	http://classroom.google.com

Moodle, World's Leading Open Source LMS

MOODLE [4], The Modular Object-Oriented Dynamic Learning Environment is an online Course Management program with a flexible environment for learning communities. It is a software package designed to implement educational principles and is designed to support the educational framework in community building. Moodle is Certified OSI, open source and freely available. Moodle open-source license and modular design allow any engineer to create additional modules and features. It can be installed on Windows, Mac, and Linux with servers using php. Moodle has continued to emerge since 1999 (since 2001 with current construction). Current version 1.9.9, released in June, 2010. Translated into 82 different languages. Significant improvements in accessibility and flexibility are shown in 1.5. Currently, work is underway to release Moodle 2.0.

Moodle's work focuses on providing teachers with the best tools for managing and promoting learning. Moodle has features that allow it to grow in enormous enrolment with hundreds of thousands of students, but can also be used for elementary school or educational hobbyist. Moodle is used by more than 50,000 learning communities, with more than 9 million users. It is used in more than 200 lands and in some 80 languages. As of January 2010, it had a base of 45,721 registered and registered site users, using 32 million users in three million courses.

Organizations tend to be a little fearful of open source products as they do not come with the support. The more the people belonging to the support community, the better the support becomes. That is one of the Moodle's strengths. Our eLearning budget could focus on making better training, not upgrading tools every year.

Each teacher or supervisor has certain options regarding building their online courses. They can build their lessons from the Moodle website, or use the server of their established organization where the Moodle code is downloaded and stored. Depending on where your Moodle site is located in the cyber world, we determine whether you have access to all of the above features as there are different types of Moodle available. The user simply logs in and starts exploring and reading!

Potential Users in India

There are currently 184950 active Moodle LMS sites that have registered from 249 countries across the world. There are 6749 active Moodle LMS registered sites in India [5].

▪ DOEACC Mantra is a website for DOEACC students currently having 44 courses, 4928 users and 5965 posts. [6]

▪ AMIE India is a website for AMIE students currently having 239 courses, 11246 users.[7]

▪ Used by Goa University, Goa [8]

▪ Used by Christ University, Bangalore, Karnataka[8]

▪ Used by Indian Institute of Technology, Bombay[8]

▪ Ballistic Learning Pvt. Ltd. has more than three years of experience in all aspects of Moodle shipping, from complete customization to hosted management and management. They offer annual sponsorship contracts as well as new and existing Moodle sponsorship. Support services include problem solving, design and development, migration, upgrading, content conversion, training and community building. They offer managed hosting of Moodle apps and servers - on VPS and dedicated servers - of gates that have or expect heavy traffic. Their 99.9% uptime management includes setup, migration and escalation services.

Moodle Benefits

The [10] have highlighted some of the benefits of Moodle LMS in education are:

▪ Moodle is free to download and has facility of adding plug-in to customize the system.

▪ Moodle Community provides help to solve any problems coming across.

▪ Moodle has got great flexible environments that help in the customization by addition of plug-in and add-ons freely available.

▪ For a small business, Moodle offers a fully capable course delivery and sales platform.

▪ Most of the interfaces are similar. So working with Moodle will be of great ease.

▪ Moodle has got a great way of keeping backups and also restoring functions.

Moodle Drawback

There are few drawback of the Moodle system which are as [10]:

▪ There are difficulties in getting the report of many studies from the other side. You may face problems on each course site to view one course distance at a time, or use an all-view view report to view one user's distance at a time.

▪ Skilled staff or users are required to use and implement it.

▪ Moodle is not open but closed because someone can "unlock" your Moodle, but most installations require registration, and too many courses require course passwords (registration keys)

▪ The "Resources" provided by the fields in the interface are small and do not provide early help.

Case study on moodle lms

We at Shri Siddheshwar Public School and Junior College had a plan to develop a new collaborative method of e-learning along with the classroom teaching. Our colleges were aiming at developing a cost-effective solution for the same. There were many requirements and suggestions from the faculties and the students for the development. Combining all their requirements we came out with the solution of using the world's leading Open-Source LMS, MOODLE. We, a team of two Faculty members and some Engineering students had started working on this project. We used the MOODLE 1.9.4 version. Initially we had installed moodle on stand-alone computers and explored it and customized it to meet the specifications of the users, by adding various features into it. Most of the specifications were met by moodle. So we had introduced moodle on the campus intranet for testing for the user acceptance and compatibility. It was found that most of the learning activities were made simple by its introduction and we were also able to manage the software in-house.

According to the original Technology Acceptance Model (TAM), perceived usefulness and perceived ease of use is hypothesized to affect intention to use, and perceived ease of use is not hypothesized to directly affect intention among users [13].

Users had a request for making the software available online so that they could be able to access it from anywhere. So with this success rate we had made Moodle online making it more flexible.

