



**3<sup>rd</sup> INTERNATIONAL CONFERENCE ON  
APPLIED SCIENCES, ENGINEERING, TECHNOLOGY &  
MANAGEMENT VIRTUAL CONFERENCE**

# ICASETEM-22

**17<sup>th</sup> - 18<sup>th</sup> March 2022**

**Ghana**

**Organized By**

**Crown University Int'l Chartered Inc in USA official partners constituent campuses  
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**in Association with**

**Institute For Engineering Research and Publication (IFERP)**

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## Rudra Bhanu Satpathy

Chief Executive Officer

Institute For Engineering Research and Publication.

On behalf of *Institute For Engineering Research and Publications (IFERP)* and in association with *Crown University Int'l Chartered Inc in USA official partners constituent campuses at government regulated Universities worldwide and online operation*. I am delighted to welcome all the delegates and participants around the globe to *Crown University Int'l Chartered Inc in USA official partners constituent campuses at government regulated Universities worldwide and online operation* for the “*3<sup>rd</sup> International Conference on Applied Sciences, Engineering, Technology & Management "(ICMATSD-22)"* Which will take place from *17<sup>th</sup> – 18<sup>th</sup> March 2022*

It will be a great pleasure to join with Engineers, Research Scholars, academicians and students all around the globe. You are invited to be stimulated and enriched by the latest in engineering research and development while delving into presentations surrounding transformative advances provided by a variety of disciplines.

I congratulate the reviewing committee, coordinator (**IFERP & Crown University**) and all the people involved for their efforts in organizing the event and successfully conducting the International Conference and wish all the delegates and participants for their virtual presence.

Sincerely,



**Rudra Bhanu Satpathy**



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## Preface

The **3<sup>rd</sup> International Conference on Applied Sciences, Engineering, Technology & Management (ICASETEM-22)** is being organized by **Crown University Intl Chartered** in Association with **IFERP-Institute for Engineering Research and Publications** on the 17<sup>th</sup> – 18<sup>th</sup> March, 2021.

The “**3<sup>rd</sup> International Conference on Applied Sciences, Engineering, Technology & Management**” was a notable event which brings Academia, Researchers, Engineers, Industry experts and Students together.

The purpose of this conference is to discuss applications and development in area of “**Applied Sciences, Engineering, Technology & Management**” which were given International values by **Institute for Engineering Research and Publication (IFERP)**.

The International Conference attracted over 100 submissions. Through rigorous peer reviews 20 high quality papers were recommended by the Committee. The Conference aptly focuses on the tools and techniques for the developments on current technology.

We are indebted to the efforts of all the reviewers who undoubtedly have raised the quality of the proceedings. We are earnestly thankful to all the authors who have contributed their research works to the conference. We thank our Management for their wholehearted support and encouragement. We thank our Principal for his continuous guidance. We are also thankful for the cooperative advice from our advisory Chairs and Co-Chairs. We thank all the members of our local organizing Committee, National and International Advisory Committees.

**ICASETEM-22**



**ICASETEM-22**

**3<sup>rd</sup> International Conference on  
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# ICASETEM -2022

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*Virtual Conference, 17<sup>th</sup> – 18<sup>th</sup> March, 2022*

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# Facemask Detection using Convolutional Neural Networks (CNN) with MobileNetV2 Architecture

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## Abstract

Coronavirus Disease (COVID-19), which flared up at the end of 2019, continued to be a source of concern for all organizations and people till date. According to World Health Organization (WHO), around 228 billion people have been affected and seen 4 billion deaths globally. Even after considerable vaccination worldwide, there is still a wide spread of the virus. WHO stated that, the best way to protect ourselves is to avoid exposure to the virus, and also advised proper use of facemasks, i.e., covering the mouth and nose with a mask in public areas and continuous sanitization will avoid exposure to the virus. Implementing the "no mask-no service" method has been recommended by the governments of all countries. Even then, the goal was obstructed by wearing a mask improperly, which led to the spread of the virus. For classification of images, a technique in deep learning called Convolutional Neural Network (CNN) is used. CNN is a part of Artificial Neural Network (ANN), which has an ability in recognizing and classifying the images by processing images in video streams. An image classifier is created for identifying masked and unmasked faces from video streams. The proposed system was carried out by making use of Python, OpenCV, and TensorFlow, which can recognize whether a person is with proper facemask or with no facemask from live video streams. 2000 images are collected from two different datasets, from Kaggle repository, where each dataset contains images with and without masks. During training, the model has attained an accuracy of 98.2%

## Keywords

COVID-19, Convolutional Neural Networks, Artificial Neural Network, Face mask Detection, Generative Adversarial Network (GAN).

## I. INTRODUCTION

Globally, thousands of people are dying due to the pandemic disease called COVID-19. Both the first and second waves started a wildfire spread due to which the mortality rate has been increased. The first case was detected at the end of December 2019, Wuhan city, province of Hubei, China [1] and in March 2020, WHO recognized it as pandemic. The virus can be spread among people along with animals, lead to severe illness i.e., from common cold to severe respiratory syndrome. The International Committee on Taxonomy of Viruses and the World Health Organization, in February 2020, declared a formal name to virus and disease which is a basic cause for SARS-CoV-2 and COVID-19 respectively [2]. Latest report given by WHO, specified that around 231 million people are infected and 4.7 million people are killed with the disease across 231 countries in the world [3]. United States stood first among world countries list with highest number of cases [4]. Fig. 1 specifies the graph of COVID-19 cases, how they are growing daily and Fig.2 shows the graph of Number of COVID-19 cases world-wide how they are differing from country to country.

COVID-19 is a transmissible disease which lead to illness in human respiratory system which causes severe pneumonia, which spreads due to direct contact when an infected person sneezes or coughs. It can cause due to touching the contaminated surface. The virus goes into the body via nose, eyes and mouth and highly affects the person with weak immune system and accompanied by other health

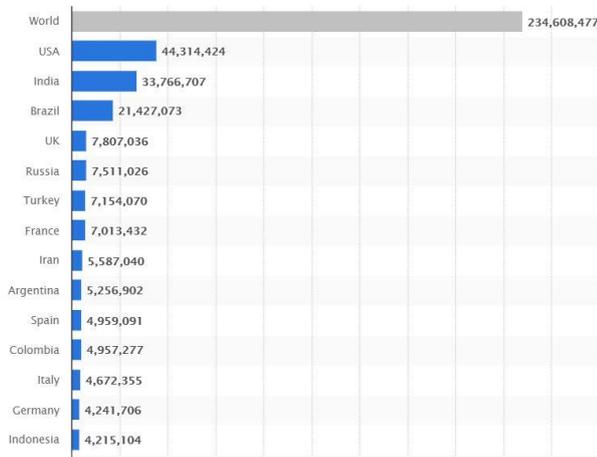
complications like cancer, heart disease, diabetes, etc., [5]. A fungus called Black Fungus or Mucormycosis came into the picture during the second wave of pandemic. It is an air borne fungal infection which is present in air, food and water. It is affecting pre and post covid-19 patients [6].



**Fig. 1: According to WHO the Graph of United States of America which shows rapid growth of cases as of September, 2021.**

In a short span, than any other virus the corona virus has spread massively. Lack of awareness, improper maintenance of social distancing and improper wearing of facemasks in public areas are some 2 reasons for vast spread of the disease [7]. Corona virus transmission can be averted by following the entente that are laid by the authorities of medical field across the world and WHO strongly recommended wearing of facemasks outside and in communal gatherings as it halts

the hauling of virus through oral and nasal cavity [8]. The other way to control the spread of viruses is to protect ourselves by washing our hands regularly with sanitizer and by not touching our noses, eyes, and ears without proper sanitization. The transmission can be limited by following social distance in the crowd and by wearing masks, face shields, and hand gloves.



**Fig. 2: Number of corona virus (COVID-19) cases world-wide as of October 1, 2021.**

Wearing a face mask disrupts airborne diseases and limits their ability to reach the human respiratory system; it is a low-cost method of controlling respiratory infections. The transmission is still on due to inadequate use of face mask. So, it is essential to develop a model which can automatically identify masked and unmasked faces, which helps to provide individual protection and can prevent the pandemic. In early December 2020, the Corona Virus vaccine has been invented and was distributed massively which lessened the difficulty and ailment of COVID-19 instead of suppressing the virus [9].

Advancement in the field of science and technology is good for achieving achievements in day-to-day life. Similarly, advancements in deep learning with integration of image processing will help to achieve a breakthrough, for the growth in different fields. Deep learning, particularly convolutional neural networks (CNNs), is one such advancement which shows success in image classification. The creation of artificial models is the basic idea behind CNN. Important features are extracted from whole images by using CNN.

In this study, to construct an image classifier, deep learning techniques are used in order to identify masked and unmasked faces which includes number of convolution layers that effects the prediction accuracy

## II. Related Work

Based on different attributes, a face can be detected from an image using face detection method.

N.Muthukumar et al., prior to the COVID-19 disease, computer vision kindred with impersonate faces received little attention. Masking is considered as a broad problem area which is related to the classification of latent facial image processing [10].

G.Deore et al., specifies that many works are linked to facemask detection and proposed a methodology that uses four different steps for detection. Those are - estimating distance from camera, eye-line detection, facial part detection and eye detection. The proposed technique is used in crime related scenarios for detecting masked individuals [11].

Divya Meena et al., observed that recognizing the face of a human is easy when compared with a computer because the human body is rigid, which means the human body changes from time to time. The most important problem with face detection is identifying or recognizing the face. For automatic face detection, the main prerequisite is face detection [12].

M.Yang et al., conducted a survey and specified that face detection can be done by using different methods and those methods are categorized into four categories: knowledge-based methods, template-based methods, feature-invariant methods, and appearance-based methods [13].

S.Ge et al. says that detecting a face comes with two challenges, of which one is eliminating facial expressions in uncovered areas and the second one is the unavailability of datasets having both masked and unmasked faces [14].

X. Cheng et al., proposed a model for face recognition called as Face Segemento-Enhanced Network (FSENet) and presented a face segmentor for parsing the face into local components and explores internal correlations. In order to obtain local features, the segmented facial regions are masked by parsing maps and finally incorporated local and holistic information to improve the discriminative power of face detector [15].

Ghiasi et al., developed a hierarchal framework to achieve key point localization and face detection [16]. Gonzalez Diego et al., presented a design for recognizing the use of masks from image sequence which will have an ability to operate in real-time. A training scheme was proposed using generic object detection network which gave an accuracy higher than 90 % [17].

Arjya Das et al., gave a simple approach with basic Machine Learning Packages like TensorFlow, Keras, OpenCV and Python. Sequential Convolutional Neural Network model is used to identify the person is with proper facemask or with no facemask without causing over-fitting and obtained an accuracy of 95.77 % and 94.58 % on two different datasets [18].

Bhargavi et al., proposed a basic approach for facemask detection along with that it also identifies the person is properly covered with facemask or with no facemask [19]. Rusli et al., proposed a method using LeNet algorithm without considering full image as the face image mostly focuses on face area [20].

Sammy V.Militante et al., developed a system in which it measures the physical gap between person to person and identifies masked and unmasked faces using OpenCV and Python using TensorFlow [21].

Remarkable progress has been shown in recent years in conventional face detectors using conventional neural network models. P. Dollar et al., proposed a model for extracting features from CNN by adapting a feature aggregation model [22].

S.V.Militante et al., specified that, in the processing of human language, image processing, and self-driving automobiles, CNN is applied precisely [23]. Le Chun et al., specify that deep learning is a neural network learning process, through image patterns some characteristics are obtained automatically and processed expressively [24]. Sammy V.Militante et al., says that deep learning has proved that through image processing recognizing and classifying of images can be done effectively and developed a Raspberry-Pi based facemask detection application which captures the facial images and identifies masked and unmasked faces [25].

### III. Proposed Methodology

#### A. Dataset Collection

To train and test the model, the images are obtained from Kaggle and other repositories. A Python script was developed in order to detect the face from a live video stream and create a web associated application which helps the person who is supervising the process in remote locations. The collected dataset contains 2000 images in which the data has been classified into 2 classes: with a facemask and without a facemask. The collected images are formatted in JPEG format. The collected images dataset sample illustrates whether the person is having facemask or not. Fig. 3 shows the sample of collected dataset of persons with and without facemask.



Fig. 3: Sample images in the Dataset

The problem with smaller sample sizes is

- a) *Variability*: To calculate variability, the standard deviation is used, which specifies how far the results might be true from the sample we have. The larger the deviation is, the lesser the accuracy is, as smaller sample sizes get decreasingly representative of the entire population.
- b) *Bias*: Reliability of the model is affected by the small sample size. For example, if we train the model only for certain physical traits or an image that is straight, the model won't work well for all possible cases and will not produce accurate results.

#### B. Data preprocessing

The first step in the model is image pre-processing. The images should be formatted prior to model training and inference. For model input, to decrease model training time and increase model inference speed it is necessary to clean image data.

#### C. Data Augmentation

It is a technique where by applying various transformations the amount and diversity of training data will get expanded, so that the model that is built will not take any image twice,

which helps prevent over-fitting of the model and will eventually help the model to generalize better.

#### D. Activation Function

The activation function is also called as transfer function, which suppresses irrelevant data points and helps to use the meaningful piece of information. Deriving output from a group of input data which is fed to the node is the main task for activation function. ReLu and SoftMax are two such activation functions used in this model.

The Rectified Linear Unit (ReLU) activation function is a linear activation function which does not stimulate all of the neurons simultaneously and will be deactivated if the linear transformation output is less than zero. It can be written as:

$$R(z) = \max(0, z) \quad (1)$$

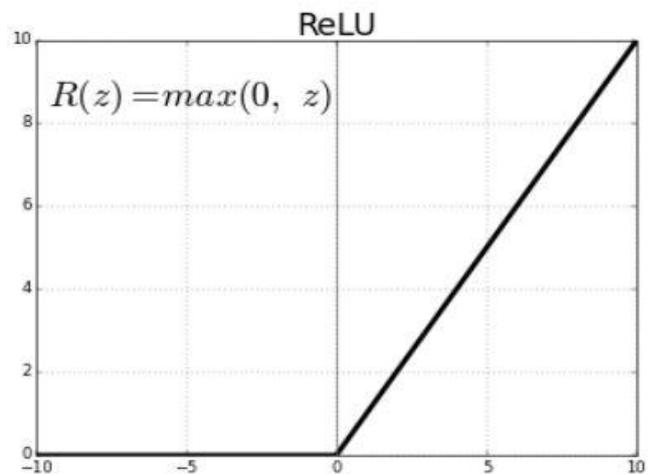


Fig. 4: ReLU Activation Function

Fig. 4 specifies ReLU activation function which is half-rectified from bottom. The SoftMax function is also called the softargmax or normalized exponential function. It is used as a last activation function in order to normalize the network output to a probability distribution over predicted output class.

$$\sigma(z) = e^{z_i} / \sum e^{z_j} \quad (2)$$

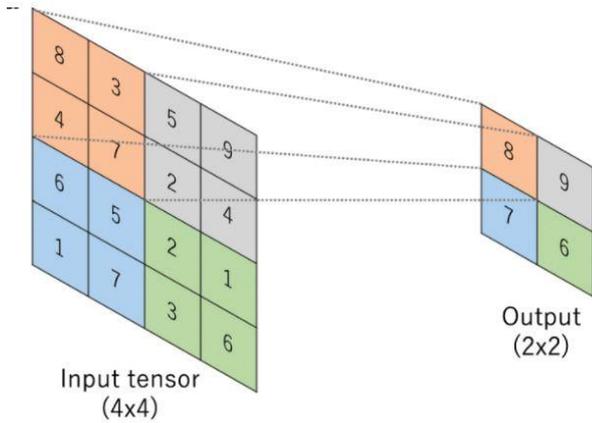
#### E. Fine Tuning

The process where the parameters of a model should be adjusted in such a way that they should fit certain observations. It is the final method of training the model, and in CNN, feature extraction is used in the first layer, with the last few layers dedicated to learning. A feature detector is used to obtain features, and filters are applied in order to get a feature map from the input image.

The designed model is able to pick up only two classes, with mask and without mask, with a good bias rate on both SoftMax activation and fully connected layers to speed-up the process of training on new layers.

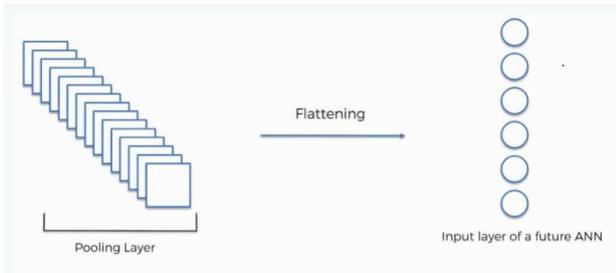
#### F. Max Pooling and Flattening

Max pooling, or maximum pooling, calculates the max. value in each pattern of a feature map. Later on, the results are down sampled in order to highlight the most present feature in the pattern.



**Fig. 5: Max Pooling**

Fig. 5 shows the working of max pooling where max pooling on 4\*4 channel using 2\*2 kernel with a stride of 2 and always picks the maximum value from each set. Flattening is used to reduce the file size by merging the outputs of convolution layers in the background layer to create a single long feature vector. Turning pooled feature map to a sole pile and passed to fully connected layer is carried out by flatten function.



**Fig. 6: Flattening**

Fig. 6 shows the example of flattening where we would flatten maximum pooled result wiz. feature map into a long vector or converting 2D array to 1D. So that, the result wiz. the 1D array becomes the input layer to a layer of Artificial Neural Network that we connect.

#### G. Classification

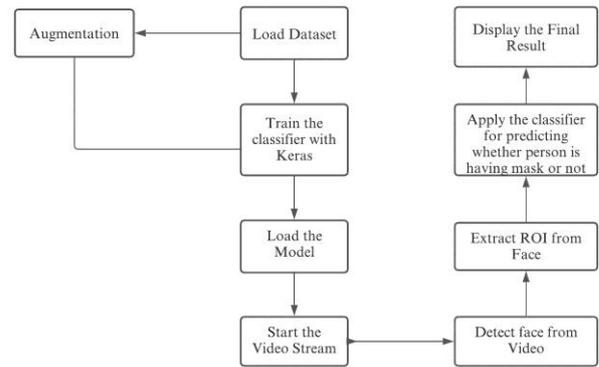
Classification is done by training the model, that classifies and recognizes trained images from the visual patterns which are available from live video streams. A supervised learning model is applied with 80% of dataset for training, 10% for testing, and the remaining 10% for validation.

#### H. Fully Connected Layer

Fully connected layers form the last few layers in the network and form a feed-forward neural network. We will add an Artificial Neural Network (ANN) to the CNN in order to combine features into more attributes, which predicts the input with high accuracy. The output from the final pooling is the input for the fully connected layer, which is flattened and then fed into the connected layer. The following calculation will take place for each layer of ANN:

$$g(Wx + b) \quad (3)$$

where  $x$  is the input vector,  $W$  is the weight matrix,  $b$  is the bias vector and  $g$  is the activation function. Activation function may be either ReLu or SoftMax.



**Fig. 7: Block Diagram of Proposed System**

## IV. Implementation

In this study, faces are detected from video streams and classified them as masked and unmasked face. The implementation is carried by including Open CV, TensorFlow, Keras and Flask. For classification we need to concentrate on two steps:

### 1) Training Model

In training model, we will utilize two datasets in which one dataset contains persons image having masks, other dataset contains persons image not having masks and To train the model, we have combined two datasets.

### 2) Testing Model

For detecting the accuracy of classified images the model will be tested. To test the model, we will use test dataset. The considered dataset contains 1284 images having masks and 716 images not having masks. In this paper, the proposed model will make use of CNN algorithm in order to identify the faces and the features are marked from live video streams. To identify the faces having and not having masks, the facial images need to be processed.

#### A. Model Building

For analysis of visual images, CNN is used as it includes deep neural networks. CNN has multiple neurons and each contains bias. After applying bias, those are passed to an activation function for generating output. Convolution, pooling, flattening, and fully connected are the major layers of CNN.

#### B. Model Training

The model should be initialized sequentially for training the model and convolution 2D layer is added with three parameters, i.e., number of features detector, image shape with color channel, and an activation function, then maxpool and flatten the data in order to extract the features, then add a hidden layer with two major parameters, i.e., dimension and activation function, called the ReLu activation function. Add an output layer with an activation function, i.e., Softmax. After all this, import the dataset, apply pre-processing techniques, and then train the model.

Model training includes training the model with training inputs and validating it with test inputs. To obtain better results, 80% of the dataset is used for training and 20% for testing.

C. Detection

Adam optimizer to improve the CNN’s classification and segmentation abilities. The MobileNetV2 architecture is used to improve the state-of-art performance and is an effective feature extractor and segmentor. The Face detection model is used to extract people’s faces from video and will feed the images into the MobileNetV2 model for face mask classification, while training the model. Face detection model detects face in the frame and makes the classification. The MobileNetV2 architecture makes a classification when the face is detected.

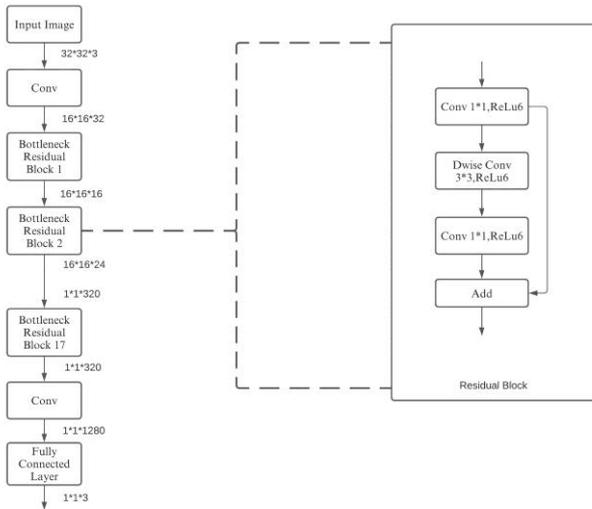


Fig. 8: Architecture of MobileNetV2

V. Results and discussions

To train the model, the proposed system collected dataset from Kaggle repository which contains masked and unmasked faces of persons and are labelled as same. To train the model, we have collected a dataset which contains 2000 images. Fig. 3 displays images in dataset which we have taken for training the model.

While training the CNN model, acceptable validation accuracy was achieved through several experiments and recorded an accuracy rate of 98.2%. Fig. 9 shows the result of test images with a rate of 88.49% and 92.01% detected with facemask. Fig. 10 shows the result of test images with a measure of 99.06% and 99.69%, detected without facemask. Fig. 11 shows the outcome of test image analysis with a rate of 100% detected with and without facemask.



Fig. 9: Result of test images with a measure of 88.49% and 92.01% with facemask.

While training the model we have achieved an acceptable accuracy by continuous experiments and Fig. 12 displays the performance of test results through accuracy and loss. While implementing the model, the proposed system collects the video from the source and feeds it into the system for surveillance for detecting whether the people is having facemask or not.



Fig. 10: Result of test image with a measure of 99.06% and 99.69% without facemask.

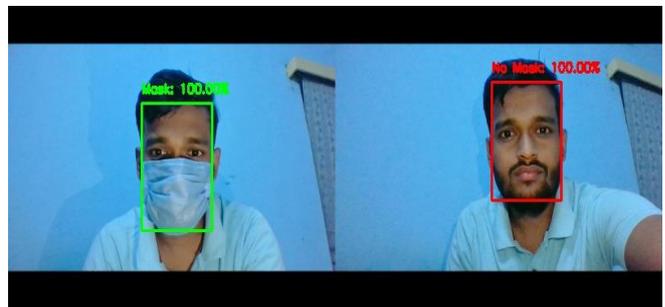


Fig. 11: Outcome of test images analysis with a measure of 100% detected with and without facemask.

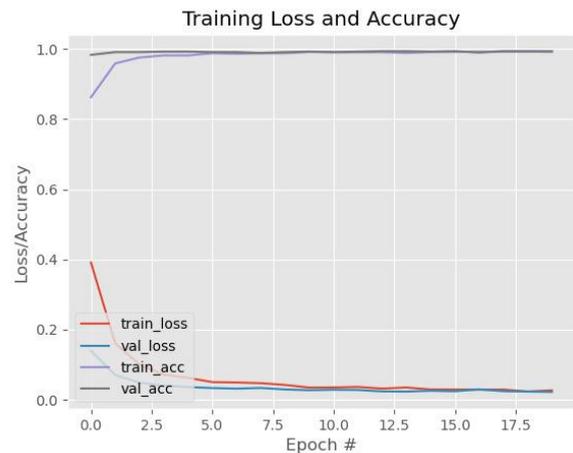


Fig. 12: Accuracy or Loss Performance while training the model

VI. Conclusion and Future Work

This study mainly targets on detecting facemasks in video streams, whether the person has properly worn a facemask or not, using Convolutional Neural Networks, which is a Deep Learning algorithm. During training the model achieved an accuracy of 98.2%, the test results show an exceptional accuracy rate in distinguishing between people with

facemask and with no facemask. The proposed model can be used to integrate with organizations and assist them. Future work is to improve the accuracy of model by introducing a different Neural Network called GANs (Generative Adversarial Network), through which we can generate new pictures with existing datasets. GAN model is trained with two datasets in which one is called as generator that generates probable images and the other one is discriminator that differentiates generated images from real images.

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# Impact of Pandemic Measures on Construction Project Performance in Indonesia

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## Abstract

Covid-19 has resulted in recession and economic downturn. In Indonesia, the pandemic and its measures pose challenges for construction companies. This study aims to identify the impact of the Covid-19 pandemic measures on the performance of construction projects in Indonesia. This study identifies five potential factors which affect project performance, namely: (1) challenge in implementing social distancing, (2) movement restrictions, (3) challenge of working from home, (4) planning for limiting the number of workers, (5) continuous use of PPE. A cross-sectional survey is performed with targeted respondents of top-level management of Indonesian construction firms. The primary analysis was conducted by using Partial Least Square (PLS). Results indicate that overall construction has two variables affect project performance and industrial construction has three variables affect project performance. This result is essential for the top-level management to ensure their awareness of factors that affect performance on construction and facilitate the construction players to overcome the five factors mentioned in this paper.

## Keywords

construction, pandemic, performance, project.

## I. INTRODUCTION

In December 2019, there was a new outbreak caused by Corona Virus Disease 19 (Covid-19). Since spreading throughout the country, the Covid-19 pandemic has had very severe consequences [1]. The emergence of Covid-19 caused many industries to be closed, and a lockdown policy was implemented. Most of the employees lost their jobs, and most small companies could not pay the salary during the lockdown policy [1].

In 2021, the case of Covid-19 in Indonesia had increased significantly. The Ministry of Health of the Republic of Indonesia, on December 26, 2021, reported that 4,261,759 people were confirmed positive for Covid-19. The number of patients who recovered was 4,113,049 people, the number of patients who died was 144,055, and the case fatality rate was 3.4%.

Based on data from the Central Statistics Agency (BPS), the growth of Gross Domestic Product (GDP) in the second quarter was at minus 5.39% (year on year), and in the second quarter is at minus 4.52% (year on year) [2].

The decline in the construction sector makes this sector important for research. Business activity in the construction sector in Indonesia in the first quarter showed signs of contracting growth with WNB (Weighted Net Balance) of 0.08%, lower than 0.66% in the previous period [3].

As a result of the uncertainty of the current situation, the impact of the Covid-19 pandemic being faced by the construction industry is not enough to be identified only from the economic aspect. In addition to the financial part, there are many impacts faced by the construction industry due to the Covid-19 pandemic. In construction, problems that come will affect the performance of project completion [4]. Project

performance in construction is considered an indicator of project management's success or failure.

Therefore, a study is needed to examine the impact of pandemic measures on project performance.

## II. LITERATURE REVIEW

### II.1 Variables Identified in Previous Research

Past studies identified several variables which affect construction performance, as seen in Table 1.

**TABLE 1. Variables Identified in Previous Research**

	Impact of Construction Industry	References										
		(Alsharef, 2021)	(Ogunnusi, 2020)	(Yadeta, 2020)	(Osuzugbo, 2020)	(Shibani, 2020)	(Ghandour, 2020)	(Stiles, 2020)	(Abdullah et al., 2020)	(Hebburn et al., 2020)	(Simoneh F. et al., 2020)	(Zhimin et al., 2020)
1	Challenge due to implementing social distancing	v	v	v	v	v	v	v				
2	Level of movement restriction during the pandemic (lockdown)		v	v	v	v	v					
3	Challenge due to working from home	v	v	v			v					
4	Level of planning		v					v	v	v		v

	limiting the number of workers								
5	Level of Continuous Use of Personal Protective Equipment (PPE)	of	v	v	v	v	v	v	v

*II.1.1 Challenge due to implementing social distancing*

The challenge of implementing social distancing is the most common variable in previous research. Social distancing is one of the central policies widely implemented after the Indonesian state was affected. The implementation of social distancing in Indonesia, according to [5], is complicated due to cultural issues.

*II.1.2 Level of Movement Restrictions During Pandemic (Lockdown)*

Restrictions on movement during the pandemic are the second most common variable after social distancing. The restriction reduces mobility, which resulted in the closure of many industries.

For construction projects, lockdown means delays for equipment supply and delivery, as well as material shortages [6]. There is a scarcity of materials to support ongoing projects and fluctuations in material prices [1]. Thus, in effect, it resulted in significant scheduling problems.

*II.1.3 Challenges due to working from home*

The Ministry of PUPR issues Ministerial Instruction No. 02/IN/M/2020 regarding the protocol for preventing the spread of Covid-19 which contains the mechanism for organizing construction. The instruction was then implemented by construction companies, both at the head office and project operations, one of which was the implementation of Work from Home. The WFH policy creates several challenges to completing projects in teams and communication skills that affect the quality of a project [7].

*II.1.4 Level of planning limiting the number of workers*

Limiting the number of workers is the main factor that requires employees to work from home. Research conducted by [8] states an increased frequency of requests for employee leave due to concerns when traveling to the office by public transportation. The rules imposed by the government on several construction sectors are employees who are allowed to work from the office or Work from Office (WFO) a maximum of 50 percent so that restrictions on the number of workers to come to project sites are getting tighter. The main factor in the challenge in implementing planning for limiting the number of workers in this study is that many countries globally, especially in Indonesia, have adopted a planning policy for restricting the number of workers.

*II.1.5 Level of Continuous Use of Safety Personal Protective Equipment (PPE)*

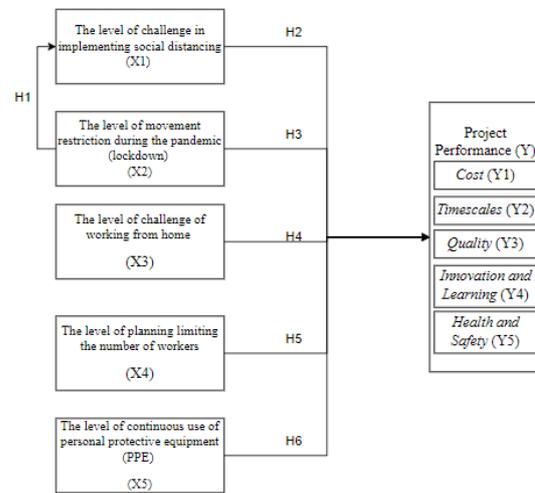
An essential policy in the workplace, especially projects that require teams to work together. Research [9] stated that 24.6% believed that Personal Protective Equipment (PPE) for

COVID-19 infection control would be fully available in the workplace. Research by [10] states that in Indonesia, the ability of the public to understand how to handle the Covid-19 pandemic is considered very low. Construction companies often ignore the concept of occupational safety and health (K3), which is one aspect of labor protection and is a fundamental right of every worker. It can be seen that the importance of Personal Protective Equipment (PPE) in the country globally, but awareness of construction in Indonesia does not yet exist.

**III. THEORETICAL WORKS**

*III.1 Theoretical framework*

The framework of this research is shown in Figure 1. The independent variable (X) was taken from several previous research. Meanwhile, the project performance (Y) in the construction industry domain was adopted from previous research.



**FIGURE 1. Research Framework**

*III.2 Hypothesis*

The initial hypothesis of the research is as follows:

- III.2.1* H1: The level of movement restrictions during the pandemic (lockdown) has a positive effect on the level of challenge in implementing social distancing.

Lockdown measures are very effective means of social distancing and ultimately alleviating pandemic severity [11]. According to [11], different lockdown measures implemented in affected countries influence pandemic severity and social distancing (i.e., mobility). The result is adopting strict lockdown measures (e.g., restriction on public gathering, workplace closing, and stay-at-home order) significantly reduces mobility at transit stations, retail and recreation facilities, and workplaces increases time spent near one's home, all of which entailing people to stay home and avoid unnecessary travel. For construction companies, the covid-19 pandemic has resulted in grounding of many projects due to lack of construction materials because of lockdown that made the supply of materials impossible [12].

- III.2.2* H2: The level of challenge in implementing social distancing has a negative effect on project performance.

Social distancing policies in a workplace will carry out work from home policies. The impact of social distancing policies allows project completion to be delayed [13]. Social distancing policies require all workers to avoid social gatherings [14]. Some companies cannot hire workers to participate in some jobs. The reduced number of the project management team also has impact on construction work. The more fewer number of workers, the longer it will take to realize each stage of construction [14].

**III.2.3** H3: The level of movement restriction during the pandemic (lockdown) negative effects on project performance.

The issue of lockdown alone within establishment has impacted a lot of things negatively; in terms of movement of workers to work, movement of materials, movement of everything that has to do with job. Enactment of regulations to restrict human movement is against construction industry resources. All the workers and technical engineers need to nearly work on-site either to perform activities or to monitor the work is done correctly. MCO as lockdown alternatives has given a lot of negative impacts towards the project success whereby the contributing factors to project success such as time, cost, and resource availability are affected [15].

**III.2.4** H4: The level of challenge of working from home has a negative effect on project performance.

Work from Home (WFH) requires workers not to come to office by face to face with other workers. The WFH situation during the Covid-19 pandemic will certainly provide a change in the working atmosphere for workers. Obstacles that can affect the implementation of WFH are the absence of work and communication tools, lack of coordination, "domestic" environmental disturbances in the household, and so on. Process to communication management on a project in accordance with PMBOK requires an intense exchange of information and project reports [16]. Communication will be difficult to achieve if there are restrictions on direct communication and interaction within a project team.

**III.2.5** H5: The level of planning limiting the number of workers has a negative effect on project performance

Restrictions on the number of employees working on the project because occupational health and safety (K3) policy due to the Covid-19 pandemic has been implemented in nine countries including Indonesia, Malaysia, Singapore, India, Taiwan, New Zealand, Australia, Japan, England, and America. A number of workers are considered to have a high impact on project performance [17]. Lack of availability local workers a has resulted in a high demand for labor outside region and high labor wages. Overburdening may have adverse implications on their productivity because wellness compromises which negative implications on project [14].

**III.2.6** H6: The level of continuous use of Personal Protective Equipment (PPE) has a positive effect on project performance.

According [13], Covid-19 pandemic requires project managers to focus on the safety and health of employees. The occupational safety and health (K3) program carried out by contractors is the basis for building a program system for workers and employers to prevent accidents and diseases due

to work relations in the work environment. Availability of all PPE, construction safety equipment, and the implementation of infection control policies are important things to attention [9]. According [12], general 76.7% of respondents agreed that contractors in the construction industry had equipped their PPE while working to prevent Covid-19.

#### IV. METHOD

This study used a project analysis unit. Selected project is a construction project in Indonesia. A purposive sampling technique was used in this research in which consideration of certain characteristics, in accordance with the criteria that the researcher wants [18]. This research used a questionnaire survey with the population in this study were project leaders and managers who came from top-level management from service providers or contractors who carried out construction projects and were being affected by the covid-19 pandemic. Questionnaires were distributed to 265 respondents by online (linkedin and social media) and offline distribution. Responses were obtained 144 respondents with total response rate of 56%. Classifications respondent resulted in Table 2. Number of respondents who filled out the questionnaire was 62 respondents from the construction industry, 12 infrastructure construction, 16 commercial construction, and 10 residential construction.

Sample selection indicates the sample size should be equal to the larger of 10 times the largest number of formative indicators used to measure a single construct [19]. This research have 60 minimum sample that must be fulfilled. Based on the minimum number of samples, this research can process 62 data from the construction industry and 100 data from overall construction.

**TABLE 2. Classification of Respondents**

Respondent Profile		Frequently
Construction Type	Industrial Construction	62
	Infrastructure Construction	12
	Commercial Construction	16
	Residential Construction	10
Total Project Value	0-2,5M	71
	2,5 M- 50M	17
	> 50 M	12
Project Working Time	1 – 6 month	77
	7– 12 month	5
	>12 month	18

#### V. RESULT AND DISCUSSIONS

This research consists of four independent variables, one dependent variable, and one mediating variable. The scale used is the Likert scale, which is a scale with four or five levels of statements that express an agreement or disagreement of a series of questions [20].

*V.1 Result for overall construction (100 respondents)*

To evaluate the convergent validity of the formative construct, the researcher considers the value outer loadings must be equal to or greater than 0,7 [19]. Based on the minimum limit for the value of the outer loading Table 3. lists

the variables that were omitted because they had an outer loadings value < 0,7.

**TABLE 3. Outer Loadings Overall Construction**

Variable	Indicator	Loading Factor	Interpretation
X1	X1.1	0,854	Valid
	X1.2	0,859	Valid
	X1.3	0,85	Valid
X2	X2.1	0,848	Valid
	X2.2	0,711	Valid
	X2.3	0,756	Valid
	X2.4	0,703	Valid
	X2.5	0,707	Valid
X3	X3.2	0,719	Valid
	X3.3	0,852	Valid
	X3.4	0,925	Valid
X4	X4.2	0,856	Valid
	X4.3	0,785	Valid
	X4.4	0,789	Valid
X5	X5.1	0,809	Valid
	X5.2	0,9	Valid

The approach to assessing discriminant validity is indicated by the value of cross-loadings. The current cross-loadings value must be greater than the cross-loadings value with other constructs that can be shown in Table 4.

**TABLE 4. Cross Loadings Overall Construction**

Var	X1	X2	X3	X4	X5
X1.1	0,854	0,374	-0,05 7	-0,00 7	-0,08 6
X1.2	0,859	0,304	-0,15 9	-0,11 7	-0,14 6
X1.3	0,850	0,436	-0,16 0	-0,14 6	-0,13 0
X2.1	0,527	0,848	0,089	0,049	0,106
X2.2	0,156	0,711	0,089	0,140	0,086
X2.3	0,228	0,756	-0,08 2	0,044	0,028
X2.4	0,286	0,703	-0,06 9	0,007	0,001
X2.5	0,238	0,707	0,096	0,119	0,050
X3.2	-0,23 5	-0,01 4	0,719	0,508	0,489
X3.3	-0,05 0	0,111	0,852	0,463	0,362
X3.4	-0,12 2	0,014	0,925	0,497	0,408
X4.2	-0,15 4	0,043	0,505	0,856	0,434
X4.3	-0,05 0	0,073	0,445	0,785	0,400
X4.4	-0,04 4	0,102	0,448	0,789	0,368
X5.1	-0,14 8	0,114	0,387	0,413	0,809
X5.2	-0,10 3	0,040	0,444	0,438	0,900

Table 5 swown value of Composite Reliability and Cronbach's Alpha for X1; X2; X3; X3; X4; Y from the variable was reliable because it produced a value > 0.6 [21]. Colinearity is under number 5 so there is no problem with collinearity [19].

**TABLE 5. Reliability Test Overall Construction**

Variable	Cronbach's Alpha	Composite Reliability	VIF
X1	0,817	0,89	1,31
X2	0,815	0,863	1,286
X3	0,783	0,874	1,64
X4	0,740	0,852	1,654
X5	0,643	0,846	1,463
Y	0,932	0,942	

Variable X1; X2; X3; X4; X5 provides on project performance (Y) amounted to 0.397 or 39.7%. While the rest is influenced by variables outside the research model. Tabel 6 shows the influence of a weak variable.

**TABLE 6. R Square Overall Construction**

Variable	R Square
Y	0,397
X1	0,195

Figure 2 shows PLS-SEM model for overall construction. Table 7 shows the results of the hypothesis test from t table parameter. The hypothesis test results can be concluded that the effect of variables on the performance of construction projects in Indonesia due to Covid-19 pandemics is:

1. The level of movement restrictions during the pandemic (lockdown) has a positive effect on the level of challenge in implementing social distancing
2. The level of challenge in implementing social distancing has a negative effect on project performance.
3. The level of movement restriction during the pandemic (lockdown) has a positive effect on project performance.
4. The level of challenge of working from home has a positive effect on project performance
5. The level of planning limiting the number of workers has a positive effect on project performance
6. The level of continuous use of personal protective equipment (PPE) has a negative effect on project performance.