Tasks carried out by using Moodle

▪ Putting up learning materials like class notes, presentations, documents at one place according to the department and course wise

▪ Assignments were put up by the faculty members and the students could submit the assignments online

▪ Attendance was taken on Moodle. This enabled the students to keep track of their attendance

▪ Quizzes were taken up by various department on various topics

▪ Discussion Forums used to have discussions on various topics of interest

▪ Moodle support creation and maintenance of wiki on any topic

▪ Create and maintain data repository of any category, be it a file, a link, etc. by the department and share with other departments

▪ Keep track of the daily activity by maintaining calendar

▪ Using the chat facility, the teachers and the students could chat with any person like any other chatting source

▪ Mails and messages could by send across to a single user or a group of users on bulk

▪ Notices could be put up by the faculties and the students could respond on the same

Modules and plug-ins used in Moodle

1) **Assignment:** Faculties can put up assignments for the students. Categories of submitting assignments are also present; wherein a student can either submit the assignment online or offline. Options like the submission date, permissions for resubmissions can be set. An automatic remainder is set in the students profile calendar. Students can be graded according to the assignment submitted by them. So they have a check on the grades, comments and also have a back-up of the submissions done.

2) **Resource:** Resources deals with the lecture notes, presentations, links to particular webpage, etc. Faculty can put up any kind of resource and keep it open for the student's to view it and download it if required. It is like a repository of all the class materials.

3) **Attendance:** Faculty can take up online attendance of the class. This helps in the reduced paper work for the faculty in maintaining the records and also calculation of the attendance at the end of the semester. This module does the calculations based on the settings made. The faculty can export the attendance and get the hard-copy for the same. The students can also keep track of their individual attendance.

4) **Forum:** Open discussion that can be carried out by the faculty and the students on any topic of interest. It can be moderated.

5) **Database:** A data repository for storing any data pertaining to any department or course. Can be of any type like documents, file's, webpage's, pictures, etc. This can be moderated. All the users can view the entries and make their own entries. The users can grade others and can comment on the entries.

6) **Questionnaire:** Questionnaire is suitable for the survey part, wherein some set of questions can be put up. The reports would be auto generated and can be used.

7) **Wiki:** Discussion that can be carried out by the faculty and the students on any topic of interest. It can be created and maintained for further reference. It can be moderated.

8) **Quiz:** Quizzes can be taken up on any topic by the faculty. This becomes a good method of learning. Faculty can get an idea of the students learning capacity. Also the students get to know their grades and can find out their understanding level in that area.

9) **Shout box:** Place where the notices could be displayed on the course page. Separate shout box could be maintained by the courses.

10) **Chat:** Chatting facility can be done in Moodle also. Here the students and teachers can have chat sessions on some topic as an activity or can chat personally. Increases the possibility of interaction between the faculty and the students.

11) **E-Mail List:** Enables the email facility to all. User can send personalized mails or send mails to group using this module. So any class related information could be send across in this manner.

Challenges faced using Moodle

- Few user acceptance problems
- Training the non-technical user to work with the software with ease
- Server getting hanged when many user try logging in at the same time
- Fear of the system getting crashed
- Network an connectivity problems

Many of the above mentioned problems are solved and some, still getting solved. Our project is now being used by potential users that include all management students and faculties. Moodle makes the interaction between the students and faculties much simpler, anytime, from anywhere. Students get to know their learning progress by the grades awarded for their participation in the various activities put up by their faculties on Moodle. Most of the paper works of both the students and the faculties are reduced as most of such work is done in Moodle.

The team working on the development and management of the Moodle software in the campus has been interacting with the different users to find out problems they are facing and to come up with some solution for the same. Also the team gets suggestions and requirements on the development of the software and is working to make it convenient and potential e-learning software.

The [11] have mentioned in their research, LMSs and Virtual Teaching Environments offer a convenient and economical alternative to physical classrooms using online LMS platforms available particularly in the case of

urgent needs, such as COVID-19 pandemic. Using Information and Communication Technology (ICT), Online LMSs and Applications, School or Colleges can conduct courses virtually. Some of the popular platforms used so far by academicians and students for virtual classrooms and study are Zoom Meetings, Google Classrooms, Google Meet, Facebook, WhatsApp Groups, Cisco Webex, Microsoft Teams etc., All of them are evidently more efficient in terms of information technology, communication, knowledge sharing, availability and cost.

Importance of lms software during covid-19

The online learning has rose during COVID-19 pandemic, it is helping students and teachers to continue in their educational activities. Educational institutes, Schools, Colleges, and Universities have already started to shift away from physical classrooms to virtual classrooms and they are leveraging the digital space. A recent study [12] elaborated how educational institutions are leveraging the potentials of LMS and it will further invest up to $350 billion on these technologies by 2025. This will include Educational websites, Online Teaching Tools, LMSs, Mobile Applications, Social Media Channels like Facebook, YouTube among many others.

LMS is software system particularly used for the purpose of Education can manage course administrations, student's monitoring, assessment, evaluation, reporting and results of online courses and training programs. It could be thought of a classroom where teachers can interact with their students and conduct learning activities virtually using Internet and LMS.

This kind of systems is essential during state of emergencies like Covid-19 pandemic where social distancing, health and safety protocols need to be followed. There are obvious reasons to do that as listed below:

▪ **Continuity in education:** The LMS used for Schools, Colleges and Higher Education acts as a virtual classroom. They only need internet connection and equipment to go to school again.

▪ **Ensures health and safety:** Education systems are finding the appropriate virtual classrooms, where schools, colleges can continue teaching and learning activities while ensuring health and safety measures.

▪ **Effective online learning:** LMS provides tools and functions to help simulate the experiences and activities that normally occur in traditional classrooms. Teachers can share, upload and update e-learning contents on the LMS. Even it is possible to further share supplementary learning materials, give reminders, assignments, quizzes, and administer tests, assessments and reports.

▪ **Performance Monitoring:** The biggest advantage of using LMS is that you can analyse and report on the effects of online courses. LMS is useful in getting monitoring and performance reports of the teacher and students in time. It normally has an in-built feature to keep track of these records, students' assessment scores, their submissions, and teachers' engagement with the course.

▪ **Increase Engagement:** One more advantage of LMS is to keep students engaged, it offers a mechanism to communicate and stay informed to both teachers and students. There are notification features, chat boxes, forums, posts, blogs, and even social media channel integration can be made available. It helps students to encourage participating during and even later in the class activities and discussion.

▪ **Personalize Learning Experience:** LMS tools can personalize not only students learning experience but the way teacher can conduct classes, interact with their students, feedback, contacts, communication, follow ups, submissions, tests, assessments and reports can be generated to enriched the overall experience. It further imposes no restrictions from where, how, and when one take classes and access the course.

Challenges from teachers point of view

▪ Many senior teachers or less tech savvy educators are still gearing up with the emerging technologies related to teaching and learning and trying their best to bridge the gap with the younger generations who are considered to be more knowledgeable in recent technologies.

▪ A lot of time is invested for Preparation, creating assignment, presentations, reviewing assignment as compared to that of classroom teaching.

▪ It is very difficult to judge whether a student is clear with the concept which otherwise through their non-verbal gestures was considered to be a valuable feedback for teachers.

▪ It becomes difficult to give individual attention to students especially when the class strength is huge

▪ Being aware of the fact that they will not be questioned, many students fail to complete the assignment and submit it on a timely basis.

▪ It has been observed that students when asked to answer give excuses about technical issues with the system or other network issues.

In spite of these challenges Technology has the potential to optimise the learning experience both for students as well for facilitators. These changes are proving to be a great idea to cope with the pandemic Emergency situation but definitely not proving to be efficient enough to replace the benefits of classroom learning. Various exploratory studies investigated some applications of LMS use from user perspective, such as studying online management programmes and their impact on working mothers [14].

Conclusion

The Learning Management Systems (LMSs) may it be open source software or other tools available over the Internet has much potential in enhancing the online teaching and learning. LMS has given a better and an easy implementation and insight in the e-learning management. The LMS is well worth considering for converting class based learning to online e-learning technology. This would complement the traditional teaching method to a new teaching and learning dimension. In our case of LMS, Moodle implementation has brought various challenges for us to face. We are trying to upgrade our Moodle with the refined development process that would customize the faculty and the learner's requirements to a greater extend. However, we have adopted the Moodle LMS and using it conveniently to enhance educational experience and educational need during the Covid-19 pandemic.

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VOLUNTARY SOFTWARE TESTING IN COMPANIES: A MODERN APPROACH TO FIX BUGS IN LARGE PROJECTS

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ABSTRACT

The proposed research emphasis the abilities and productivity of a software engineer. In this article, considered the motivation of open source community for the contribution of skills for various projects. Article highlights the interest of an engineer to collaborate and help voluntarily to other software engineers by sharing the knowledge, skills, techniques and though process improvement needed to fix the bugs in software. The main objective of this article is to motivate the software engineers to help and contribute their skills to the information technology society. The overall cost of software development can be reduced by implementing the volunteer testing.

Introduction

Software development like other engineering processes comes with a lot of risks. The lack of visibility into software products makes these risks and their consequences more critical. 60% of the time in the software lifecycle is spent on testing trying to make the software bug free and making sure it is of necessary quality.

A "Volunteer and TEST" scheme in large companies which cater to various domains would be beneficial for both the tester and the company. The idea here is that software developed in the company is kept open for testing by any personnel in the company. The code of projects suitable for testing is kept in an open repository. Any employee or an employee in a certain division of the company can volunteer his/her time to test the code, report bugs, pin-point the problem. The success of the following methodologies contributes to the idea of Voluntary testing.

Success of open testing in open source community

A person who wishes to contribute to the open source community usually starts by testing (Naresh & Kumbhar, 2016). This is the informally accepted means of getting involved in a project. Not everyone who contributes is a coding genius. For smaller code bases the quality of open source software is found to be significantly better because it is being tested my many people.

Success of test outsourcing

Naresh (2020), this proves that testing can be clearly isolated from development and a decision can be made when a project is ready for testing. A third party with enough data can carry out testing independent of the developers (Naresh & Kumbhar, 2018).

Fresher's are pretty good testers.

A fresher is typically put into a testing job when he/she first joins an organisation. With minimal domain knowledge and testing experience a fresher is able to carry out testing. This proves that extensive training is not required to take up manual testing.

Applications of manual testing.

Manual testing is effective in functional testing, date and time debugging, configurations and compatibility, User interface, Localization and Internationalization etc. This type of testing has manual testing as its backbone because not everybody can automate a test case.