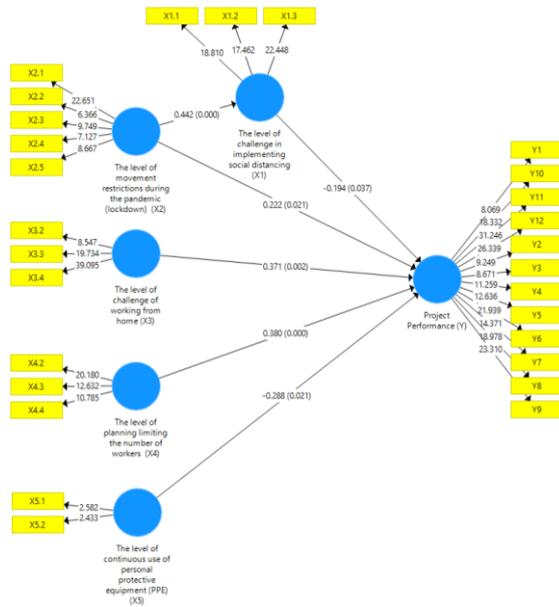


FIGURE 2. PLS-SEM Model Overall Construction

TABLE 7. Results of Hypotheses Overall Construction

Code	Variable	Original Sample (O)	t value	P value	Conclusion
H1	The level of movement restrictions during the pandemic (lockdown) -> level of challenge in implementing social distancing	0,442	4,64	0,000	Reject H0
H2	The level of challenge in implementing social distancing -> project performance	-0,194	2,029	0,043	Reject H0
H3	The level of movement restriction during the pandemic (lockdown) -> project performance.	0,222	2,258	0,024	Reject H0
H4	The level of challenge of working from home -> on project performance	0,371	3,442	0,001	Reject H0
H5	The level of planning limiting the	0,38	4,078	0,000	Reject H0

	number of workers				
	->project performance				
H6	The level of continuous use of personal protective equipment (PPE) ->project performance	-0,288	2,378	0,018	Reject H0

V.2 Result for industrial construction (62 respondents)

To evaluate the convergent validity of the formative construct, the researcher considers the value outer loadings must be equal to or greater than 0.7 [19]. Based on the minimum limit for the value of the outer loading Table 8 lists the variables that were omitted because they had an outer loadings value < 0.7.

The approach to assessing discriminant validity is indicated by the value of cross-loadings. The current cross-loadings value must be greater than the cross-loadings value with other constructs that can be shown in Table 9.

Table 10 shows value of Composite Reliability and Cronbach's Alpha for Each item from the variable was reliable because it produced a value > 0.6 [21]. Colinearity is under number 5 so there is no problem with collinearity [19].

TABLE 8. Outer Loadings Industrial Construction

Variable	Indicator	Loading Factor	Interpretation
X1	X1.1	0,744	Valid
	X1.3	0,745	Valid
	X1.4	0,805	Valid
X2	X2.2	0,832	Valid
	X2.3	0,901	Valid
	X2.4	0,914	Valid
	X2.5	0,919	Valid
	X2.6	0,931	Valid
X3	X3.3	0,855	Valid
	X3.4	0,887	Valid
	X3.5	0,755	Valid
X4	X4.1	0,748	Valid
	X4.2	0,910	Valid
	X4.5	0,744	Valid
X5	X5.1	0,973	Valid
	X5.2	0,884	Valid

TABLE 9. Cross Loadings Industrial Construction

Var	X1	X2	X3	X4	X5
X1.1	0,744	0,496	0,153	0,400	0,095
X1.3	0,745	0,467	0,071	0,323	0,034
X1.4	0,805	0,563	0,064	0,227	-0,194
X2.2	0,600	0,832	0,126	0,328	-0,063
X2.3	0,550	0,901	0,257	0,294	0,040
X2.4	0,614	0,914	0,151	0,289	-0,161
X2.5	0,596	0,919	0,168	0,311	-0,060
X2.6	0,638	0,931	0,165	0,254	-0,129
X3.3	0,067	0,141	0,887	0,154	0,170

X3.4	0,033	0,205	0,755	0,153	0,133
X3.5	0,311	0,268	0,113	0,748	-0,014
X4.1	0,376	0,257	0,245	0,910	0,072
X4.2	0,287	0,301	0,243	0,744	0,106
X4.5	-0,049	-0,085	0,117	0,040	0,973
X5.1	-0,016	-0,079	0,151	0,126	0,884
X5.2	-0,125	-0,044	0,128	-0,194	0,197

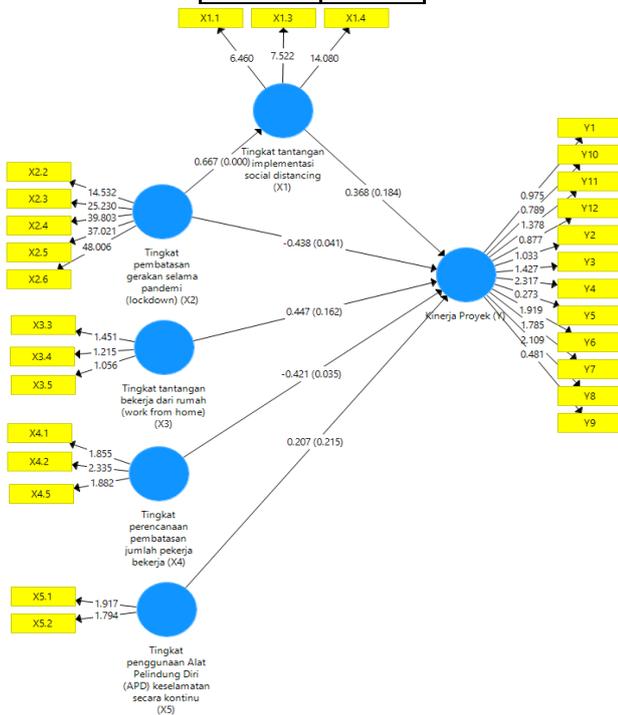
**TABLE 10. Reliability Test Industrial Construction**

Variable	Cronbach's Alpha	Composite Reliability	VIF
X1	0,647	0,809	1,951
X2	0,941	0,955	1,868
X3	0,795	0,873	1,111
X4	0,745	0,845	1,275
X5	0,860	0,927	1,039
Y	0,634	0,714	

Variable X1; X2; X3; X4; X5 provides on project performance (Y) amounted to 0.417 or 41.7%. While the rest is influenced by variables outside the research model. Table 11 shows the influence of a strong enough variable.

**TABLE 11. R Square Industrial Construction**

Variable	R Square
Y	0,417
X1	0,445



**FIGURE 3. PLS-SEM Model Industrial Construction**

Figure 3 shows PLS-SEM model for industrial construction. Table 12 shows the results of the hypothesis test from t table parameter. The hypothesis test results can be concluded that the effect of variables on the performance of construction projects in Indonesia due to Covid-19 pandemics is:

1. The level of movement restrictions during the pandemic (lockdown) has a positive

effect to the level of challenge in implementing social distancing

2. The level of challenge in implementing social distancing is not significant on project performance.
3. The level of movement restriction during the pandemic (lockdown) has a negative effect on project performance.
4. The level of challenge of working from home is not significant on project performance
5. The level of planning limiting the number of workers has a negative effect on project performance
6. The level of continuous use of personal protective equipment (PPE) is not significant on project performance.

**TABLE 12. PLS-SEM Model Industrial Construction**

Code	Variable	Original Sample (O)	t value	P value	Conclusion
H1	The level of movement restrictions during the pandemic (lockdown) -> level of challenge in implementing social distancing	0,667	7,463	0,000	Reject H0
H2	The level of challenge in implementing social distancing -> project performance	0,368	1,293	0,197	Failed Reject H0
H3	The level of movement restriction during the pandemic (lockdown) -> project performance.	-0,438	2,005	0,046	Reject H0
H4	The level of challenge of working from home ->on project performance	0,447	1,437	0,151	Failed Reject H0
H5	The level of planning limiting the number of workers ->project performance	-0,421	2,224	0,025	Reject H0
H6	The level of continuous use of personal protective equipment (PPE) ->project performance	0,207	1,277	0,202	Failed Reject H0

This research conducted a different calculation between overall construction (100 respondents) and industrial construction due to the results of the hypothesis with 100 respondents produced several counterintuitive results. These results are contrary to the original hypothesis. For example, the result of hypothesis 1 the level of movement restrictions during the pandemic (lockdown) has a positive effect on project performance, which explains that the results are contrary to so-called counterintuitive. The results of hypotheses 2, 4, and 6 are also not in accordance with the alleged early hypothesis.

The data obtained by the researcher consists of four classifications of project types. One project that meets the minimum sample criteria for processing data again. Selected samples for processing are industrial construction samples with 62 respondents. The results obtained on processing data in industrial construction are hypotheses 1, 3 and 5 proved to be in accordance with the initial hypothesis.

Processing data respondent industrial construction is a construction that requires specific specifications and requirements such as for oil refineries, heavy industry / basic industries, mining, nuclear, and so on. Its planning and implementation require specific accuracy and expertise/technology. The need for more workers than other types of construction. Value this research is in accordance with the characteristics or characteristics of the type of project that is used for data processing.

## VI. CONCLUSION

The results of data processing show that the results of data processing with different types of projects produce different conclusions. Overall construction shows all variables that have an effect on project performance, but only the level of challenge in implementing social distancing as mediation variables, the level of challenge in implementing social distancing have negative effect on project performance and the level of continuous use of personal protective equipment (PPE) have negative effect on project performance. Whereas in industrial construction only three variables according to the initial hypothesis shows that level of movement restrictions during pandemic has a positive effect to level of challenge in implementing social distancing, the level of movement restriction during the pandemic (lockdown) have negative effect on project performance and the level of planning limiting the number of workers have negative effect to project performance.

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# Performance Analysis of Support Vector Machine in Identifying Comments and Ratings on E-Commerce

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## Abstract

Consumers who have shopped at E-Commerce will provide reviews/comments on products that have been purchased. Customer confidence in the rating is hampered due to inconsistency of answers such as reviews that have negative text with a positive rating value. For this reason, a technique is needed to adjust the rating with comments or reviews of purchased goods to make it easier for consumers when shopping to see the rating directly without reading the reviews/comments of previous buyers. purpose of this study is to classify comments and ratings and then obtain the results of the accuracy of the classification system so that the above problems can be answered. This study uses Support Vector Machine classification technique because this algorithm is better in classification's terms. Data used are 1044 comment data and 1044 rating. Data are grouped into Good, Neutral, Less good categories using Python by Google Colab and divided into training and test data. To test capability of system, data that has been classified then analyzed using Confusion matrix. Results showed that SVM Algorithm was able to classify with an accuracy rate of 71.14%, 88% precision, and 79% recall. SVM algorithm is able to formulate training data with an accuracy of 91.3%.

## Keywords

*E-Commerce, Sentiment analysis, Support Vector Machine, Confusion Matrix, Google Colab Phyton*

## I. INTRODUCTION

E-commerce is a container in the process of buying and selling goods and services online or the ability to transact online, including retail, online banking and shopping which involves transactions where buyers actually buy and shop [1]. Based on the results of the analysis that has been carried out, most of the consumers who have shopped at E-Commerce will provide a review of the products that have been purchased. Reviews and ratings are also very important to increase the frequency of customers, because reviews and ratings from customers can provide a more accurate and emotional assessment because they are given by fellow customers so that they have a higher trust value. Therefore, the rating of an online store requires special attention from the online store manager to increase its customers [2]. However, customer confidence in the rating can be hampered due to inconsistency of answers such as reviews that have negative texts with positive rating values. The existence of different answers such as good ratings but bad reviews and vice versa can make other people confused [3]. Several previous studies, according to Wanda (2018), in conducting sentiment analysis, a method that supports classification is needed. In the research of Dina Maulina (2018), it is stated that with Text Mining technology, it can solve complex problems [4]. In his research, Norwawi (2020) states that for data mining techniques, appropriate methods and algorithms are needed to obtain appropriate results, so

that at this time there are very many types of algorithms used in data mining techniques [5]. Dedi Darwis (2020) has conducted research on the application of the SVM Algorithm in analyzing sentiment on twitter data against the Corruption Eradication Commission of the Republic of Indonesia. The classification method used in this research is Support Vector Machine (SVM) and feature extraction using TF-IDF. Each occurrence of the word is labeled Positive, Negative, Neutral. Based on the test results, the application of the SVM method produces an accuracy value of 82% and produces a sentiment with a larger negative label with a total of 77%, a positive label of 8% and a neutral label of 25% [6]. The topic of this research is the analysis and classification of the existing comment data on Lazada. The process of classifying and identifying data is called Text Mining. The purpose of text mining (which is also referred to as data mining and text analysis) is to analyze textual documents from an unstructured form to a structured one so that it can be continued in the next stage of analysis both qualitatively and quantitatively [7]. The algorithm used in this research is SVM can be applied in a labeled data set, which will produce a series of input-output mappings labeled functions and feature details, SVM can also be used as a classification method [8]. Before processing the data, it must first go through the preprocessing stage to get better data and reduce noise. The data is taken from the Kaggle website in the form of Excel and then converted to a CSV file. For accuracy

measurement, use confusion matrix for Precision, Recall, and F-measure assessment.

## II. RESEARCH METHOD

### 2.1. Research Stages

The stages in this research are as follows: Data collection, data analysis, design and implementation of results to the classification of test data which can be seen in Figure 1.

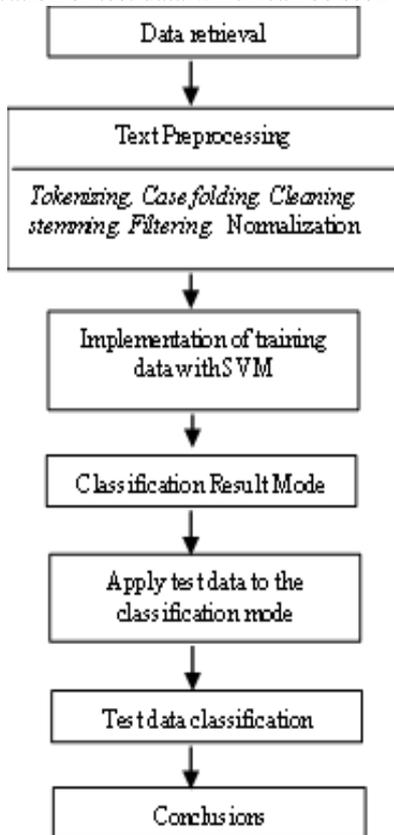


Figure 1. Research Stages

### 2.2. Research Dataset

The object involved in this research is a dataset in the form of a collection of reviews in the form of comments and also ratings given by people who have shopped at the Lazada Online Store taken from the Kaggle site. Then the rating list and review data in the form of comments which were originally in the form of an Excel file were converted into a CSV file and given a label. The next step is to read the CSV dataset into Google Colab using the Python Programming Language. The data used in this study were 1044 comments and rating data, then divided into 3 categories (classes) namely less good, neutral, good. Data that already has a class category that is not good, net is split the data into test data and training data with the comparison that will be used in this study is training data: test data = 90%: 10%.

### 2.3. Preprocessing Data

The dataset taken from the Kaggle site is still in the form of raw data so that the preprocessing stage is carried out to obtain clean data to facilitate the next stage and produce more accurate analysis results. The stages in Preprocessing are as follows:

1. Case folding is the process of converting all letters in the document into lowercase letters and removing all letters that are not alphabetical (az) [9]. Example: The item is good → the item is good.
2. Cleaning is the process of cleaning documents from words that are less important in order to reduce noise in order to increase the accuracy of the classification process [10]. The words that will be removed from the comments are numbers, symbol characters, hashtags (#), changing the word alay to standard words and mentions (@username). Example: i love the same goododddd → I love the same good.
3. Stemming is looking for the basic word from the sentence and reducing it because it is a type of word that has the same meaning [11]. In this study using the library provided by Sastrawi.
4. Filtering is the process of saving word choices or deleting words [12]. The deleted words are words that have been categorized into Stopwords or general words that often appear in large numbers but have no meaning, including “and”, “or”, “to”, “di”, punctuation.
5. Tokenizing is the process of separating a full text string into a separate list of words [13]
6. Normalization is the weighting of sentences.
7. Term Frequency or TF is a word weighting process by adding up the words that appear in a document. While Inverse Document Frequency or IDF is the number of occurrences of a word in all existing documents, and DF is obtained from the results of TF [14].

The TF formula can be seen in the following equation:

$$Tf_{t,d} = \begin{cases} f_{t,d} & \text{if } f_{t,d} > 0 \\ 1 & \text{Otherwise} \end{cases} \quad (1)$$

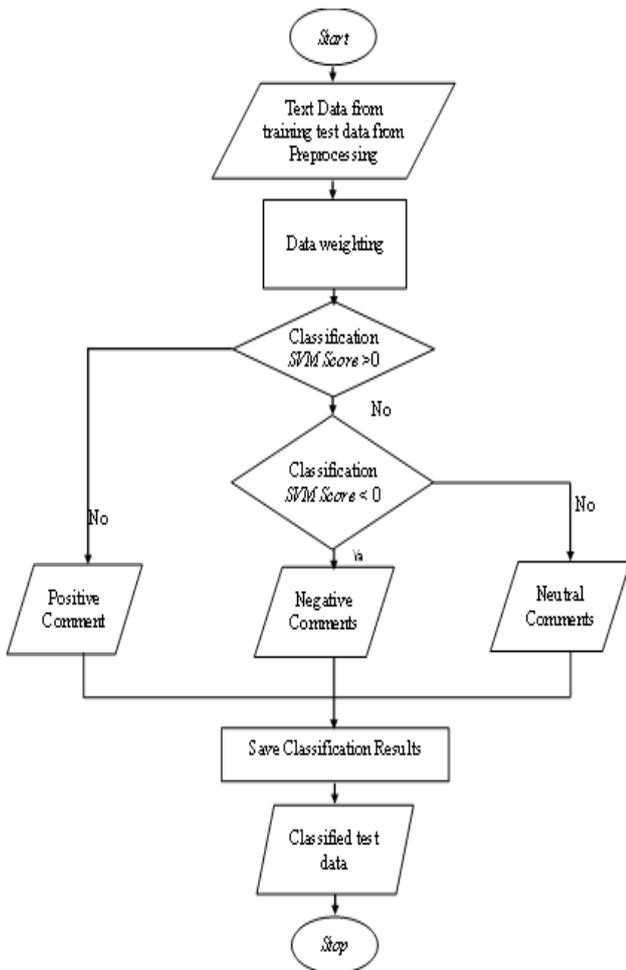
As for the IDF formula, it can be seen in the following equation:

$$IDF_t = \log\left(\frac{N}{df_t}\right) \quad (2)$$

Where N is the number of all documents in the dataset and  $df_t$  is the number of documents containing term t in it.

### 2.4. Analysis with Support Vector Machine

At this stage, an analysis of the classification method is carried out based on the data that has been processed using training data and the results of the analysis of the training data will be tested using test data. The flowchart of the SVM classification process is shown in Figure 2.



**Figure 2.** Flowchart of Text Classification Process Using SVM

The method used in SVM is a sequential method, which is a method that is useful for getting a hyperline, while the function of a hyperline is as a separator of two classes in the input space. The function of the sequential method is to speed up the iteration process. The following are the steps of the sequential method [15]:

1. Initialization is carried out on the parameters to be used, namely (lambda), (learning rate), C (complexity), (epsilon), and maximum iterations.
2. Initialize the value then calculate the matrix with equation
 
$$D_{ij} = y_i y_j (K(x_i, x_j) + \lambda^2) \dots\dots\dots(3)$$
3. Calculates equations (4), (5), and (6) to update the values of E and  $\alpha$ .
  - a.  $E_i = \sum_{i=1}^n \alpha_i i_j \dots\dots\dots(4)$
  - b.  $\delta_{ai} = \min\{\max[\gamma(1 - E_i), -\alpha_i], C - \alpha_i\} \dots\dots(5)$
  - c.  $\alpha_i = \alpha_i + \delta_{ai} \dots\dots\dots(6)$
4. Perform step 3 until maximum iteration or  $\text{Max}(\delta\alpha) < \epsilon$ .

After the above process is complete, it will be obtained and support vector. The next step is to calculate the value of b bias with equation 7.

$$b = -\frac{1}{2} \left( \sum_{i=0}^n \alpha_i y_i K(x_i, x^-) + \sum_{i=0}^n \alpha_i y_i K(x_i, x^+) \right) \dots\dots(7)$$

Sentiment analysis can be calculated using equation 8.

$$f(x) = \sum_{i=0}^n \alpha_i y_i K(x, x_i) + b \dots\dots\dots(8)$$

### 2.5. Testing the classification results using the Confusion Matrix

Confusion Matrix is an important measure to evaluate the accuracy of the classification model [16]. In the Confusion Matrix there is a binary classification type which only has 2 output classes which are shown in the following table:

**Table 1. Binary Classification**

Class	Classified Positive	Classified Negative
Positive	TP (True Positive)	TN (True Negative)
Negative	FP (False Negative)	FN (False Negative)

Confusion Matrix produces 3 outputs, namely [17]:

$$\text{Recall} = \frac{TP}{FN+TP} \times 100\% \dots\dots\dots(9)$$

$$\text{Precision} = \frac{TP}{FP+TP} \times 100\% \dots\dots\dots(10)$$

$$\text{Accuracy} = \frac{(TP+TN)}{(TP+TN+FP+FN)} \times 100\% \dots\dots\dots(11)$$

## III. RESULTS AND DISCUSSION

### 3.1. Research dataset analysis

To continue the analysis process, the dataset in the form of CSV is uploaded to Google Colab. The research dataset is called "datasetpenelitian.csv", then the data is imported and displayed on the system.



**Figure 3. Results of Research Data Display on the System**

The labeling in this study was made into 3 categories, the Good category was given a label 1, the Neutral category was given a label 0, the Less good category was given a label -1. So the results of the system test based on the label given show that there are 696 comment data that are in the good category, 220 are in the neutral category, and 129 are in the less good category. After that, the system proceeds to the preprocessing stage and the classification process using SVM. See Figure 4.

```
[ ] def classes_def(x):
    if x == 5:
        return 1
    elif x == 4:
        return 0
    elif x == 3:
        return 0
    elif x == 2:
        return -1
    else:
        return -1

data['class']=data['Rating'].apply(lambda x:classes_def(x))

print("Bagus: ", data[data['class'] == 1].shape)
print("Netral: ", data[data['class'] == 0].shape)
print("Kurang Bagus: ", data[data['class'] == -1].shape)

Bagus: (696, 4)
Netral: (220, 4)
Kurang Bagus: (129, 4)
```

Figure 4. Data Display Results that have gone through the labeling stage

To support the preprocessing process, there are two CSV files that are imported to the system, namely files to remove words/term stopwords and change words that are included in the "alay" dictionary, while the purpose of these two supporting files is to assist the data cleaning process. which is more accurate. See Figure 5.

```
[77] #2.1. Import file CSV kumpulan stopwords
id_stopword_dict = pd.read_csv('stopwordbahasa.csv')
id_stopword_dict = id_stopword_dict.rename(columns={0: "stopword"})

print("Shape: ", id_stopword_dict.shape)
id_stopword_dict.head()

Shape: (758, 1)
stopword
0    ada
1  adalah
2  adanya
3  adapun
4  agak
```

Figure 5. Display Stopword

```
#2.2. Import file CSV kumpulan kamus alay
alay_dict = pd.read_csv('new_kamusalay.csv')
alay_dict = alay_dict.rename(columns={0: 'original', 1: 'replacement'})

[73] print("Shape: ", alay_dict.shape)
alay_dict.head(15)

Shape: (15169, 2)
original replacement
0  anakjakartaasik  anak jakarta asyik asyik
1  pakcikdahtua    pak cik sudah tua
2  pakcikmudalagi  pak cik muda lagi
3  t3tapjokowi     tetap jokowi
4  3x              tiga kali
5  aamiin          amin
6  aamiinn         amin
7  aamin           amin
```

Figure 6. Display of Alay Dictionary

### 3.2. Preprocessing Results

#### 3.2.1. Text Preprocessing

The results of the text preprocessing data process :

##### a. Case Folding

Based on the preprocessing method, the words of each comment will be changed to lowercase as shown in the following figure:

	Data Komentar
0	bagus mantap dah sesuai pesanan
1	bagus, sesuai foto
2	okkkkk mantaaaaaaapppp ... goood
3	bagus sesuai
4	baru 10 bulan layarnya dah bergaris
...	...
1040	semoga awet
1041	barang sesuai gambar dan berfungsi dengan baik...
1042	barang sudah diterima dan sesuai pesanan.
1043	pengiriman ok banget, cepat.
1044	imut, blm sempat dicoba

1045 rows x 1 columns

Figure 7. Results of Preprocessing with Casefolding

##### b. Cleaning

Based on the Preprocessing method, the results of the Cleaning process show that words that are considered less important have been removed automatically at this stage, as shown in the following figure:

	Data Komentar	Komentar_clean
0	bagus mantap dah sesuai pesanan	bagus mantap sudah sesuai pesanan
1	bagus, sesuai foto	bagus sesuai foto
2	okkkkk mantaaaaaaapppp ... goood	ok mantap goood
3	bagus sesuai	bagus sesuai
4	baru 10 bulan layarnya dah bergaris	baru bulan layarnya sudah bergaris
...	...	...
1040	semoga awet	semoga awet
1041	barang sesuai gambar dan berfungsi dengan baik...	barang sesuai gambar dan berfungsi dengan baik...
1042	barang sudah diterima dan sesuai pesanan.	barang sudah diterima dan sesuai pesanan
1043	pengiriman ok banget, cepat.	pengiriman oke banget cepat
1044	imut, blm sempat dicoba	imut belum sempat dicoba

1045 rows x 2 columns

Figure 8. Results of Preprocessing with Cleaning

##### c. Stemming

Based on the Preprocessing method, the results of the Stemming process are obtained, namely removing affixes and retaining basic words as shown in the following figure:

	Data Komentar	Komentar_clean	Komentar_stem
0	bagus mantap dah sesuai pesanan	bagus mantap sudah sesuai pesanan	bagus mantap sudah sesuai pesan
1	bagus, sesuai foto	bagus sesuai foto	bagus sesuai foto
2	okkkkk mantaaaaaaapppp ... goood	ok mantap goood	ok mantap goood
3	bagus sesuai	bagus sesuai	bagus sesuai
4	baru 10 bulan layarnya dah bergaris	baru bulan layarnya sudah bergaris	baru bulan layar sudah gar
...	...	...	...
1040	semoga awet	semoga awet	moga awet
1041	barang sesuai gambar dan berfungsi dengan baik...	barang sesuai gambar dan berfungsi dengan baik...	barang sesuai gambar dan fungsi dengan baik ki...
1042	barang sudah diterima dan sesuai pesanan.	barang sudah diterima dan sesuai pesanan	barang sudah terima dan sesuai pesan
1043	pengiriman ok banget, cepat.	pengiriman oke banget cepat	pengiriman oke banget cepat
1044	imut, blm sempat dicoba	imut belum sempat dicoba	imut belum sempat coba

1045 rows x 3 columns

Figure 9. Preprocessing Results with Stemming

##### d. Filtering

Based on the Preprocessing method, the results of the Filtering process are obtained, namely common words have been removed to reduce noise as shown in the following figure:



Next, calculate the level of accuracy of the SVM algorithm on the research test data. The value of the classification accuracy of the SVM algorithm from the test data is 71.42%.

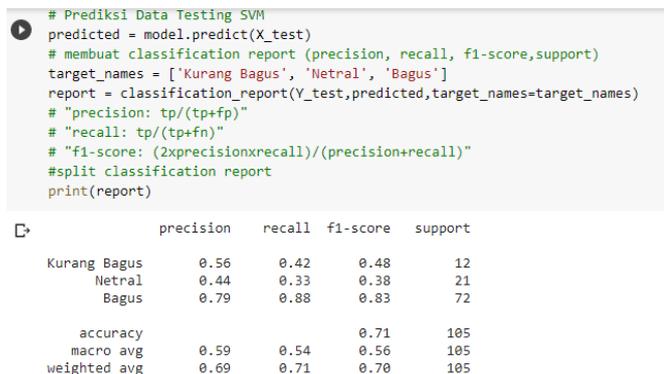


Figure 17. SVM Classification Result Report based on test data.

### 3.7. Analysis of Classification Results with Confusion Matrix

From the application of equation (9), the Confusion Matrix results from the SVM analysis for the Good category have a recall value of 79%. With equation (10), SVM analysis has a precision level of 88%, and in equation (11), SVM analysis has an accuracy rate of 71%. After testing the classification based on commentary and rating data simultaneously using SVM for the less good and neutral categories, the results are lower than the good categories. Following are the results of the Confusion Matrix SVM analysis:

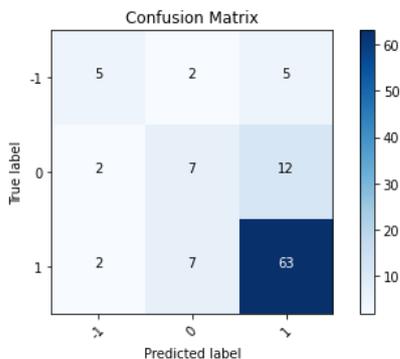


Figure 18. Confusion Matrix Diagram

## IV. Conclusion

The dataset used in this study is 1044 comment data along with ratings from the Lazada platform. Then the comment data along with the rating are labeled with good, neutral, and bad categories, and classified using the SVM algorithm and the level of accuracy using the Confusion Matrix. However, in this study only the classification process for datasets that have been inputted previously, not for datasets that have just been inputted. SVM classification resulted in training data classification accuracy of 91.3% and test data classification accuracy of 71.4% with a compiler time of 11,575 seconds. For further research, do a classification using more data and higher preprocessing techniques so as to get clean data and more accurate classification results.

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# Developing a Framework for Sustainable Social Housing Delivery in Greater Port Harcourt City, Rivers State, Nigeria

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## Abstract

This research has developed a framework for the provision of sustainable and affordable housing to accommodate the low-income population of Greater Port Harcourt City. The objectives of this study among others were to: examine UN-Habitat guidelines for acceptable and sustainable social housing provision, describe past efforts of the Rivers State Government and the Federal Government of Nigeria to provide housing for the poor in the Greater Port Harcourt City area; obtain a profile of prospective beneficiaries of the social housing proposed by this research as well as perceptions of their present living conditions, and living in the proposed self-sustaining social housing development, based on the initial simulation of the proposal; describe the nature of the framework, guideline and management of the proposed social housing development and explain the modalities for its implementation. The study utilized the mixed methods research approach, aimed at triangulating findings from the quantitative and qualitative paradigms. Opinions of professional of the built environment; Director, Development Control, Greater Port Harcourt City Development Authority; Directors of Ministry of Urban Development and Physical Planning; Housing and Property Development Authority and managers of selected Primary Mortgage Institutions were sought and analyzed. There were four target populations for the study, namely: members of occupational sub-groups for FGDs (Focused Group Discussions); development professionals for KIIs (Key Informant Interviews), household heads in selected communities of GPHC; and relevant public officials for IDI (Individual Depth Interview). Focus Group Discussions (FGDs) were held with members of occupational sub-groups in each of the 8 selected communities (Fisher folk,). The table shows that there were forty (40) members across all occupational sub-groups in each selected community, yielding a total of 320 in the eight (8) communities of Mgbundukwu (Mile 2 Diobu), Rumuodomaya, Abara (Etche), Igwuruta-Ali (Ikwerre), Wakama (Ogu-Bolo), Okujagu (Okrika), Akpajo (Eleme), and Okoloma (Oyigbo). For key informant interviews, two (2) members were judgmentally selected from each of the following development professions: urban and regional planners; architects; estate surveyors; land surveyors; quantity surveyors; and engineers. Concerning Population 3 - Household Heads in Selected Communities of GPHC, a stratified multi-stage sampling procedure was adopted: Stage 1- Obtaining a 10% (a priori decision) sample of the component communities of GPHC in each stratum. The number in each stratum was rounded to one whole number to ensure representation of each stratum. Stage 2 - Obtaining the number of households to be studied after applying the Taro Yamane formula which aided in determining the appropriate number of cases to be studied at the precision level of 5%. Findings revealed, amongst others that poor implementation of the UN Habitat global shelter strategy, lack of stakeholder engagement, inappropriate locations, undue bureaucracy, lack of housing fairness and equity and high cost of land and building materials were the reasons for the failure of past efforts towards social housing provision in the Greater Port Harcourt City area. The study recommended a public-private partnership approach for the implementation and management of the framework. It also recommended a robust and sustained relationship between the management of the framework and the UN-Habitat office and other relevant government agencies responsible for housing development and all investment partners to create trust and efficiency.

## Keywords

*Development, Framework, Low-income, Sustainable, Social Housing.*

## I. INTRODUCTION

### 1.1 Background to the study

There is substantial evidence of a growing housing deficit and affordability problems in Nigeria and the world at large (Zayyanu, Foziah, Soheil & Zungwenen, 2015). The incidence of the problem in Nigeria has engulfed the low income groups and forced them into unhealthy and substandard settlements, without basic amenities and

facilities; there is also now consistent calls by UN- Habitat, directing all partner-countries to make affordable and decent housing a priority after food to ensure acceptable living standards.

Homelessness is evident in both the industrialized and developing countries. In developing countries, rapid population growth has outpaced the expansion of housing by a wide and unprecedented margin, leading to the rise in homelessness. Squatters live in sub-standard housing, yet that is only one of the many problems they face (Schaefer, 2010).

Residents do not receive most public services, since their presence cannot be legally recognized. However, despite these harsh conditions, well-developed social organizations can still be found in some societies.

Access to appropriate and affordable housing is a fundamental human right, which is essential for individual, family and community wellbeing (ACOSS, 2008). According to Guidelines on Social Housing by the United Nations (Geneva, 2006), poverty and social exclusion of the vulnerable population groups are increasing social and political challenges throughout the world. In recent years, the gaps between income and housing prices has continued to widen across the globe, particularly in the developing countries, making housing less affordable. Okechukwu (2009) asserted that housing all over the world has remained an interdependent phenomenon that faces mankind and it represents one of the most basic human needs which no doubt has a profound impact on the health, welfare and productivity of every individual irrespective of social-economic status, colour or creed. The housing problems and the housing needs are manifested in overcrowding, poor and inadequate social amenities, unsatisfactory and unwholesome environmental conditions and urban squalor, the absence of open space, the development of land area leading to overcrowding of buildings, inaccessibility within residential areas and in scarcity and high cost of building materials. In urban areas, the major housing problems are severe shortages of housing, overcrowding and the spread of slums and shantytowns. Furthermore, the nature of housing problems in the United States has shifted from shortages to problems of quality, affordability and inability of certain groups in the population to obtain decent housing.

Social housing is basically affordable rental housing, specifically designed for those on low incomes. It may be provided by government authorities or agencies or by private housing associations, helping to assist those who cannot access accommodation in the private rental market (Stephens, Gibb, & Blenkinsopp, 2003). In many countries, it serves as a remedy for the inequalities of housing, particularly in places where real estate prices are rising rapidly. It gives those who might otherwise end up in unsafe or condemned buildings access to low cost housing that meets building requirements and safety standards while making economical use of land and urban resources. Most social housing are run by authorities or organizations with physical onsite presence, handling repairs or concerns, which residents may have and acting as a landlord would in private rental situations. Funding for social housing remains a serious issue in both developed and developing countries lacking money to deal with repairs, resulting in rundown or outdated rentals.

### 1.2 Problem specification

In Nigeria, delivery of what the 2012 National Housing Policy Document described as Social Housing has not occurred. Much of what has been described as “low-cost housing” or “mass housing” has gone to the medium and even high-income groups through system inefficiency and system manipulation. There is the need, therefore, to

provide the kind of housing that is adequate, affordable and acceptable to the low-income groups, which form the bulk of the population and this has been a very difficult task for the various tiers of government in Nigeria so far. This research is intended to assist in remedying this national tragedy and bridge the huge gap in housing provision. Onyike (2012) observed that the 20th century saw a lot of failed attempts by the Nigerian government to deliver affordable housing to a majority of her citizens, and worse still for the “No and Low income” groups. It was further argued that housing policies have not been able to meet set targets of affordable housing delivery to the low-income groups and with the high population growth rate and unprecedented unemployment, the insignificant response by government makes the housing deficit more cumbersome. Ibem (2011) further stated that non availability of mortgage loans, high interest rates, inadequate infrastructure and difficulties in obtaining building plan approvals and Certificates of Occupancy (C of O) are some factors responsible for the failure of housing policies and programmes in delivering affordable housing to the “No and Low income” groups in Nigeria (as defined in the 2012 Housing Policy Document). Urban infrastructure and services have failed to keep pace with population growth (Ebiwari, 2017). As a result of many years of neglect, problems such as a poorly developed housing finance system, limited supply of long-term loans and funds, low household income levels, high levels of unemployment, high inflation rate, high interest rate on mortgages, high cost of land and building materials, poor planning and implementation, administrative bottlenecks and corruption have become the order of the day (Umoh, 2012).

In fact, Umoh (2012), further observed that the nature of involvement of the public sector in housing provision in Nigeria has been more of policy formulation than housing delivery. The idea of affordable or sustainable housing recognizes the needs of households whose incomes are not sufficient to allow them to access appropriate housing in the market without assistance (Xiaolong *et al.*, 2004). Social or affordable housing therefore describes housing that assists lower income households in obtaining and paying for appropriate housing without experiencing undue financial hardship (Xiaolong, Jian, Peng, Jun, Ruidong, Tao, 2017). In fact, in recent years, the term affordable housing has been used as an alternative to terms such as public, social or low-cost housing. The research gap identified that will be addressed is stated thus; there is unprecedented homelessness among the, 'No-income', 'Low-income and Lower medium income' groups in Nigeria. There is no satisfactory framework for the provision of social housing for the foregoing income categories in Greater Port Harcourt City. There is the urgent need to provide such a framework for the provision of social housing for the aforementioned income groups in Greater Port Harcourt City.

### 1.3 Purpose/objectives of study

The purpose of this research is to develop a sustainable framework for the provision of social housing to accommodate the target groups identified by the 2012 Housing Policy Document, i.e. the 'No-income',

'Low-income' and 'Lower -medium income' populations of Greater Port Harcourt City, Rivers State, Nigeria.

The objectives of the study are to:

- i. Examine UN-Habitat 2012 Guidelines for acceptable and Sustainable Social housing indicators for Social Housing Development in Greater Port Harcourt City.
- ii Examine the nature of the framework and management of the proposed sustainable Social housing development in the Study area.

#### 1.4 Research questions

- i. What are the UN-Habitat 2012 Guidelines for acceptable and Sustainable Social housing indicators for Social Housing Development in Greater Port Harcourt City?
- ii What is the nature of the framework and management of the proposed sustainable Social housing development in the Study area?

#### 1.5 Background Information about the Study Area

Port Harcourt is the capital and largest city of Rivers State, Nigeria. It lies up the mouth of the Bonny River and is located in the Niger Delta. According to the census data released in 2006, Rivers State had a population of 5,198,716 and Port Harcourt Municipality had a population of 1,382,592 inhabitants.

In 2009, a law was passed by the Rivers State House of Assembly and governor Amaechi's administration to spread development to the surrounding communities as part of the effort to decongest the Port Harcourt Municipality. Thus, Greater Port Harcourt City was born, spanning all or parts of eight Local Government Areas that include Port Harcourt, Okrika, Obio-Akpor, Ikwerre, Oyigbo, Ogu-Bolo, Etche and Eleme. Its total population was estimated at 2,000,000 as of 2009, making it one of the largest metropolitan areas in Nigeria.

This study, since it employed both the qualitative and quantitative research paradigms, falls into the category referred to as Mixed Methods Research (MMR) approach. The specific design used under this approach was *concurrent parallel* (Cresswell, 2014), so called because qualitative and quantitative data were collected contemporaneously and later -- during data analysis -- triangulated (compared and contrasted) to provide deep insights into research questions. In practice, the quantitative research paradigm employs a number of designs: quasi-experimental, true experimental and non-experimental (survey research) designs (Creswell, 2014).

#### 2.2 Population

There were four target populations for the study, namely: (1) Members of occupational sub-groups for FGDs; Regarding **Population (1) – occupational sub-groups** -- Focus Group Discussions (FGDs) were held with members of occupational sub-groups in each of the 8 selected communities. There were forty (40) members across all occupational sub-groups in the study area.

(2) Development professionals for KIIs: Key Informant Interviews, two (2) members were judgmentally selected from each of the following development professions: (a) urban and regional planners; (b) architects; (c) estate surveyors; (d) land surveyors; (e) quantity surveyors; and (f) engineers.