Adhoc testing and Monkey (random) testing.

(Naresh et.al, 2019) Adhoc testing is a methodology where experts carry out testing without any planning or creating test cases. This is usually done after formal testing as a means of verifying testing and to ensure testing completion (Naresh et.al, 2016). Monkey testing is inputting random values and files and seeing if only valid outputs are processed. This

proves that any person with little domain expertise can easily carry out such tests.

Tasks of a volunteer tester:

- Find a bug.
- Check the bug tracking system to ensure that the bug was not already found.
- Write a test case to reproduce the bug.
- If bug is already listed, join the discussion forums to find a resolution for it.
- Try and code a patch that can fix the bug or observe and learn how the code is fixed.

Who can participate in this?

- **Fresh graduates:** As a part of the curriculum, students learn about various technologies and methodologies as part of their projects. They tend to try different ways of testing and can have a good test to break attitude. They will involve themselves in this voluntarily to pursue their interests as well to open up opportunities for themselves.
- **Technical and Customer support staff:** These people have a good idea about the real problems that crop up after deployment. They are good at diagnosing and troubleshooting a problem. They would involve themselves to open up opportunities.
- **Data entry professionals:** UI testing can be carried out effectively as they are aware of the abnormal data that an application may encounter.
- **Developers:** While writing code, developers only test their module. They can later participate in voluntary testing and test the application as a whole.
- **Designers:** The top design team of the organisation can test and review their designs as part of the final system. This experience will help in future projects as well.
- **Employees** with previous testing experience or previous experience in the domain. This kind of experience may be gained by employee by working for a different team or organisation.

Essentials

- All data must be available in electronic format i.e. code, documentation about requirements, design etc.
- Code base must be relatively small.

- A bug tracking system that can manage geographically apart testers.
- Providing the right tools and self -read material to train in domain and tool.

Projects for which Voluntary testing is suitable

- Mobile development projects like Android projects.
- Web application projects- web portals, web services, web sites.
- Proprietary tools- Analysis tools, automation tools etc.

Measuring achievement of the voluntary test group

Verification if the goals set for the regular test team were met more effectively with assistance from voluntary test group should be done. Clear metric should be used to measure effectiveness, efficiency and stakeholder's satisfaction.

Defect detection efficiency % for a phase = (number of defects injected and detected/Total number of defects injected) * 100.

Risk coverage = Risks for which tests were designed/total quality risks identified during analysis).

Test return on investment = ((average cost of a production defect * test defects) - cost of internal failure)/cost of detection.

Can volunteer testing completely replace the frmal test team?

NO. The company has customer expectations and deadlines to meet and release the product. The uncertainties in voluntary testing are high as it depends on the expertise and number of participants. White box testing and deployment testing needs expertise and resources respectively which may not be available. Formal testing can be done first and voluntary testing can complement it by improving the quality of software and introducing new features which can be considered for the next release.

Advantages

Advantages from the organisation's perspective:
- Split of workload: As more people are involved, test coverage can be greater and

faster as compared to a small group testing the entire system.

▪ Better quality software: Linus law states that "Given enough eyeballs, all bugs are shallow". This law is directly applicable because people testing software from different perspectives will bring out more bugs and also developers will be more cautious as their work will later be reviewed by many (Nayak, et.al, 2020).

▪ Leads to innovation: People looking at a product and giving suggestions for new features will lead to innovative improvements in the product's future releases.

▪ Internal Hiring: Organizations can better the internal hiring process by reviewing the work of employees and select them to start developing for the future releases.

▪ No trust issues: Companies are completely in control of what bugs are being discussed and how they are being dealt with.

▪ All data is kept in-house: The data and design is kept in-house. All employees are bound by the company's rules and regulation and so the data is in safer hands.

▪ Training tool: People working on similar technologies or platforms can just observe the discovery and correction of bugs. People who will be working in that domain in the near future can use this as a hands-on training tool.

Advantages from the participant's perspective:

▪ Sharpen skills: Any employee who either tests, writes patches or just observes will sharpen their testing skills and domain knowledge.

▪ Opportunity for employees to follow their interests: Employees might want to work in an emerging technology but may not have a way to change their current team. They can volunteer learn new things.

▪ Get better jobs: Testing is seen as a way to get one's foot in the door of a company. So an employee can use volunteer testing as a step towards getting into a desired team.

▪ Skills become recognized: Due to low hiring for higher positions, often employees are over qualified for the positions they hold. They can use this platform to get their skills recognized.

Disadvantages

▪ Managerial challenges: Problems in evaluating performance of the employee participating in open testing. As there is no formal structure, evaluations must be made based on number of bugs found, number of fixed bugs and severity of the bugs found. Such data cannot be collected in a short term.

▪ Neglect of regular work: One of the biggest challenges for the organisation is to ensure that the employee does not deviate from or side-line the regular work assigned.

▪ Problems with getting optimal number of participants: As there is no immediate gain, people might not participate. Some projects may be more attractive than others and there may be an imbalance in the number of participants.

▪ Additional costs maintaining both the regular testing team as wells as providing resources for the volunteers.

▪ Automation of testing is not possible as volunteers may not be skilled in scripting languages.

Conclusion

Voluntary testing can be successful in either large organisations that have projects in every possible domain, technology and platform or in smaller organisations where a formal testing team cannot be put together or in places where certain teams are waiting for new projects to arrive and are idle. A monetary reward for finding severe bugs can greatly enhance the participant's enthusiasm. In a world of fast changing technologies, all employees should be given adequate opportunities to learn newer things and should be able to pursue their passions, voluntary testing provides this opportunity.

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WORK–LIFE BALANCE OF HEALTHCARE HOUSEKEEPING STAFFS DURING THE OUTBREAK OF COVID-19

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ABSTRACT

Discussing about the health care industries we are much concentrating on doctors and nursing staffs. This study highlights the astonishing contribution of housekeeping staffs in the same industries. Equal to the lifesaving doctors, same amount of responsibility, risk and contribution is contributed by the housekeeping staffs. Nonetheless their family is also wanted to be considered, because the life is same for all. The opportunity of the killing virus treats all of equally. The study explores to contemplate the work-life balances of such housekeeping workers in the healthcare industry. The study reveals the soundness of their suffering during the pandemic time and how the institutions / Organizations support them to balance their work-life in the smooth manner. The factors which affect the imbalances are ranked in this study to identify which is the most influencing factor for the imbalances of their professional and personal life. According to which some fruitful suggestions are suggested to the organizations to protect the employees during this pandemic. The article articulates that the entire society responsibility cannot be under one shoulder, therefore every individual are having the same quantum of responsibility to overcome from this scenario. We all are helping hand in some way or other to contribute towards the quick relief from the pandemic situation to happily reach the new normal.

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Keywords: Factors of WLB, House-keeping Staffs, Hospital Industries, Work-life balance.

Introduction

The entire exclamatory become question for the whole human fraternity with no exemption. Extra-terrestrial ruled the entire globe and teaches a lot to the society and helps to question about the life perpetuity. Individuals, companies, industries, economy so on and so forth are motionless. At this time the only some industries are active and their contribution towards their duty is remarkable. One such industry which we always want to remember to the entire life is healthcare industry. In our tradition we have a culture to see the god in humans, but all will not encounter the circumstance to experience. Parallel to which we could understand the risk of their life and their beloved family ones. Discussing about the health care industries we are much concentrating on doctors and nursing staffs. This study highlights the astonishing contribution of housekeeping staffs in the same industries. Equal to the lifesaving doctors, same amount of responsibility, risk and contribution is contributed by the housekeeping staffs. Nonetheless their family is also wanted to be considered, because the life is same for all. The opportunity of the killing virus treats all of equally.

The study explores to contemplate the work-life balances of such housekeeping workers in the healthcare industry. The intention to select the housekeeping employees particularly having many reasons on which their standard of living, spending patterns, commitment to fulfill their responsibility, indebtedness, children and their dependents responsibility and the list goes on and on. One peculiar factor for the entire housekeeping staffs are the risk will parallelly travel with their profession. In addition to this the extra burden lies on the shoulders of particular people and pressurize more on their life. The travel of this study helps us to understand how they led their life and especially to balance their professional life and personal life in the balanced manner. This will also attempt to identify to what extend their intuitions act as a backbone to them and family.

Reviews of earlier studies

Maureen Snow Andrade, Doug Miller and Jonathan H. Westover (2020). The study was conducted at world-wide. 37 countries are considered in the study to analyze factors influencing job satisfaction of the housekeeping workers. The study reveals the fact that the job satisfaction of the hospitality industry particularly housekeeping staffs is

lower compared to the other industries. This article come to the conclusion that the intrinsic and extrinsic compensations are comparatively less with other industries, because of which the employees are not satisfied in their job.

Kirti Shivakumar & Veena Pujar (2017). The study reveals the impact and relationship of employees in their personal and professional life. The researcher analyzed in different dimensions of the employees. Specifically it focuses on the breadwinner of the family and the employees are having dual incomes are more specifically concentrated. The relationship with the employees and the human resources department are also examined. The impact of work life is analyzed with the three different variables which are psychological, physical and behavioral aspects. While analyzing the factors the lack of societal support plays an important role. From that we come to know that the people particularly

having the sufficient sources to fulfill their needs, they are not socially recognized.

Dr. Kalyani Mohanty & Sasmita Mohanty (2014). The article was discussing the work-life balance of housing keeping staffs in hotel industries. The study helps us to determine the factors affecting the work-life balance of housing keeping staffs. The study aims to identify the factors affecting the WLB and establish the relationship between WLB and the employee satisfaction. The study results are evident that the people in the hospitality industry are struggling to attain the work-life balance compare to the other industries. The compensations of the employees are not sufficient enough to meet the basic requirements suppose if the employee is the breadwinner for the family. Due to which the more indebtedness is become the part of their lifestyle. It also suggest various ways to balance the work and the life.

Research Design
Statement of the problem

This is the high time to balance the work and life in the efficient manner. Nonetheless it is not a normal situation to tackle. Therefore the extra care and efficiency are required in this time period for all of us. Particularly there are much more care should be taken for the employees who are working in healthcare industry.