(3) Household heads in selected communities of GPHC (Greater Port Harcourt City); Household Heads in Selected Communities of GPHC, a stratified multi-stage sampling procedure (Kish, 1965) was adopted;

(4) Relevant public officials for KIIs: for Population (4) - i. Ministry of Urban Development and Physical Planning; ii. Housing and Property Development Authority; and iii. Greater Port Harcourt City

#### 2.3 Sample and sampling technique

The table below shows how the eight communities sampled were selected using a multistage sampling technique.

## II. METHODS AND MATERIALS

### 2.1 Research design

**Table 1: Sampling Details 1**

S/No.	Local Govt. Area (Stratum)	Names and Number of GPHC Component Communities*	10% Sample With Rounding
1	Port Harcourt Municipality	Port Harcourt Township, Rumuibekwe, Abuloma, Amadi-Ama, Diobu, Elakahia, (12) Nkpolu Oroworukwo, Ruumukalagbor, Ogbunabali, Orogbum, Oromineke, Oroworukwo	1
2	Obio/ Akpor	Eneka, Rumuodomaya, Elelenwo, (10) Rukpokwu Rumuosi, Iriebe, Rumuagholu, Ogbogoro, Eliozu, Rumuokwurusi	1
3	Etche	Igbo-Etche, Abara, Elele-Etche, (6) Umuebulu, Chokocho, Ikwerengwo	1

4	Ikwerre (7)	Igwuruta, Igwuruta-Ali Omagwa, Ipo, Aluu, Ozuoba, Omademe	1
5	Ogu-Bolo (7)	Ogu Town, Bolo Town, Wakama, Agokien, Mbikiri, Owo-Ogono, Iwokiri	1
6	Okrika (12)	Okrika, Okujagu, Abam-Ama, Omodara- Ama, Kalio, George, Obo, Ele, Ibuluya, Ogoloma, Donkiri, Mabegbeboko	1
7	Eleme (10)	Nchia, Ebubu, Esama, Eteo, Onne, Ogale, Alode, Aletto, Akpajo, Alesa Oyigbo Town, Komkom, Izuoma, Ayama,	1
8	Oyigbo (7)	Okoloma, Umusia, Iwuoma- Estate	1

**Total number of communities selected = 8**

\*Source of component communities: Greater Port Harcourt  
City Development Authority (GPHCDA)

**Table 2: Sampling Details 2 (Population 3)**

S/No.	Stratum	Names of Selected Communities	Population (1991 Census)	2019 Population (Projected, Using 6.5% Annual Growth Rate)	Total No. of Households (From Listing)	No. of Households Selected for Study after Application of Yamane Formula	Sampling %
1	Port Harcourt Municipality	Mgbundukwu (Mile 2 Diobu)	9,600	55,682	8,808	120	1.5
2	Obio/Akpor	Rumuodomaya	4,548	25,519	4,828	65	1.5
3	Etche	Abara	1,866	10,823	1,940	26	1.5
4	Ikwerre	Igwuruta-Ali	2,805	16,269	2,480	34	1.5
5	Ogu-Bolo	Wakama	2,717	15,759	2,266	31	1.5
6	Okrika	Okujagu	5,794	33,785	3,191	43	1.5
7	Eleme	Akpajo	5,195	30,298	3,092	42	1.5
8	Oyigbo	Okoloma	3,474	20,149	2,488	34	1.5
<b>Total</b>			<b>35,999</b>	<b>208,284</b>	<b>29,093</b>	<b>395</b>	<b>1.5</b>

Researchers Computation, February 2020

#### 2.4 An instrument for data collection

Data collection relied on primary and secondary sources. Secondary sources were:

- Published and unpublished information;
- Government archival records; and
- The Internet

Primary sources comprised:

- A pre-coded household questionnaire, to obtain socio-demographic information on selected households and tap information related to social housing; aided by a

simulation of the layout and house types in the proposed social housing development

- Checklist of questions for Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs);
- Photography;
- Direct observation of key features in past mass/low-cost housing estates; and
- Measurement - for instance, geo-locating key features pertinent to the research.

#### 2.5 Validity and Reliability

To ensure instrument validity, all instruments were thoroughly vetted by the research team and by selected development professionals. With respect to reliability,

especially of the Household Questionnaire, the test-retest method (Sauro, 2015) was employed. This entailed administering the instrument twice within an interval of 3 days to a set of 10 randomly chosen respondents in one of the GPHC communities and correlating the results. The obtained Pearson correlation coefficient (r) of 0.8 assured the researcher that the instrument was reliable for use in the main study.

**2.6 Data collection procedures**

Having so established the representative number of cases to be interviewed, systematic probability sampling was applied to the ordered list of households in the 8 communities, which constituted the probability sampling frame. Since the sampling fraction was approximately 1%, a random start was made in the interval 1 – 100. Thereafter, every 100th case was picked until the probability sample size of 395 was achieved. There were 63 non-response cases, yielding a non-response rate of 16%. Therefore, 332 valid cases were analyzed. Among private organizations interested in housing development, the managers of four (3) Primary Mortgage Institutions (PMIs) were interviewed to tap their opinions on the proposed sustainable social housing development. For the KIIs, 1 judgmentally selected director was interviewed from each of MDAs and 2 from the different professional groups.

**2.7 Method of data analysis**

Analytical techniques employed in this research pertain to the quantitative and qualitative research paradigms. For the quantitative aspect, all levels of statistical analysis – univariate, bivariate and multivariate were employed. For qualitative data, analysis took the form of intensive content analysis. This was aimed at discovering the key issues and patterns in the free flowing responses that were received from the field. These key issues were itemized and compared and contrasted (triangulated) with the information obtained from the quantitative paradigm.

**III. 3. RESULTS**

**3.1 Discussion of findings**

**i. Support for Development of Integrated Housing Estate**  
Respondents were asked if they would support development of sustainable social housing in the area. The modal response was “Yes”, accounting for 78.7% of the distribution. As Table 3 shows, the modes among the first, second and third mentioned reasons were:

**Table 3: Reasons for Support for Development of Integrated Housing Estate (Percentage Distribution of First, Second and Third Mentions)**

S/No. Reason	% First Mention (N=258)	% Second Mention (N=258)	% Third Mention (N=258)
1 The scheme will not work	3.2	0	0
2 It will help the low-income earners	15.0	12.8	7.3
3 It will enable me own my personal house	10.2	18.2	11.4
4 It will enable me provide accommodation for my children	3.2	7.4	4.9
5 It will create employment	2.7	2.0	5.7
6 More persons will own better homes	27.3	11.5	16.3
7 Affordable houses for all	4.3	17.6	2.4
8 It will lead to reduction in rent by landlords	2.7	7.4	11.4
9 People will stop paying rent instead paying for their personal homes	3.7	3.4	11.4
10 It will solve the housing problem in the area	25.7	5.4	16.3
11 It will help me move to a cleaner neighbourhood	1.1	9.5	7.3
12 New estate will decongest the neighbourhood	1.1	3.4	0
13 Installment payment is good	0	1.4	2.4
14 The unemployed can take advantage of the opportunity	0	0	3.3
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

(Source: Researchers Field Survey, February, 2020)

i. Modal first mention: “More persons will own better homes” (27.3%)ii. Modal second mention: “It will enable me own my personal house” (18.2%)iii. Modal third mention: “It will solve the housing problem in the area” (16.3%)

**Respondents’ Perceived Benefits of the Proposed Sustainable Social Housing Development**

Respondents were asked to state the perceived benefits of the proposed sustainable socialhousing development. Their

responses are detailed in Table 4.19. The modal first, second and third mentions were “Easy/Installment repayment plan” (9.9%), “Better Neighbours”(6.9%) and “Well planned estate” (4.6%).

**Table 4: Perceived Benefits of the Proposed Integrated Housing Estate**

S/No.	Item	First Mention (N=258)	Second Mention (N=258)	Third Mention (N=258)
		%	%	%
1	Easy Installment payment	9.9	2.3	1.9
2	Peace of Mind	3.8	4.6	1.1
3	Well-planned estate	0	4.6	4.6
3	It will eliminate landlord and tenant problems	1.9	0	2.7
4	It will enable me plan well	1.9	0	0
5	I need my own accommodation as a young man	1.9	1.5	0
6	It will give me privacy	1.5	0	0.4
7	Youths can own homes early in their lives	4.2	1.5	1.1
8	Everything will be within the state	1.1	1.1	1.5
9	Employment will be provided	0	1.1	0.8
10	Low income earners can now own homes	0	2.7	1.1
11	Good environment	2.7	2.3	1.1
12	New and modern houses	3.8	4.6	3.5
13	Housing for all	2.3	0	0.4
14	Work and home will be close	3.1	0	2.3
15	Better neighbours	3.1	6.9	4.2
16	Basic amenities will be present	1.1	3.8	3.8
17	Security will be provided	0.8	0	5.0
18	Working and paying for the house is good	0	3.8	0
19	Recreational facility will be present	0	0.8	2.3
20	Missing Data	52.7	41.6	61.8
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>

(Source: Researchers Field Survey, February, 2020)

**Suggestions for the Sustainable Social Housing Development**

Respondents were asked to suggest ways of making the scheme better. Table 4.21 shows details of their suggestions.

The modal first, second and third mentions were: “They should be transparent in the allocation of houses” (3.8%), “The houses should be modern”(3.4%) and “There should be many units to accommodate more households, accounting for 2.7% of that distribution.

**Table 5: Suggestions towards the Proposed Sustainable Social Housing Development**

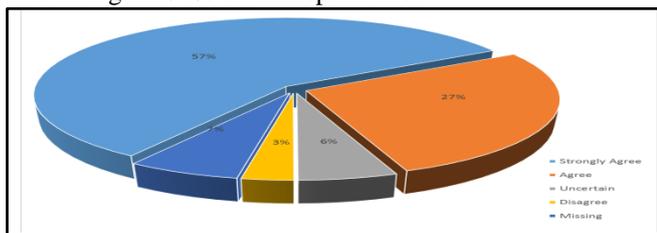
S/No.	Item	First Mention (N=258)	Second Mention (N=258)	Third Mention (N=258)
		%	%	%
1	Create adequate awareness	1.5	0.8	0
2	The houses should be modern	2.7	3.4	1.9
3	Provide security	0.8	0	2.3
3	The cost should be low	2.7	1.5	1.5
4	They should be transparent in the allocation of houses	3.8	0.4	0
5	The estate should not be in the village	1.1	3.1	0.8
6	The rooms should be large	2.3	1.9	2.3
7	Good salary for workers	0	3.1	2.3
8	There should be many units to accommodate more households	1.1	0	2.4
9	The scheme should be targeted at the youth	0	1.1	0

	It should not be called low cost estate	1.1	0	0
10	There should be monitoring/supervision by government	1.5	0.4	1.1
11	The scheme should not be hijacked by the rich	0.8	1.9	0
12	Seek opinion of prospective participants before design	1.1	0	0
13	Repayment should not be by work	0	0	0
14	Facilities/amenities should be provided	0	1.1	1.1
15	Good management for the estate	0.8	0	0
16	Quality Building materials should be used	1.1	0	0
17	The organization should follow due process with government agencies	1.1	0	0
18	There should be legal and administrative framework	0	0.8	0
19	Missing Data	76.3	80.5	84.0
<b>Total</b>		<b>100</b>	<b>100</b>	<b>100</b>

(Source: Researchers Field Survey, February, 2020)

### Comparison between Proposed Development and Past Government Schemes

Respondents were asked if they strongly agree that the proposed scheme was better than the ones provided by government. The modal answer was “Strongly Agree”, accounting for 57% of all respondents.



**Fig.1: Perception of Respondents Regarding Previous Government Housing Schemes and the Proposed Scheme**

(Source: Researchers Field Survey, February, 2020)

### Key Informant Interviews

Key Informant Interviews (KIIs) were conducted with professionals in the built environment (development professionals); relevant public officials (directors of housing related ministries) and managers of 3 (three) Primary Mortgage Institutions. (a) Development Professionals, Comprising Urban and Regional Planners, Architects, Engineers Quantity, Land and Estate Surveyors.

**(i) Urban Planners:** Discussions with practicing urban and regional planning professionals can be summarized thus: Posited that Sustainable Social Housing is a welcome development as it will satisfy the yearnings of the urban poor and fits rightly into the Greater Port Harcourt City Development Programme. They also opined that high cost of land and zoning policies could pose problem to implementation with regards to siting and proposed the urban fringes for social housing development. They agreed that the SSHP, will fit properly into the GPHC Development plan, as development will shift to the urban fringes and decongest the city centre. They also noted that it is necessary as a social

responsibility by the government to provide accommodation and employment for the thousands of unemployed youths in the study area.

**(ii) Architects:** The focus group discussions with Architects can be N=258 summarized below: They observed that certain categories of housing are missing and some in short supply especially social housing in Greater Port Harcourt City. They also advised that the usual bungalow type low-cost housing units undertaken by government waste land resources which are depleting and also distorts the skyline of the modern city. They also recommended well serviced and maintained low-rise condo-style housing in a decent environment to compliment the beauty of the city and that affordable housing provision should be anchored on a need-stay policy trust to maintain the quality of life of the city dwellers especially the target groups. They advocated for simplification of building approval process, provision of land with secure and boosting of mortgages and financial to support housing.

**(iii) Estate Managers and Valuers:** Find below focus group discussions with Estate Managers/Valuers. They advocated for housing development laws that put the interest of the poor in focus and intended to stimulate housing growth and attract private sector interest an investments. Advised government to acquire land and allocate for housing development with relevant laws and zoning regulations. They also sued for lower taxes, levies, land registration fees, stamp duties, processing fees etc. as incentives. Also, advocated for the utilization of mortgage facilities, flexible payment plans, access to housing loans and discouragement of community disturbance by aborigines through proper settlement. Advised that government should invest in social housing as a social responsibility and engage the private sector in the execution and management, through Public-private partnership. Also, advocated for a comprehensive urban renewal programme to upgrade the entire GPHC.

**(iv) Geomatics and Land Surveyors:** Focus groups discussion with land surveys is summarized as follows; they

sued for government attention to resilience in planning to withstand natural disaster and climate change impacts like flooding in the development of the Sustainable Social Housing Community. Advocated for a green belt at the fringes of the city to serve as forest reserve and for agricultural development with necessary amenities. Advised that the agropolitical community should be a peri-urban development that will serve as a food basket for the city and create employment. Opined that land for the SSHD should be properly surveyed and protected with relevant laws and titles. Advocated for delineation and proper framework for social housing development within the city.

**(v) Quantity Surveyors:** Focused group discussions with Quantity Surveyors is summarized thus: That government should consciously device means of subsidizing cost of building materials by encouraging local production and dealing directly with manufacturers. Advocated for private sector driven construction mechanisms where modern technology, equipment and knowledge can save project implementation time and cut costs. Advised the use of modular and efficient living spaces in apartments to eliminate wastage. That there should be more beneficial engagement between policy makers, government functionaries and private investors. Recommended strongly the implementation of a framework for the implementation of the sustainable Social housing development in Greater Port Harcourt City.

**(vi) Engineers:** Key informant interview with Engineers can be summarized thus: They advocated for low-rise development to complement development in other parts of the city. That only professional engineer and other experts in built environment should handle key assignments from conception to commissioning to guarantee quality and integrity. Suggested continuous training and retraining of all workers to guarantee compliance with modern techniques and procedures.

**(vii) Managers of Primary Mortgage Institutions:** Key Informant Interviews with managers of Private Mortgage institutions can be summarized as follows; They strongly stated that government alone cannot fund housing programmes, that financing through public-private-partnership arrangements is the sustainable solution to housing development globally. That a successful peri-urban development in Greater Port Harcourt City, will help to decongest the city centre and reduce slum development. Emphasized that housing and urban agricultural development of this magnitude is a welcome development as it will create jobs, boost living standards and raise quantity of life in the city. They all sued for the recapitalization of the Mortgage apex bank and the Federal Mortgage Bank of Nigeria and also grant approval to private mortgage institutions/commercial banks to create mortgage at single digit under the Federal government scheme. That there should be advocacy and serious efforts towards enlightening the public about the benefits mortgage financing. Advocated for review of government policies and laws towards housing provision.

**(viii) Director, Development Control, Greater Port Harcourt City Development Authority**

Discussions with the Director, Development Control, Greater Port Harcourt City Development Authority can be summarized thus: Informed, that though there is no specific provision for Social housing development in the master plan, there is provision for Low-income housing and that there is land use designated for high density along the corridors and fringes of the city. Concerning resilience to flooding and climate change impacts, he informed that there is provision for a central storm water canal in the GPHC Master plan. He recommended tax holidays, Site and Services Scheme and mortgage finance for new housing developments. Recommended phasing for projects in view of the huge cost and technical content to ensure efficiency and sustainability. Sued for Public-Private partnership as the solution for a successful implementation. Advised that grants from government agencies and mortgage institutions should be given to encourage social/cooperative housing development. That there should be proper collaboration between all parties involved in the actualization of the programme. He identified problems with present system of housing delivery in Greater Port Harcourt City as; lack of government support, poor implementation and financing, fraud, corruption in the system, poor administration, lack of coordinated and consistent policy, high cost of construction, poor implementation framework, among others. Sued for aggressive compliance and advocacy for social housing, total review of the National Housing Policy, empowering of housing agencies and investors and the involvement of professionals of the built environment and not politicians. He advocated for more beneficial engagement between policy makers, government functionaries, private investors and the organized labour, more government funding for public sector housing and strongly appreciated the development of this agropolitical community to create employment and provide affordable housing for the low-income population.

**(ix) Director, Ministry of Urban Development and Physical Planning.**

Discussions with the Director, Ministry of Urban development and Physical Planning can be summarized thus; That housing provision for the city dwellers is grossly inadequacy and terrible for poor population. That government should consciously pursue and implement policies that will sustain housing development since population growth is on the constant rise and also review planning and housing laws that are obsolete. That housing should be given top priority in development plans of government and that the private sector should be properly integrated for proper funding and management in a public private partnership arrangement. That the agropolitical investment is wonderful solution to both unemployment and housing for the poor population of the study area.

**(x) Director, Housing and Property Development Authority, Port Harcourt**

Discussions with the Director, Housing and Property Development Authority, Port Harcourt is summarized thus; There is gross inadequacy of rental and home ownership

apartments for Port Harcourt residents coupled with high cost of land and building materials. There are no incentives for housing development for the working class and worse for low income earners. There is lack of political will and inconsistency on the part of government to deliver housing to the poorest poor. The social housing development proposed for greater Port Harcourt City is a welcome relieve that will provide both accommodation and jobs for the teaming unemployed youths and also boost the economic potential of the state and living standards. He advocated for concerted efforts towards public enlightenment in mortgage financing and agricultural development which are key components of the agropolitan investments. Advised that only professionals and contractors with proven records and expertise should to participate in the execution and management of the programme.

**Nature of the Framework and Guidelines for the Implementation and Management of the Sustainable Social Housing Development (SSHD)**

**i. Location of the Sustainable Social Housing Development**

This project is an all-inclusive and sustainable agropolitan enclave, to be located in an area zoned for future residential development in the Greater Port Harcourt City Master Plan. The objective, first, is to provide affordable housing for members of the target group and then create sustainable, mainly agro-based livelihoods, which will enable beneficiaries to painlessly take care of their housing and other needs. A secondary motive is to create an iconic residential skyline to complement the proposed beautiful townscape of Greater Port Harcourt City. The site will have easy access to the rest of the new city to take advantage of the latter’s proposed robust facilities.

**ii. Target Group**

The target group are young and energetic people who are willing to make a living in integrated farming, entailing such aspects as livestock production, poultry farming, pig farming, snailry, rabbitry, apiculture, aquaculture and olericulture. The project targets young, unmarried, newly married without children and the married with young children. Beneficiaries must fall within the income groups “No income” (less than the minimum wage of N30, 000 monthly), “Low Income” (N30,000 to N60000 monthly and “Lower Middle” (N61000 -90,000 monthly).

**iii. Types of Housing**

Beneficiaries are to be accommodated in studio (self-contained), one-bedroom, two bedroom and three-bedroom apartments (as appropriate) (See Figs.2) and all types shall be well integrated in condo-style, low-rise housing to ensure bonding and social cohesion.

**Residential Block Type 1  
Mixed-used: 3-Bedroom, 1-Bedroom, Studio, 2-Bedroom**



**Fig. 2: Typical Floor Plan (1, 2 and 3)**

Source: Researchers Design Proposal, February 2020

**Residential Block Type 2**



**Fig. 4: Typical floor plan (Ground, 1, 2 and 3)**

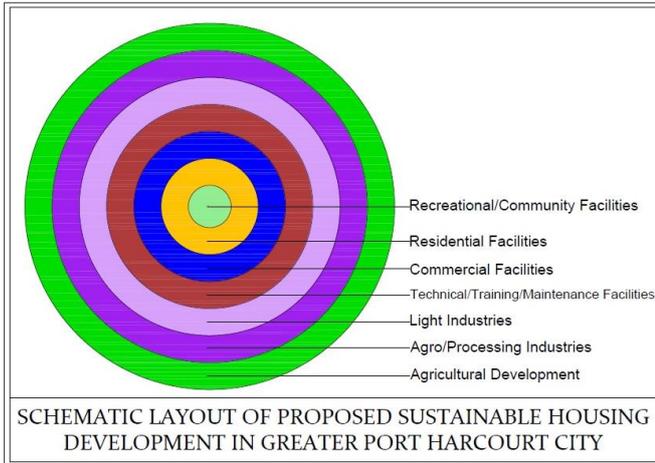
(Source: Researchers design Proposal, February, 2020)



**Fig. 5: 3D View of Plot for the Proposed Sustainable Social Housing Estate**

(Source: Researchers design Proposal, February, 2020)

**Site Schematic Layout**



**Fig. 6: Site Schematic Layout**

(Source: Researchers Design Proposal, February, 2020)

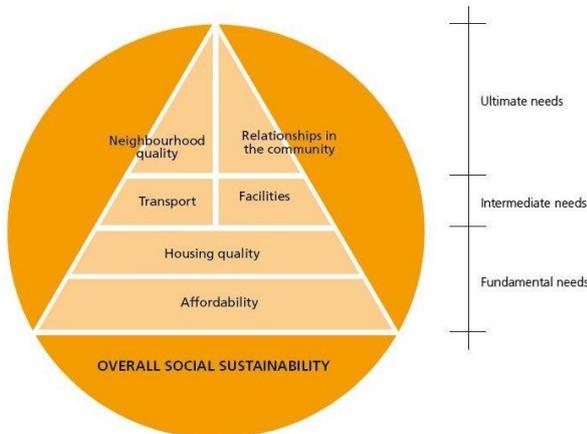
**IV. Social Sustainability**

Social sustainability in housing is about creating affordable, good-quality, inclusive and diverse (mixed-tenure and mixed-income), secure and healthy dwellings, residential areas

and communities which are well integrated into the wider socio-spatial systems of which housing is part. As an integrated and sustainable social housing development, this project will provide all shades of benefits and multiplier effects that will impact positively on the well-being of the target population

Furthermore, within this development, healthy and safe lifestyles will be encouraged by facilitating walking and cycling as means of transport and beneficial for health and social

attractiveness and cohesion. Amenities for physical exercise and recreation, family activities as well as conveniences for the physically challenged and the elderly shall be provided. Cultural sustainability will take into consideration cultural worldviews and values, norms and traditions, as well as the lifestyles and behaviours of beneficiaries, thus supporting the dignity of communal life as illustrated in Fig. 8.



**Fig. 7: Conceptual Representation of Social Sustainability**

(Source: Ancell and Thompson-Fawcett, 2008: 432)

**Summary of Findings**

**UN-Habitat 2012 Guidelines for Acceptable Sustainable Social Housing Development**

Government previous efforts were only targeted at civil servants in the form of mass housing which were grossly inadequate, even for the government workers who form less than 5% of the entire eligible population. No attempt was intentionally targeted at the poorest poor who deserve attention in view of their condition. The guideline of UN Habitat could not be implemented because there was no programme in the first instance to evaluate as recommended. This new approach seeks cooperation between UN-Habitat, governments, development partners, investors and financiers who will operate a private sector driven programme based on a public-private-partnership agreement. The agropolitan development will leverage on the robust benefits of the guidelines of the UN Habitat to deliver a sustainable, affordable, self-serviced housing development in Greater Port Harcourt City.

In summary, UN Habitat recommends that the development of sustainable social housing should incorporate Environmental, Social, Cultural and Economic Dimensions in the planning and implementation of social housing programmes.

**Determinants of Perceptions of Superiority of the Proposed Sustainable Social Housing Development and Acceptability of the Proposed Development**

This research found that socio-demographic variables such as income, educational attainment, marital status, occupation and gender could explain a little over 20% of the variation in each of the dependent variables: Perceptions of Superiority of the Proposed Sustainable Social Housing Development and Acceptability of the Proposed Sustainable Social Housing Development. In this line of research, this finding is considered a high level of explanatory power, indicative of a high level of precision of the models, in the light of previous research in the area of residential satisfaction and overall quality of life. For instance, Obinna (1987), working on the planned and non-planned residential areas of Port Harcourt found that socio-demographic characteristics such as the afore-mentioned

ones emerged as weak predictors of neighbourhood and dwelling unit satisfaction, the explanatory power being of the order of 5% and 10%, respectively. The latter is consistent with the findings of earlier quality of life researchers in the USA, (Campbell, Converse & Rodgers, 1976).

In summary, the UN-Habitat 2012 Guidelines for acceptable housing development were not implemented effectively in Nigeria and the study area as previous efforts to provide housing for the poor were highly insignificant and unsuccessful. The poor population in the study area live far below the International poverty line (\$1.90 per day), and are uneducated and mostly unskilled. However, they were highly dissatisfied with their present living conditions and unsure means of livelihood and were willing to embrace the proposed social housing programme. All the key informants interviewed from the built environment and captains of mortgage and financial institutions all supported the establishment of an agropolitan social housing development in the study area. There is no proposal presently for the poor

population to have access to affordable housing and most of them do not have identifiable sources of income.

## V. CONCLUSION

Examining the UN-Habitat 2012 guidelines, the framework that this research has developed will effectively provide affordable housing for the target groups as well as boost their living standards, quality of life and improve the environment. This proposal has found a veritable approach for dealing with livelihood and housing problems of the poorest of the poor by adopting a workable and sustainable strategy through the development of a self-sustaining agropolitan investment. In fact, potential beneficiaries are anxious, willing and ready to take advantage of the new initiative. The fears of tenure security, poverty, crime, inadequate amenities and facilities and forced eviction have been thrown away by this robust and well managed programme, with an array of neighbourhood best-practice amenities.

### 4.1 Recommendation

This study recommends the implementation of the proposed Policy framework for Sustainable and Affordable Social Housing Development as suggested by UN Habitat at the 2005 World Sustainable Building Conference in Tokyo, taking into account the social, economic, cultural and environmental dimensions, to ensure sustainable social housing in Greater Port Harcourt City.

- i. As a new concept, adequate awareness and advocacy should be created.
- ii. There should be transparency in the allocation of the houses and provision of employment, through investment in agriculture, light industries and support services.
- iii. As a new town, there should be many units to accommodate more households and good salary for the workers.
- iv. The opinion of prospective beneficiaries and participants should be sought during design stage.
- v. Modern facilities and amenities should be provided with effective security and good management.
- vi. There should be proper legal and administrative framework for all aspects of the community. Government should enact efficient policies and regulations to create an enabling environment for all stakeholders to participate in the provision of social housing.
- vii. There should be a concerted and continuous relationship between the UN-Habitat office, the relevant state and federal government agencies responsible for housing development in the country and the management of this proposed sustainable social housing development in Greater Port Harcourt City, Port Harcourt Nigeria.
- viii. Professionals in all aspects of the SSHD should do their utmost by researching and recommending best practices to ensure the use of modern techniques and technologies.
- ix. Efforts should be doubled to encourage local production of quality building materials as a way of

ensuring quality and creating employment in the course of social housing delivery.

- x. For effective implementation of the SSHD, it is recommended that the framework should have a well thought-out Public-Private-Partnership agreement where government is responsible for providing land and infrastructure as equity to demonstrate her social responsibility towards the poor, while the estate is fully managed on a private sector model with returns on investments as a key objective, leveraging on the benefits of good management, investor participation and professionalism.

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# Teachers' Self- Efficacy and Academic Performance of Students in Public and Private Senior Secondary Schools in Ilorin Metropolis

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## Abstract

Teacher efficacy has been connected to a number of crucial educational results, including instructors' perseverance, passion, dedication, and instructional behaviour, as well as student outcomes including accomplishment, motivation, and belief in self-efficacy. The study used four research questions and four hypotheses to determine teachers' self-efficacy and academic performance of students in public and private secondary schools in Ilorin. The study used a descriptive survey method of correlation type. The survey included 21 public and 90 private senior secondary schools, with 1178 teachers in public senior secondary school and 1952 private senior secondary school. The 399 teachers were randomly selected and the students' performance in WAEC (2017, 2018 and 2019). To collect the data, teacher self-efficacy questionnaire was adopted. The analysis of the data was done using frequency count and percentages, Simple Linear Regression (SLR) for the research questions and Pearson Product Moment Correlation (PPMC) for the hypotheses and was tested at a 0.05 level of significance. It was found that teachers' self-efficacy, community involvement, as well as school climate had influence on academic performance of students. Also, it was gathered that teachers' self-efficacy, community involvement, and school climate had a statistical relationship with academic performance of students. It was proposed among others that teachers should put in their best so that they have the ability to connect with even the most tough and uninterested kids.

## Keywords

*Teachers Self- Efficacy, Academic Performance of Students, Public, Private, Senior Secondary Schools*

## I. Introduction

Education's importance in national development cannot be overstated. Understandably, excellent education is an essential component of every country's growth and development. Education is a powerful tool used for illuminating every aspect of the society; in achieving long-term growth and a vehicle for pushing the frontiers of knowledge forward (Salisu, 2010). Education is a lifelong process through which a person earns a living and contributes to the nation's progress.

In regards to the National Policy on Education (NPE 2013), to be worthwhile, individuals must be developed into morally sound, patriotic, and effective citizens, development of relevant skills, mental, physical, and social talents and competencies; inculcation of national awareness, value, and unity. In this framework, education is viewed as a means of advancing economic, social, and political goals. A veritable means of developing sound intelligent societies that fit and relate to the twenty-first century, an aggregate tool of employment for the poor and socially marginalized group.

Teachers' activities are the most efficient means of achieving all of these admirable goals. Teachers are indispensable elements in educational sector. No educational system can progress beyond the caliber of its teachers according to the National Policy on Education (NPE 2013). The primary goal of secondary

education is to prepare secondary school leaver for higher education and to produce an individual who would be useful to himself, self-reliant, self-disciplined and the society at large. This research is therefore, aimed at finding out teacher self-efficacy and academic performance of students in private and public secondary schools in Ilorin Metropolis

In educational sphere and term, self-efficacy has been studied at various educational levels and situations; spanning from elementary to higher education and from rural to urban schools. Students academic performance consists of scores obtained from teacher-made test and standardized test. Academic performance refers to a students', instructors', or institution's ability to meet short and long-term educational goals..., students' academic attainment was a measure of their success in accomplishing certain tasks in a subject or field of study (Ali, 2013). This implies that following a learning experience, students' academic success was a measure of their success in accomplishing specific tasks in a subject or field of study.

The school climate is regarded as the heart beat of the institution, and it is a major aspect in determining student outcomes and overall success. It can be defined as the psychosocial impact of the school's norms, goals, targets, values, relationships, organizational structure, and learning environment on students and adults. -teaching techniques (Cohen et al., 2010).

The importance of discipline in any educational institution cannot be over stressed. For any organization to achieve its

stated goal, rules and regulations must be established that all members must follow, whether they are political, social, economic, or educational. Schools occupied students of different socio-cultural background exhibiting different behaviour such as aggressiveness, truancy, lateness; theft among others to minimize all these is need for discipline in school. In the educational system, a disciplined student is one whose conduct, actions, and inactions adhere to the school's predetermined norms and regulations. (Simba, et al., 2016).

However, discipline is a collection of steps established by the school district to correct established student/s' erroneous actions. It is defined as the technique of teaching others rules or norms by enforcing them through punishment. School discipline was mentioned as one of the factors that influence school performance (Omari, 2015). It is a prerequisite for effective teaching and learning in schools, as well as a source of concern for teachers (Eshetu, 2014). Effective discipline measures will improve academic performance of students, without discipline learning cannot be accomplished. If students constantly disrupt the teacher, the other students are affected. If students do not follow rules and does not complete class work or homework, that student is missing out on valuable learning opportunity.

Educational wise, discipline's goal is to put boundaries around specific actions or attitudes that are deemed damaging or in violation of school policies, educational norms, or school traditions. Therefore, due to high dropout rates, disproportionate punishment of minority students, and other educational injustices, the focus of discipline is shifting, and alternatives are emerging. Students' attainment of goals, expectations, and responsibilities are all aided by effective discipline (Weli & Nnaa, 2020). Therefore, the study sought to:

1. examine teachers instructional self-efficacy and academic performance of students in secondary schools
2. find out community involvement and academic performance of students in secondary schools
3. find out school climate and academic performance of students in secondary schools
4. examine discipline and academic performance of students in secondary schools

#### Research Question

1. The following questions were raised to guide to the study.
2. Does teacher's instructional self-efficacy affect academic performance of students?
3. Does community involvement have an influence on academic performance of students?
4. Does school climate affect academic performance of students?
5. Does discipline influence academic performance of students?

#### Research Hypotheses

**Ho<sub>1</sub>**: There is no relationship between teacher's instructional self-efficacy and academic performance of students in Ilorin metropolis. **Ho<sub>2</sub>**: There is no relationship between community involvement and academic performance of students in Ilorin metropolis.

**Ho<sub>3</sub>**: There is no relationship between school climate and academic performance of students in Ilorin Metropolis

**Ho<sub>4</sub>**: There is no relationship between discipline and academic performance of students in Ilorin metropolis.

## II. Methodology

The study used a descriptive survey method of correlation type. The population for the study comprised 90 private and 21 public senior secondary schools with 1952 teachers in private and 1178 teachers in public senior secondary schools in Ilorin Metropolis. The total numbers of teachers in public senior secondary were 1178 and 1952 in private senior secondary schools making a total number of 3130 respectively. Proportional sample techniques were used to select 182 teachers in public senior secondary school and 157 teachers from private senior secondary school. Sample of 339 teachers were selected with the use of Research Advisor table of determining the sample size of a known population. The data were collected using structured questionnaire on a 5-point scale of A Great Deal =5, Quite a bit = 4, Some Influence =3, Very Little = 2 and Nothing =1. Bandura's teacher self-efficacy measure was used to create the instrument. (2012). All the copies of questionnaire and the questionnaire items were duly completed and retrieved by the researchers. Multiple Regression was used to answer the research question and Pearson Product Moment Correlation (PPMC) to test the research hypothesis at 0.05 level of significance.

## III. Results

**Research Question 1:** Does teachers' instructional self-efficacy affect academic performance of students?

Table 1

Teachers' instructional self- efficacy affect academic performance of students			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.130	0.017	0.014	1.089

#### ANOVA

Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	6.880	1	6.880	5.799	0.017	Significant
Residual	399.828	337	1.186			
Total	406.708	338				

Table 1 indicates the impact of teachers' instructional self-efficacy to the prediction of academic performance of students. The table 3 also contains the coefficient of correlation ( $R = 0.130$  and  $R^2 = 0.017$ ). This implies that 1.7% of the variance in academic performance of students was accounted for by the teachers' instructional self-efficacy. The contribution's significance was determined at a level of 0.05. The table also revealed that the F-ratio = 5.799 was significant at 0.05 level.

**Research Question 2:** Does community involvement have an impact on academic performance of students?

**Table 2**

The Impact of community involvement on academic performance of students			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.126	0.016	0.013	1.090

**ANOVA**

Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	6.433	1	6.433	5.416	0.021	Significant
Residual	400.275	337	1.188			
Total	406.708	338				

From table 2, it was revealed that community involvement highly influenced the academic performance of students. Also, the coefficient of correlation ( $R = 0.126$  and  $R^2 = 0.016$ ) showed that 1.6% of the variance in academic performance of students was accounted for by the community involvement. The contribution's significance was determined at a level of 0.05. The table also revealed that the F-ratio = 5.799 and  $p = 0.021$  was significant at 0.05 level.

**Research Question 3:** Does school climate affect academic performance of students?

**Table 3**

The impact of school climate on academic performance of students			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.124	0.015	0.013	1.090

**ANOVA**

Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	6.302	1	6.302	5.304	0.022	Significant
Residual	400.406	337	1.188			
Total	406.708	338				

From table 3, climate effect had influence on the academic performance of students. The coefficient of correlation ( $R = 0.124$  and  $R^2 = 0.015$ ) and (F-ratio = 5.304,  $p$ -value = 0.022) implies that 1.5% of the variance in academic performance of students was accounted for by climate effect. Also, there was

an important impact of the climate effect on the students' performance.

**Research Question 4:** Does teachers' self-discipline impact students' academic performance?

**Table 4**

The impact of teachers' self-discipline on academic performance of students			
R	R Square	Adjusted R Square	Std. Error of the Estimate
0.052	0.003	0.0001	1.097

**ANOVA**

Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	1.092	1	1.092	0.907	0.342	Not Significant
Residual	405.616	337	1.204			
Total	406.708	338				

As table 4 showed that the teachers' self-discipline had no impact on the academic performance of students. The coefficient of correlation ( $R = 0.052$  and  $R^2 = 0.003$ ) and (F-ratio = 0.907,  $p$ -value = 0.342) implies that 0.3% of the variance in academic performance of students was accounted for by climate effect.

**Testing of Hypotheses**

**H<sub>01</sub>:** There is no relationship between teachers' instructional self-efficacy and academic performance of students in Ilorin Metropolis.

**Table 5**

Relationship between teachers' instructional self-efficacy and academic performance of students						
	N	Mean	SD	Pearson Correlation	Sig (2-tailed)	Remark
Students' Performance	339	8.21	1.097	0.130	0.008	Significant
Teachers' Instructional Self-efficacy	339	16.91	4.400			

**p<0.05**

Table 5 showed that teachers' instructional self-efficacy had a low positive correlation with academic performance of students. This implies that there is a favourable correlation between academic performance of students and teachers' instructional self-efficacy ( $r = 0.130$ ,  $n=339$ ,  $p<0.05$ )

**H<sub>02</sub>:** There is no relationship between community involvement and students' academic performance in Ilorin Metropolis.

**Table 6**

Relationship between community involvement and academic performance of students						
	N	Mean	SD	Pearson Correlation	Sig (2-tailed)	Remark
Students' Performance	339	8.21	1.097	0.126	0.010	Significant
Community Involvement	339	15.86	4.670			

**p<0.05**

Table 6 showed that community involvement had a low positive correlation with academic performance of students. This implies that there is a positive relationship between academic performance of students and community involvement ( $r = 0.126, n=339, p<0.05$ )

**H<sub>03</sub>:** There is no relationship between school climate and students' academic performance in Ilorin Metropolis

**Table 7**

Relationship between school climate and academic performance of students						
	N	Mean	SD	Pearson Correlation	Sig(2-tailed)	Remark
Students' Performance	339	8.21	1.097	0.124	0.011	Significant
School Climate	339	17.96	4.723			

**p<0.05**

In table 7 showed that the school climate had a low positive correlation with academic performance of students. This implies that there is a favourable correlation relationship between academic performance of students and school climate ( $r = 0.124, n=339, p<0.05$ )

**H<sub>04</sub>:** There is no relationship between teachers' self-discipline and academic performance of students in Ilorin Metropolis

**Table 8**

Relationship between teachers' self-discipline and academic performance of students						
	N	Mean	SD	Pearson Correlation	Sig (2-tailed)	Remark
Students' Performance	339	8.21	1.097	0.052	0.171	Not Significant

Teachers' Self-discipline	339	18.48	4.821			
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**p<0.05**

The result of the Pearson Correlation in table 6 indicated that  $r = 0.052$  and the  $Sig = 0.171$ . This indicates that there is no relationship between teachers' self-discipline and academic performance at 0.05 significant level. Pearson Correlation coefficient result has a very weak correlation.

#### IV. Discussion of Findings

Results of the research question one indicated that the academic performance of students was highly influenced by teachers' instructional self-efficacy. This study is consistent with that of the findings of Ross and Bruce (2015) who concluded that the higher the level of teacher efficacy, the higher the academic accomplishment of learners, and that student's success is directly related to instructors' instructional self-efficacy.

Research question two indicated that community involvement is very influential to the academic performance of students.

This is consistent with the findings of Hussein et al. (2018), who found that community involvement in school financing, motivating teachers,

and maintaining secondary school infrastructure had an impact on academic achievement. Findings from research question three revealed that school climate had an impact on academic performance of students. This result is consistent with Evans et al. (2017) who opined that positive climate enhances learning and while negative climate poses impedance to learning and therefore, students may develop the tendency to disliking subjects.