Objective of the Study

1. To study the perception of employees towards Factors affecting Work-life balance
2. To analyze Work-life Balance dimensions.

Scope of the Study

The study is useful as it highlights the factors that affect the work life balance and the four major dimensions of work life balance and will help to sort out the place where the respondents lack and ways to overcome in work/life.

Sample Design

The present study was carried out at Multispecialty hospitals in Trichy by December 2020. A sample of 100 employees was selected for gathering primary data. The respondents are working as housekeeping employees in various multispecialty hospitals.in Trichy. To carry out the study in a more accurate and easier way, convenience sampling method was adopted.

Data Collection

1. Both primary and secondary data have been used to draw appropriate conclusions.
2. The primary data was collected through structured questionnaire.

Statistical tool used

The collected data had been analyzed by using
1. Percentage analysis
2. Simple Ranking Analysis

Limitations of the study

1. The study has the geographical limitations
2. The study is confined to the time limits
3. The statistical tools used in this study has its own limitations

Discussions and results
Table No1: General Profile of Respondents

Factors	Classification	Number	Percentage
Age	20-25	23	23
	26-30	54	54
	31-35	13	13
	Above 35	10	10
Marital Status	Single	45	45
	Married	50	50
	Separated	05	5
Experience	Below 2 yrs	18	18
	3-5 yrs	14	14
	6-8yrs	12	12
	Above 9 yrs	56	56

(Source: Primary Data)
From the table no 1, it following information's are concluded.
- 54% of the respondents are coming under the age group of 26-30 yrs
- 50% of the respondents are married and 5% come under the category of separated.
- 56% of the respondents are having above 9 years of work experience.

Table No.2: Frequency of Respondents facing difficulty in balancing personal life and work life.

Response	Frequency	Percentage
Yes	72	72
No	28	28

(Source: Primary Data)
The table no.2 shows that 72% of the respondents face difficulty in balancing personal life and work life**.**

Table No.3: Simple Ranking Analysis: Perceived Factors that affect Work Life Balance
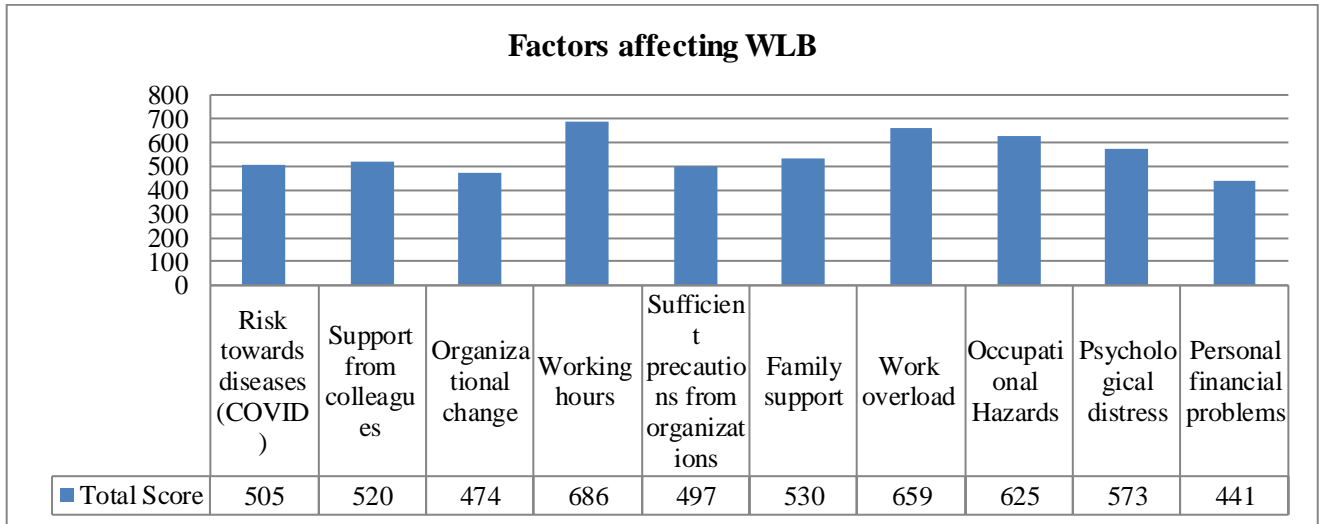
S.No	Factors	I	II	III	IV	V	VI	VII	VIII	IX	X	T.S	order
1.	Risk towards diseases (COVID)	7	10	6	12	9	7	14	10	13	12	505	**VII**
2.	Support from colleagues	12	6	8	7	11	10	9	16	12	9	520	**VI**
3.	Organizational change	12	5	7	6	7	11	8	12	14	18	474	**IX**
4.	Working hours	19	18	11	12	12	8	6	4	4	6	686	**I**
5.	Sufficient precautions from organizations	4	9	8	10	13	11	10	11	12	12	497	**VIII**
6.	Family support	5	13	11	10	8	11	9	12	9	12	530	**V**
7.	Work overload	10	12	18	16	11	12	7	5	7	2	659	**II**
8.	Occupational Hazards	12	9	16	13	13	11	8	9	4	5	625	**III**
9.	Psychological distress	14	14	6	10	9	3	16	10	8	10	573	**IV**
10	Personal financial problems	5	4	9	4	7	16	13	11	17	14	441	**X**

(Source: Primary data)

From Table No.3, it can be inferred that the factor working time is perceived by most and having the greatest impact on Work-Life Balance with score of 686. Work overload stands the next most influencing factor on Work-Life Balance with score of 659, followed by the 'Occupational Hazards' having a score of 625. Psychological distress and Family support are the other consecutive factors that are considered to be strongly affecting work-life balance.