Research question four indicated that teachers' self-discipline had no impact on academic performance of students. This conforms to the findings of Gakure et al, (2013), who opined that Students' academic achievement or success is influenced by discipline to a minor or non-significant extent. The test of hypothesis one revealed that there existed a favourable correlation between teachers' instructional self-efficacy and academic performance of students. This finding supports the results of Ross and Bruce (2015) who concluded that teachers with high efficacy affect students' outcomes. Academic performance of students is relational to teachers with high expectation about their ability to teach.

The test of hypothesis two showed that community involvement is positively related to the academic performance of students. This supports the findings of Ismael (2016) who opined that involving communities in school finance fosters a sense of ownership and strengthens their commitment to educational improvement

Hypothesis three indicated that there is a favourable correlation between school climate and students' performance. This was also supported by Ali et al, (2015) who came to the conclusion that teachers who have a positive impression of the school climate improve student progress. Finally, the test of hypothesis four indicated that there was no

relationship between students' performance and teachers' self-discipline. Gakure et al, (2013) supports this finding by stating that teachers' discipline has a minimal impact on academic performance of students.

## V. Conclusion

From the preceding, it can be concluded that teachers' confidence in their own ability had a favourable relationship with academic performance of students. However, the role of the community in a student's performance cannot be overemphasized, because the goal of each community is to have a functional member that would be useful to him/herself and the community at large. Also, a positive school climate has not only contributed to academic performance of students but also developed them socially and psychologically. As well as having a well-disciplined school, they had to monitor students' behaviour both inside and outside of the school premises.

## VI. Recommendations

1. Teachers should put in their best so that they can get connected to the most difficult and unmotivated student.
2. Teachers should be trained on the important of self-efficacy in order to produce better results on students' performance in their academics.
3. Government, at the local, state, and federal levels, should contribute to the needs of the school in order to improve students' academic performance.
4. The school environment should be made conducive for the students' learning. Discipline should be applied sparingly in order to avoid negative impact kids' academic achievement. Strict discipline does not benefit all students equally.

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# Image Recognition Using Multiple Vision Transformers in Parallel Having Different Patch Sizes

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## Abstract

With the advent of Transformers which are attention-based mechanisms, many research directions have emerged. Their prowess in natural language processing tasks is well known. Extension of Transformers to computer vision is but natural. Recently, Vision Transforms (ViT's) have achieved very good results on popular image recognition datasets. However, training Transformers is a difficult process due to the need for large computational resources. Parallel processing is a well-known phenomenon present in Nature's most efficient data processors. Inspired by the same we use a novel technique in which multiple ViT's with different patch sizes are used in parallel. This is followed by averaging the probability vectors of the ViT's for final classification. Using medium-sized ViT's we show that without going for huge scales, state-of-the-art results are achieved on popular datasets.

## Keywords

*Vision Transformer; ViT; Patch size; Computer Vision; Image recognition.*

## I. Introduction

The basic technique for using Transformers involves pretraining on a large dataset [1] and then finetuning on a smaller dataset [10]. Due to the Transformers' computational efficiency and scalability, it is now possible to train them with an unprecedented size e.g. having more than 100B parameters [4, 32]. Even with the ever growing number of models and datasets, no saturation in performance has been noted so far. Trans- formers [25, 49] have been used in various computer vision applications in the form of Vision Transformers (ViT's) [56, 14, 25] e.g. in image segmentation [20, 59], object recognition [48], object detection [5, 61], image generation [6], video understanding [45, 16], text-image synthesis [43], super-resolution [57], image based question answering [47, 44], etc. [52, 30, 12, 58] and promising results have been achieved. However various issues are faced like the need for large computation resources, lower performance and excessive training. As such in computer vision, convolution based architectures have dominance [31, 29, 21]. Pertinently, many works have tried to combine CNN models with self attention [51, 5] out of which some have been able to replace convolution holistically [42, 60]. The ViT's although being efficient are not yet hardware-accelerator friendly for the reason that they use specialized attention functions. Although for large-scale computer vision tasks, traditional architectures like ResNet have been efficient [36, 55, 27], the state-of-the-art has improved using ViT's [13].

A recent success of ViT's in improving the state-of-the-art is shown in [13], wherein they have been used directly for image recognition with minimal modification. The authors of

[13] split an image into patches after which they provide a sequence of patch embeddings as input to their ViT. Here, the image patches are used in a manner similar to tokens in NLP training with supervision. After training on datasets like ImageNet modest performance is obtained which is a little lesser than that of ResNets with similar size. The issue has been overcome by training their ViT's on larger datasets (14M-300M images) which leads to much better performance. In- spite of this, works suggesting performance improvement using ViT's are rare. Taking a hint from parallel processing which is found in Nature's most efficient data- processors, we seek to augment the performance of ViT's by using them in parallel. In our work, we use multiple ViT's in parallel each having a different patch size. Prediction probabilities of the respective ViT's are averaged across the ensemble for final classification. To the best of our knowledge this a first work to use such a parallel processing scheme in ViT based image recognition. Using an ensemble of ViT's pre-trained on the ImageNet-21k, or the JFT-300M datasets, our approach advances the state-of-the-art on multiple image recognition benchmarks. Particularly, our best ensemble reaches the accuracy of 87.92% on ImageNet, 90.74% on ImageNet-Real, 99.54% on CIFAR-10, 94.58% on CIFAR-100, 97.61% on Oxford-IIIT Pets, and 99.76% on Oxford Flowers-102 datasets achieving first rank on five out of these six datasets, and second rank on the remaining ImageNet dataset.

The rest of the paper is structured as follows. In Section 2 we give the background of the work. This is followed by Section 3 which discusses work related to our paper. Section 4 discusses the proposed approach and Section 5 discusses the experiments and their results. We conclude in Section 6.

## II. Background

In this section we discuss *attention* which is the background of the architecture of Transformers.

### A. Self attention

For a vector, the self attention gives the estimate of the inter-relevance of the components of a vector, e.g. word relevance in a sentence. Global information combination is used. Self attention is a fundamental unit of transformers which are attention based models. Let  $\mathbf{X} \in \mathbb{R}^{n \times d}$  be a vector of  $n$  elements ( $\mathbf{x}_1, \mathbf{x}_2, \dots, \mathbf{x}_n$ ) where  $d$  is the embedding dimension. Self attention captures the inter-dependency of the  $n$  elements in a global context using an encoder. For this we define three weight matrices viz. Query ( $\mathbf{WQ} \in \mathbb{R}^{n \times d}$ ), Key ( $\mathbf{WK} \in \mathbb{R}^{n \times dk}$ ) and Value ( $\mathbf{WV} \in \mathbb{R}^{n \times dv}$ ). Next,  $\mathbf{X}$  is spread out over these matrices for obtaining  $\mathbf{Q} = \mathbf{XWQ}$ ,  $\mathbf{K} = \mathbf{XWK}$  and  $\mathbf{V} = \mathbf{XWV}$ . The outcome of this process  $\mathbf{Z} \in \mathbb{R}^{n \times dv}$  given by the self attention layer is:

$$\mathbf{Z} = \text{softmax} \left( \frac{\mathbf{QK}^T}{\sqrt{d_q}} \right) \mathbf{V} \quad (1)$$

For every vector-component, self attention computes the dot product of the query and all the keys. This product is then normalized by using a softmax for inferring the attention scores. Each vector-component thus transforms into a weighted sum where the weights are the attention-map scores.

### B. Masked self attention

Self attention attends to each vector-component. If the transformer [49] has to predict the next vector-component, the decoder self attention units are masked to prevent them from processing future components. This is done by multiplying the vector-components with a mask  $\mathbf{M} \in \mathbb{R}^{n \times n}$ ,  $\mathbf{M}$  being the upper triangular matrix as:

$$\text{softmax} \left( \frac{\mathbf{QK}^T \circ \mathbf{M}}{\sqrt{d_q}} \right) \quad (2)$$

Here  $\circ$  is the Hadamard product. During vector-component prediction, the future attention-map scores are nulled by this technique.

### C. Multihead attention

For the derivation of intricate dependencies between vector-components, a multihead attention technique is used which comprises of several self attention units or heads. The number of heads is denoted by  $h$ . In the original transformer model [49], eight attention heads were used i.e.  $h$  was 8. Every attention head has its weight matrices  $\{\mathbf{WQ}_i, \mathbf{WK}_i, \mathbf{WV}_i\}$ , where  $i = 0, 1, 2, \dots, (h - 1)$ . For an input  $\mathbf{X}$ , the outputs of  $h$  self attention units are combined into one multihead weight matrix  $[\mathbf{Z}_0, \mathbf{Z}_1, \dots, \mathbf{Z}_{h-1}] \in \mathbb{R}^{n \times h \times dv}$ . These weights are then projected to a separate weight matrix  $\mathbf{W} \in \mathbb{R}^{h \cdot dv \times dv}$ .

The main difference between self attention and convolution is that in the former each weight is constantly computed, where as in the later fixed weights are used which are obtained by training. Also the self attention technique is both permutation invariant as well as input-size invariant, making it suitable for irregularity as compared to convolution. Figure 1 shows a multihead attention unit which is made up of several self attention units.

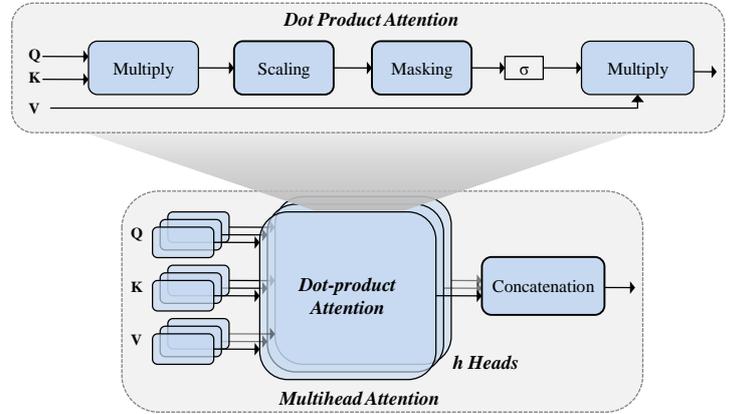


Fig. 1: Illustration of the attention mechanism used in Transformers [25]

## III. Related Work

Transformers were introduced by [49] for machine translation tasks, and have since become state-of-the-art status for many NLP applications. Transformers are pre-trained on large datasets and finetuned for specific applications. This is done in BERT [11] which uses denoising based self-supervised pretraining. The GPT version of BERT uses language modeling pretraining [40, 41, 4]. A basic application of self attention for images requires that every pixel covers all other pixels. However due to the quadratic variation of computation cost with number of pixels, this scaling is not realistic. Hence an approximation is used. [39] applies self attention locally for every pixel query instead of doing it globally. Local multihead attention techniques like these can completely replace convolution [24, 42, 60]. Sparse Transformers [8] use scaled approximation for global self attention. Attention can also be scaled by using different block sizes [53], or in the extreme only on individual axes [22, 50]. Although several of these special attention-based models show good results for computer vision applications, however they require complicated engineering for efficient hardware acceleration. The ViT of [15] is adopted by us for our ensemble approach. We extract patches from an image and apply complete self attention to them. We improve the performance of the ViT by using it in an ensemble. There has been significant interest in combination of CNNs with self-attention. This process augments the feature-maps used in image classification [2]. The same can also be achieved by subsequently processing the CNN output by self attention, as has been done in applications like object detection [23, 5], video processing [51, 45], image classification [51], object discovery using unsupervised

learning [34], or combined text & vision applications [54, 35, 33].

Image GPT (iGPT) [7] uses pixel-based Transformers having resolution as well as color-space reduction. The architecture is trained in unsupervised mode followed by finetuning. It achieves a classification accuracy of 72% on ImageNet. The work of [15] takes this performance further to 88.55%. The authors of [15] achieve this feat by augmenting the ViT training data and achieve state-of-the-art results on various benchmarks. [15] focus on ImageNet-21k and JFT-300M datasets while using Transformers instead of ResNets. We also use the ViT's of [15] and enhance the state-of-the-art on these datasets and others by using a unique parallel approach. To the best of our knowledge this is the first work in this regard.

In the next section, we discuss the proposed approach.

#### IV. Proposed Approach

The proposed approach is based on the concept of parallel processing. The parallel technique is efficient in processing volumes of data by distributing the decision making among an ensemble of data-processors [17–19]. Here we use this concept for Transformers. Multiple Transformers with different image patch sizes give their classification probabilities. The Transformers are trained on a large dataset and fine-tuned on smaller datasets as per [15]. Three patch sizes are used, viz. 16×16 (as in [15]), 14×14 and 18×18. Let  $E$  denote the number of ViT's used in parallel. A minimum of 2 ( $E = 2$ ) and maximum of 3 ( $E = 3$ ) ViT's are used. Each has a different patch size. Next the same ViT's are finetuned on the smaller datasets. The classification probability vectors for the  $E$  ViT's, are given by  $\{S_1, S_2, \dots, S_E\}$ , where  $S_i = \{S_{i1}, S_{i2}, \dots, S_{iK}\}$  with  $K$  being the number of classes. The classification probabilities are averaged over  $E$  to give final classification probability vector  $S_f$ , as given in Eqn. (3):

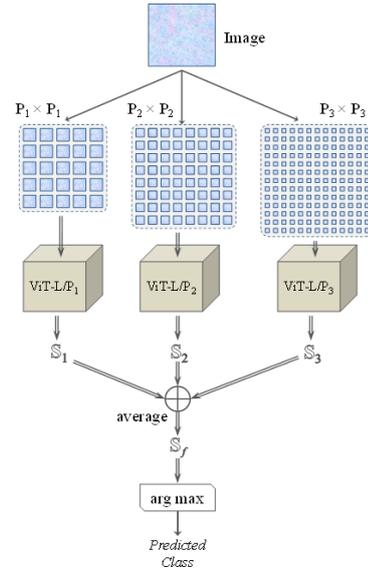
$$S_f = \frac{S_1 \oplus S_2 \oplus \dots \oplus S_E}{E} \quad (3)$$

where  $E$  = Number of Transformers used in parallel, and  $\oplus$  denotes the element-wise addition operation.

Finally the class  $c$  of the image is decided as per the maximum in  $S_f$  as given in Eqn. (4) as:

$$c = \text{argmax}(S_f) \quad (4)$$

Figure 2 shows the overview of the proposed technique.



**Fig. 2: Illustration of the proposed approach using an ensemble of 3 ViT's with patch sizes of  $(P_1, P_1)$ ,  $(P_2, P_2)$  and  $(P_3, P_3)$  respectively.  $S$  denotes the classification probability vector.**

The basic input to a Transformer is a token sequence. For handling 2D images, the image  $x \in \mathbf{R}^{H \times W \times C}$  is flattened into a sequence of 2D patches  $x_p \in \mathbf{R}^{N \cdot (p^2 C)}$  wherein  $(H, W)$  is the image resolution,  $C$  being the number of channels,  $(P, P)$  being the image patch resolution, and  $N = HW/P^2$  being the number of resulting patches. The Transformer uses a constant vector of size  $D$  in its layers to flatten the patches and map them to  $D$  dimensions for linear projection training (Eqn. (5)).

$$\mathbf{z}_0 = [x_{class}; x_p^1 \mathbf{E}; x_p^2 \mathbf{E}; \dots; x_p^N \mathbf{E}] + \mathbf{E}_{pos} \quad \mathbf{E} \in \mathbf{R}^{N \cdot (p^2 C)}, \mathbf{E}_{pos} \in \mathbf{R}^{(N+1) \times D} \quad (5)$$

**Table 1: Details of the ViT used as on lines of [15]**

Model	Layers	Hidden size $D$	MLP size	Heads	Params
ViT-Large	24	1024	4096	16	307M

Like BERT's  $[class]$  token, a learnable embedding is prepended to the embedded patches ( $\mathbf{z}_0^0 = x_{class}$ ) wherein the output state of the ViT encoder  $\mathbf{z}_0$  is the representation of the image  $y$  (Eqn. (8)).

The encoder of the Transformer [49] has alternate layers of multihead self attention (MSA), and multi layer perceptron (MLP) layers. The layernorm (LN) function is used before each block, and residual connections are used after each block (Eqns. (6),(7)). The MLP has 2 layers of the GELU non-linear function.

$$\mathbf{z}'_l = \text{MSA}(\text{LN}(\mathbf{z}_{l-1})) + \mathbf{z}_{l-1}, \quad l = 1 \dots L \quad (6)$$

$$\mathbf{z}_l = \text{MLP}(\text{LN}(\mathbf{z}'_l)) + \mathbf{z}'_l, \quad l = 1 \dots L \quad (7)$$

$$y = \text{LN}(\mathbf{z}_L^0) \quad (8)$$

The ViT's are pretrained on a large dataset and finetuned on smaller task-specific datasets.

## V. Experimentation

### A. Datasets

The proposed approach involves using the ILSVRC-2021 ImageNet dataset having 1k classes and 1.3M images, the superset of the same viz. ImageNet-21k with 21k classes and 14M images [9], and JFT [46] with 18k classes and 303M images. This is done on lines of [15]. The models are trained, finetuned as well as evaluated on ReaL labels [3], CIFAR-10/100 [28], Oxford-IIIT Pets [38], and Oxford Flowers-102 [37] on lines of [15].

### B. Model details

The ViT configuration of [15] is used as per BERT [11]. The "Large" model is used as per [15]. Their notation is used for the models e.g. ViT-L/16 means that the "Large" ViT variant is used with 16×16 patch size. On similar lines ViT-L/(14,16,18) means an ensemble of 3 "Large" variant ViT's is used having 14×14, 16×16, and 18×18 patch sizes respectively. The details of the Transformers used are as per [15]. They follow the original Transformer [49] and are given in Table 1. We compare the performance of our approach with that given in [15].

Table 2: Training hyperparameters used as per [15]. The models are trained with batch-size = 4096 and a learning-rate warmup of 10k steps.

Models	Dataset	Epochs	Base LR	LR decay	Weight decay	Drop out
ViT-L/*	JFT-300M	7	$4 \cdot 10^{-4}$	linear	0.1	0.0
ViT-L/*	ImageNet-21k	30	$10^{-3}$	linear	0.03	0.1
ViT-L/*	ImageNet	300	$3 \cdot 10^{-3}$	cosine	0.3	0.1

Table 3: Hyperparameters used for fine-tuning the ViT's as per [15]. All models have been finetuned using cosine learning rate (LR) decay, batch size = 512, no weight decay, and grad clipping with global norm = 1.

Datasets	Steps	Base LR
ImageNet	20000	{0.003, 0.01, 0.03, 0.06}
CIFAR-10	10000	{0.001, 0.003, 0.01, 0.03}
CIFAR-100	10000	{0.001, 0.003, 0.01, 0.03}
Oxford-IIIT Pets	500	{0.001, 0.003, 0.01, 0.03}
Oxford Flowers-102	500	{0.001, 0.003, 0.01, 0.03}

### C. Training and finetuning

Our ViT's are trained as per [15]. We use Adam [26] with  $\beta_1 = 0.9$ ,  $\beta_2 = 0.999$ , batch size = 4096, weight decay = 0.1. Finetuning is done using SGD with momentum, and batch size = 512. Figure 3 shows the accuracy plots for finetuning

of the models having different patch sizes on CIFAR-100. The hyperparameters used for the training of the ViT's are as per [15] and are given in Table 2. The hyperparameters used for finetuning the ViT's are as per [15] and are given in Table 3.

### D. Results

Our ViT's are trained on TPUv3 accelerators. One TPUv3-core-day ( $t_{Tcd}$ ) corresponds to the number of TPUv3 cores (2 per chip) used during training multiplied by training duration expressed in days. It should be noted that for the same patch size,  $t_{Tcd}$  for the same models is almost similar, whereas it differs if the patch size is varied. For smaller patch size (14 × 14) i.e. more tokens the  $t_{Tcd}$  is slightly larger, whereas for larger patch size (18 × 18)  $t_{Tcd}$  is slightly lesser.

The performance of different ensembles on CIFAR-10, CIFAR-100, and Oxford Flowers-102, using our finetuned ViT ensembles is shown in Table 4. The performance of the ViT-L/16 of [15] is also shown. It should be noted that the best performance is obtained for our ensemble approach using 3 ViT's with respective patch sizes of 14, 16 and 18.

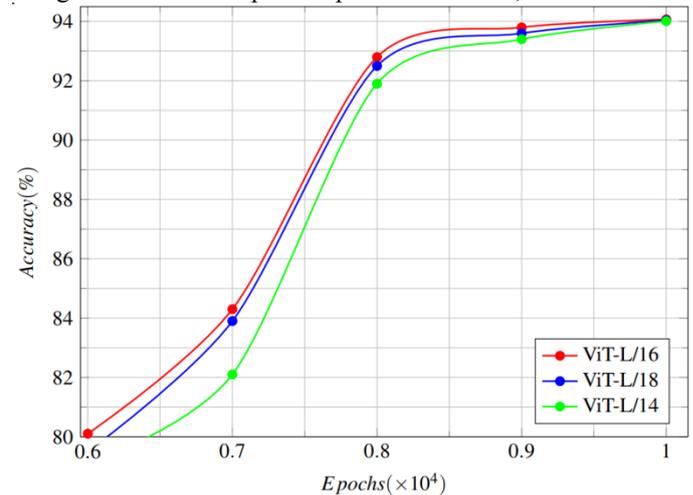


Fig. 3: Classification accuracy for finetuning on CIFAR-100 dataset for ViT-L/14, ViT-L/16 and ViT-L/18. The models are pre-trained on JFT

Table 4: Comparison of performance of variants of our ensembles against ViT-L/16 of [15], for CIFAR-10, CIFAR-100 and Oxford Flowers-102 datasets. We use models pre-trained on JFT and finetuned on the datasets given in the table. Mean and std. deviation of accuracies are reported, after taking the average over 3 finetuning runs.

	ViT-L/16 [15]	ViT-L/(16,18) Ours	ViT-L(14,16) Ours	ViT-L(14,18) Ours	ViT-L(14,16,18) Ours
CIFAR-10	99.42 ±0.03	99.51±0.01	99.49±0.04	99.43±0.02	<b>99.54±0.05</b>
CIFAR-100	93.90 ±0.05	94.41±0.05	94.32±0.06	94.23±0.04	<b>94.58±0.03</b>
Oxford-IIIT Pets	97.32 ±0.11	97.52±0.02	97.47±0.01	97.39±0.03	<b>97.61±0.09</b>

The performance of our ViT's is compared with that of all models mentioned in [15] in Table 5. Our JFT-300M pre-trained ViT-L/(14,16,18) ensemble which uses 3 variants of ViT-L having patch sizes of 14, 16, and 18 respectively, outperforms all other state-of-the-art models on ImageNet ReaL, CIFAR-10/100, Oxford-IIIT Pets and Oxford

Flowers-102. For the remaining ImageNet dataset although our proposed approach achieves 2<sup>nd</sup> rank, we are sure we would have has a better score than ViT-H/14 of [15] had we experimented with a larger ViT ensemble or with a ViT-H/(14,16,18) ensemble.

**Table 5: Comparison with the state-of-the-art on notable image classification datasets. Mean and std. deviation of accuracies are reported, after taking the average over 3 finetuning runs.**

	JFT ViT-L/(14,16,18) Ours	JFT ViT-H/14 [15]	JFT ViT-L/16 [15]	121k ViT-L/16 [15]	BiT-L ResNet152 x4 [27]	Noisy Student EfficientNet-L2 [55]
ImageNet	87.92±0.02	<b>88.55±0.04</b>	87.76±0.03	85.30±0.02	87.54±0.02	88.5
ImageNet ReaL	<b>90.74±0.01</b>	90.72±0.05	90.54±0.03	88.62±0.05	90.54	90.55
CIFAR-10	<b>99.54±0.05</b>	99.50±0.06	99.42±0.03	99.15±0.03	99.37±0.06	-
CIFAR-100	<b>94.58±0.03</b>	94.55±0.04	93.90±0.05	93.25±0.05	93.51±0.08	-
Oxford-IIIT Pets	<b>97.61±0.09</b>	97.56±0.03	97.32±0.11	94.67±0.15	96.62±0.23	-
Oxford Flowers-102	<b>99.76±0.01</b>	99.68±0.02	99.74±0.00	99.61±0.02	99.63±0.03	-

## VI. Conclusion

In this paper, the efficacy of using Vision Transformers (ViT's) for image recognition tasks was demonstrated by using a novel parallel processing scheme. An overview of the attention mechanism used in Transformers was given. This was followed by a discussion of related works. Next, we introduced our approach wherein we proposed the use of multiple ViT's in parallel with different patch sizes. In particular patch sizes of (14×14), (16×16), and (18×18) were used successfully. The next step in the proposed approach involved averaging the classification probability vectors of the ViT's. We showed experimentally that using such a scheme led to state-of-the-art results on popular datasets. However, larger ViT architectures were not investigated which could reveal more information. Also, using more ViT's (above 3) with different patch sizes is a task we intend to take up in future work. One interesting research direction in this regard would be using a single ViT having parallel processing abilities for multiple patch sizes.

## VII. Conflict of interest

The authors declare no conflict of interest.

## VIII. Declaration of funding

This project has not received any type of funding.

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# Employability Skills Requirement for People with Disability (PWD) Job Success

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## Abstract

Advancement of the nation depends on the human capital development, equal distribution of wealth, and well-being of the grassroots. Notably, having a secured job and a stable occupation is an aspiration for every human being; without leaving the people with disabilities (PWD). Problem related to PWD unemployment has always been a challenging topic because little information related to characteristics and skills needed by the industries to promote this group of people for employment. Therefore, this research explored employability skills (ES) traits among 21 PWDs who perceived three days of ES intervention program conducted at Putra Future Classroom, Universiti Putra Malaysia. A qualitative single study was employed after the program and the participating PWDs were requested to share their experiences via synchronous audio-recorded sessions using the WhatsApp application. The audio recorded was transcribed and analyzed using Atlas. Ti software. Six themes were emerged using color-coded and thematic analysis: 1) digital skills, 2) information and communication technology skills, 3) interpersonal skills, 4) marketing skills, 5) practical skills, and 6) writing skills. The findings: 1) advocate the identical ES traits among PWD align with industrial job demands, 2) foster contribution of PWD in the job market; and 3) elicit curriculum training for PWD by embedding ES elements. PWD unemployment has resumed being a great concern among stakeholders who believe in their potential and talent. Therefore, industrial players should be more tolerant and emancipate the contribution of PWD's role in the workforce as well as allow them to demonstrate their capabilities and skills.

## Keywords

*People with Disability (PWD), employability skill (ES), employment, job opportunity*

## INTRODUCTION

People with disability (PWD) is a group of people of those who categorized as the most vulnerable and marginalized society in the world. The deficiency and disability of these people continued to be discriminated against and frequently be reported as being neglected and abused mentally and physically by deviances. The PWD accumulated 80% who lived in developing countries (World Bank, 2018), continued struggles in preserving their life. In addition, 20% of the poorest people in the world, battle with some form of disability (Disabled World, 2018; Eide & Ingstad, 2017), indicated as the largest proportion of the minority (Bickenbach, Rubinelli, & Stucki, 2017; Luo & Wang, 2017; Quinn, 2009). Notwithstanding issues related to the abundant PWD population in the world, barely 45 countries regulated anti-discriminatory acts and disability employment laws (United Nations, 2017). However, it is a shocking fact that the employment rate gap varies as much as 40% in the US and few European countries (United Kingdom, Hungary, Netherlands, and Romania) and it was reported higher in other countries such as Peru (United Nations, 2017).

Referring to a local report, there are 468,520 registered PWDs out of a total population of 33 million people in Malaysia (Department of Social Welfare Statistic Report,

2018). Nevertheless, it is thought that many PWDs fail to inform the government of their status. This situation has caused inaccuracy of data. While in this case, it is critical to have accurate statistics on PWDs to observe their societal well-being and advocate job opportunities for them. To elaborate, the category of PWDs can be vary and unique to some extent. The types of disability among PWD comes in different categories, for example (1) learning disabilities, (2) physical disabilities, (3) vision impairment, (4) hearing impairment, (4) mental disorders, (5) multiple disabilities, and (6) speech impairment (Department of Social Welfare Statistic Report, 2018). Equally important, overt acts upon understanding these categories of disability is vital to minimize the risk and reduce jeopardized of PWDs', especially when preparing a suitable job for them.

The government needs to look into several concerns concerning the welfare of disabled persons in the country. Social stigma, a lack of representation in the job market, equitable policies, and decisions on disability-related issues are issues hampering PWD's existence. PWDs frequently endure economic insecurity as a result of limited access to education and job prospects. Despite efforts to ensure PWD workforce involvement, it was a clear disparity in 2008 that only 581 PWDs were employed in the public sector in Malaysia (Department of Social Welfare Statistic Report,

2018). The private sector, on the other hand, performed better, with 17,000 PWDs employed. This result, by far, only 10-20% of PWDs being economically active and employed. Statistics on PWD's employment rate remain scarce and limited.

The Malaysian government's national social policy, which was implemented in 2003, emphasizes equality, rights, and involvement of PWD in society. The policy was further changed in Circular No. 3 2008-9, which outlined the implementation of a 1% policy of job placement for PWDs in the public sector. The policy described a great step forward in terms of implementation to promote the employment of PWD. According to Islam (2015), the positive efforts made by having such policies and rulings aim to ensure that PWDs have equal rights and full participation in Malaysian society. The national welfare program's overall goals, on the other hand, are expected to secure and stabilize the society and allowing people to live in peace without jeopardizing human rights, including the rights of PWD.

Henceforth, the purpose of this study is to explore the employability skills (ES) traits and attributes derive from the intervention ES program participated by the PWD. We embarked on the salient contribution of ES as 'most critical skills in the job market and reflecting on employability skills needed by the current job market. The tentative three days program accumulated module-based employability training is hopeful to be the kick-start program to empower the workforce among PWD in Malaysia.

### **Employability Skills for Career Success**

The employment trend has evolved dramatically in recent years, and a bachelor's degree is no longer sufficient to find graduate employment (Smith et al., 2010; Verder, Denhart, & Robe, 2013). Any higher education institution has a critical challenge on how to train people today for employment (Oliver, & Jorre de St Jorre, 2018), as well as how to shape teaching and learning so that people can gain occupationally relevant abilities for the types of work required in the future (Bishop, 2019). Indeed, determining the appropriate balance of technical, employability, and academic abilities for workplace education is a difficult task. Furthermore, graduates holistic grasps on knowledge content and apply the knowledge into real-life employment settings are crucial (Jackson, 2009) Putting forward, interested stakeholders, such as the government, industry, and educational institutions, must be aware of the crucial need for employability skills (ES) that keeps on evolving through changes in the industrial landscape.

It is becoming increasingly difficult to ignore the role of ES as part of compulsory skills needed by the industries (Griffin, & Coelho, 2019). ES is the leading cause in contributing the job placement among graduates and might be the job security among the worker (Hossain et al., 2018). Thus, increasing the employability of its graduates should be a top priority for any responsible university (Miclea, 2004). The second facet of the learning-to-do pillar, acquiring job-related social skills, is increasingly relevant to the occupational sphere, owing to the development of service industries and

their growing importance in the system of post-industrial economies (Burns, 2020). Myriad services are defined by the personal ties that form between the supplier and the customer, rather than the material or energetic processing that occurs in their enterprises. Interpersonal skills become extremely important for employment and job performance in these circumstances. Soft skills such as collaboration and problem-solving ability, communication, and personal initiative are no longer desirable but insignificant labor market add-ons, but rather decisive factors in the service economy's market. Individuals' ability to shape the future, act as change agents, and be willing to take risks is the third component of learning to do (Miclea, 2004).

One of the most significant current discussions in education is whether students are fit to enter a job market, and which employability issues among graduates have been questioned by employers. In the vocational practice, employability has been seen as an indicator to determine the readiness of entering the profession (Forrier & Sels, 2003). There is an increasing concern on adapting employability in institutions; employers are not convinced with readiness among graduates to enter the job market. Guile and Okumoto (2007) has embarked on this issue through their research that "academic and vocational qualifications struggle to facilitate access and learning and employability in the creative and cultural sector because employers are not convinced that graduates have developed, or that the forms of 'vocational practice,' that is, a combination of knowledge, skill and judgment, which they are looking for" (pg. 562).

Because of the rapidity of the industrial environment, the development of ES has necessitated action by educational stakeholders. Because technology advancements and globalization have made the workforce more unpredictable, requiring relevant skills is the way to go if you want to stay in the workforce (Rojewski & Hill, 2017). It does provide a barrier to job seekers in terms of meeting industrial skill expectations; nevertheless, strong rivalry among corporate organizations has driven them to seek exceptional workers among the finest prospects on the job market. As a result, businesses are searching for people that are well-developed and matured in ES traits than technical abilities to execute the job.

There has been a lot of research done on how to define employable abilities. This research resulted in a slew of new terms to define the abilities needed in the job. There were some examples to describe the value of non-technical skills for example transferable skills (O'Neil, Allred & Baker, 1997), career skills (Smith & Krüger, 2011), and work readiness skills (Zinser, 2003). Furthermore, Omar, Bakar, and Rashid (2012) defined ES as a set of skills that can be transferred from one job to another and are obtained through education and training. The nurturing process and educational journey can also pass along values and personality development. In today's business, ES such as leadership, teamwork, negotiation, communication, and creative and critical thinking are all vital.

This is parallel with individuals who have strong characteristics such as a high sense of self, innovation,

productivity, skill, and competitiveness, a strong sense of determination and creativity in facing the challenges of the nation as well as globalization in the 21<sup>st</sup> century (Kazilan, Hamzah & Bakar, 2009). Graduate attributes, according to a generally accepted definition, are the qualities, skills, and understandings that a university community feels its students should develop throughout their time at the institution and, as a result, shape the contribution they can make to their profession and as citizens (Bowden et al., 2000).

A more accessible and appropriate definition in respect of PWD maybe that developed by Yorke and Knight (2003, p.5) who define ES as “a set of achievements - skills, understandings and personal attributes, that make individuals more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community, and the economy”. In the skills plus project, assessment, learning, and employability, Yorke and Knight (2004) developed the USEM (Understanding, Skills, Efficacy Beliefs and Meta-cognition) theory of learning and concluded that what makes a good student makes a good employee. Students’ self-image and self-confidence allow them to cope with failure. The efficacy beliefs are to do with how a student’s self-image and self-confidence allow them to cope with failure. Those with strong efficacy beliefs regard failure as the opportunity to learn and to do better in the future. Those with weak efficacy beliefs see failure as the irremediable result of their lack of intelligence. Meta-cognition is the knowledge of one’s thinking processes and strategies, and the ability to consciously reflect and act on that knowledge to modify those processes and strategies (Graduate Prospects, 2010).

Yorke (2004) considers employability to be a multi-faceted personality trait. After all, it is the individual whose suitability for a job is assessed, which is defined as a set of skills, knowledge, and personal characteristics that makes graduates more likely to find work and succeed in their chosen fields, which benefits themselves, the workforce, the community, and the economy. Knight and Yorke (2004) suggest four main areas of competence that constitute employability: (1) understanding (mastery of the subject matter of a field), (2) skillful practices (so-called generic skill in addition to subject-specific skills), (3) efficacy beliefs (trust that one can make some impact on situations and events), and (4) metacognition (awareness of one’s competence as well as limitations combined with an insight in how to learn more).

*Figure 1. USEM Model. Adapted from "Learning, curriculum, and employability in higher education" by P. Knight, and M. Yorke, 2004, London: RoutledgeFalmer*

### **Employability Skills and Disability**

Over the past years, there has been a focus on employability skills (ES) or soft skills development among graduates, however, few researchers pointed the significant issues of unemployment among PWDs. Previous studies were also primarily concentrating on training and induction programs

for PWD (de Mb Oliveira et al., 2016; Zainal et al., 2020). Because the ES is a vital skill that is required by employers, the focus on developing this trait has to belittle the role of PWD in the job landscape. Foster et al. (2019) pointed out the remarks on ES or soft skills as non-technical skills reflecting the need for 21<sup>st</sup>-century skills that help employees securing and keeping their job. Every time PWD was called upon to develop these non-technical skills with nebulous and structured special programs, often left out PWDs blunt with these elements. When the employer reviewed such job applications from PWD, often they struggle especially when the interview session takes place. The skills are related to professionalism, communication, a positive attitude and politeness, teamwork, problem-solving and critical thinking, and networking skills (Foster et al., 2019), frequently being left out from PWD training programs.

When the ES becomes the premise in many human resource offices related to the hiring process, the elements of these skills concur with the ‘code of principle’ to find potential employees. Employers valued the element of ES and even much more as compared to academic skills. Lonis (2017) reported a lack of individuals with fundamental ES, such as the ability to use basic math, communicate effectively, read technical manuals, work successfully in teams and participate in complex problem-solving. While the above elements are crucial not only to the non-disabled employees albeit PWD should strive forward to training the aforementioned traits. Rockwood (2021) pointed out soft skills reflect behaviors, personality traits, and work habits, such as collaboration, critical thinking, perseverance, and communication, that help people prosper at work; adding to the critical area of employability requirement by the organization.

The academic requirement has become less primal when it comes to the hiring process instead of the capability of job seekers in marketing themselves during interviews and portfolios sharing. These PWDs determined to get hired a position in the workplace, however being compulsion by the lack of training on soft skills development. This condition making the PWDs far beyond getting the job placement adding to their deficiency to perform technical jobs with requires physical movements.

The ES for PWDs brings into the discussion when the unemployment issue among PWD has become a serious matter throughout the globe. Scheef, Walker, and Barrio (2019) anticipated that researchers looked into what individuals with intellectual disabilities in Singapore should do to succeed in the workplace. Core qualities, such as attitude, dependability, stamina, adaptability, and communication, appear to be appreciated more than job-specific technical skills. Similarly, Ab Halim, Muda, and Izam (2019) found that there is a strong positive relationship between self-efficacy and the students with special needs employability skills. Although these findings produce significance to understand the elements of employability skills often employers complained about the paucity of the talents and potentials among PWD. Notwithstanding the PWD was distraught to learn the employability skills that

their furloughs had been quite a challenge at the training institutions.

The industries summoned a representative of training institutions especially the administrators and instructors to the lack of training related to PWDS employability skills. This condition has contributed to the lack of promotion and outstanding performance of employability traits by the PWD. Zainal, Mahmud, and Wan Pa (2020) introduced Career Transition Program (CTP) to students with disabilities (SWDs) to prepare and train them for the job market. Skills training in the field of employment is provided to SWDs in the implementation of CTP. However, it was reported that PWD is still difficult for this group to get a job despite having good skills. Basic academic skills, emotional management skills, communication skills, and self-management skills are essential traits to ensure a successful CTP training output. In encapsulating the issues, the program related to training is often less popular and is not ear to elicit due to lack of exposure and communication between industry and training institutions related to module and ES elements needed by the industry.

The rapid change in the job landscape adding to struggle and challenges to PWD in positioning themselves in the workforces. It is often ineffective to disregard the importance of ES. Barnes (2019) espoused the acquisition of soft skills element in empowering PWDS career development. Among a group of hearing-impaired students, he concentrates on the specific topics of general skills, emotional intelligence, communication skills, career development learning, and job experience. While some of the general abilities were

relatively easy to acquire, other important career development learning and job-seeking skills were more challenging for this group of students.

Just as important, the need for prompt action on reinforcing PWD's involvement in the job market is vital to flourishing their societal and economical well-beings (Vilà, Pallisera, & Fullana, 2007). The reported literature mentions critical stages of ES development as a strategy to increase the employment rate among PWD. As proactive measures, studies on PWD employment remain significant as the spirit to advocate their participation in the community.

## METHODS

In this study, a case study was employed as part of a qualitative investigation. We planned a structured employability skills (ES) course that was led by a local-based professional image consulting firm. The module was developed based on the study findings from employers' input on employing PWD. The employers' conclusions focused on particular ES. We invited non-governmental organizations (NGOs) that assist PWD. The Malaysian Society for the Blind from the Gurney Training Center and the Universiti Putra Malaysia (UPM) PWDs Support and Services Unit are both engaged in this program. There were a total of 21 PWDs who spent three days program with the organizer. Twenty individuals were classified as having a level of blindness, while one was classified as a deficit hyperactivity disorder (ADHD) patient. The tentative of the program is stated in Table 1.

**Table 1. Tentative of the employability skills development program for PWD.**

Date	Time	Activity
30 September 2020 (Wednesday)	8.30 AM - 9.00 AM	Opening Ceremony
	9.00AM - 10.30 AM	Module 1- Exploration of BETTER <ul style="list-style-type: none"> <li>● First-class people (BETTER module)</li> <li>● Be prepared (B) with VUCA</li> <li>● The Employability Skills Framework</li> </ul>
	10.30 AM - 10.45 AM	Breakfast
	10.45 AM - 1.00 PM	Module 2- Integrity Management <ul style="list-style-type: none"> <li>● Building a personal integrity boundary</li> <li>● Enhancing work and personal ethics (E)</li> <li>● Integrity at workplace</li> </ul>
	1.00PM - 2.30 PM	Lunch Break
	2.30 PM - 4.30 PM	Module 3- Communicate Effectively <ul style="list-style-type: none"> <li>● Establish a trustworthy (T) environment</li> <li>● Exploring personal social style</li> <li>● Adapting social style to work best with others</li> </ul>
1 October 2020 (Thursday)	4.30 PM - 5.00 PM	Teatime and Dismiss
	8.30 AM-10.30 AM	Module 4 - Approach to Problems <ul style="list-style-type: none"> <li>● Tactful (T) in approaching a difficult situation</li> <li>● Problem-solving approach</li> <li>● PDCA analysis</li> </ul>
	10.30 AM – 10.45 AM	Breakfast
	10.45 AM – 1.00 PM	Module 5 - Continuous development <ul style="list-style-type: none"> <li>● Enable (E) yourself to learn new skills</li> <li>● Resources needed to learn</li> <li>● Practice make perfect</li> </ul>

2 October 2020 (Friday)	1.00 PM - 2.30 PM	Lunch Break
	2.30 PM – 4.30 PM	Module 6 - Mirror yourself ● Re-evaluate (R) yourself ● Exploring opportunities ● Award yourself
	4.30 PM - 5.00 PM	Teatime and Dismiss
	8.30 AM-10.30 AM	Module 7 – Professional Image Branding ● Exploring style personality ● Men’s & Women’s Professional Wear
	10.30 AM – 10.45 AM	Breakfast
	10.45AM – 12.30 PM	Module 7 (Continue)
	12.30 PM - 12.45 PM	Q&A
	12.45 PM	Closing Ceremony

The program's participants were asked to participate in a focus group discussion (FGD). After completing the employability skills training, participants were asked to phone in to a group message system. These FGD sessions lasted a month and included both open conversation and scripted questions to transmit participants' input via synchronous and asynchronous responses using WhatsApp (WA) application. One question was posted to the application daily. Participants may either provide feedback in the WA group that was formed before the FGD, or they could send a private message via the same application. For documentation, we transcribed the audio message and encoded them in Microsoft Excel. The excel spreadsheet was exported to Atlas. Ti, a sophisticated qualitative analysis software to perform thematic analysis.

### RESEARCH FINDINGS

A thematic qualitative analysis using a CAQDAS namely ATLAS.ti (ver. 9) was performed on ten pages of interview transcripts. The purpose of the interview was to determine the employability skills (ES) traits for the PWD to secure jobs soon. Based on the analysis, a total number of six themes and 17 quotations related to ES were derived from the interview transcripts. The themes are (1) digital skills, (2) information and communication technology (ICT) skills, (3) interpersonal skills, (4) marketing skills, (5) practical skills, and (6) writing skills. In specific, five (29.4%) quotations were derived related to the digital skills, four (23.5%) quotations were derived related to the ICT skills, three (17.6%) quotations were derived related to the interpersonal skills, two (11.8%) quotations were derived related to the marketing skills, two (11.8%) quotations were derived related to the practical skills, and one (5.9%) quotations were derived related to the writing skills. The following subtopics narrate the themes along with several quotation instances.

#### ● Digital skills

Firstly, the PWD conveyed that they need digital skills to secure jobs after graduation. A total number of five quotations (29.4%) related to digital skills were extracted. For instance, informant 1 asserts that digital editing skills are important to secure a job soon:

“In addition, for me, the important skills that I need to master is (digital) editing... [1:9 para(s) 8 in Informant 1]

Informant 1 further states, apart from digital editing, skills related to the creation of digital storyboard are also important for him/her to secure a job in the future:

“...at the same time, I also have the skills in producing storyboards. With the skills, for example, a company uhh... film production company, they need skilled manpower in producing (digital) storyboards. ” [1:19 para(s) 10 in Informant 1]

On the other hand, informant 4 asserts that digital video editing and digital photo editing skills are deemed important for him/her to get and a job and generate side incomes after graduation:

“Or maybe in the future we could also teach the PWDs on how to edit videos or edit photos using applications such as Photoshop. I think that it would be beneficial for them if they want to generate side incomes.” [4:17 para(s) 24 in Informant 4]

#### ● Information and Communication Technology (ICT) skills

Secondly, the ES needed by the PWDs to secure jobs soon is ICT skills. A total number of four quotations (23.5%) related to ICT skills were extracted. To illustrate, informant 1 asserts that skills related to information technology (IT), digital media, and digital communication are important for him/her to secure a job soon:

“For example in broadcasting. Skills in IT, including media, information technology, and communication...” [1:2 para(s) 8 in Informant 1]

Other than that, informant 1 also states, skills related to personal computing such as utilizing the Microsoft Office software are also important for him/her to secure a job after graduation:

“...skills that need to be provided to... people with disabilities like me uhh... we need more... skills such as computer skills for instances using the Microsoft Word, Excel...” [4:19 para(s) 26 in Informant 4]

Similar to informant 1, informant 10 also believed that he/she needs the skills related to IT for him/her to secure a job in the future:

“...about the skills we need to get a job... IT skills...” [10:1 para(s) 8 in Informant 10]

● **Interpersonal skills**

The next ES needed by the PWD students to secure jobs soon is interpersonal skills. A total number of three quotations (17.6%) related to interpersonal skills were extracted. To exemplify, informant 5 conveys that being friendly when dealing with others is an important skill to be grasped for him/her to secure a job soon:

“...our service as an employee or as a business owner should be friendly...” [5:17 para(s) 22 in Informant 5]

Other than being friendly, informant 5 add, being rational and modest are indeed other aspects that are equally important to be grasped in making sure he/she secures a job in the future:

“...rational...” [5:18 para(s) 22 in Informant 5]

“...and not being arrogant.” [5:19 para(s) 22 in Informant 5]

● **Marketing skills**

Forth, the employability skills needed by the PWDs to secure jobs soon are marketing skills. A total number of two quotations (11.8%) related to interpersonal skills were extracted. To demonstrate, informant 3 expresses that the ability to promote products is an important skill to be mastered for him/her to secure a job soon:

“Skills that we can learn, how to promote our company’s products.” [3:10 para(s) 20 in Informant 3]

Informant 5 continues by stating that the ability to convince and inspire customers in buying products is equally important to be learned in making sure he/she secures a job after graduation:

“Then we need to know about what products we are selling. Because if we want to convince our customers, we have to know the product very well. We have to provide evidence that says this product can help the community. So we can inspire them or even stimulate their thinking to buy our products.” [5:16 para(s) 22 in Informant 5]

● **Practical skills**

Fifth, the ES needed by the PWDs to secure jobs soon is practical skills. A total number of two quotations (11.8%) related to practical skills were extracted. To elucidate, informant 1 states that skills related to carpentry are indeed important to be mastered for him/her to secure a job soon:

“...the skills of carpentry are also needed nowadays because our country needs skilled manpower in the labor sector...” [1:4 para(s) 8 in Informant 1]

On the other hand, informant 10 believes that skills related to computer maintenance are also important to be acquired for him/her to secure a job after graduation:

“...if our computer is broken or our boss’s computer is broken, we don’t have to call uhh... a computer technician. We could fix our computers or we could fix our boss’s.” [10:2 para(s) 8 in Informant 10]

● **Writing skills**

Last but not least, the sixth ES needed by the PWDs to secure jobs soon is writing skills. A total number of quotations (5.9%) related to the writing skills were extracted. To illuminate, informant 5 conveys that skills related to preparing a proposal are indeed important to be acquired for him/her to secure a job soon:

“...skills that could be included in addition to the skills that have been taught in the program, umm for me skills... of writing proposal. Writing a group’s proposal.” [5:23 para(s) 28 in Informant 5]

**4.1 Summary of findings**

The purpose of the study was to determine the ES needed for the PWDs to secure jobs soon. Based on the analysis, a total number of six themes related to the ES were derived from the interview transcripts. The themes are (1) digital skills, (2) ICT skills, (3) interpersonal skills, (4) marketing skills, (5) practical skills, and (6) writing skills. In specific, Table 2 below shows the distribution of quotations according to the theme.

**Table 2. Distribution of quotation according to theme**

No.	Theme	No. of Quotation	Percentage (%)
1	Digital skills	5	29.4%
2	ICT skills	4	23.5%
3	Interpersonal skills	3	17.6%
4	Marketing skills	2	11.8%
5	Practical skills	2	11.8%
6	Writing skills	1	5.9%
<b>Total</b>		<b>17</b>	<b>100.0%</b>

**Discussion**

This study calls for employability effort to flourish PWD employment, focused on employability skills development, changing perceptions and sentiments of communities and industrial players. To execute such changes, the methods of instruction and training require ES and soft skills element and a broader effort at different layers of institutional and ministry levels. The research findings proposed the operation and support on disability employment-related programs to

pursue and strengthen these programs by examining the adequacy of ES development to industry's requirement for job placement and efforts and, where needed, further develop and implement more complete employment empowerment programs.

Facilitating and empowering PWDs employment demands strategy to hone for success and ultimately increase PWD participation in the workforce. While it remains a challenge especially with the world struggle with the pandemic COVID-19, safeguarding the PWD's life becomes the responsibility of all. Due to significant challenges in advocating PWD employment, this study explored employability skills elements from the perspectives of PWD through a structured intervention program at Putra Future Classroom, UPM, and embark on the employability skills element from a collection of literature especially reflecting from non-disabled employees and specifically on PWDs. As above-mentioned, six themes emerged from thematic analysis: (1) digital skills, (2) ICT skills, (3) interpersonal skills, (4) marketing skills, (5) practical skills, and (6) writing skills.

The first theme eventuates the important elements of digital skills. The transition from training institution to work becomes a great challenge of there is a scarcity in terms of digital knowledge for myriad types of the job seeker. Digitalization which involves mobile applications and computer software possesses minimal physical movement. Hence, the PWD issues an undebatable opinion in regards to the importance of digital skills to assist them with employment. The evolution of digital skills demands upskilling and reskilling overtime to cope with the latest technology and developed in formal education, others in informal and non-formal education settings (Leahy & Wilson, 2014). Digital skills are gained from formal teaching, self-learning, and peer-to-peer learning over time through educational and social usage of technology. Today's environment necessitates digital skills for people to locate, evaluate, and create information for further and higher education, training, and job. On another note, Van Laar et al. (2017) described digital skills, 21<sup>st</sup>-century skills are not necessarily underpinned by ICT. It goes beyond technical, information management, communication, collaboration, creativity, critical thinking, and problem-solving which stimulates the important elements under the umbrella of employability skills.

The lack of ICT skills of PWD is evident. This condition affects participation among PWDs in a digital society. Mavrou et al. (2017) agreed that emphasize ICT competence among PWD is vital to encourage independence, social integration, educational success, employment opportunities, and ultimately improve quality of life among various groups of PWD. This is consistent with the significant contribution of ICT skills by Stendal (2012) which indicated the several research disciplines have focused on how the advantage of the technology is available for social, educational, and personal purposes. Virtual worlds represent the latest

addition to the technologies available, yet there is little research on how PWD use and experience virtual worlds.

Technical and job skills are repleting with a plethora of technology evolution. Most technologies especially on assembly and manufacturing processes involve automation and machines; added to the less dependence on human effort. Modern technologies often result in indiscriminate PWD's employment opportunities, albeit some assistive tools can simplify and accommodate PWDs when performing certain tasks. Therefore, another important trait in inculcating PWD employment is the mastery of interpersonal skills. Hendricks and Wehman (2009) agreed that instead of learning job-related skills, developing interpersonal skills promotes the transition to work from education and training programs. Gurchiek (2016) and NACE (2017) shared similar findings related to the essential contribution of interpersonal skills to as someone who "gets along well with others" and "lacks a bad attitude," specifically, not complaining all the time about the job, co-workers, or the organization. These traits are highly recommended for PWD. On another note, they added that most human resource professionals desire employees with certain attributes, including reliability, flexibility, and good interpersonal skills. After few years of PWD job enrolment in the organization, human resource offices found to find that PWD will expose to voracious promotions and wide employment fields across the nation.

PWDs in the job market have demonstrated their ability to find their way out of the most challenging life situation by securing a job. PWD's effort to explore entrepreneurial opportunities will encourage them to be more independent. It is proven that entrepreneurial knowledge will bring them out of poverty and isolation. In addition to that, entrepreneurship requires excellent marketing skills. The crucial aspect of developing marketing and communication skills will assist the entrepreneurs to deliver quality service to their customers (Essien & Nseobot, 2019), prosper positive images of the company owned by PWD.

Oswald et al. (2015) reported that there are thousands of résumé resources available to college-level job seekers, combining a skill-focused résumé with a self-marketing plan can help stand out from other similarly qualified graduates while minimalizing job gaps or sparse work history. Given the fact that digitalization has taken place in a myriad of business pathways, digital marketing practice continues to grow along with the need for a qualified workforce (Key et al., 2019). Adding this value will help PWD to cope with challenging economic deprivation by exploring opportunities and expand their marketing skills through the use of technology and e-commerce marketing applications.

The mentor or trainer for PWDs are nettles about the ease with which the struggles PWDs in job placement. Schalock et al. (2010) suggested that one area that may be especially relevant for employment outcomes among PWD is an adaptive behavior. The adaptation with the organizational climate and aligning PWD with the need to immerse the job environment will help

them to remain in the job. Schalock et al. (2010) added adaptive behavior refers to the conceptual, practical, and social skills performed by individuals in their everyday lives. Conceptual practical skills include communication, numeracy, academic skills, and self-direction, while social skills include social responsibility, self-esteem, interpersonal skills and social problem solving are the eminent traits for ES to break down the gap of PWD employment with other job applicants. PWD are demanded to demonstrate practical skills which include daily living skills, safety, health care, routines, and occupational skills (Smith et al., 2018), to suiting themselves with current job environment.

Following several successful applicants among PWDs to enter the workforce, the employers perceive several benefits. Lindsay et al. (2018) espoused by hiring PWD in an organization improvement in profitability (i.e., profits and cost-effectiveness, turnover and retention, reliability and punctuality, employee loyalty, company image), competitive advantage (e.g., diverse customers, customer loyalty and satisfaction, innovation, productivity, work ethic, safety), inclusive work culture, and ability awareness. Secondary benefits for PWD included improved quality of life and income, enhanced self-confidence, expanded social network, and a sense of community (Lindsay et al., 2018). They have had to prosper the life of PWD to accommodate the PWDs basic necessity. With strong collaboration and support from the industry, many PWDs now have a better opportunity in career.

PWD employment has more than a veneer of benefits to properly evaluate their potential and talents to perform job responsibilities. With the right training and facilitation, PWDs would develop skills and knowledge to contribute to the industry in comprehensive ways. Dreavers et al. (2020), believed in ensuring the strategies and supports that facilitate successful employment of PWD was from care training and education. Strategic planning including “formulating realistic goals” education about appropriate physical boundaries “business writing skills” training “integrity training” education about “workplace basics” are suitable content on training module development (Dreaver et al., 2020). This is consistent with the training module employed in the employability training program held in this research which focuses on employability skills added to the values that are highly demanded by the industries.

PWDs are deemed by employers to be the best job applicants for their organization if they have specific employment skills targeted needed by them. When the hiring process begins PWDs are hoped to market themselves by demonstrating their skills and capabilities to execute job scopes as advertised on the job-seeking websites. Job preparation skills such as resume writing and job interviewing skills are the key criteria when the first encounter with potential employers (Munandar, et al., 2020). On another note, Lackenby et al. (2015) describe impediments to employment for young PWD. These include issues such as the structure of the welfare system, resulting in part-time employment that effectively reduces income. Interestingly, the attitudes of

both employers and the family of young PWD can sometimes impede young people from finding employment.

### Limitations

There are limitations to consider when interpreting these results. One possible limitation is the potential for selection bias. It is not known why those who participated volunteered to do so. Perhaps informants volunteered because of personal experiences with blindness and ADHD disability. Additionally, all study participants involved in the ES training intervention program met three days for training and employability skills development. These participants may not be representative of all PWDs in that they may engage in more opportunities to increase their knowledge on issues facing their field. Finally, the focus groups were held in 2019, during a time of pandemic COVID-19 which resulted in asynchronous audio messages was used to obtain feedback from the informants. The results may have been influenced by the COVID-19 situation of that time and may not be fully reflective of the views of PWD's today.

### Conclusion

In light of the unemployment issue among PWDs, the strategy of training and ES intervention is more significant than the conventional teaching and learning approach to PWD. Therefore, cognizance of the PWD teaching and learning module by embedding the ES element is necessary. For these initiatives to be successful, bilateral and collaborative efforts between industrial players and PWD skill training institutions should be in place. Fostering close cooperation and shared information on specific skills and knowledge requirements to work industry shall be executed concurrently through conference and industrial meetings. Access to internship and practicum in industrial settings would expose PWDs to real-life workforce settings. This environment will flourish PWDs confidence and integrate with industrial communities and other employees. The social gaps between PWD and other employees will spur harmonization and tolerance with the culture of positive mutual relationships and attitudes toward acceptance of PWD in the organization. Employment barriers among PWDs can lead to social exclusion and poverty in life; hence, we must develop a better understanding of the factors shaping PWD's employment and find ways to overcome the often subtle patterns of discrimination appearing to exist in our society.

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# Analysis Maintenance System in Applied By Wartsila Group in Two Central Diesel Power Plants, In Timor Leste

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## Abstract

The Hera and Betano diesel engine power plants are the centers of general electricity Public entrepreneurs in Timor Leste. These two centers diesel engine power plants are vital sites to provide electricity to the peoples of East Timor. For the maintenance of the two generating diesel engines, there are maintenance methods that can be applied based in working hours diesel engine. This has been done since the two central diesel engine power plants operated in 2012. The maintenance method is carried out with the role of the generator diesel engine manufacturer. To replace spare parts, you must follow the advice of the diesel engine manufacturer, so that you can maintain the condition of the diesel engine according to the maintenance recommendations. This is to prevent component failure in the operation of the machine diesel engine power plant, up to the age of working hours. Likewise, to maintain the performance of a long diesel engine working life. For the future research, recommended to make collaborated and conducted with management like Reliability Centered Maintenance management.

## Keywords

*Preventive Maintenance Method, Maintenance Based in Working Hours, Analysis the Method, Described the Method, Formulated the Maintenance*

## INTRODUCTION

As we known that East Timor Country situation in Southeast Asia, between Australia and direct land border with Indonesia, one of the city land enclaves in Indonesia land too, so we called it Oecusse enclave. From the 2008, government has planned to provide the good electricity for East Timor Country, as well as bought engines power plants from Wartsila Group Company. Every engine of power plant has an output capacity 17 MW. Thirds Government constitutional implemented his planned, bought 16 Diesel engines power plants, and divided it in two different location to installed it, in each central 8 diesel engines power plant, has an output capacity 136 MW. So, Government prepared land one in Hera, situated north of East Timor, near the country capital Dili, has an output capacity 119 MW, unfortunately, one of the engine fall from the delivery way, and broken some of component when it is to delivery to the place, it has fall down from the trailer, on the way, before delivery it in destination central Hera, like showing in the picture.

The others 8 diesel engines power plants has an output capacity 136 MW delivery to the Betano, situated in the southern part of country.

Hera Central diesel power plants construed and installed all the diesel engines of power plant and it started operations in December 2011. Betano Central diesel engine power plant construed and installed it, and started operations in May 2014.

## Research and Phenomena.

Prior of the both central electricity established and operation, the Government facing many problems in term of older central electricity, from Indonesia heritage, every hour the electricity goes out because the energy consumption is very large. The characteristics of an old generation diesel engine [1], and the output capacity is small. The maintenance budget is too high. So, at that time, the Dili capital city situation in Dili was very chaotic, because in every corner of the house and office, there were private generators scattered everywhere, with noise, which made the city of Dili, like the city of a generator. So, that the energy of electricity it cannot serve the entire East Timor region. Small people cannot enjoy electricity, because the price of generators is expensive. At night the little people live by lighting themselves, with artificial lamps filled with kerosene.

### **Benefit of Research.**

Now the both of central power plants can supplying energy of electricity to all territories in East Timor. Because the total capacity of energy, is needed by whole country including to serving like local households, offices, hotels and industries, as well as the country's port and airport. The maximum capacity energy electricity from both power plants is needed every day around 60-65 MW. The maximum consumption at the day like around 65 MW maximum, and at the night around 60 MW. There for Hera and Betano become central of power plants are production energy electricity more than needed and it is likely vital electricity sources for Timor-Leste country.

With the existence of two central power plants, situated in two different location, can made synchronization of output production energy electricity, to maximized distribution capacity to all subcentral. But it is means, not that there are no more problems faced, but it can reduce the government's burden a little, to shift focus to other things. What are going the Government will be do more in order about the both central power plants? Solved other and new other problem came again. There is about operation running, Management and maintenance. Because we do not have sufficiency technical expert to handle it all. So, made the good decision to designed expert contracted. So, that made contracted expertise from Wartsila Group Company, in order it is offer to Wartsila Branch in Jakarta, to handle this contract. It is bringing a new sense by [2] for ensure maximized lifetime and guaranteed performance of the both central power plants. What is coming the next problem, with the overview about operational running and management and maintenance purpose? Such of it had have different characteristic problem met in the operational running. To solve it, make recruitment local peoples and offer them the training to become technical expert in their own local work place. It is needed budget and time, but it is can solved step by step, by the transfer scient.

### **Objected of Research.**

The purpose of this research is to obtain operational cost savings, both in terms of maintenance management and diesel fuel. Solutions range from spare parts and basic support to ensuring the performance and maximized lifetime cycle of the power plants, increased efficiency [3] and guaranteed performance of the customer's equipment in installation on a safe, reliable, and environmentally sustainable way. Expertise Center in Jakarta in order to evaluate the installations' performance and ensure efficient and optimized operations. This is according with the agreement also includes training of local staff to allow them to independently operate and maintain both power plants. It is, has been in charge of the operation and maintenance of the power plants since 2012. After Wartsila group running five-years contracted operation and maintenance agreement with the government of the Democratic Republic of Timor-Leste (Republic Democratic of East Timor) was signed in the second quarter on 2017. This appears to have had good results in ensuring the life cycle performance of the two power plants, but on the other hand, it has had its share of very detrimental to the state in terms of contractual agreements. This is implied in the terms agreed upon by both

parties, but there are two very contradictory statements, so that it does not benefit the owner of the asset.

### **Central Phenomena of Contract.**

The central phenomenon of signed contracts is the reliability of expectations and the availability of knowledge, which is dominated by political action. Not based on economic considerations [4] and savings, but expectations are more focused on the availability of electrical energy to fulfill electricity users. Considering the political style [5] at the time, and a lot of experience with power outages in the city of Dili, with careful consideration, it was decided that the important thing was to be safe, under control, and not to experience power outages again.

So, it was decided that the important operational method was to run safe and the electricity didn't turn off as often. The problem of operational efficiency, it is fully left to the hands of maintenance management, because those who understand better, assets and spare parts are contractors.

## **LITERATURE REVIEW**

### **Definition of Maintenance**

Preventive maintenance (PM) is a schedule of planned maintenance actions [6] aimed at the prevention of breakdowns and failures. The primary goal of preventive maintenance is to prevent the failure of equipment before it actually occurs. It is designed to preserve and enhance equipment reliability by replacing worn components before they actually fail. Preventive maintenance activities include equipment checks, partial or complete overhauls at specified periods, oil changes, lubrication and so on. In addition, workers can record equipment deterioration so they know to replace or repair worn parts before they cause system failure. Recent technological advances in tools, for inspection and diagnosis have enabled even more accurate and effective equipment maintenance. The ideal preventive maintenance program would prevent all equipment failure before it occurs. However, the maintenance carried out at Hera and Betano is based on machine working hours [7].

### **Company rules**

1. Should not ask the technician, because it interferes with the technician's work activities [8].
2. Not all questions have to be answered [9].
3. We are free to observe maintenance activities carried out by technicians [10].
4. We can only observe, and should not sit around the machine [11].
5. Must wear a helmet [12].
6. Must use earmuffs [13].
7. Must wear a mask [14].
8. Coming to work must be on time, must not be late [15].
9. Must dress in uniform [16].
10. Before work starts, you have to join the morning meeting to hear the explanation from the head of maintenance [17].

### **Philosophy and Basic Principles Manager.**

Managers perform tasks in accordance with the instructions and directives of the highest leadership [18].

**Technician and Technology**

Technicians are still in the process of being guided [19], towards independence, and becoming experts in the field of maintenance. One day they will be released and become independent.

**OBJECTIVES OF THE STUDY**

The purpose of this research and observation is to prevent waste money [20] in terms of management and maintenance operations of power plants in Hera and in Betano. According to ... that we must be good at choosing between two things: 1. Do you want to be a machine producer? [21] or 2. Do you want to be a machine user only? [22] If you want to become a machine producer, then ignore a little machine maintenance, which is maximum, and carry out machine maintenance according to the machine manufacturer's instructions. If you choose to be a good machine user, then ignore the machine maintenance instructions from the machine manufacturer, and take care of your machine as well as possible.

**RESEARCH METHODOLOGY**

The research methodology [2] is based on deductive and inductive methods. The research was carried out with an independent approach to carefully observe all the activities of technicians in the diesel power plant environment, during working time. It's a rule not to ask the technician a lot, because the workspace is full of diesel engine noise. If you ask a lot of questions to the technician, the technician's work will be disrupted. The head of care will answer questions as necessary. Because not all questions can be answered. There are some questions that don't need answers. Example: how much does a set of pistons cost? This question will not be answered by the head of maintenance or the head of logistics.

**RESULT AND DISCUSSION**

**Dili is a Capital of East Timor Country.**

As we know that East Timor Country situation in Southeast Asia, between Australia and direct land border with Indonesia, one of the city land enclaves in Indonesia land too, so we called it Oecusse enclave. From the 2008, government has planned to provide the good electricity for East Timor Country, as well as bought engines power plants from Wartsila Group Company. Every engine of power plant has an output capacity 17 MW. Thirds Government constitutional implemented his planned, bought 16 Diesel engines power plants, and divided it in two different location to installed it, in each central 8 diesel engines power plant, has an output capacity 136 MW. So, Government prepared land one in Hera, situated north of East Timor, near the country capital Dili, has an output capacity 119 MW, unfortunately, one of the engine fall from the delivery way, and broken some of component when it is to delivery to the place, it has fall down from the trailer, on the way, before delivery it in destination central Hera, like showing in the picture.



**Figure 5.2. Research location Timor Leste**

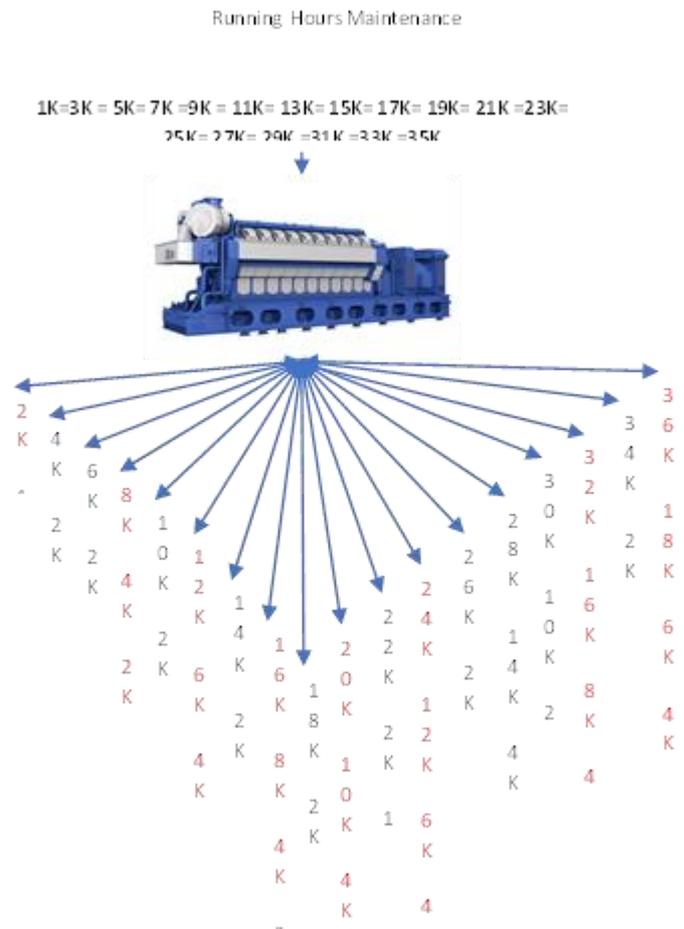
**Two central diesel engine power planted located**



Hera

Betano

**Figure 5.3. Research location Timor Leste**



**Figure 5.4. Flowchart Running Preventive Maintenance Methods.**

Criticality based on this method of maintenance by [23] is very simple, but reliable, as maintenance that is able to carry out the mission of preventing unwanted things from happening while the machine is in operation. Let's review one by one the functions of 1K, 2K, 3K ... up to the 36K limit, as

the maximum age limit for a component that must be replaced with a new one. Not that all engine components are up to 36K. Some can be replaced at the age of 1K, depending on the type and function of each. The definition of K is the value of 1000, so, if 1K is equal to 1000 hours of work, the life of the engine components. Likewise, for the other K, up to 36K or more than 36K, depending on how we function k according to the task we want. However, for power plant maintenance, in Hera and Betano, the maximum limit is 36K, for engine overhaul. That's the recommendation conveyed from the power plant engine factory [24] and [25]. Here is a table that will show each function from 1K to 36K with the duty of the component age.

Type of Schedule for inspection running hours working	
Types	Observe: Checking, Clear, Remove, Change, Overhaul
12K	Maintenance 12000 hours is maintenance of the Connecting Rod parts which include measuring, replacing or reconstructing worn components to get optimal operation. Work carried out on Semi Overhaul as: Top Overhaul Check, Inspection of all cylinder heads and their components, Inspection and measurement of Piston, Piston Ring, Cylinder Liner and Cylinder Head, Connecting Rod inspection, material replacement if needed, Turbocharger inspection and cleaning, Check for cracks, corrosion or wear, Check bearing lubrication, Machine capability testing, Add jobs 6K+4K+2K+1K
14K	<ul style="list-style-type: none"> <li>➤ Check and clean injectors</li> <li>➤ Check camshaft, crankshaft and flexible coupling</li> <li>➤ Check for looseness of bolts, nuts, gears and bearings</li> <li>➤ Check and replace cooling water</li> <li>➤ Checking the oil filter</li> </ul> Add jobs 2K+1K
16K	Maintenance of 16000 hours on the EDTL Machine includes measuring, replacing or reconditioning worn components to get optimal operating conditions. The work carried out is as follows: 16K Semi Overhaul work, if there is a material defect, it will be replaced. Crankshaft inspection and bearing inspection, and inspection of the tooth surface, Check the engine vibration damper, auxiliary equipment and machine testing
18K	<ul style="list-style-type: none"> <li>➤ Check the function and operation of security devices and alarm systems</li> <li>➤ Check valve and valve rotator</li> <li>➤ Changing governor lubrication</li> <li>➤ Check and clean the grease filter</li> <li>➤ Check the quality of cooling water and water treatment units</li> <li>➤ Check oil and battery viscosity</li> </ul> Add jobs 2K+1K
20K	<ul style="list-style-type: none"> <li>➤ Check and clean injectors</li> <li>➤ Check the camshaft, crankshaft and flexible coupling</li> </ul>

	<ul style="list-style-type: none"> <li>➤ Check the looseness of bolts, nuts, gears, and bearings</li> <li>➤ Check and replace cooling water</li> <li>➤ Checking the oil filter</li> </ul> Add jobs 4K+2K+1K
22K	<ul style="list-style-type: none"> <li>➤ Check and clean injectors</li> <li>➤ Check camshaft, crankshaft and flexible coupling</li> <li>➤ Check for looseness of bolts, nuts, gears and bearings</li> <li>➤ Check and replace cooling water</li> <li>➤ Checking the oil filter</li> </ul> Add jobs 2K+1K

**Figure 5.1. Table of the schedule running working hours**

Type of Schedule for inspection running hours working	
Types	Observe: Checking, Clear, Remove, Change, Overhaul
24K	Maintenance of 24000 hours on the EDTL Machine includes measuring, replacing or reconditioning worn components to get optimal operating conditions. The work carried out is as follows: 24K is Semi Overhaul work, if there is a material defect, it will be replaced, Crankshaft inspection, and bearing inspection, and inspection of the tooth surface, Check the engine vibration damper, auxiliary equipment and machine testing.
26K	<ul style="list-style-type: none"> <li>➤ Check oil filter</li> <li>➤ Remove oil filter</li> <li>➤ Clean oil filter</li> <li>➤ Change oil filter</li> </ul>
28K	<ul style="list-style-type: none"> <li>➤ Check oil filter</li> <li>➤ Remove oil filter</li> <li>➤ Clean oil filter</li> <li>➤ Change oil filter</li> </ul>
30K	<ul style="list-style-type: none"> <li>➤ Check and clean injectors</li> <li>➤ Check camshaft, crankshaft and flexible coupling</li> <li>➤ Check for looseness of bolts, nuts, gears and bearings</li> <li>➤ Check and replace cooling water</li> <li>➤ Checking the oil filter</li> </ul> Add jobs 2K+1K
32K	<ul style="list-style-type: none"> <li>➤ Check and clean injectors</li> <li>➤ Check the camshaft, crankshaft and flexible coupling</li> <li>➤ Check the looseness of bolts, nuts, gears, and bearings</li> <li>➤ Check and replace cooling water</li> <li>➤ Checking the oil filter</li> </ul> Add jobs 4K+2K+1K
34K	<ul style="list-style-type: none"> <li>➤ Check and clean injectors</li> <li>➤ Check camshaft, crankshaft and flexible coupling</li> <li>➤ Check for looseness of bolts, nuts, gears and bearings</li> </ul>

	<ul style="list-style-type: none"> <li>➤ Check and replace cooling water</li> <li>➤ Checking the oil filter</li> </ul> Add jobs 2K+1K

Figure 5.2. Table of the schedule running working hours

Type of Schedule for inspection running hours working	
Type	Observe: Checking, Clear, Remove, Change, Overhaul
36K	Maintenance of 36,000 hours on the Machine: overhaul total for Diesel Overhaul Services - General overhaul of diesel engine as per Maker manual instructions - Recondition of all Turbochargers - Overhaul and calibration of governors - Calibration and overhaul of engine components i.e. cylinder heads, pistons, connecting rods, etc. - Recondition and calibration of fuel injection pumps and injectors at workshop - Renewal of cylinder liners - Renewal of crankpin bearings and main bearing shells - Dismount and remount the alternator - Chemical cleaning of radiator - Calibration and functional test of safety devices - Engine commissioning, no load and load test - 72 hours engine reliability test.
	1K=3K=5K=7k=9K=11K=13K=15K=17K=19K = 21K=23K=25K=27K=29K=31K=33K=35K
	The definition is the number of working hours of power plant engine components that are not divisible by two, the function of working hours is equal to 1K
	36K = 36000 hours = 1500days = 4.1 years is an one period of working power plant engine to be overhaul. ENGINE OVERHAUL RESULTS As a result of seamless coordination between the on-site diesel service team and the workshop service team, experts completed the job within the agreed time frame of eight (8) days per engine finishing within the total project window of 60 days for the 7 units.

Figure 5.3. Table of the schedule running working hours

In carrying out and analysis engine power plant, by [26] his duties as maintenance, he does not carry out routine maintenance such as daily maintenance, weekly maintenance, monthly maintenance, or trimestral or even semesterly maintenance. Optimized schedule by [27] for all activities that are routine are inspections. Cleaning problems, checking is adjusted to working hours, unless in operation there are components that fail before working life, then they must be replaced immediately. When the failed component, it is necessary to stop the machine operation, it must be fulfilled, to replace a new one. The definition is the number of working hours of

power plant engine components that are not divisible by two, the function of working hours is equal to 1K.

**Diesel Engine Power Plant essentially consists of the following components [28]:**

- Engine.
- Fuel System
- Lubricating System
- Cooling System and Starting System
- Boiler for Heating Cooling Water
- Exhaust Gas System
- Air Filter and Supercharger.
- Radiator and Ventilator
- Governing System.

**Engine**

Diesel engines in power plants, are the prime mover. Diesel engines, using fuel, as thermal heat in the cylinder, to convert heat into mechanical, then mechanically converted into electrical energy [29].

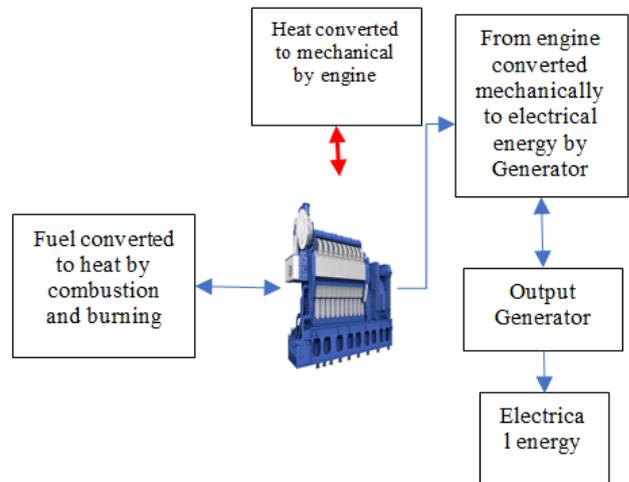


Figure 5.5. Engine Power Plant

**Fuel System**

Diesel engine fuel has an important role, in the operation of diesel engines as power plants. For this reason, the quality of the fuel must be maintained from contamination with other particles. Because the business world is now looking for profit [30] rather than maintaining the quality of diesel fuel. So before using diesel engine fuel, the quality of the fuel must be checked, so as not to easily damage components such as: Pump injection, plunger, nozzle, piston, piston ring, intake valve and gas exhaust valve.

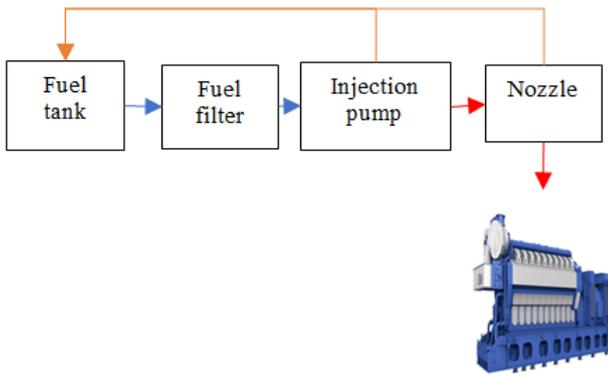


Figure 5.6. Fuel System of Engine Power Plant

**Lubrication Oil**

The engine lubrication system, which is present in the power plant engines at Hera and Betano, is a separate unit, [31] which supplies oil to the generating engine, non-stop. What is meant by non-stop is because the circulation of lubricating oil is always flowing in and out of the engine, whether the engine is in operation or the power plant engine is waiting for its turn to operate.

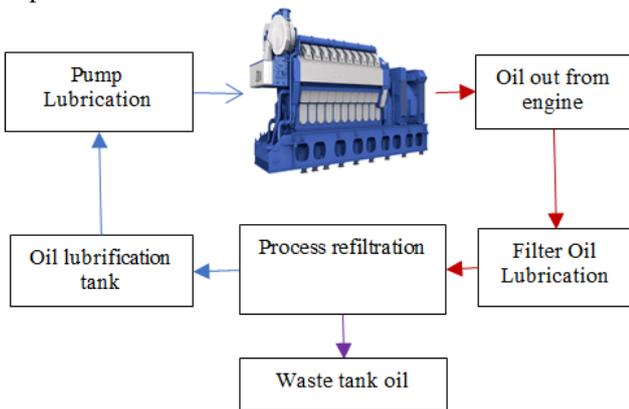


Figure 5.7. flowchart of circulation of lubrication engines oil

**Cooling Water**

We often hear about water cooling power plants. Sometimes our perception leads to water which, at normal temperature, is used for cooling power plant engines. The cooling water system for the power plants in Hera and Betano feels unique, because the cooling water to be used must be above an average temperature of 62 degrees to 80 degrees [32]. If the cooling water of the power plant engine does not meet the specified temperature, the engine will stop or cannot be started. How to keep the cooling water temperature constant? The answer to this question lies in the water heating kettle. The hot gas that comes out of the power generating machine, across the bars, and diverted into the holes in the pipes in a tank called the boiler. The surface of the pipes is submerged in the water tank, so the surface of the pipes will heat the surrounding water.

Cooling system of diesel power station does exactly so. The cooling system is required to carry heat from diesel engine to keep its temperature within safe limits [33]. The water pump circulates water to cylinder of diesel engine to carry away the

heat. The cooling tower is used for the same water reused. The system includes water circulating pumps, cooling towers are spraying ponds and water filtration or treatment plant.