The diagram represents the perceived factors and its total score for easy understanding.

Factors affecting WLB

Total Score	Risk towards diseases (COVID)	Support from colleagues	Organizational change	Working hours	Sufficient precautions from organizations	Family support	Work overload	Occupational Hazards	Psychological distress	Personal financial problems
	505	520	474	686	497	530	659	625	573	441

Suggestion

Though the study is the evident enough to prove the housekeeping workers are also having the equal life and risk compare with all levels of health care people. It is mandatory for the institution to take care of them. The institutions can provide the insurance for the employees to protect them from the danger. To provide the safe stay places to ensure their safety. Though it belong to the healthcare industry they can give the proper medication at a free of cost to the housekeeping employees and their families as well. A good training session for them to teach them to safeguard themselves and their families. The preventive measures like gloves, sanitizers, and other immune booster should provide to them.

Conclusion

The situation where we are experiencing now teaches a lot to the entire human fertility. We use to live in the ignorance that the human life is endless, because of which we forget to show our love and gratitude to our immediate neighbors. Till the COVID-19 arrival many of us thinks that money can be solution for all the problems. There was a ruination happened in the minds of humans and that too because of losing our loved ones because of COVID-19. All are affected in some way or other to experience this current scenario. What is there in our hands to do this is the next question arising in our minds. One thing great is there with us is helping others. For this Governments, individuals, organizations, corporates NGO's, philanthropist are having major role to show our strength and unity to safeguard our society since we are been the society.

Union and state governments are having the additional responsibility to safeguard their citizens of their countries. During this pandemic time the government should come forward to support the people, organizations, industries, individuals by tax holidays, reduction of taxes, so on and so forth. Then it will also help the entire economy to have a smooth flow of money, by the same way it will also help to recover fast from this deadly virus.

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WORK STRESS DURING PANDEMIC LEADS TO IMBALANCE IN FAMILY INVOLVEMENT – AN EXPERIMENTAL STUDY

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ABSTRACT

Necessity is the mother of invention. One such quest arises during the pandemic in the all the sectors especially in the teaching industry. The adoption of new teaching learning pedagogy was become mandatory in the new normal. It is necessary for us to examine the impact of adopting the new technology, which will helps to rectify the flaws to continue them in the near future. The study reveals the impact in different determinants namely health, psychology, emotional so on and so forth. The study identifies the mindset of the teaches in continuing the new technologies. The article was also directing the institutions overcome the hurdles faced by the teachers.

Keywords: Teachers, Technology, Teaching Pedagogy, Work Stress.

Introduction

Stress becomes the vital part of human life and it now becomes inseparable part. Globalization is the base for the drastic adoption of job culture. We as a human being have no other chances expect accepting this change. The change should not result in destroying the human factor. The inventions and innovations should align with the humanity. Because the job is vital sources for the human mankind to satisfy the wants and needs of individual and their family members. Therefore the humans want to rule the technology but not vice versa. In addition to this pandemic situation creates more pressure on the jobs because of the remote working. Incorporating the new technologies coping with the changes, learning the new things so on and so forth makes the life more complex. Irrespective of profession, job, and business it has a wide spread rather. One among the major profession is teaching. There is a paradigm shift in the teaching and learning pedagogy. But the problem here is the technical literacy, easy adoption of technology, new preparation methods, time spent on preparations, all lies on the same shoulder. This is the problem we are going to address in this study. in contrast to which there are other dark side to discuss, nevertheless the impact of adopting the technology. There are negative aspects to health, psychological, psychological are also to be considered. Long hours of preparations, reduction in family time, eye paining, fatigue, back pain, headache, neck pain and the list goes on. Automatically the real time scenario is the deliberate evident for acknowledging these things. Resulting of which is increase in the stress level, anxiety, fear and all other aspects. The study reveals the fact that hoe the teaching federation coping with the new teaching learning pedagogy and out of which what are the causes and effects they are going to face all those this will be revealed.

Pros and cons of remote working- a new phase

PROS	CONS
Adaption of Technology	Increasd duration of Work
Caliber Enhancement	Non-avaliability of teaching aids
Reduction of COVID Risk	Lack of personal work accomplishments

Research design

Statement of Problem

Any new adoptions will always have the cause and effect at the initial stages. It is necessary to examine the cause and effect to identify the need of technology to be continued to be in the near future. This study will examine the fact of adopting the new technology of teaching and learning pedagogy adopted by the college teachers during pandemic.

Objectives

The objective of the study is
1. To identify the job stress during pandemic.
2. To offer suggestions to reduce the stress level.

Methodology

The study was conducted at various arts colleges located at Tiruchirappalli district. Total 50 samples are collected from the teachers in the arts college from different categories. For this convenience sampling techniques are used for the study. The data are collected through the structured questionnaire by using Google forms. Simple percentage analysis, graphs and charts are used for analysis and interpretation of the study.

Limitations

1. The study is confined to time limits
2. The study is only with the arts colleges teaching staff.
3. It has the geographical constrains
4. The tools used for the study has its own limitations.

Analysis and interpretation

Table: 1 Demographic profile of the respondents

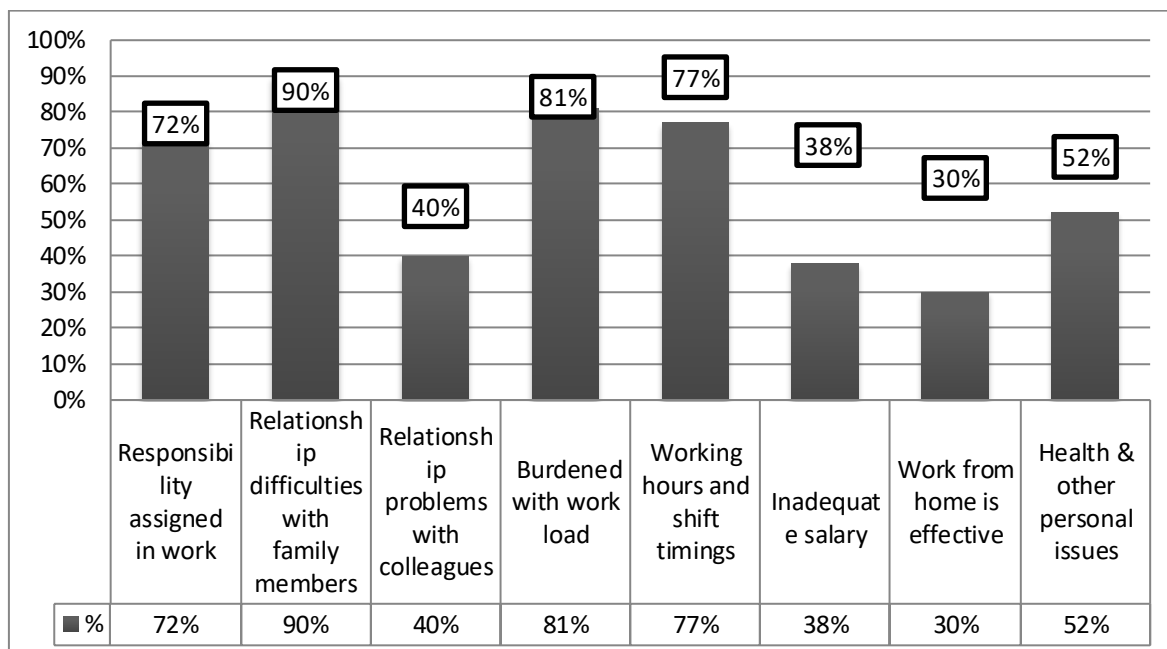| S.No	Opinion		%
1	Age	Below 30 years	20
		30 - 35 years	21
		Above 35 years	09
2	Marital Status	Single	44
		Married	06
3	Educational Qualification	Post-Graduation	05
		M.Phil	08
		Ph.D	37
4	Experience	1-3 years	19
		3-6 years	16
		6-9 years	11
		Above 9 years	14

Source: Compiled from primary data

Table: 2 Factors of Stress

Attributes	%
Responsibility assigned in work	72%
Relationship difficulties with family members	90%
Relationship problems with colleagues	40%
Burdened with work load	81%
Working hours and shift timings	77%
Inadequate salary	38%
Work from home is effective	30%
Health & other personal issues	52%

■ %	Responsibility assigned in work	Relationship difficulties with family members	Relationship problems with colleagues	Burdened with work load	Working hours and shift timings	Inadequate salary	Work from home is effective	Health & other personal issues
%	72%	90%	40%	81%	77%	38%	30%	52%

Source: Compiled from primary data

Discussions and results

It is being inferred from the Table 2 and Figure ,90% of the respondents say that they have some relationship difficulties with the family members because of this remote working, 81% of the respondents feel that they are burdened with work load, 77% of the respondents feel that they are having problem with working hours and shift timings because they feel that they are work hours has taken up their personal timing, 30% of the respondents agree that remote working option is comfortable but the majority of the respondents feel that work from home is not a comfortable mode of working, 38% of the respondents find it difficult to manage the expenses incurred for purchase of teaching aids and addressed as inadequate salary.

Suggestions

In the real time scenario the teachers are not willing to continue the new teaching pedagogy in the near future. Therefore if the situation requires the new changes to continue, the institutions want to provide the required aids and facilities to have a confortable teaching. The institutions also want to consider the impacts arising out of the technology and reduce the work load of the teachers in various means. This would help them to accomplish the work in the efficient manner. This also helps them to improve the health as well. The institutions should also provide the proper training and guidance to the teachers.

Conclusion

The stress is the important factor which consists of positive and negative aspects. There is some good stress which is called as Eustress. The technology should motivate the mankind foe enrichment, it should not ruin humanoid. Therefore it is mandatory for the benefit of human society to have more human component in innovation and inventions.

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