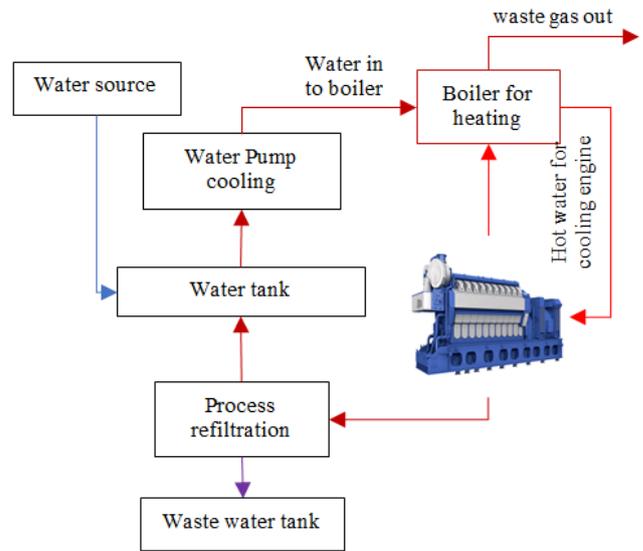


Figure 5.8. flowchart of circulation of heating water boiler for cooling engines

**Boiler for Heating Cooling Water**

Heating water for cooling power plants [34], sometimes called a boiler. The heat used to heat the engine cooling water is taken from the heat of the engine exhaust gases. The hot gas that comes out of the power generating machine, across the bars, and diverted into the holes in the pipes in a tank called the boiler. The surface of the pipes is submerged in the water tank, so the surface of the pipes will heat the surrounding water. Thus, it can maintain the temperature of the cooling water, to remain constant [35].

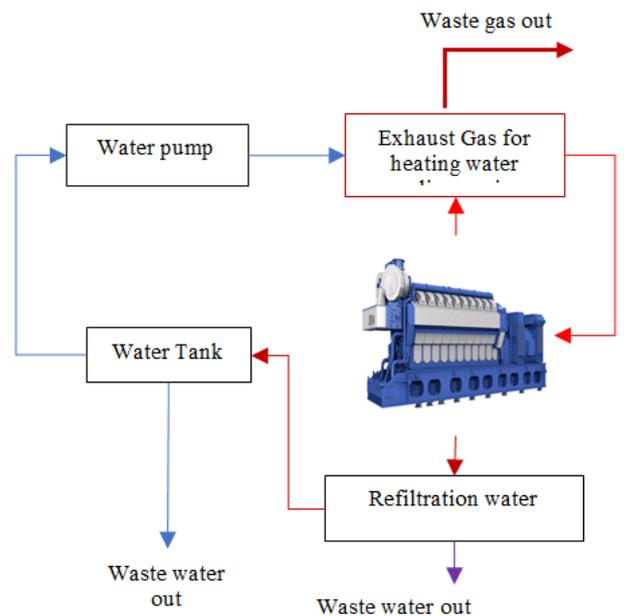


Figure 5.9. Boiler for heating water cooling Engine Power Plant.

## CONCLUSION

### 6.1.1 Safety Running Method

Safety running method for operated power plants, it is not necessary. Because it is made the wasted times, wasted number of power plants, wasted capacities of energies, wasted fuel, wasted spare parts, wasted money for all activity maintenances.

### 6.1.2. Efficiency Running Method

Efficiency running method [36], for operation power plants, it is very suggested, because to minimized wasted times, and operational cost of power plants.

### 6.1.3. Implication of Both Methods.

The implications of both methods are possible consequences, in theoretical and practical [37] are not balanced each other. Because safety running is very abstracted and are possible consequence cannot predicable in order to minimized operational cost. The other hand efficiency running it is explicitly are possibility to maximized efficiency and ensure performance of live time cycle of power plant, and minimized cost operation.

### 6.1.4. Limitation of The Theory and Method.

Root cause analysis by [38] to performing routine troubleshooting and diagnosing diesel engine of power plant, doing every day to ensure performance live time cycle and retrofits of engines. In these arrangements, public entrepreneur engine diesel Timor Leste (EDTL) works with end customers to define specifically what the scope and periodicity of the support will entail. Contractor (Wartsila) can provide full turn-key project support where they supply all of the required spares and perform all maintenance required on the engine. Public Entrepreneur engine diesel Timor Leste (EDTL) can also accommodate scenarios where the customer/contractor [39] provides parts and components of the required service, while contractor (Wartsila) delivers against a more tightly [40] and well-defined scope. From an efficiency perspective, contractor (Wartsila) has developed "swing set" [41] maintenance programs task with operators local (owner) and Contractor experts either with multiple engines of the same execution or those who cannot afford, the downtime of component overhaul on site. In these cases, preventive maintenance strategies for deregulation by [42] an extra set of major components that generally includes: Cylinder Heads, Fuel Pumps, fuel injectors, cylinder liners, Pistons is purchased for rechanging engines component and retrofit engine condition. Technician often also doing turbochargers, governors and air coolers.

### Suggestions for the Future Research.

The most important things, bottom line is that preventive maintenance tasks [43] can be the best way to help, Hera and Betano engines power plants reduce engines breakdowns. Minimize downtime, increase efficiency and extend equipment life. However, it is important to consider things like understanding what type of situation and what type of equipment would benefit [44] the most from a solid preventive maintenance task.

Be sure to identify critical assets that play a critical role in the day-to-day operation of engines power generation or are critical to employee safety or environmental compliance. In addition, if you want to identify potential sources of equipment failure, so that preventive maintenance tasks can be linked directly to improve reliability.

Once the foundation is established, ensure the maintenance support facilities in the team, people to carry out the task successfully. Clear and complete instructions, [45] as well as technician training, will go a long way towards the effectiveness of preventive maintenance tasks. Finally, set systematic steps to track all tasks, inventory and data on an ongoing basis. If the data collection is of high quality throughout the process, the management team will have excellent resources [46] to analyze critical equipment performance and will make smarter decisions in the long run. The next research to be pointed on quality of engines fuel. Phenomenal to fuel injection and combustion in cylinders. If the fuel is of low quality it will affect the quality of combustion in the cylinder, and will damage the injector components.

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# Linking Dry port with Intermodal Transport: Opportunities and Challenges

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## Abstract

Most Ports are not as effective as they should be and are becoming barriers to foreign trade. most of them have not been able to meet the demands of modern trade. another type of problems that have a negative effect on the port performance such as, lack of capacity of the stations that leads to decrease service of cargo areas of ports, increases the duration of customs clearance procedures. The concept of dry ports come because of increased competitiveness and growth in the volume and the global trade movement, which led to an increase in the demand for transport services. So, the aim of this research to verify opportunities and challenges that are facing the connectivity between dry port and intermodal transport through conducting semi structured interviews.

This research will have an original contribution through highlighting the importance of the linkage between dry port and intermodal transport and its impact on the port in terms of opportunities and barriers.

## Keywords

*Dry ports, Intermodal transport, Seaports, SWOT Analysis.*

## I. INTRODUCTION

Ports are frequently unable to handle and manage these product movements, and the traffic of heavy-duty vehicles around the seaport can cause relevant congestion and environmental problems. In addition to that shipping companies faces many difficulties in procedures due to delays, including damage to the goods. These of logistics systems can play in reducing these problems (Chandrakant, 2011). However, logistics concepts, in their role of decreasing obstacles in ports, have not been extensively researched until recently (Chandrakant, 2011)One of these concepts is a concept of dry port that, apart from reducing those problems(Roso, 2013),it has the potential to create numerous benefits for the actors of transport systems. In the past decades, dry ports have been adopted in both developed and developing countries to promote inland logistics or advance port-inland connectivity. Moreover, the emergence of the concept of 'dry ports' helped provide an integrated approach to solve the problems of regulating cargo flows (Roso, 2013) as the dry port is an intermodal inland terminal that has a direct rail connection to A sea port, where customers can leave or collect their goods in multi-modal loading units, as if they were directly from the sea port and have value-added services such as warehousing, consolidation, warehousing, tracking, tracing and maintenance Containers and customs clearance in dry ports (Varese et al., 2020)

This paper has been prorated in a total of five sections. Section 1 introductory phase which gave an overview of the research. Section 2 the literature review which shed the lights on verifying the relationship between dry ports and intermodal transport. Section 3 semi-structured interviews analysis and this section will be finalized through SWOT

analysis, Section 4 Discussion and findings, Finally, Section 5 concluded with the further research.

## II. LITERATURE REVIEW

The first studies regarding indoor terminals date back to the early 1980s.. The term "dry port" was initially used to describe the solution to the problem of increasing congestion at port gates, by redistributing the flows of goods arriving by sea. The United Nations Conference on Trade and Development - UNCTAD - proposes the following definition of dry ports: "An inland terminal to which shippers issue their bill of lading for import goods with full responsibility for the cost and conditions from which the shippers issue their bill of lading (Varese et al., 2020)

A dry port becomes part of a competitive transportation system that has numerous stakeholders with different strategies and interests. As far as the port and terminal management is concerned, enhancing operational flexibility should be given more attention to face the increasing demand. On the other hand, the levels of inefficiency resulting from the capacity problem. As regards governments, some measures should be put in place to help port operators. However, logistics concepts, in their role of decreasing obstacles in ports, have not been extensively researched until recently (Jørsfeldt, L.M., Hvolby, H., & Nguyen, 2016).

The growth stage of dry port development, referred to as "development outside and-inside," requires a joint effort towards dry port development by different actors engaged in hinterland transportation(Shafran, 2014)dry ports are elements of a hinterland transportation system, and their development depends on the state of other infrastructure. (Khaslavskaya & Roso, 2020)The most widely used definition of a dry port is the one suggested (Khaslavskaya & Roso, 2019)

“A dry port is an inland intermodal terminal directly connected to seaport with high capacity transport means, where customers can leave/pick up their standardized units as if directly to a seaport.” However, as noted by the author, “no two dry ports are the same.” Dry ports exist in very different forms and arrangements under different terms around the world, and they differ in location, functionality, maturity level, ownership, and initiation processes. (Khaslavskaya & Roso, 2020)

Dry port and intermodal transport could be a potential alternative to seaport congestion in addition to improving port service that is currently focused on rail. It is generally believed that multimodal transport is applicable in markets with higher flows or long distances; Due to the costs of congestion, increasing environmental restrictions, and the competitiveness of seaports. (Roso, 2013) seaport with a strong link between on-dock and off-dock terminals. They act as extensions of seaports with the purpose of dealing with problems at seaport terminals, such as land shortage, congestion or local environmental issues. A mid-range dry port or Trans loading terminal is set in the middle point between a seaport and its end market and works as a consolidation point for different rail services. Such terminals are mostly found at country or state borders, as identified by Beresford et al. (2012).

dry ports can also be inserted along long-distance transport corridors, such as in the context of the Belt and Road initiative (Wei, Sheng, and Lee 2017). Distant dry ports or load centers are situated in the proximity of the end markets, such as consumption areas or export-based industrial zones to consolidate or deconsolidate cargo from/ to such market. (Ambrosino et al., 2021)

### III. RESEARCH METHODOLOGY

The aim of this paper to identify the main opportunities and obstacles that faces the linkage between dry ports and intermodal transport. This objective will be done through conducting semi structured interviews. the target participants in the interviews are 10 participants, preselected from some officials in the Ministry of Transport and some officials at railway stations, academics working in this field, officials from the Roads Authority and Ports Authority, and some officials in dry ports. the interviewees are asked about their points of view concerning the following aspects.

- Importance of Dry ports in terms of their weaknesses and strengthens points.
- Barriers of facing applying the connectivity between dry ports and intermodal transport.
- Opportunities behind having dry ports connected with intermodal transport.

Then, transpose SWOT analysis based on the output of the interviews analysis.

Data collected from interviews was analyzed by applying the thematic analysis using NVIVO software package. The findings of the study are presented in this research with the purpose of introducing a qualitative analysis of Factors that affect having dry port connected with intermodal transport opportunities and barriers.

### IV. DISCUSSION & RESULTS

This section will analyze the interview questions in terms of opportunities, barriers, strengths, and weaknesses points, and it will be concluded with SWOT analysis.

The interviews were conducted with people working in fields related to dry ports and intermodal transport.

Firstly, from the interviews, the theme of dry ports importance is generated, and from it several codes are generated, represented in the following: international trade, prices, and cost, facilitates transportation, weakness, strength and customs clearance. These codes are illustrated in Figure 1, where the codes are presented for the theme of dry ports importance.

#### A. International Trade

International trade was the first code that appeared in the theme of dry ports importance, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in several evidence that appeared in the statements of the participants in the interviews. The interviews considered that international trade are a code and an important and influential element in the study, which affects the efficiency and direction of dry ports.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the international trade code. Evidence appeared in the first interview, and this evidence were as follows: “To the lack of an international information network”. Moreover, some evidence appeared in the eighth interview.

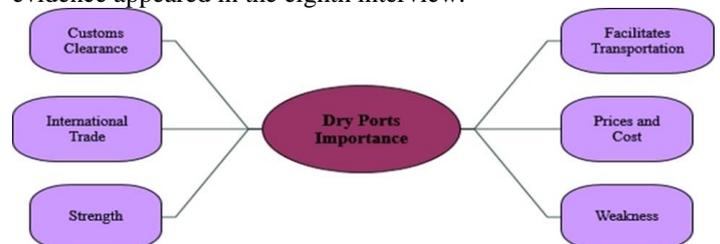


Fig.1. Theme of Dry Ports Importance

This evidence was as follows: “Dry or land ports are one of international trade activities and the movement of international trade goods from exports and imports”, “Dry ports also play an important role in serving the national economy through handling containers and supporting international trade, and within the framework of the state’s general policy to encourage travel movement, develop the volume of intra-Arab trade” and “Lifting the burden on seaports, reducing the accumulation of goods and activating the activity of containers in them at the regional and international levels”.

#### B. Prices and Cost

Prices and cost were the second code that appeared in the theme of dry ports importance, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in several evidence that appeared in the statements of the participants in the interviews. The interviews

considered that prices and cost are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the prices and cost code. Evidence appeared in the second and third interviews, and these evidences were as follows: “The price of storage in the dry port is lower”, “Is it transported on the dry port due to price competition? because of the price of the dry port is cheaper”, “The cost is expensive since the smallest dry port is Damietta dry Port, which is 15 acres and costs \$20 million” and “Service and pricing, which are some of the most significant elements that attract customers, including quality and speed in providing services”. Moreover, some evidence appeared in the fourth, seventh and ninth interview. This evidence was as follows: “Allowing larger storage durations and pricing advantages to encourage storage in dry ports”, “Containers to this port cause a high” and “The cost per square meter in the dry port is 10% of the cost in the seaport, so the best opportunity will be in the dry port, in addition to the decrease in cost and the increase in the allowing period”.

#### **C. Facilitates Transportation**

Facilitates transportation were the third code that appeared in the theme of dry ports importance, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in several evidence that appeared in the statements of the participants in the interviews. The interviews considered that facilitates transportation are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the facilitates transportation code. Evidence appeared in the third interview, and this evidence were as follows: “It facilitates trade interchange between industrial regions by connecting them to seaports, while also facilitating the flow of trade in the processes (export and import goods) between the stakeholders of the shipment”.

Moreover, some evidence appeared in the fourth, fifth and eighth interview. This evidence was as follows: “It facilitates trade interchange between industrial regions by connecting them to seaports, while also facilitating the flow of cargo movement”, “It is facilitating the flow of goods from seaports. And to end transit procedures”, “So, the 6th of October port facilitates the transit movement and the completion of customs procedures” and “Facilitate transportation procedures for vehicles and encourage land transit trade”.

#### **D. Weakness**

Weakness was the fourth code that appeared in the theme of dry ports importance, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that weakness are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the weakness code. Evidence appeared in the first interview, and these evidences were as follows: “Dry ports are of great importance, but in the case of the deterioration of the infrastructure of roads, bridges and railways, they will be weak points and require development”. Moreover, some evidence appeared in the tenth interview. This evidence was as follows: “The weaknesses are represented in the problem of connecting the dry port to the railway”.

#### **E. Strength**

Strength was the fifth code that appeared in the theme of dry ports importance, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that strength are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the strength code. Evidence appeared in the second interview, and these evidences were as follows: “Before applying the (ACI system), the dry ports had a high competitiveness because the procedures for release, storage, and exchange in the dry ports are better than those in the seaports” and “The time to keep the container in the yard in the dry port is better, as the container can be stored in the dry port and released about two or 3 times”.

Moreover, some evidence appeared in the sixth and seventh interview. This evidence was as follows: “As the goods are automatically exited on X-RAY, the goods of the dry port are remote from the container yards and waiting areas, which helps reduce bottlenecks outside the port gates”, “The strength of the dry port is that when the pressure on the seaports decreases”, “The border areas will have to handle more” and “To its proximity to the industrial areas”.

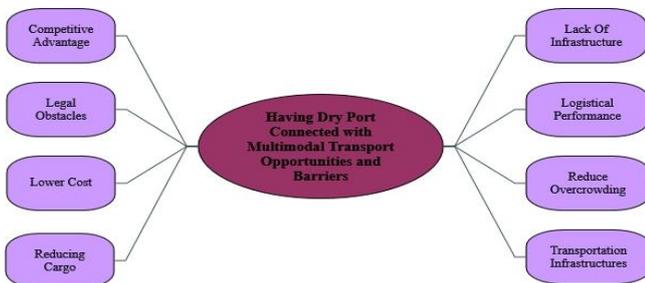
#### **F. Customs Clearance**

Customs clearance was the sixth code that appeared in the theme of dry ports importance, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The

interviews considered that customs clearance are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the customs clearance code. Evidence appeared in the sixth interview, and this evidence were as follows: “The ACI system for shipments, logistic centers were established inside the seaports became responsible for customs clearance. This system will help in a boom and a complete transformation of customs procedures”.

Moreover, some evidence appeared in the seventh and tenth interview. This evidence was as follows: “Due to the ease of customs clearance procedures and speed, then the goods are transported to the sea port”, “The speedy completion of customs procedures and reduces the pressure on the seaports”, “Because of the delayed customs processes, a decrease in the performance index is expected following the implementation of the ACI system” and “Reducing overcrowding inside the ports, withdrawing goods, and completing customs clearance operations, it reduces the idea of empty trips, because the truck that arrived at the dry port with raw materials to make added value and re-export without paying any customs taxes because it is a customs-exclusive manufacturing area”.



**Fig.2. Theme of Having Dry Port Connected with Multimodal Transport Opportunities and Barriers**

Secondly, theme of having dry port connected with multimodal transport opportunities and barriers, and from it several codes are generated, represented in the following: transportation infrastructures, competitive advantage, reduce overcrowding, reducing cargo, lower cost, logistical performance, lack of infrastructure and legal obstacles. These codes are illustrated in Figure 2, where the codes are presented for the theme of having dry port connected with multimodal transport opportunities and barriers.

**A. Transportation Infrastructures**

Transportation infrastructures was the first code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that transportation

infrastructures are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the transportation infrastructures code. Evidence appeared in the first, second and fourth interviews, and these evidences were as follows: “The continuous development of transportation infrastructures such as land transport (cargo transportation), railways, and river transport”, “Develop the infrastructure of railways and roads to facilitate the cargo movement from seaports to the dry ports through different modes of transport”, “Infrastructure such as roads, bridges, railways, and connecting them to dry ports to facilitate cargo movement”, “Its connection to river transport or railway transport and to be near an industrial area and an agricultural or industrial production area because it is a commercial hub for the flow of goods”, “The continuous development of transportation infrastructures” and “Service and pricing, and speed in providing services. Infrastructure such as roads, bridges, railways, and connecting them to dry ports to facilitate cargo movement”.

Moreover, some evidence appeared in the sixth, seventh, eighth and tenth interviews. This evidence was as follows: “It has established a legal environment that governs the operation of dry ports and multimodal transport”, “Multimodal transportation plays a role in the development of dry ports. Currently, rail transport accounts for 90% of all dry port activities”, “a railway was built from Al-Manashi Station in Giza to the 6th of October Dry Port transporting containers from and the 6th of October Dry Port, thus providing the infrastructure and rail transport to save the cost of trucking”, “Supporting the Egyptian national economy by increasing the revenues generated from transporting and trading goods”, “Infrastructure and transportation readiness to accommodate the quantities of goods flowing from sea ports to dry ports”, “It was to ensure the infrastructure of railways and land transport” and “The infrastructure qualified for this connection, there must be Legal legislation and a link with an international operator”.

**B. Competitive Advantage**

Competitive advantage was the second code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that competitive advantage are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the

competitive advantage code. Evidence appeared in the second and fourth interviews, and these evidences were as follows: “The fact that customs warehouses are the largest competitor to the dry port”, “The competitive advantage of the 6th of October Dry Port is the work of the railway link”, “This link is a competitive advantage for this port, in addition to the fact that customs warehouses are more competitive because they were established 15 years ago” and “Competition between dry ports and seaports”.

Moreover, some evidence appeared in the sixth, seventh and eighth interviews. This evidence was as follows: “Competition between dry ports, seaports, and container handling companies is one of the obstacles that affect Egypt's dry ports, leading to an increased crisis for the dry ports”, “Competition between dry ports and seaports”, “The competitiveness of the dry port in terms of cost and its connection to the railway, which gives a competitive advantage to the customer and it is preferable to deal with the dry port”, “Expedite the operations that take place inside the dry port to show a competitive advantage over other sea ports or warehouses”, “Keeping abreast of global trends to facilitate cross-border trade and achieve competitive advantages for investment in Egypt by improving the rates of time taken to complete customs release and export procedures” and “The competition between dry ports, seaports, and container handling companies is one of the obstacles that affect Egypt's dry ports, leading to an increased crisis for the dry ports”.

#### **C. Reduce Overcrowding**

Reduce overcrowding was the third code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that reduce overcrowding are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the reduce overcrowding code. Evidence appeared in the second and third interviews, and these evidences were as follows: “The 6th October dry port aims to reduce overcrowding and obtain a market share of customs warehouses” and “The main opportunity from establishing dry port is reducing overcrowding in seaports and allowing for an increase in ship operations at the seaport, as well as accelerating commodities distribution from the seaport to the dry port and decreasing the duration of (import and export containers) in seaports”.

Moreover, some evidence appeared in the seventh, eighth, ninth and tenth interviews. This evidence was as follows: “As more dry ports spread throughout the republic and linked to a railway transport network, the more relief in the seaports is in addition to speed, in addition to the speedy completion of

*customs procedures and reduces the pressure on the seaports”, “Reducing the pressure on seaports, preventing the accumulation of goods and containers in them, and maximizing the use of port expansions to revive international trade and transit”, “Getting rid of the problem of overcrowding in seaports, linking seaports with neighboring cities, facilitating the process of multimodal transport” and “Reducing overcrowding inside the port, in addition to increasing the withdrawal rates of goods from sea ports”.*

#### **D.Reducing Cargo**

Reducing cargo was the fourth code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that reducing cargo are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the reducing cargo code. Evidence appeared in the fourth interview, and these evidences were as follows: “There are many opportunities of connecting seaport with dry port, such as increasing the rates of cargo in seaports”. Moreover, some evidence appeared in the fifth interview. This evidence was as follows: “Reducing cargo bottlenecks inside and outside seaports, in addition to speeding up customs release of shipments, ending procedures and facilitating the indirect transit process”.

#### **E. Lower Cost**

Lower cost was the fifth code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that lower cost are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the lower cost code. Evidence appeared in the fifth interview, and these evidences were as follows: “The fact that the cost in land ports is lower and storage areas are larger than in seaports, as seaports aim to trade from and to ships”. Moreover, some evidence appeared in the ninth interview. This evidence was as follows: “Reducing the net operating costs of multimodal transport, which leads to an increase in trade” and “Shipping goods by rail or trucks over long

distances is cheaper than any other means of land transport, and the seaports”.

#### ***F. Logistical Performance***

Logistical performance was the sixth code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that logistical performance are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the logistical performance code. Evidence appeared in the seventh interview, and these evidences were as follows: “The more evaluating the country's logistical performance, as Egypt is annually decreasing in the logistical performance index. Because of the delayed customs processes, a decrease in the performance index is expected following the implementation of the ACI system” and “The more evaluating the country's logistical performance, as Egypt is annually decreasing in the logistical performance index”.

Moreover, some evidence appeared in the eighth, ninth and tenth interview. This evidence was as follows: “Improving the level of logistics services provided, which contributes to increasing the movement of exports and imports”, “These ports have become a logistical center for activities that add value to the port, such as service activities to end all administrative matters such as shipping agencies, banks, insurance companies, customs, information and communication centers, in addition to a network of river, land and railway roads” and “Since the multimodal transport agreement has not entered into force, in addition to the fact that the agreement did not reach the minimum level of approvals to be applied in Egypt, the multimodal bill of lading is not recognized and there is no multimodal transport operator, and in the case of problems, there is no legislative system for this agreement”.

#### ***G. Lack of Infrastructure***

Lack of infrastructure was the seventh code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that lack of infrastructure are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials

at dry ports. Generate some directories that expressed the lack of infrastructure code. Evidence appeared in the first and second interviews, and these evidences were as follows: “Lack of infrastructure such as roads, bridges, railways, and not connecting them with dry ports, besides unavailability of electronic connectivity”, “The location of the land ports is on the trade hubs located in Egypt and that they are linked to the railways before the roads”, “Currently a railway is being established and two proposals for an external participation to operate the lines, as the movement of goods trade will start from the exit of goods from the sea port to the dry port” and “The requirements of any dry port and the presence of a handling station from the railway to the yard, in addition to the bill of lading in which all means of transport that handled goods are mentioned”.

Moreover, some evidence appeared in the fourth, fifth, ninth and tenth interview. This evidence was as follows: “Lack of infrastructure such as roads, bridges, and railways”, “There was no correct concept of the land and dry ports, besides, there was no obstacle facing the land ports, as they were planned to be established and linked to the railways”, “The main barriers of any dry port the presence of a handling station from the railway to the yard, in addition to the bill of lading in which all means of transport that handled goods are mentioned” and “Infrastructure that links seaports and dry ports, as well as efficient roadways and trains, as well as a regulatory system that controls activities”

#### ***H. Legal Obstacles***

Legal obstacles were the eighth code that appeared in the theme of having dry port connected with multimodal transport opportunities and barriers, as it was one of the actors on which the interviews that had an impact on this theme. This appeared in a number of evidence that appeared in the statements of the participants in the interviews. The interviews considered that legal obstacles are a code and an important and influential element in the study of the objectives of the study, which affects the efficiency and direction of dry ports in Egypt.

The evidence emerged in interviews with some officials at the Ministry of Transport stations and some officials at railways, after academics working in this field, officials from the Roads Authority and Ports Authority, and some officials at dry ports. Generate some directories that expressed the legal obstacles code. Evidence appeared in the third and fourth interviews, and these evidences were as follows: “Legal obstacles due to Egypt's non-implementation of the agreement” and “The necessity of activating a legal system related to dry ports within a specific legislative framework”. Moreover, some evidence appeared in the fourth, fifth, ninth and tenth interview. This evidence was as follows: “The necessity of activating a legal system related to dry ports within a specific legislative framework”.

*The following table1. (SWOT ANALYSIS) will summarize the output of the interview analysis. Based on which opportunities, obstacles, strengths, and weakness that have an impact on the linkage between dry ports and intermodal.*

Table.1. SWOT Analysis of linking Dry ports and Intermodal Transport

Strengths	Weaknesses
Services provided Facilitating the indirect transit process Lower Cost in dry ports Larger Storage areas than in seaports. Reducing empty trips	Infrastructure of roads and railways Legislative framework related to dry ports Lack of experience Lack of an international information network.
Opportunities	Threats
Reducing overcrowding inside the port Increasing the withdrawal rates of goods from seaports Speeding up customs procedures release of shipments .	Infrastructure and transportation readiness Lack of connection of railways to all ports. competition between dry ports, seaports, and container handling companies Procedures require a large financial guarantee.

### V. CONCLUSION

This paper aims to give an overview about the main opportunities and challenges faces the connectivity between dry ports and intermodal transport.

Data gathered through conducting some interviews with some responsible persons. this data collected from interviews was analyzed by applying the thematic analysis through NVIVO software package

. Firstly, the theme of “dry port importance” was the first theme and from it several codes are generated, represented in the following: international trade, prices and cost, facilitates transportation, weakness, strength and customs clearance.

Secondly, the theme “Having dry port connected with multimodal transport opportunities and barriers” from it several codes are generated, represented in the following: transportation infrastructures, competitive advantage, reduce overcrowding, reducing cargo, lower cost, logistical performance, lack of infrastructure and legal obstacles.

And concluding through SWOT analysis to summarizes the four main strategic factors (SWOT) highlighting the opportunities and barriers of having dry ports connected with intermodal transport. And the main findings extracted from this paper: the dry port reducing the pressure on seaports, preventing the accumulation of goods and containers, completing customs clearance operations, it reduces the idea of empty trips, because the truck that arrived at the dry port with raw materials to make added value and re-export without paying any customs, and necessity of activating a legal system related to dry ports within a specific legislative framework.

### VI. FURTHER RESEARCH

This research is essential as it explains the potential of the concept of dry ports and intermodal transport to highlight the opportunities and obstacles of having dry ports connected with intermodal transport

Moreover, other researchers could use the output of this paper by applying case study on other ports or other countries. The four main strategic factors (SWOT Analysis) of the dry ports and intermodal transport were illustrated, and it is concluded that the dry ports could avoid some of its weaknesses by enhancing the strength points and grabbing some of the opportunities.

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# Designing Interaction Video Game “Tapel Saga” for Mobile Application

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## Abstract

Utilize the interaction design form the video game “Tapel Saga” with android base to respond the teenager’s mental problem and deliver the good values to the teenagers. In other ways, this interaction design can be used to taking the advatage of the positive side of video game. The main points of its design are focused on four elements where it contains the function, understandability, convinient, and the feeling. This four main point used to allow players are getting the psychological pleasure. When the design has purpose (for example when it was used for open menu) and easy to understand when the user or player get noticed on the first saw, the click doesn’t complex and the user doesn’t bother when press the button, the design would scored as a good design. These good interaction design was very important for the game design so the player could have good experience while playing it. So, this is why the interface of the must be designed so well with the four main point of design element. Because this not only affects the player experience about the convenience while using or play the “Tapel Saga” game, but also affect the player’s emotion and the player’s capability to play the game so well.

## Keywords

*Game; Game Design; Interaction Design; Human Computer Interaction.*

## I. INTRODUCTION

Ports In this digital world era, computerized technology is growing rapidly. One of them is the world of games where games that are usually played physically begin to enter the digital world, namely video games or what are commonly called video games. On the other hand, mental problems do not only occur in adults but can also occur in adolescents. According to National Alliance of Mental illness, the population who has the mental disorders aged more than 18 years is estimated that there are around 61.5 million of people, 13.6 million people among them are encounter several mental illness such as schizophrenia or bipolar disorder. People who experience depression around 35 million people, people with bipolar disorder occur about 60 million people, schizophrenia occurs around 21 million people, and dementia occurs around 47.5 million people. The same condition was happen in Indonesian as a developed country. Aording to the data from the Basic Health Research (Risksedas) in 2018 says that around 6.1% from the indonesian civilian shows the symptom of depression and anxienty [1].

Video games themselves have their own advantages for players, especially for teenagers. One of the advantages of playing games is that it makes people smarter. Recently, 116 scientific studies have been compiled and summarized the results by researchers to determine how the addiction of

online games could changing the function and the structure of a brain, and affect the common behavior of the players. According to the various studies, video games just not only change how the brain works but also the structure of the brain. For the example, video games are not just affect the level of player focus but also the thinking ability of the brain. For addition, many researches have giving statement that players who ussually play online games can became more focused compared to people who don't play the online game. The recent research that has been done by researcher has also found that video games can increase the ability of brain to capture the visual image (which are seen with the eye). For the examples, speed reading, differentiate shapes and colors, also about placing an object correctly [2].

By taking advantage of the positive side of video games, the Team can deliver a message of kindness through video games. After consider of few things, the writer decide that the good Human and computer interaction design was important to deliver a message of kindness of the application “Tapel Saga” games. The common development cycle covers three main parts among them are designing, development, and testing. On the design stage, Team will design the mechanic of the game also design the UI and position of the UI that would be done. This design will decide wether the interaction design that would be made will be good or bad and in this case, this is the main problem. The team would be design the model and shape of the buttons including font and color that

would be used. But usually, the design of the interaction design, that was made doesn't match with the player experience. So, it become a problematic for making a good design for human and computer interaction design.

## II. GOAL

Utilize the interaction design form the video game "Tapel Saga" with android base to respond the teenager's mental problem and deliver the good values to the teenagers. In other ways, this interaction design can be used to taking the advatage of the positive side of video game. To achieve that goal, the interaction design must be designed as good as possible so the values of the game can delivered well to the players.

## III. METHODOLOGY AND DATASET

A literature review is a literature that review previous work based on any available given research question. It was contained summary, analysis and evaluation of the previous works. The other one is about explanation of the reviewed research that has been already performed for the simmlar research area [3].

(1) Choose a topics is the first step that must to do when want to make a literature review. This could be taken form the research question where it contains further investigation area that was wish to do. After making choice of the research area that wanted to invetigate further, the writer have to analyze it and then search the related part of the works, try to change the sentence with the synonyms and alternate words, anything to do will help for searching the current content for the research [3].

After (1) Choose topics, the next step is (2) formulate a search strategy. Take a note the main point that important to writer would looking for. Take point at the available resources and deside which one are most appropriate for needs. Always check the quantity of results to know that how much of the quantity. The quantity also give clue to narrow or expand the search. Sometimes the works need to be narrow. Always watch the boundaries of the research question, check that the resource could in or should be excluded. The writer may also need to review the initial question for checking the data found [3].

The Next one, writer should know about what is game itself. According to Ernest Adams, Games emerge from human desire to having fun (play) and capacity of human to have an imaginary world (pretend). Play is one of human activities that has a wide category of nonessential, and usually recreational, it was developed by social significantly. Pretending is the ability to crate an imaginary world that the player (pretender) always know the different between reality and imaginary world. Playing and pretending are the main element for playing games. Both was learned in detail as cultural and psychological phenomena. Games are so Complicated, so its was difficult to create a definition that could satisfied. So the convenient definition that cover many cases, GAMES are one of a type of play activity, held in an imaginary world, the participant(s) always try to achieve the achievement, the goal must still in the rules boundary. Maybe there are many exception, the activities that easy to recognize

as a game but it doesn't appropriate with the definition, it still a game. The definition should be pratical than theoretical [4]. After that, we need to know about the interaction design. Interaction design is one of the important part as a part of the user experience (UX) design. Interaction design could be understood as the design of interaction between human and machine [5].

## IV. PREVIOUS WORK

According to "An Interaction Design for Machine Teaching to Develop AI Tutors". They make a novel interaction design to create an "intelligent tutoring systems" to train Simulated Learners. They demonstrated their novel interaction design that supports the users while creating a nearly model-tracing complete intelligent tutoring systems in short time. In the end, they provided any design recommendations if needed for future work that related to "Simulated Learner" based on authoring tools [6].

Another paper describes the design of an automated assessment and training tool for psychotherapists beside to make illustration challenges with creating an interactive machine-learning systems, especially in contexts where human life, livelihood, and wellbeing. They explore interaction design and machine learning apply to the psychotherapy context with the existing theory, and identify "contestability" as a new principle for designing systems. The system would be used to evaluate human behavior [7].

The next one is the paper titled that written by Preist, Schien, and Shabajee. They testing about Sustainable Interaction Design for digital services especially youtube. They explore how Sustainable Interaction Design could contribute for greenhouse gas reduction [8].

In the other one, there is paper titled "Model-driven Framework for Human Machine Interaction Design in Industry 4.0". They talk about the new Human and Machine Interaction (could be Human and Computer Interaction) solutions are required for the workers's demands in the factory which is the industry still evolving [9].

Other work titled "A Framework of Touchscreen Interaction Design Recommendations for Children (TIDRC): Characterizing the Gap between Research Evidence and Design Practice" discussed about how the Touchscreen Interaction Design Recommendations for Children could work properly especially for children. They introduce their framework that named "Touchscreen Interaction Design Recommendations for Children". The test was done with an empirical analysis of 50 iPad application for children with research-based design guidelines are being implemented in practice. Many application tried to accommodate children's physical abilities, there was a great disconnect between design practice and recommendations that actually used to meet the children's cognitive also to meet socio-emotional needs [10].

"Understanding Interaction Design Challenges in Mobile Extreme Citizen Science" by Veljko Pejovic and Artemis Skarlatidou in 2019 is telling about Extreme citizen science that exercise for empower human being through assisting them, through procedure and technological tools, to seek out solutions for native problems, yet additionally to address the most important sustainability challenges situations in 21st

century. We gather 9 professionals who study and work with extreme citizen science for information purposes and who have spent large time in developing area operating with low-literate groups to setup strategies and solution that customized to users' particular wishes and contextual characteristics. Guidance is spreading through the textual content in thematically prepared section with a purpose to maintain the history at the observation that led to the components of exact recommendations [11].

On the paper titled "Do you trust me?": Increasing User-Trust by Integrating Virtual Agents in Explainable AI Interaction Design" concluded that inside this paper they tested the effect of digital sellers inside the subject of XAI at the perceived trust via human end-users to this end, they performed a user-study which they provided visible reasons of predictions made via automated speech and recognition system to user. Their outcomes shown that the mixture of XAI techniques with linguistic statistics provided with the aid of using an agent it may be useful for bringing honest AI system to end-users and accordingly make contributions in the direction of a liable AI [12].

Other worked with titled "AV-Pedestrian Interaction Design Using a Pedestrian Mixed Traffic Simulator" discuss about how interaction will impact the pedestrian safety. In their current duty, they explore a subset of things that may influence pedestrian behavior at a crosswalk. We confirmed on Foot towards previous simulation and Wizard-of-Oz studies, and carried out a user study, interfaces, behavior of pedestrian group, and manipulating vehicles 'autonomy level [13].

The paper titled "Digital Outdoor Play: Benefits and Risks from an Interaction Design Perspective" discuss about Outside play has been confirmed to be useful for child progress of development. HCI studies on Heads-Up Games indicates that the famous decline in outside play may be addressed through including technology to such action [14]. "Comparison and Analysis of FPS Mobile Game Interaction Design" by Shi-Yu Wang, Young-Hwan Pan discuss about analysis of interaction design on FPS mobile game. Mobile video games have come to be an tremendous desire for plenty human beings to spend their time and have fun with life. Among many forms of mobile video games, Number of gamers of FPS games has expanded in current years. In mobile video games, outstanding emotional interaction experience cannot only evolve the stickiness of gamers, however additionally allow gamers to consider that the means of themselves and matters in fact from the game and encourage human being to some positive energy, that's one of the values of the game [15].

"The Design Journal" was released a work that discuss about interaction design in museum. The paper is telling about how to raise the experience in museum with a robotic activity conceived in codesign with some museum stakeholders. The intelligence of the robotic which lets in it to transport and be pushed in a semi-autonomously manner through the vacationer gives an enjoy extra empathetic and much less detached. Truth that in interactive elements robotic takes complete benefit of its potential. [16].

Next paper titled "Application of Human Computer Interaction Interface in Game Design" discuss about how the

game design affect the user experience through HCI. The shape of interaction design is mentioned from the mode of operation, statistics show and the comments layout. The Production of the interface style, layout specs, and the theme of the environment is aimed toward exploring the style of visual design; from dynamic loading and exciting layout to discover the dynamic of overall performance design [17].

The paper titled "Mobile game-based learning as a solution in COVID-19 era: Modeling the pedagogical affordance and student interactions" about mobile game as learning bases in pandemic era. In the mild of COVID-19 pandemic, the sphere of education needed to be converted and enriched with online technology for the continuity of learning, because of the closure of instructional institutions. In fact, there has been a changed from face-to-face to online synchronous instruction. [18].

"Social Affordances at Play: Game Design Toward Socio-Technical Innovation" by Katherine Isbister, Elena Márquez Segura, Edward F. Melcer discuss about game layout techniques and theories may be beneficial tools for assisting the layout of innovative socio-technical structures aimed toward assisting social co-presence-. We declare that game layout idea and strategies may be value in tackling the layout assignment of develop technology to assist and upgrade co-presence [19].

Other paper is resulting a proof that the emotional design enables player to be satisfied and self-realization. The process itself, using interactive interface, interactive method, interactive experience, etc. The process is the truly excellent emotional interactive design. The behavior of level design of the interaction usually aimed for the player's experience. The main points of its design are focused on four elements: Understandability, feeling, Function, and Convenient. Four fundamental factor allow gamers to get mental pleasure. [20]. Other work titled "Serious games to teach social interactions and emotions to individuals with autism spectrum disorders (ASD)" discuss about the use of information communication technologies (ICTs) in remedy gives new views for treating many domain names in people with autism spectrum disorders (ASD) due to the fact they may be used in lots of distinct methods and settings and they're appealing to the patients. [21].

"MATHe the Game: A Serious Game for Education and Training in News Verification" from Education Science discuss nowadays study deals with gamification assessment, focusing on the information verification topic. In this context, its miles tried to unveil beneficial information concerning the gambling revel in and its education impact. [22].

"Interaction Design in Virtual Reality Game Using Arduino Sensors" by Juin-Ling Tseng and Chia-Wei Chu study centered at the mixture of Arduino and VR technology and used the interactive layout characteristics of Arduino to offer a greater intuitive manipulation mode for VR video games. The experiment outcomes validated that Arduino sensing gadgets are of a huge range and handy to be mixed with VR video games and make sure qualify best execution performance [23].

Another works titled "A Visual Interaction Cue Framework from Video Game Environments for Augmented Reality" by Dillman, Kody R. This work presented several points of

discussion after having worked through the process of developing the interaction cue framework and applying it to AR designs. The writer developed a framework to describe the types of visual interaction cues that video game designers use to guide players through virtual worlds [24].

“Activity as the Ultimate Particular of Interaction Design” by Annika Waern and Jon Back advise a complementary angle via searching at layout project and traditions where in the “ultimate particulars” may be taken into consideration to be on activities better than things. This article contends that it’s far viable to not forget activities because the remaining details produced with interaction layout. While the concept to considerate activities as remaining detail is stimulated with the aid of using preceding activity-centric reach to HCI, its far exclusive in that it particularly goals the articulation of designer community of practice [25].

## V. RESULT AND DISCUSSION

After Evaluate the Literature and analyzing the papers and taking conclusion of it. We read the papers carefully one by one and analyze it according to grouping in the one step before. The first group is the interaction related to human and computer interaction and the second group is the interaction related to the game design.

The first group, most of them are talking about the relation between human and machine through the user interface. For the “An Interaction Design for Machine Teaching to Develop AI Tutors” [6] and the “Designing Contestability: Interaction Design, Machine Learning, and Mental Health” [7], the researcher show that the interaction design was used for to show how the programs work in machine learning. In this case, the interaction showed the arithmetic and large number of variables. The difference between them is the usage for teaching and for mental health issue. The next paper, the researcher was telling about how the interaction show the back end of the system, in this case are *you-tube*. On this paper, the usage of the interaction design for giving a good user experience for the users. And then the paper “Model-driven Framework for Human Machine Interaction Design in Industry 4.0” [8] was telling about the human and machine interaction (HMI). The interaction design was used for designing and implementing the human and machine interaction, so the developer require basic and agile answer that lead to the implementation of smart HMI throughout I4.0 scenarios [9]. And ont the other paper, the scenario was showing about how the user can interact with the computer especially in a mobile application. The researcher of the both papers say the same thing that the framework was used to help designing the interaction design so the user can use the application well. The framework that the researcher made from the interaction design theory can reduce the barrier between the backend system and the user.

The second group are mostly talking about the relations between game design and interaction design from the different genres. The papers have the same things that the interaction design can affect how the player or the user emotions. In some scenarios, the games were delivered for educational purpose, can affect the players in the way of they think and their interest even in the pandemic scenario. In other ways, the game can affect the player’s emotion.

Gamer’s emotion cannot just improve the stickiness of user, and yet gamers also allow users to think the that means of them self [15]. The excellent emotional interaction design inside a game was generally reflected in instinctual hierarchical design that contain some point of the interactive interface, the behavioral hierarchical design from interactive mode, and the reflective hierarchical design from interactive experience [20]. The structure of interaction design is discussed from the mode of operation, information display and the feedback design [26].

All of paper has discussed same thing, it’s all about how the human and computer interact. All of the researchers have shown their idea about how does the good interaction design could make the human and the computer interact and has the good experience of using the machine. The main points of its design are focused on four elements where it contains the function, understandability, convinient, and the feeling. The four main point used to allow players are getting the psychological pleasure. When the design has purpose (for example it was used for open menu) and easy to understand when the user or player get noticed on the first saw, the click doesn’t complex and the user doesn’t bother when press the button, the design would scored as a good design. These good interaction design was very important for the game design so the player could have good experience while playing it.

## VI. CONCLUSION

From this paper, the writer knowing that the interaction design must be good. The user interfaces are the gate for the users to interact with the computer or machine. The main points of its design are focused on four elements where it contains the function, understandability, convinient, and the feeling. The four main point used to allow players are getting the psychological pleasure. So, this is why the interface of the must be designed so well with the four main point of design element. Because this not only affects the player experience about the convenience while using or play the “Tapel Saga” game, but also affect the player’s emotion and the player’s capability to play the game so well. So, after do this paper, hopefully the team would design a good interaction design so it would be helped the player’s experience.

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# The impact of social media platforms on the growth of startups in India

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## Abstract

The fundamental reason behind this research is to study and investigate what role digital channels play if startups in India decide to advertise and promote their brand, product, or service through online mode. Nowadays, almost everyone wants to start a new venture and want to launch their brands and compete with more prominent names in the markets through cost effective ways. There have been several studies in the past where one can learn how one should expand their business in a certain targeted market. These research materials give us insights on failed startups as well who were unable to grow and could not run their business for more than two years.

However; in today's era; we have observed that many entrepreneurs are now gaining momentum and their success rate is higher and they are relying maximum on digital strategies to promote their companies' offerings. Smart phones and smart devices have been a massive trend in marketing and they are contributing to more than half of the online traffic. Startups are now leveraging the digital space and using several digital channels for increasing their brand's visibility and influencing online sales. They are finding virtual mediums more cost effective with better customer engagement rate. They are able to control their marketing funds and execute their campaigns effectively if using digital marketing techniques such as pay per click, email marketing, search engine optimization & social media marketing.

The findings of this research imply that digital advertising for entrepreneurs has a huge impact on growing their business. If they do not utilize digital channels effectively, the augment is slow and redundant in some cases. It does show that online marketing efforts impact sales numbers and lead numbers for startups.

## Keywords

*social media advertising; startups, online sales; digital strategies; social media marketing effectiveness*

## I. INTRODUCTION

The study's fundamental need is to comprehend the social media platforms from which a new business might profit since its commencement. Every year, thousands of new start-up firms develop with the ambition of becoming the next big thing; some of them succeed spectacularly in a short period of time. Only a few people are endowed with a wonderful idea that can be made even better with greater leadership, but the majority of them fail miserably. "Marketing" is a true word that has a lot of weight when it comes to a product's success. Social Media Marketing has taken the role of traditional marketing. Whereas some failed start-ups fail as a result of vision strategies that were drawn incorrectly.

When it comes to promoting their enterprises a few decades ago, start-up companies faced a lot of severe difficulties. They had to decide on product features and quality, as well as supporting services, pricing, distribution methods, and marketing budgets, as well as how to allocate their resources between advertising, sales force, and other promotion approaches. Starting a firm and getting into marketing used to take a lot longer, and marketing costs were always much greater. In recent years, there has been a significant shift in the business world, with start-up businesses utilizing their full resources to be extracted from social media platforms with less budget and effort than traditional marketing.

For start-ups, social media has become a valuable marketing tool that is becoming increasingly important. Indeed, social media platforms such as Facebook and Twitter have become critical components of content distribution, lead creation, and brand recognition in customer acquisition tactics. This is especially beneficial for start-ups with limited resources and a high return on investment. As a start-up or small business, ignoring social media as a form of communication, advertising, and potentially even recruiting or money is no longer an option. That is also true for any company that is new to the internet. However, jumping into an ever-expanding world of social media networks can be daunting at best.

Each platform has its own eccentricities in terms of usernames, graphics, and usage, in addition to a distinct user base. Start-ups must develop better social media strategies to connect and engage current and new customers, as well as to spread the word about their products and services in the market. In today's age of global connection, consumers connect to the internet to check online reviews, comments, and seek recommendations from friends and family before making a purchase. It is in the best interest of most start-up enterprises to have a dynamic and engaging social media presence. It's important to recognize that not all start-ups succeed. Successful companies should and appear to be adaptable enough to move with technology and embrace the

internet and social media. When it comes to failing start-ups, some of them fail as a result of poor vision strategies drawn from the outset. Finally, they lacked vision, which may have rescued their businesses.

## II. Research Objective

1. To find out the impact of social media techniques on start-ups
2. To analyze which social media technique is better for start-ups
3. To examine the impact of social media on target audience

## III. Literature Review

Entrepreneurs who implement a social media strategy that leverages social media impact, benefit their firm in a variety of ways including helping the company lead the way in its niche and exposing the products and services to target audiences.

A social media strategy targeted primarily at expanding the online influence is an important aspect of the new venture's marketing toolset. Even though fundamental tasks such as engaging with possible investors, recruiting efforts, and product management are all handled by a small staff, social media strategy should not be overlooked.

One of the main steps is to establish the culture of a start-up and business principles so that the social media posts are consistent with them. There should be a well-considered policy that supports the social media initiatives by the company and makes sure that the tone of the message shared is consistent across all platforms.

Social media marketing has shown to be an extremely cost-effective method of introducing your products and services to the market. Users of social media networks such as Facebook, LinkedIn, and Twitter can employ promotional campaigns to promote their products. When compared to traditional marketing channels (ATL, offline advertising, etc.) the cost to reach a given amount of people using social media is substantially lower.

When choosing a premium platform to advertise on, one needs to focus on the age range of the target audience and the location of an organisation. Paying attention to what the audience shares on social media is a great approach to learn about their likes, dislikes, what items they're interested in and it can further be used to create beneficial relationships for the start-up.

Clients now a days are already accustomed to utilising social media platforms to check for the reviews of businesses and their ratings and user experiences. Social media is a terrific approach to assist produce those reviews. E-mail marketing can also be used awareness and to your customers asking them to post a review, and include links to your social media sites in the email. It's also a good idea to include it on your website.

Businesses can also use social media to manage their online reputation. Even if a consumer is unhappy, potential customers can see how you handle the matter. This is significant since businesses that respond to internet evaluations are seen more preferable.

The benefits of social media marketing tactics are not limited to reaching out to potential clients; they also assist firms in forming alliances with other businesses. They can connect with professionals in a variety of industries and genres through platforms like LinkedIn. These connections can help a start-up in surprising ways.

Social media techniques are being integrated into business plans for better results. Organizations believe that using these techniques, especially from the beginning of operations, can be a great approach to influence their position in their respective industry.

The impact of engaging in social media marketing is beneficial to companies in a variety of ways, but being a start-up and using these techniques from the beginning can highly impact the growth of the company.

## IV. Research Methodology

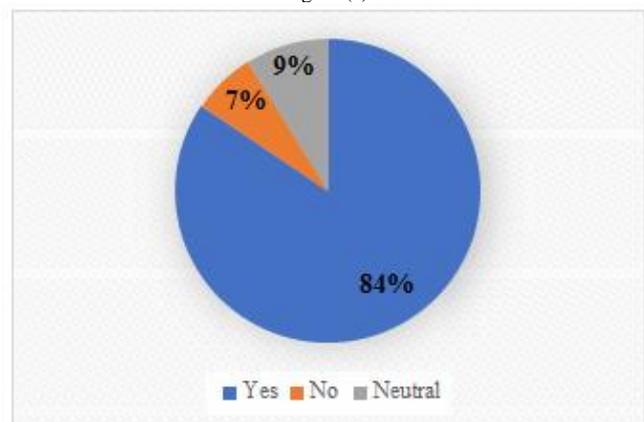
Sample size of the survey conducted were 50 employees. The data was taken from employees engaged with start-up companies.

## V. Data Analysis

1. Is a social media strategy beneficial in allowing customers to learn more about the company?

Responses	Number	Percentage
Yes	16	35.55%
No	26	57.77%
Neutral	3	6.66%

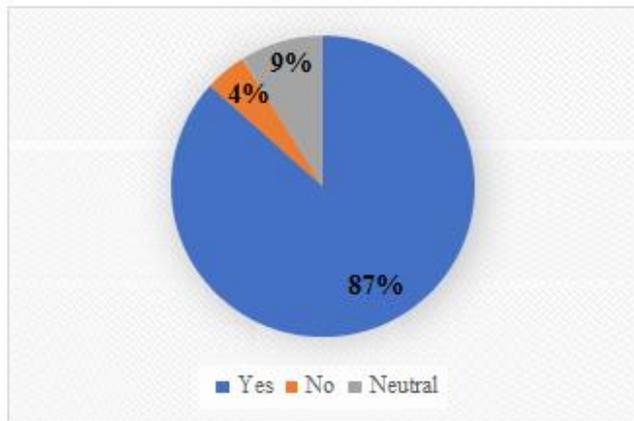
Figure (a)



2. Is social media assisting the company in educating consumers about its products or services?

Responses	Number	Percentage
Yes	39	86.66%
No	2	4.44%
Neutral	4	8.88%

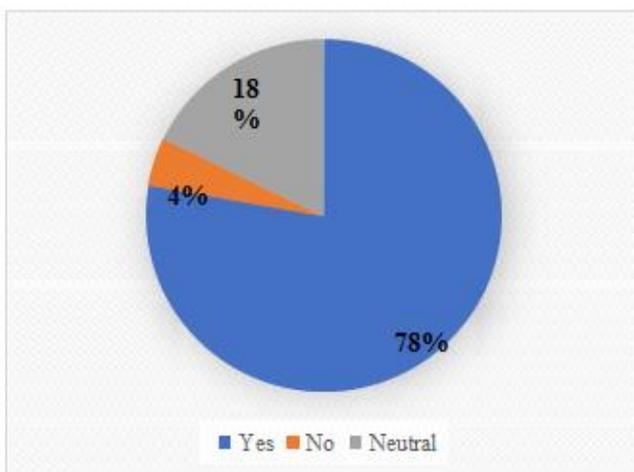
Figure (b)



3. Social Media provides a platform to have a conversation regarding products or services?

Responses	Number	Percentage
Yes	35	77.77%
No	2	4.44%
Neutral	8	17.77%

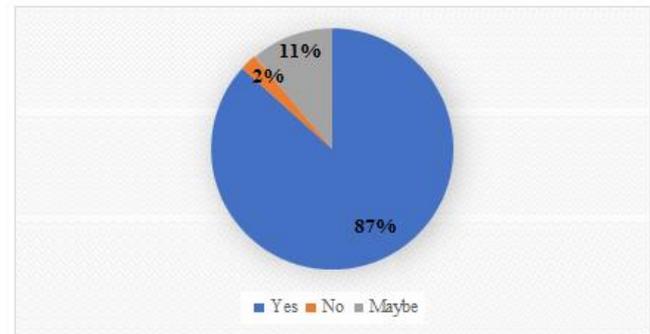
Figure (c)



4. Could social media spread a conversation to a wide number of people in a brief period?

Responses	Number	Percentage
Yes	39	86.66%
No	1	2.22%
Maybe	5	11.11%

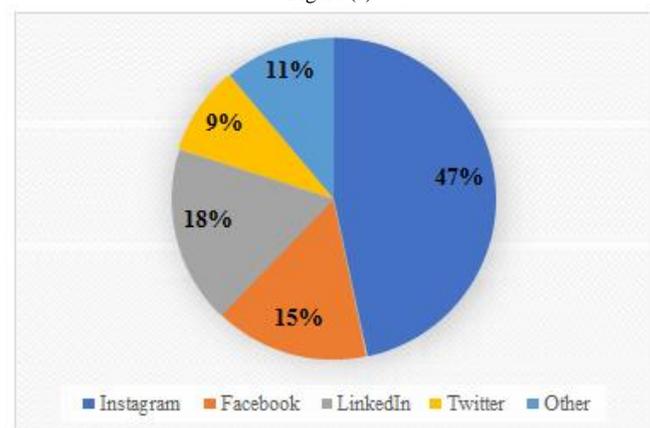
Figure (d)



5. Which platform do you think is more preferable for your company and why?

Responses	Number	Percentage
Instagram	21	46.66%
Facebook	7	15.55%
LinkedIn	8	17.77%
Twitter	4	8.88%
Other	5	11.11%

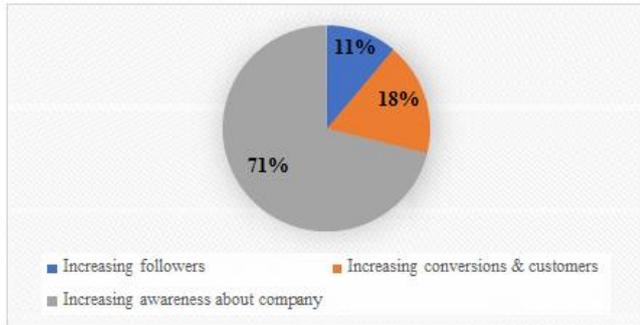
Figure (e)



6. How has social media helped your business?

Responses	Number	Percentage
Increasing followers	5	11.11%
Increasing conversions & customers	8	17.77%
Increasing awareness about company	32	71.11%

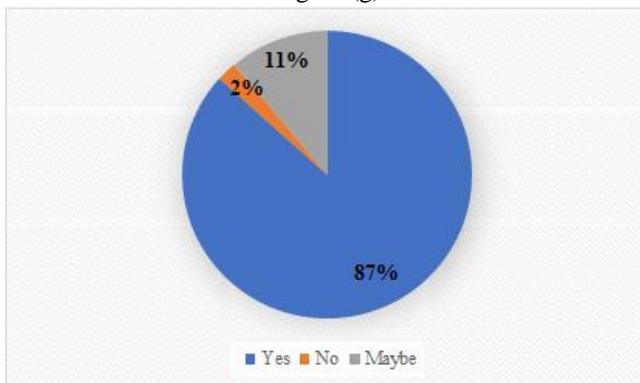
Figure (f)



7. Do you believe that business will achieve better results when it comes to customer loyalty and profit if social media is integrated into marketing?

Responses	Number	Percentage
Yes	39	86.66%
No	1	2.22%
Maybe	5	11.11%

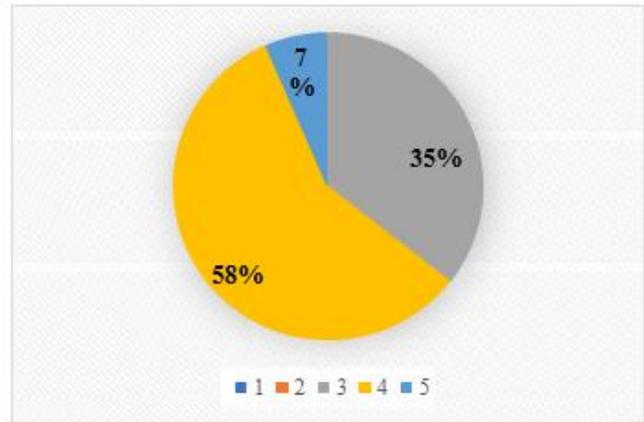
Figure (g)



8. How would you rate the impact of integrating social media techniques into your business?

Responses	Number	Percentage
1	0	-
2	0	-
3	16	35.55%
4	26	57.77%
5	3	6.66%

Figure (h)



VI. Findings

- 84% people thinks social media strategy is beneficial in allowing customers to learn more about the company
- 87% of the people feels that social media helps assisting the company in educating consumers about its products or services
- 78% people feels that social media provides a platform to have a conversation regarding products or services
- 87% people in our survey feels that social media can spread a conversation to a wide number of people in a brief period
- Our survey saw that people feels Instagram is the platform that is more preferred for the company
- 71% of the people feels that social media has helped their business by increasing awareness about the company
- 86% people feels that YES business will achieve better results when it comes to customer loyalty and profit if social media is integrated into marketing
- 35% people gave rating of 5/5 for the impact of integrating social media techniques into your business

VII. Conclusion

According to our survey we found that social media plays a vital role in business. Through research we have found that more than 80% of people do believe that social media platforms and strategies are beneficial for their customers which allows them to learn more about the company and its products, as well as help company to spread awareness to a large audience within a short duration of time.

Brand recognition, content dissemination, community participation, lead generation, and customer acquisition have all been demonstrated to be effective with social media. Start-ups with lower funding and less clout than established businesses can make the most of social media platforms and reap the benefits. Start-ups can benefit from social media networks in the long run. The purpose of this study was to see how start-ups may use social media to their advantage. Due to the limited resources and finances available to entrepreneurs running small enterprises and start-ups, social media networks are utilized to promote their brands at a low cost. Furthermore, social media has shown to be an effective word-of-mouth

advertising strategy for promoting items and raising brand awareness.

To sum up, social media networks can offer a long-time period boom to startups and SMEs. This take a look at has tried to discover how startups can maximize their ability with social media. Entrepreneurs jogging small groups and startups have restricted sources and budgets; therefore, social media networks are used to sell their logo at little or no economic cost. Moreover, social media has additionally proved to be a robust word-of-mouth marketing and marketing device to marketplace merchandise and logo awareness. Startups should often examine their on-line sports and interactions on social media platforms.

Tools like Hoot suite and Buffer offer suitable analytics that may assist them to evaluate and compare the effect in their sports. Based at the analytics report, the organizations can edit their content, adjust their campaigns through devising new information snap shots or videos. Moreover, in the event that they undertake the suitable strategies, failing to have a terrific risk of revival.

We finish that social media can play 2-fold instrumental roles. First, it's far one of the critical re-assets of advertising of a start-up. It can lead closer to sale augmentation and make contributions to the emblem fairness of firms. Second, social media also can make contributions to the development of enterprise procedures. It means that social media is probably applied to execute enterprise procedures except advertising and promoting activities. The examination concludes that social media may be an essential supply to lessen the failure charge of start-ups. However, the disadvantage is the lack of articulation of a clean and specific social media coverage to advantage most out of this colorful tool.

### VIII. Limitations

The following are some of the research's limitations:

1. Due to a large number of start-up companies, it was impossible to cover every industry in this study.
2. Generalizations across industries, firms, and places are challenging due to the limits of the acquired data.
3. There is no comparison in the research between the practices of a firm (start-up) that is known for using social media marketing successfully and a company that is not.

### IX. Managerial Implications

The struggle for attention-time is becoming more severe as more firms go digital. Traditional marketing appears foolish and archaic in comparison to social media marketing due to a reduction in organic reach of posts and a rise in sponsored posts.

It is implied that the main aim for a business to opt for social media techniques is to increase their brand awareness, customer engagement and traffic being a close second. For this to work, they need to make sure that the type of content they're putting up is eye-catching and unique. With the increase in competition, it is quite possible for your target audience and potential customers to miss out on your post if it isn't something different from the rest. Another point to focus

on in this is to reflect who you are through the posts. Adding a bit of creativity, and can help the companies catch the desired attention, and starting a simple conversation can get the profile going.

Nowadays, customers are more likely to check for an online review or an online status of the product or company before considering them. This could either help build a brand or destroy it. If the efforts are made in the right direction, this can actually help company gain the trust and expand their customer base. But one needs to make sure, that they cannot just leave this task after initiating, it requires regular monitoring for there are parties who will not be satisfied with the products/services or the company.

The type of content the company is posting, the tone and the articulation of their message should be clear, or it could spark controversies and drive the conversation in another direction completely.

Integrating social media in the marketing techniques is basically helping the companies to reach for customer base beyond their physical and local bounds. Harnessing the platform correctly is helping the companies to cut costs, step into creative dynamics, harness the power of social media to expand further, the art lying in the way they maintain their reputation online and showcase what they truly are.

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# The Marlian's Influence on Social Behavior among Youths in Ado-Ekiti, Nigeria

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## Abstract

This study examined the Marlian's influence on social behavior among youths in Ado-Ekiti, Nigeria. The study adopted the descriptive non-experimental survey design. The target population includes youth in some selected areas in Ado Ekiti consisting Iyin Road, Ejigbo, Oke-Iyinmi, Adebayo way and Post-office area. The choice of these areas is due to their population density of the youths. Thus, the total population consisted a total of 1,605 respondents among which a sample of 300 was randomly selected. Data collection involves the use of semi-structured questionnaire which was validated for inter-item consistencies using the Cronbach's alpha coefficient of 0.7% and above. Data analysis involved the use of the descriptive statistics such as the simple frequency counts and percentage distribution. Findings from the study shows that (51%) of the respondent strongly agreed that character and attitude of youths are usually influenced by the media and celebrity culture. The study further indicated that (51%) of the respondents strongly agree that Naira Marley lifestyle influence the usage of drugs among youths. The study concluded that youth now see cybercrime as a career choice and criminality among youth has been encouraged through Marlians behaviours. This study recommended that the Nigerian artists and celebrities should see themselves as role models to the younger generation and try their best to imbibe good moral values that young people can emulate.

## Keywords

*Marlians , Social Behavior , Youths , Ado-Ekiti, Nigeria*

## Introduction

The general impression of mass media is that it has the potentials to reinforce celebrities' lifestyle, thus, relying on that in setting agenda for the society they dwell. In most cases, the media may not tell the entire story, but it is one of the means of reaching out to a large audience, this is the case especially with films, the print and broadcast media, as well as placing due or undue importance on them, thus increasing celebrities' exposure and power. It has also been argued that the mass media have the singular potential to set agendas for the society in which they are embedded. They may not tell us what to think, but they have become successful in telling and suggesting to us what to think about. The Youths in particular plays a significant role in using media to disseminate both trusted and untrusted information and they also involves in Marlians behaviours which does not conform with the societal norms. Rall, Coffey and Williamson (1999) argued that the youths are people who enjoy activities that makes them derive satisfaction in it. However, it cannot be overemphasized that what the youths engages in may have last effects on their relationship with the society and this shaping their behaviours (M/Cyclopedia of New Media, 2005). Meanwhile, the word 'marlians' was named after the popular Afrobeat music artist known as Azeez Fashola. His style of music has gained ground in the minds of the Nigeria youths hence, his lifestyles have great influence on them. the lifestyle of the man in question has affected thousands of youth who now engages in Malians activities.

## Statement of Problem

Media globalization has altered the way culture is consumed especially among youths who find it very easy to access the various forms of popular culture. Youths constitute the group of people that are easily susceptible to external opinions and influences especially when such influences come from their favorite celebrity or people that they regard as their role model. The Nigerian society is faced with youth delinquency such as; cyber-crime, dressing out of culture, drug addictions among others. Naira Marley is known for the depiction of substance use (drugs and alcohol consumption) in most of his songs. His profound usage of substances has given him the name "Igbolabi", which means "we have given birth to weed". His continuous and irresponsible tweets and public display of alcohol and marijuana in his music videos and on his various social media platforms have also stirred Marlian youths to see nothing wrong or harmful with underage drinking or smoking. Therefore, all these despicable behaviors which are contrary to the norms and values of the society as perpetrated by the youths as well as adult cohorts qualify as antisocial behavior seems to have been influenced by Marlians. Against this backdrop, effort geared towards analyzing Marlians influence on social behavior among youths in ado-Ekiti, Ekiti state necessitate this study.

### Research objectives

The main objective of this study is to examine the Marlian's influence on social behavior among youths in Ado-Ekiti.

The specific objectives are to:

1. To ascertain the youths' exposure to media contents that glamorize the lifestyles of Marlians.
2. To determine the youths' perception of Marlian on social behavior
3. To examine the influence of Marlians on social behaviour among youths in Ado-Ekiti, Ekiti state.

### Research Questions

1. Are youths exposed to media contents that glamorize the lifestyles of Marlians?
2. What is the youths' perception of Marlians on social behaviour?
3. What is the influence of Marlians on social behavior among youths in Ado-Ekiti?

### Review of related literature

**New media and its influence:** The emergence of new media and communication technologies, particularly the internet has created a world in which young people, irrespective of their background, consume almost the same form of popular culture. The presence of these new forms of communication technologies have also made celebrity culture easily accessible for youth's consumption, thereby resulting in an increase in youth's fascination and obsession with celebrities (Okere & Uzom, 2012). Rather than attending shows or visiting the cinemas, youths can now access their favourite celebrity from the comfort of their home via various social media platforms like Instagram, Twitter, YouTube and Facebook as long as they have a smart phone and the internet. Celebrities play a significant role in influencing people especially with regards to how they relate and act, their communication and dressing pattern as well as their attitudes, beliefs and values.

**The Marlian Empire:** In contemporary times, majority of Nigerian youths now reside in what can be referred to as the "marlian empire". The marlian empire has its root in the person of Afeez Adeshina Fashola, popularly known as Naira Marley, who is also the president of the fan base known as 'marlians'. Naira Marley is a Nigerian young singer and song writer famous for his Afrobeat and hip-hop genre of music and the use of the blend of English, Pidgin and Yoruba language in his songs. He became known for his 2017 song titled "Issa Goal" featuring Olamide and Lil Kesh, which was also used by the Super Eagles as their theme song during the 2018 FIFA World Cup (Onyekwena, 2018). He has also become famous for his songs and dance steps, some of which include Japa (2019). Efevottu, Adumati and Oje (2020) noted that there are some unspoken rules about being a member of the marlian empire and to be referred to as a "marlian". For example, the respondents agree that it is true that marlians don't wear belt. One of the respondents stated that he is a true marlian but that it is because of school that he is wearing belt. He went further to state that if you identify as

a marlian but you are caught wearing belt, you will be beaten for violating the marlian code. Another student affirms that May 13 has been set aside as "Marlian Day" and that all marlians will come together on that day to celebrate Naira Marley. He went on to imply that there are several branches of Marlian Gang/Cult spread across several locations within and outside the state and that members usually come together to support and help themselves when the need arise. The marlian empire is thus characterized by certain noticeable features, some of which can be grouped under; criminality, substance use and irreverent youth culture.

**Influence of Marlians on Criminality among Youths:** One of the foremost components in the marlian empire is criminality especially in the form of cybercrimes. The 21st century Nigerian society has witnessed an alarming increase in cybercrime, particularly yahoo-yahoo especially among youths. Yahoo-yahoo has become widely acceptable by youths in the marlian empire who see it as a response to the failure of Nigerian leadership and also as a means of taking back what has previously been taken from them by the Nigerian colonial masters. Naira Marley, the leader of the marlian empire has openly expressed support for cybercrime and internet fraud. Today, marlian youths are beginning to justify internet fraud and see cybercrime as a better alternative to legitimate hustle especially since their role models keep saying that there is nothing wrong in taking back what has previously been taken from us by the west. His fans are known for verbally attacking other artists that speak negatively about cybercrime.

**Substance Use:** Alcohol and drug usage by celebrities is often criticized in the media because of the influence such practices can have on public attitude towards drug and alcohol abuse especially among young people, still in their formative years. Naira Marley is known for the depiction of substance use (drugs and alcohol consumption) in most of his songs. His profound usage of substances has given him the name "Igbolabi", which means "we have given birth to weed" (Gidado, 2019). His continuous and irresponsible tweets and public display of alcohol and marijuana in his music videos and on his various social media platforms have also stirred marlian youths to see nothing wrong or harmful with underage drinking or smoking.

**Irreverent Youth Culture:** Naira Marley yields a heavy influence on youths due to advocacy for rebellion from long held moral values. He is seen as a youth ambassador and has a fan base that is ever ready to stand in his defense no matter the nature of his crime. The attitude and behaviour of Naira Marley and members of the marlian empire have led to moral decadence and loss of moral values among youths. Naira Marley is largely known for his vulgar music outpouring and lewd lifestyles (Gidado, 2019).

Most of his songs encourage promiscuity, nudity, materialism and crime but has come to be accepted by youths as the latest trend and their failure to partake in these activities often lead to being referred to as local or primitive by their peers. In all, there is a saying that: marlians don't wear belt; marlians are alcohol and drug users; marlians keep

crazy hairstyle; marlians don't follow rules; marlians don't go to school and even if they do, they don't graduate; marlians must enjoy their youth; marlians don't have manners; marlians don't respect authority; marlians are irresponsible. These have become trending issues in Nigeria and have led to a collapse of our valued societal norms and standards.

**Impact on Youth's Appearance:** Celebrities are often recognized as spearheading the latest trends in fashion and young people tend to emulate these celebrities by dressing like them. While it is true that some celebrities in the entertainment industry have excellent taste in fashion and dress modestly, it is also a truism to state that most of these celebrities particularly the ones in the music industry including Naira Marley dress in a manner that is not usually appealing to the older audience but widely favoured by youths who see such dressing as the latest styles. Naira Marley, known for his hashtag NBG, meaning "no belt gang" has influenced most young men into seeing the lack of trouser belt as the new trend in fashion. The dress styles of most of these artists have driven young boys into seeing rugged/torn jeans, tight/pencil trouser as the new code of dressing, which they must emulate if they want to be regarded as being fashionable.

**Impact on Youth Behaviour:** Celebrity culture also tends to have implication on the behaviour of most young people. This behaviour usually follows the impression of "I don't care". Naira Marley has a negative impact on youth's behaviour and attitude. His songs often encourage a lot of obscenities among youths who see being a "marlian" as being the acceptable norms. Songs like "Soapy" and "Am I a Yahoo Boy" promote social vices like masturbation, internet fraud etc. Today, there is an increasing decay of morality in the society today, with youths no longer having respect for elders or people in authority. Uzuegbunam (2017) investigated the impact of celebrity culture on youth and found that media users can model after figures portrayed in the media.

### Theoretical framework

The study is anchored on Albert Bandura (1977) social learning theory which stipulated that learning will be difficult if people only belief in their own opinions to set the pace to what they have to do at all times. The theory implies that certain behaviours that emanated from personal view may be detrimental to the life of individuals. Instead, it proposes that new positive behaviours can be attained by observing others and copying them. Thus, when youths are found of emulating a popular celebrity, they end up behaving like such an individual because of the social behaviour entrenched in them.

### Methodology

The descriptive non-experimental research design was employed. Meanwhile, this design was considered apt for the study based on the objectives formulated. The target population of this study of includes youths who were

residents of Ado-Ekiti. For this study, the target population includes youth is some selected area in Ado Ekiti which includes; Iyin Road, Ejigbo, Oke-Iyinmi, Adebayo way, Post-office area. The choice of these population is due to the population density of those areas. Thus, the total population of this study will be 1,605. In order to achieve an adequate and accurate result for this project, data was sourced by means of primary and secondary sources. This involves the use of questionnaire. Questionnaire can be defined as a method of elicitation, recording and collecting of information (Ifenowo, 2012).

## Result

### Analysis of research question

#### Presentation of Results

**Table 1: Demographic distribution of the Respondents**

Variables	Category	Frequency (n=300)	Percentage
Gender	Male	200	66.7
	Female	100	33.3
Marital Status	Single	182	60.7
	Married	99	33.0
	Divorce	19	6.3
Age	18-25	124	41.3
	26-35	144	48.0
	36 and above	32	10.7
Religion	Christianity	180	60.0
	Muslim	102	34.0
	Traditional	18	6.0
Family Structure	Monogamy	222	74.0
	Polygamy	68	22.7
	Others	10	3.3

Table 1 revealed that almost two-thirds of the respondents 66.7% were male while females accounted for 33.3%. Besides, 60.7% were singles while married and divorced accounted for less than 40%. The age distribution shows that 41.3% were below age 25years, 48% were between the age of 26-35yaers while those older accounted for 10.7%. with regards to their religion, they were predominantly Christians 60% while Muslim and traditional religions accounted for 40%. More than two-thirds majority 74% were members of monogamous family while polygamous and others accounted for 23% respectively.

**Analysis of the research questions**

**Research Question 1: Are youth exposed to media contents that glamorize the lifestyles of Marlians?**

**Table 2: The possibility of youths' exposure to media contents that glamorize the lifestyles of Marlians**

S/N	ITEMS	Strongly agreed	Agreed	Disagreed	Strongly disagreed
1.	Character and attitude of youths are usually influenced by the media and celebrity culture.	153 (51%)	69 (23%)	48 (16%)	30 (10%)
2.	Media plays negative roles in the lifestyle of Nigerian youth.	46 (15.3%)	218 (73%)	15 (5%)	21 (7.0%)
3.	Celebrities style shown through the media encourage bad character among Youths in Nigeria	81 (27%)	166 (55%)	33 (11%)	20 (6.7%)
4.	Media globalization and emergence of Marlians influence Nigeria youth thinking Nigerian youth have interest in Naira Marley songs and style carried through the media.	141 (47%)	115 (38%)	20 (6.7%)	24 (8%)
5.	Nigerian youths know Naira Marley songs and listen to it	153 (51%)	110 (37%)	22 (7%)	15 (5%)
6.	Nigerian youths like to be called Marlian	174 (58%)	73 (24%)	30 (10%)	23 (7.7%)
7.	Nigerian youths like to be called Marlian	177 (59%)	105 (35%)	9 (3%)	9 (3%)

Table 2 shows that 153(51%) of the respondent strongly agreed that character and attitude of youths are usually

influenced by the media and celebrity culture, 69(23%) agreed, 48(16%) disagreed while 30(10%) of the respondents strongly disagreed. Analysis of this study revealed that 46(15%) of the respondents strongly agreed that media plays negative roles in the lifestyle of Nigerian youth, 218(73%) agreed, 15(5%) disagreed while 21(7%) of the strongly agreed. This implies that majority of the respondents agreed that media plays negative roles in the lifestyle of Nigerian youth. This could be due activities and lifestyle shown to the masses through the media. Also, this study found out that 81(27%) of the respondents strongly agreed that celebrities style shown through the media encourage bad character among youths in Nigeria, 166(55%) agreed, 33(11%) disagreed while 20(6.7%) strongly disagreed. This implies that celebrities style shown through the media encourage bad character among youths in Nigeria. In addition, findings of this study revealed that 141(47%) strongly agreed, 115(38%) agreed, 20(6.7%) disagree while 24(8%) of the respondents strongly disagree. This is an indication that media globalization and emergence of Marlians influence Nigeria youth thinking. It was obtained that 153(51%) strongly disagree that Nigerian youth have interest in Naira Marley songs and style carried through the media, 110(37%) agree, 22(7%) disagree while 15(5%) of the respondents strongly disagree. This implies that Nigerian youth have interest in Naira Marley songs and style carried through the media. However, findings of this study realized that 174 representing 58% of the respondents strongly agree that Nigerian youths know Naira Marley songs and listen to it, 73(24%) agree, 30(10%) disagree while 23(7.7%) of the respondents strongly disagreed. This implies that majority of the respondents strongly agree that Nigerian youths know Naira Marley songs and listen to it. Meanwhile, findings of this study realized that 177(59%) of the respondents strongly agree, 105(35%) agree, 9(3%) disagree while 9(3%) strongly disagree. This implies that majority of the respondents strongly agree that Nigerian youths like to be called Marlian.

**Research Question 2: Does the lifestyle of Naira Marley as reinforced by the media have any influence on the attitudes and behaviour of youths in Ado-Ekiti, Ekiti-State, Nigeria?**

**Table 3: Lifestyle of Naira Marley as carried by the media and the influence it poses on the behaviour of youths**

S/N	ITEMS	Strongly agreed	Agreed	Disagreed	Strongly disagreed
1.	Naira Marley lifestyle carried through the media influence the usage of drugs among	154 (51%)	118 (39%)	13 (4%)	15 (5%)

	youths					encourage d through Marlians empire carried on the media.
2.	Naira Marley songs encourage cybercrim e	67 (22%)	188 (63%)	23 (8%)	22 (7%)	<p>Table 3 revealed that 154(51%) of the respondents strongly agree that Naira Marley lifestyle carried through the media influence the usage of drugs among youths, 118(39%) agreed, 13(4%) disagree while 15(5%) strongly disagree. This implies that majority of the respondents strongly agree that Naira Marley lifestyle carried through the media influence the usage of drugs among youths. Analysis of this study realized that 67(22%) strongly agree that Naira Marley songs encourage cybercrime, 188(63%) agreed, 23(8%) disagree while 22(7%) of the respondents strongly disagree. This implies that majority of the respondents agree. More so, this study found out that 133(44%) of the respondents strongly agree that youths behavior and thinking have been greatly influenced by Naira Marley style, 130(43%) agree, 17(5.7%) disagree while 20(6.7%) strongly disagree. This implies that majority of the respondents strongly disagree. Analysis of this study found out that 161(54%) of the respondents strongly agree that indecent dressing among youths is encouraged by Naira Marley style, 100(33%) agreed, 23(8%) disagree whereas 16(5%) of the respondents strongly disagree. This implies that majority of the respondents strongly agree that Indecent dressing among youths is encouraged by Naira Marley style. Furthermore, it was estimated that 213 representing 71% of the respondents strongly agree that the statement Marlians don't graduate' has influenced the academic performance of Nigerian youths Naira Marley supports immoral behavior Youths now see cybercrime a career choice Criminality among youth has been</p>
3.	Youths Behaviour and thinking have been greatly influenced by Naira Marley style.	133 (44%)	130 (43%)	17 (5.7%)	20 (6.7%)	
4.	Indecent dressing among youths is encourage d by Naira Marley style.	161 (54%)	100 (33%)	23 (8%)	16 (5%)	
5.	The statement Marlians don't graduate' has influenced the academic performan ce of Nigerian youths Naira Marley supports immoral behavior	213 (71%)	45 (15%)	19 (6%)	23 (8%)	
6.	Youths now see cybercrim e a career choice	57 (19%)	204 (68%)	19 (6%)	20 (7%)	
7.	Criminalit y among youth has been	187 (62%)	78 (26%)	17 (6%)	18 (6%)	
8.		93 (31%)	175 (58%)	15 (5%)	17 (6%)	

**Research Question 3: How social and good moral behavior can be improved among youth**

**Table 4: Social and good moral behavior can be improved among youth**

S/N	ITEMS	Strongly agreed	Agreed	Disagreed	Strongly disagreed
1.	Government should ban Naira Marley music	138 (46%)	84 (28%)	39 (13%)	39 (13%)
2.	Youths should be oriented periodically about the negative effects of obscene songs and styles	192 (64%)	100 (33%)	2 (1%)	6 (2%)

Table 4 indicated that 138(46%) of the respondents strongly agree, 84(28%) agree, 39(13%) disagree while 39(13%) strongly disagree. This implies that majority of the respondents strongly agree. Lastly, this study establishes that 192(64%) of the respondents strongly agree, 100(33%) agree, 2(1%) disagree while 6(2%) of the respondents strongly disagree. This implies that majority of the respondents' youths should be oriented periodically about the negative effects of obscene songs and styles.

### Major findings from the study

This finding however corroborates with Effevottu, Adumati and Oje (2020) who noted that "celebrity culture and lifestyle impacted on the lives of youth in Nigeria" Also, this study found out that celebrity's style shown through the media encourage bad character among youths in Nigeria. The finding here however correlates with Uzuegunam (2017) who noted that celebrity lifestyles have greater negative effective on the youth when they are being exposed. In addition, this study established that 58% of the respondents strongly agree that Nigerian youths know Naira Marley songs and listen to it. Analysis of this study revealed that majority of the respondents strongly agree that Nigerian youths like to be called Marlian. Findings of this study realized that majority of the respondents strongly agree that Naira Marley lifestyle carried through the media influence the usage of drugs among youths and Naira Marley songs encourage cybercrime. This finding however aligns with Effevottu, Adumati and Oje (2020) who submitted that "musicians often create songs that are capable of drawing the attentions of youths to take in drugs" It was also obtained that 44% of the respondents strongly agree that youth's behavior and thinking have been greatly influenced by Naira Marley style. This study established that indecent dressing among youths is encouraged by Naira Marley style. Nevertheless, analysis of this study established that among strategies on how social and good moral behavior can be improved among youth is that government should ban Naira Marley music. Nonetheless, this study revealed that youths should be oriented periodically about the negative effects of obscene songs and styles.

### Conclusion

It was shown that youth's behavior and thinking have been greatly influenced by Naira Marley style and indecent dressing among youths is encouraged by Naira Marley style. Meanwhile, findings of this study made it known that the statement 'Marlians don't graduate' has influenced the

Nigerian youths and Naira Marley supports immoral behavior. The study concluded that youth now see cybercrime as a career choice and criminality among youth has been encouraged through Marlians. Hence, government should ban Naira Marley music and youth should be oriented periodically about the negative effects of obscene songs and styles. This study recommends that the Nigerian artists and celebrities should see themselves as role models to the younger generation and try their best to imbibe good moral values that young people can emulate. The study further recommended that parents, guardians and other stakeholders should monitor the type of culture that youth copy or learn to avoid spurring a generation that will contribute badly to the growth and development of the country at large.

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# Readership of Newspaper Editorial among Undergraduates of Mass Communication Department, Federal University Oye-Ekiti, Nigeria

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## Abstract

This study investigated the readership of editorial contents among Nigeria youths with focus on FUOYE Mass Communication students. It sought to find out whether or not FUOYE Mass Communication students read newspaper editorials; investigated the exposure of FUOYE Mass Communication students to newspapers editorials; and how frequent FUOYE Mass Communication students read Newspaper editorials. This study was anchored on only Individual differences theory. The study used descriptive survey research design. The population comprised a total number 944 Mass Communication undergraduates. In determining the sample size (I am suggesting we use something current-Checkmarket .com site. I sent you a whatsapp message on it) Taro Yamane (1967) formula was used to select a sample size of 281 respondents. Data collection involves the use of a semi-structured questionnaire, which was studied with the aid of simple percentage and frequency counts, copies of the questionnaire were administered to respondents through stratified and simple random sampling techniques. Findings revealed that Nigerian university students still read newspaper editorials and they prefer reading it to other content, their newspaper preference and where they access newspaper editorials was also known, it was discovered that most people access it online than buy the hardcopy, this study also discovered that majority do not read it daily but often. This study therefore recommends that print media industries should ensure the availability of online editorial contents and that there should be provision of daily newspaper in the school library to enable easy accessibility, and the respondents should be educated on the importance of reading newspaper editorials.

## Keywords

*Readership, Newspaper, Editorial, Undergraduates, Mass Communication Department, Federal University, Oye-Ekiti, Nigeria*

## Introduction

Editorials in news media contain factual accounts of boiling issues, opinions, and the organization of the newspaper outfit on any particular issue of national interest. Newspaper is simply, a printed unbound paper that contains news about current political, economic, socio-cultural, educational, environmental, scientific-cum-technological and sundry affairs as well as other relevant sales information. Oladele (2019) posited that the central aims of information provider is to affect then (than?) control desires, actions, and the inaction of their audience. This editorial page of every newspaper is accorded with so much importance that offers a serious, conversational and investigative viewpoint to common issues with a view to suggesting explanations and steering the people and society forward (Gbonegun et al., 2016).

Human society from time immemorial depends so much on newspapers' contents on daily basis to keep themselves abreast of happenings in the country. Newspaper readership has experienced a decline recently, and this has also affected editorial readership from the available studies in the literature. The few people that often read newspaper have little preference for editorial contents (Ashong & Ogaraku,

2017; Singh & Arya, 2012). The decline is also evident among the youths, who are supposed to be active readers. Similarly, there are also concerns regarding the few youths who actually read newspapers, particularly concerning their content preferences. Many of the youths often choose sports, entertainment and even news contents over editorials. Despite this narrative, many previous studies only focused on newspaper readership, with no or little focus content preference, particularly editorial readership. Also, many of these previous studies focused on youths generally, with no specific focus on Mass communication students, who are supposed to be the role models for other youths in the country in information accessing and dissemination. Thus, the study sees the aforementioned as the gaps in the literature, which it aims to fill. The study is an attempt to explore the rate at which FUOYE Mass Communication student read newspaper editorials, their exposure to it, how frequent they read it, the reasons for poor newspaper editorials readership, and recommendations on how to enhance editorial readership among them.

## The aim and Objective of the study

This study basically investigated readership of newspaper expositions among Nigerian Youths with focus on FUOYE

Mass communication undergraduate students. Other specific objectives include to:

1. Ascertain whether or not FUYOYE Mass Communication students read newspaper editorials.
2. Determine the exposure of FUYOYE Mass Communication students to newspapers editorials.
3. Investigate how frequently FUYOYE Mass Communication students read newspaper editorials.

#### Research Questions

1. Do FUYOYE Mass Communication students read newspaper editorials?
2. What is the level of exposure of FUYOYE Mass Communication Students to newspapers editorials?
3. How frequently do FUYOYE Mass Communication students read newspaper editorials?

#### Conceptual Review

**Newspaper Readership:** Apuke & Omar, (2020) defined newspaper readership with respect to each of the various reading materials. For instance, Oxford Advanced Learner's Dictionary, (2010) defined readership as the number or type of people who read a particular newspaper, magazine or periodicals. To read is to get ideas from printed or written materials. Reading is a way of acquiring knowledge. Oyeyemi, (2005) observed that reading is a means of tapping knowledge from superior minds.

**Newspaper Editorials:** Newspaper editorials have been widely defined by scholars, which makes the concept not to have any universal definition. However, one of the broadest definitions of newspaper editorials is the one presented by Jegede, (2015), Oladele, (2019) which they described as whatever opinion or stance on an issue of public interest, that is observable in an editorial represents the view of the entire news organization.

**Newspaper Editorial Readership in Nigeria:** Newspaper editorial readership is not a new concept in the literature. It simply means the volume of the audiences who read newspapers' editorials. In other words, it refers to the number of people who read the editorial contents of newspapers. However, there are very few available studies which focused on it; scholars have devoted more time on newspaper readership, with few examining the patterns of newspaper readership with respects to the content preferences among their respondents, such the editorial page, news page, sports page etc. For instance, Al-Shaqsi, (2013) stated that readership of print newspapers has been the focus of many studies and analyses because of the advancement of online journalism, information technologies and socio-economic changes in recent years. In simple terms, there has been decline in the readership of newspaper all over the world. The most available and accessible relevant study on newspaper editorial readership in literature is that of Gbonegun et al., (2016), which focused on audience apathy towards newspaper editorials in Nigeria, using University of Ilorin staff as a case study.

### Theoretical Framework

#### Individual Differences theory

This study is anchored on the individual difference theory that was propounded by Melvin De Fleur (1970). This theory recognized the individual positions and perspectives on issues being discussed on the media. It suggests that people have right to their own opinions and are in the best position to report what is perceived to be true story behind a scene. The author therefore gives room to individualism in matters relating to newspaper opinions.

#### Methodology

This study employed the survey research design. The study population includes all 944 undergraduates in the department of Mass Communication, Federal University, Oye Ekiti, Nigeria. Comprising students at all levels in the department, with no prejudice for age, sex, ethnicity, and religion. According to the data obtained from the Dean of Student (DSA), the number of all undergraduate students in the department of Mass communication is 944, which includes 412 in 100 level, 246 in 200 level, 200 in 300 level, and 86 in 400 level. The study employed the primary data collection via questionnaire while the secondary data includes books, journals and internet. Data gathered for the study was analyzed descriptively using frequency counts and percentage distribution. This was achieved by means of statistical package for social sciences version 22.

### Results

**Table 1: Socio-Demographic Characteristics of the Respondents**

Parameter	Classification	Frequency	Percent
Age in years	10-14	2	0.7
	15-20	93	32.7
	21-24	167	59.4
	25-30	19	7.1
	Total	281	100.0
Gender	Male	124	44.1
	Female	157	55.9
	Total	281	100.0
Marital Status	Single	278	98.9
	Married	1	.4
	Divorced	1	.4
	Widowed	1	.4
	Total	281	100.0
Ethnicity	Yoruba	235	83.6
	Hausa	14	5.0
	Igbo	23	8.2
	Others	8	3.2
	Total	281	100.0

Source: Field Survey 2021

Table 1 showed that 0.7% were between the age range of 10-14, 32.7% was between the age range of 15-20, 59.4% was between the age range of 21-24, and 7.1% was between

the age range of 25-30. This showed that majority of the students in the department of Mass communication were between the age range of 21-24. The Table showed further that 43.8% were in 100 level, 27.4% were in 200 level, 21.4% were in 300 level and 7.5% were in 400 level. With regards to marital status, majority were Single with 98.9%, 0.4% were married, 0.4% were Divorced and 0.4% were widowed. With reference to ethnicity of the respondents, majority were Yoruba with 83.6%, 5% were Hausa, 8.2% were Igbo and 3.2% were from other ethnic groups.

**Research Question 1:** Do FUYOE Mass Communication students read newspaper editorials?

**Table 2: Determining whether or not FUYOE Mass Communication Students read Newspaper Editorials (N = 281)**

Survey items	Strongly Agree	Agree	Indifferent	Disagree	Strongly disagree
Readership of newspaper editorials	15.3	44.8	19.9	19.9	
Enjoyment level of reading newspaper editorials	15.3	44.8	19.9	19.9	
Preference for reading newspaper editorial to any other newspaper contents	7.5	45.2	24.9	22.4	
Choice of buying newspapers for the editorial contents	7.5	34.9	19.9	37.7	
Choice of going to the newspaper	5.3	29.9	19.9	39.9	5.0

**Table 3: percentage distribution of Level of exposure of FUYOE Mass Communication Students to newspapers editorials Table 3 (N = 281)**

Statement	Classification	Percentage
Daily access/exposure to newspaper editorials	Yes	50.2
	No	49.8
	<b>Total</b>	<b>100</b>
Preference for editorials in a particular newspaper	Yes	37.7
	No	62.3
	<b>Total</b>	<b>100</b>
Choice of Newspaper in accessing editorials	The Nation	27.8

Vendor/stand to read editorials

Table 2 revealed that 15.3% use to read newspaper editorials, 44.8% agreed that they used to read newspaper editorials, 19.9% were indifferent of if they used to read newspaper editorials, 19.9% disagreed that they used to read newspaper editorials and 0% strongly disagreed that they used to read newspaper editorials. The table showed 15.3% strongly agreed that they used to enjoy reading newspaper editorials, 44.8% agreed that they used to enjoy reading newspaper editorials, 19.9% were indifferent of if they used to enjoy reading newspaper editorials, 19.9% disagreed that they used to enjoy reading newspaper editorials and 0.0% strongly disagreed that they used to enjoy reading newspaper editorials. With reference to individuals preference for reading newspaper editorial to any other newspaper contents, 7.5% strongly agreed that they preferred to read newspaper editorial than any other newspaper content, 45.2% agreed that they preferred to read newspaper editorial than any other newspaper content, 24.9% were indifferent of if they preferred to read newspaper editorial than any other newspaper content, 22.4% disagreed that they preferred to read newspaper editorial than any other newspaper content and 0% strongly disagreed that they preferred to read newspaper editorial than any other newspaper content.

With regards choice of buying newspapers for the editorial contents, 7.5% strongly agreed that they used to only buy newspapers for the editorial contents, 34.9% strongly agreed that they used to only buy newspapers for the editorial contents, 19.9% strongly agreed that they used to only buy newspapers for the editorial contents, 37.7% strongly agreed that they used to only buy newspapers for the editorial contents and 0% strongly disagreed that they used to read newspaper editorials. As regards choice of going to the newspaper vendor/stand to read editorials, 5.3% strongly agreed that they used to only go to newspaper vendor stand(s) to read editorials, 29.9% agreed that they used to only go to newspaper vendor stand(s) to read editorials, 19.9% were indifferent if they used to only go to newspaper vendor stand(s) to read editorials, 39.9% disagreed that they used to only go to newspaper vendor stand(s) to read editorials and 5% strongly disagreed that they used to only go to newspaper vendor stand(s) to read editorials.

**Research Question 2:** What is the level of exposure of FUYOE Mass Communication Students to newspapers editorials?

	Vanguard	32.4
	Punch	32.4
	Daily Sun	5.0
	Others	2.5
	<b>Total</b>	<b>100</b>
Readership of editorials on online news media platforms	Yes	55.2
	No	44.8
	Total	100.0
Specification of the online news media platforms where they access editorials	Daily Sun	5.0
	Nairaland	20.3
	None	24.9
	Operamini	19.9
	The Nation	10.0
	Twitter	5.0
	Total	100.0

Table 3 showed 50.2% agreed that they access editorials on any newspapers, while 49.8% disagreed that they access editorials on any newspapers. As regards preference for editorials in a particular newspaper, 37.7% agreed that they access editorials on a particular newspaper, while 62.3% disagreed that they access editorials on a particular newspaper. When it comes to choice of Newspaper in accessing editorials, 27.8% preferred to access editorials on the Nation newspapers, 32.4% preferred to access editorials on Vanguard newspapers, 32.4% preferred to access editorials on Punch newspapers, 5% preferred to access editorials on Daily Sun newspapers, and 2.5% preferred to access editorials on other newspapers aside from the ones listed. As regards readership of editorials on online news media platforms, 55.2% agreed that they used to read editorials on online news media platforms, and 44.8%

disagreed that they used to read editorials on online news media platforms. With specification of the online news media platforms where students access editorials. The table indicates that 5% preferred to read editorials on Daily Sun online platform, 20.3% preferred to read editorials on Nairaland online platform, 19.9% preferred to read editorials on Operamini online platform, 14.9% preferred to read editorials on Punch online platform, 10% preferred to read editorials on the Nation online platform, 5% preferred to read editorials on Twitter online platform, and 24.9% preferred none.

### Research question 3: How frequently do FUYOE Mass Communication students read newspaper editorials?

**Table 4: Determining how frequently respondents read Newspaper editorials**  
Source: Field Survey 2021

Survey items	Strongly Agree	Agree	Indifferent	Disagree	Strongly disagree
Respondents' readership of newspaper editorials on regular basis	15.3	42.3	17.4	24.9	0.0
Daily readership of newspaper editorials	0.0	25.3	10.0	64.8	0.0
Readership of newspaper editorials as a result of boredom	5.0	24.9	10.0	57.3	2.8

Table 4 showed that **15.3%** strongly agreed that they used to read newspaper editorials often, 42.3% agreed that they used to read newspaper editorials often, 17.4% were indifferent of if they used to read newspaper editorials often, 24.9% disagreed that they used to read newspaper editorials often and 0% strongly disagreed that they used to read newspaper editorials often. With regards to daily readership of newspaper editorials, 0.0% strongly agreed that they used to read newspaper editorials daily, 25% agreed that they used to read newspaper editorials daily, 10% were indifferent of if they used to read newspaper editorials daily, 65% disagreed that they used to read newspaper editorials daily and 0% strongly disagreed that they used to read newspaper editorials daily. When it comes to readership of newspaper editorials as a result of boredom, 5% strongly agreed that they used to read newspaper editorials whenever they are bored, 24.9% agreed that they used to read newspaper editorials whenever they are bored, 10% were indifferent of if they used to read newspaper editorials whenever they are bored, 57.3% disagreed that they used to read newspaper editorials whenever they are bored

and 2.8% strongly disagreed that they used to read newspaper editorials whenever they are bored. It was discovered that majority of the FUYOE Mass Communication Students used to read newspaper editorials and they used to enjoy reading it. Also, majority of the FUYOE mass communication students preferred reading newspaper editorial content than any other contents. However, majority of the FUYOE Mass Communication Students disagreed that they only buy or go to the newspapers stand for newspaper editorials. It was discovered that majority used to read editorials on online news media platforms, such as *Nairaland*, *Operamini*, and *Twitter* online platforms.

### Conclusion

The study concluded that FUYOE Mass Communication undergraduate students still read newspaper editorials. However, the rate at which they prefer editorial contents is not as encouraging as it ought to be; their preferences cut across other contents, which reduce the rate at which they

read editorials. Also, the students prefer to access editorials more on online platforms than reading it on newspapers. This is probably due to wave of digitalization in the world. Finally, the study concluded that FUYOYE students do not read newspaper editorials on daily basis; they only read it once in a while; it is not in their habits to read newspaper editorials as a daily routine.

Based on the findings made, the following recommendations were made:

1. It was recommended that print media industries should ensure the availability of online editorials contents, since the world is becoming so much digitalized and youth are more used to reading online.
2. It was recommended that there should provision of daily newspapers in the school library to enable easy accessibility of newspaper editorials for those that don't have smartphones and those that have issues of bad network in their area.
3. It was recommended that the undergraduates should be educated on the importance of reading newspaper editorials by their lecturers.
4. It is a center for further studies to explore the factors associated with low readership editorials

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# An Efficient Algorithm to multiply 'n' matrices on two-dimensional Mesh Network Parallel Architecture

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## Abstract

In mathematics, matrix multiplication or matrix product is a binary operation that produces resultant matrix after multiplying two matrices concurrently and matrix multiplication is implemented for composition of linear maps, graphics-Graphic software such as Adobe Photoshop for rendering of images, Cryptography, wireless communication, Economics, for finding area of triangle, collinear points, for finding Solution of Linear Equations, Records, Engineering, Physics and machine learning. Multiple numbers of matrices along with dimensions are given, before multiplying we need to find an optimal sequence of matrices i.e., the order of matrices with a minimum number of multiplications, after that, we can proceed with multiplication process. Deciding of optimal order minimizes time complexity. Matrix multiplication follows the associative law, and if we alter the sequence of the matrices, it does not affect the final result. However, the cost of matrix multiplication greatly depends on the order in which the matrices are multiplied. The sequence which we follow to multiply 'n' number of matrices saves computational time. First we find out Optimal Sequence using Dynamic approach and then we construct a complete binary tree for given 'n' number of matrices, then multiply chain of two matrices using a two-dimensional mesh network on a SIMD model having wrap-around connections, then designed an algorithm to multiply  $n \times n$  matrices using " $n^2$ " number of processors. The effectiveness of this approach is demonstrated with comparative study with other approaches.

## Keywords

*Two-dimensional mesh network, Dynamic Programming, Optimal Sequence, Parallelism, High performance, SIMD model*

## Introduction

Matrix multiplication plays vital role in day-to-day life. More precisely, if A is an  $n \times m$  matrix and B is an  $m \times p$  matrix, their matrix product AB is an  $n \times p$  matrix, in which the  $m$  entries across a row of A are multiplied with the  $m$  entries down a column of B and summed to produce an entry of AB. When matrices represent two linear maps, then the matrix product represents the composition of the two maps. In geology, matrices are used for making seismic surveys. They are used for plotting graphs, statistics and also to do scientific studies and research in almost different fields. Matrices are also used in representing the real world data's like the population of people, infant mortality rate, etc. Multiplying 'n' number of matrices takes " $n^4$ " amount of time that is very huge if you deal with larger amount of data and one should think of using parallelism i.e., by performing task parallel with advent availability of [1] parallel architectures, which are more economical nowadays. In the implementation of genetic algorithm using binary code as a matrix [17] for mobile robot navigation in both static and dynamic environment, basically path for navigation is implemented using trace theory as an optimum controller.

SIMD Model is a Single Instruction stream-Multiple Data stream parallel architecture [16] manifests excellent performance in a numerous application fields such as vision, scientific computing, geometric modeling, and artificial intelligence mainly because of the massive data parallelism. A detailed study and survey has been done on Parallel Algorithms and Architectures [4] for image processing with SIMD computers with without sharing of memory. The Parallel Architectures [3] can be categorized in to three types: mesh-connected computers, pyramid computers, and hypercube and related computers. The mesh-connected network is array processor [5] has equal number of processing elements as number of pixels in an image.

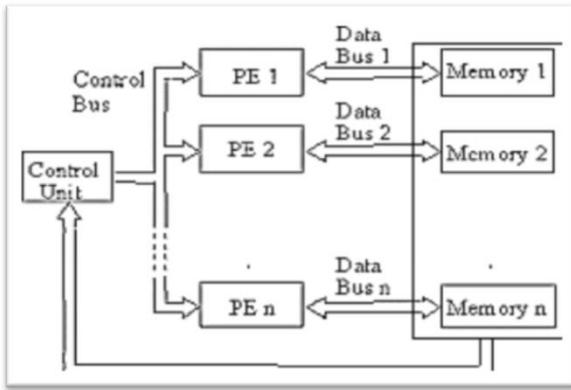


Fig 1. Architecture of SIMD

It is a variant of Instructional level Parallelism and here same instruction is executed on multiple data sets to produce the output and no processor runs the same instruction in one clock cycle. Communication network permits synchronous communication among several memory modules.

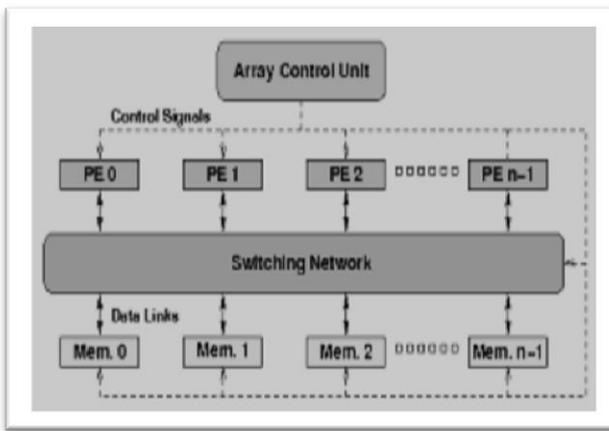


Fig 2. SIMD parallel Architecture

While a program is executed in SIMD Parallel Architecture, always we need a mask of a Program Element (PE) for doing processing along with autonomous control within PE. A mask bit within PE can be masked while processing of an instruction and mask bit in PE gets reset when PE receives instruction from control unit as no operation. Every PE has index registers, which are connected to global address space afford by CU Instruction and to reinforce data and address manipulations, the arithmetic logic unit has general-purpose registers and also contains pointer registers for additional support. In this paper we have used mesh-connected architecture, each node in this architecture uses four ports such as left, right, top and bottom ports. The instructions set in CU with PEs executes few instructions, which are fixed with P to stipulate that all instructions should execute in parallel. PEs has four bidirectional ports to communicate with four neighbors.

### 1. Matrix Chain Multiplication (MCM) Using Dynamic Programming

In dynamic programming approach, we divide given problem into smaller parts, find solutions for smaller modules, and

store those solutions into a table and can be used while solving higher level modules and bottom up approach is used to establish solution for complex task.

#### 1.1 Optimal Parenthesization

The Optimal Parenthesization for the given set of matrices can be determined by placing the parenthesis in all possible places, find out the cost of each placement and then return the minimum value. In a chain of 'n' matrices we can have set of parenthesis in 'n-1' possibilities. Let us consider an example of three matrices A1, A2, and A3 with dimensions 10X100, 100X50, and 50X20. If we multiply A1 and A2 first, then multiply with A3 leads to 60,000 multiplications. Another alternative is that multiply A2 and A3 together, then multiply with A1 leads to 1,20,000 multiplications. The number of multiplications is just double. That is the reason if we have an approach to deciding an optimal sequence of matrices before multiplications minimize the maximum amount of time.

##### 1.1.1 Sequential Approach

Algorithm MATRIX-CHAIN-MULTIPLICATION (A)

```

{
//A is an array of dimensions of matrices
nm=length(A)-1
for (p=1 to nm) do
mul [p,p]=0
for(len=2 to nm) do
{ for p=1 to nm-len+1 do
{ q=p+len-1
mul[p,q]=∞
for(r=p to q-1) do
{ temp=mul[p,r]+mul[r+1,q]+A[p-1]*A[r]*A[q]
if(temp<mul[p,q]) then
{
mul[i,j]=temp
sep[p,q]=r
} } }
} } }
return mul, sep
}
PRINT-OPTIMAL-PARENTHESIS (sep, p, q)
{
If(p=q) then
write 'Ai'
else
{
write '('
PRINT-OPTIMAL-PARENTHESIS (sep, p, sep (p, q))
PRINT-OPTIMAL-PARENTHESIS (sep, sep (p, q)+1,q)
write ')'
} }
}
    
```

**1.1.2 Time Complexity:** There is a nesting of three loops, one is for the length of matrices of the multiplications, the second loop is for row index, and column index calculated from the row index and length of the chain. The third loop is for 'r' i.e., numbers of alternatives where the matrix sequence can be get divided, and by going through all the possible values we consider the value of 'r', which gives the minimum number of multiplications. If 'n'

is the total number of matrices, then the total time required to find the optimal sequence of matrices is  $O(n^3)$ .

$$T(n) = O(n^3)$$

Sequential performance has been analyzed in Fig 3.

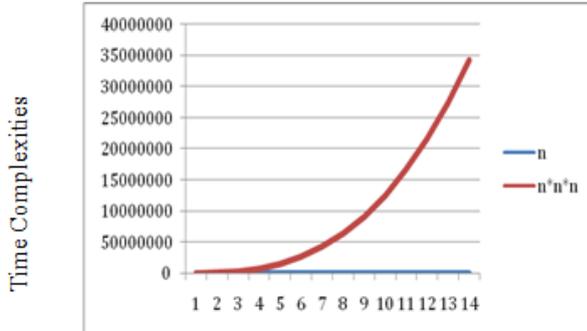


Fig 3. Sequential Analysis of MCM

### 1.2 Analysis by using Parallel Approach

The first polynomial time algorithm for the matrix chain product problem was got solved by Godbole [7] and it runs  $O(n^3)$  amount of time. Later Hu and Shing [8] gave another sequential algorithm, which runs in  $O(n \log n)$  time. This algorithm was later proven to be optimal [9]. Unfortunately, all of these algorithms are highly sequential in computation. The first algorithm or an approach based on parallelism [2] for this problem is based on dynamic programming. Using Dynamic Programming, Valiant et al. [10] implemented an algorithm which runs in  $O(\log^2 n)$  time using  $n^9$  processors and the time complexity got improved by Rytter [11] to  $n^6 / \log n$  processors on a CREW PRAM. Huang et al. [12] and Galil and Park [13] modified Rytter's algorithm and further, they reduced the number of processors to  $n^6 / \log^5 n$  and  $n^6 / \log^6 n$  respectively. The most recent research on the parallel algorithms of these problems is based on Hu and Shing's sequential algorithm. A. Czumaj [14] and P. Ramanan [15] gave algorithms that run in  $O(\log^3 n)$  time using  $O(n^2 / \log^3 n)$  processors and  $O(\log^4 n)$  time using  $n$  processors, respectively.

The pictorial representations of the above facts are being plotted in Fig 4.

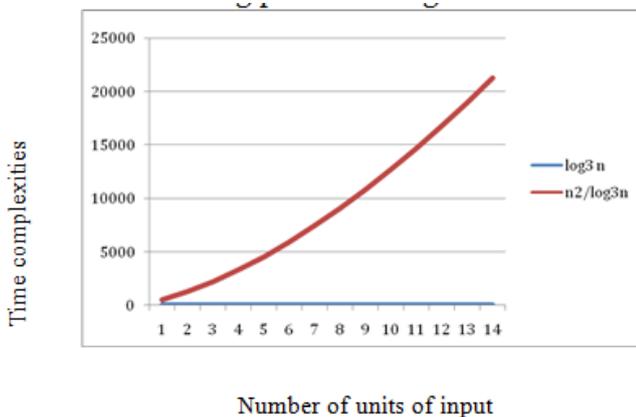


Fig 4. Parallel analysis of MCM using  $n^2 / \log^3 n$  processors

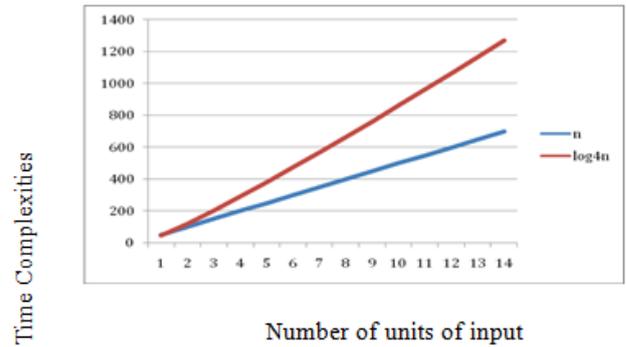


Fig 5. Parallel analysis of MCM using  $n$  processors

Sequential versus parallel approaches compared graphically in Fig 5. The blue color line represents sequential performance, red and green colored lines represents parallel approaches, which are discussed above paragraph.

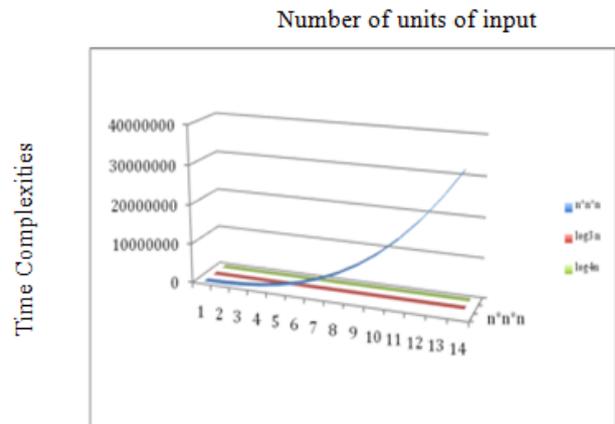


Fig 6. Comparative analysis of sequential with parallel analysis

## 2. A new approach for solving 'n' number of Matrix Multiplication using parallel architecture

Consider an example of 'n' matrices  $A_1 * A_2 * A_3 * A_4 * A_5 \dots \dots \dots * A_n$ .

Algorithm Matrix Multiplication ()

```
{
// 1. Construct a complete binary tree
(i) Initially check whether the tree is empty or not. If it empty, then make new node as root. Else, delete front node of the queue and if the left node does not exist, then make new node as a left child. If left child exists, then make new node as a right child.
(ii) If deleted node has both left and right, then Deque () it, otherwise Enqueue () the new node.
```

SIZE =20 //initialization of capacity of the queue

// A structure definition for a tree node

struct node

{

any data typeinfo;

struct node \*l,\*r;

};

// For creation of a queue node

struct Queue

```

{
    struct node* *arr;
};
// structure to create a new node
struct node* new (info)
{
    struct node* t = (struct node*) malloc (sizeof ( struct
node ));
    t->info = data;
    t->l = t->r = NULL;
    return t;
}
// sub-routine to creation of a Queue
struct Queue* createQ(intsize)
{
    struct Queue* q = (struct Queue*) malloc(sizeof( struct
Queue ));
    q->fr = q->re = -1;
    q->size = size;
    q->arr = (struct node**) malloc(q->size * sizeof( struct
node* ));
    for i = 0 to size-1 step by 1 do
        q->arr[i] = NULL;
    return q;
}
//Algorithm to check whether queue is empty or full
Algorithm QEmpty (struct Queue* q)
{
    return q->fr == -1;
}
Algorithm QFull (struct Queue* q)
{
    return q->re == q->size - 1;
}
//If queue has single element
Algorithm single element (struct Queue* q)
{
    Return q->fr == q->re;
}
// Insert an element in to a queue
Algorithm Enqueue (struct node *root, struct Queue* q)
{
    if(QFull(q)) then
        return;
    q->arr[++q->re] = root;
    if(QEmpty(q)) then
        ++q->fr;
}
struct node* Dequeue(struct Queue* q)
{
    if(QEmpty(q)) then
        return NULL;
    struct node* t = q->a[q->fr];
    if(singleelement(q)) then
        q->fr = q->re = -1;
    else
        ++q->fr;
    return t;
}
struct node* front(struct Queue* q)
{
    return q->arr[q->fr];
}
// Is tree has both the children
Algorithm twochildren (struct node* t)
{
    return t && t->l && t->r;
}
// Insertion of a new node
Algorithm insert (struct node **root, int info, struct Queue*
q)
{
    struct node *t = new(data);
    // If the tree is empty, make new node as root
    if(!*root) then
        *root = t;
    else
    {
        // go to the front of the queue.
        struct node* fr = front(q);
        // If left child does not exist, then make new node as left
child to front node
        if(!fr->l) then
            fr->l = t;
        // If right child does not exist, then make new node as
right child to front node
        else if(!fr->r) then
            fr->r = t;
        // If both children exist
        // Dequeue() it.
        if(twochildren(fr)) then
            Dequeue(q);
    }
    // Insert new node into the queue
    Enqueue(t, q);
}
// Complete binary tree
Algorithm binary tree (struct node* root)
{
    struct Queue* q = createQ(SIZE);
    Enqueue(root, q);
    while(!QEmpty(q)) do
    {
        struct node* t = Dequeue(q);
        write ( t->d);
        if(t->l) then
            Enqueue(t->l, q);
        if(t->r) then
            Enqueue(t->r, q);
    }
}
// Creation of tree starts here
Algorithm tree creation ()
{
    struct node* root = NULL;
    struct Queue* q = createQ(SIZE);
    for i = 1 to 12 step by 1 do
        insert(&root, i, q);
    binarytree(root);
}
//2. Multiply matrices in bottom up fashion using n2
processors to multiply every two adjacent matrices and
number of steps are logn

```

```

Algorithm Matrix multiplication( )
{
for h= 1 to logn step by 1do
{
//Multiplication of matrices  $A_i X A_{i+1}$ ,
 $A_{i+2} X A_{i+3}, \dots, A_{n-1} X A_n$ 
for z= 1 to n-1 do
{
for all P(x,y) do
{
for x= 1 to n do
{
for y=1 to n do
{
if (x>z) then
rotate matrix  $A_i$  in left direction
if (y>z) then
rotate matrix  $A_{i+1}$  in upward direction
} } }
}
}
}
//compute the product of  $A_i$  and  $A_{i+1}$ 
//store it in c
for z=1 to n-1 do
{
for all P(x,y) do
{
for x= 1 to n do
{
for y=1 to n do
{
rotate  $A_i$  in left direction
rotate  $A_{i+1}$  in the upward direction
 $c=c+A_i*A_{i+1}$ 
}
}
}
}
}
Algorithm Parallel_Multiplication( )
{
call tree creation()
call Matrix multiplication( ) //using cross wired mesh
network using  $n^2$  processors
//for every two matrices
}
    
```

**2.1 Matrix Multiplication Using Mesh Network**

Consider a two-dimensional mesh network on a SIMD model having wrap-around connections shown in Fig 7. Designed an algorithm to multiply  $n \times n$  matrices using " $n^2$ " number of processors.

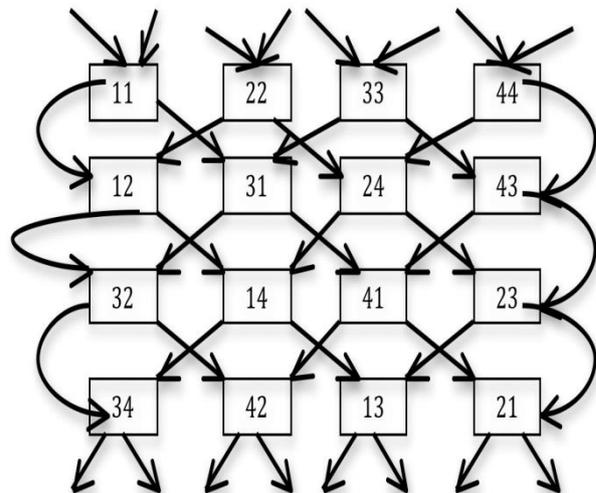
Arrange the matrices  $A_i$  and  $A_{i+1}$  in such a way that every processor  $p_{ij}$  has a pair of elements for multiplication. The elements of matrix  $A_i$  will move in a left direction and the elements of matrix  $A_{i+1}$  will move in an upward direction. All these alternations of elements of  $A_i$  and  $A_{i+1}$  stores in processing element 'p', which leads to a new pair for further multiplication. First, we stagger two matrices  $A_i$  and  $A_{i+1}$ . Secondly find multiplication of  $A_i [i, k]$  with  $A_{i+1}[k, j]$ , and then we calculate the summation of the entries once the second step is completed.

Mesh Network is a topology that makes a collection of nodes to form a grid called mesh topology and all the edges are parallel to the axis of the grid and also adjacent nodes communicate to each other through a network.

**Total number of nodes in a network = (total number of nodes in a row) × (total number of nodes in a column)**

The evaluation of mesh network can be by factors one is Diameter and second is Bisection width. A p-dimensional mesh network having  $k \times p$  nodes has a diameter of  $p \times (k-1)$ . Bisection width is the minimum number of edges required from network to divide network into equal parts.

$A_{i+1}[4,1]$	$A_i [1,4]$	$A_i [2,4]$	$A_{i+1}[4,2]$	$A_{i+1}[4,3]$	$A_i [3,4]$	$A_i [4,4]$	$A_{i+1}[4,4]$
$A_{i+1}[3,1]$	$A_i [1,3]$	$A_i [2,3]$	$A_{i+1}[3,2]$	$A_{i+1}[3,3]$	$A_i [3,3]$	$A_i [4,3]$	$A_{i+1}[3,4]$
$A_{i+1}[2,1]$	$A_i [1,2]$	$A_i [2,2]$	$A_{i+1}[2,2]$	$A_{i+1}[2,3]$	$A_i [3,2]$	$A_i [4,2]$	$A_{i+1}[2,4]$
$A_{i+1}[1,1]$	$A_i [1,1]$	$A_i [2,1]$	$A_{i+1}[1,2]$	$A_{i+1}[1,3]$	$A_i [3,1]$	$A_i [4,1]$	$A_{i+1}[1,4]$



**Fig 7. Matrix multiplication on the mesh network**

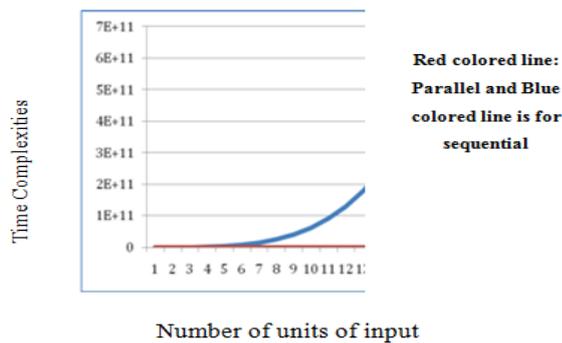
**Analysis:**

The construction of complete binary tree using linked list takes  $O(n)$  time and Multiplication of two  $n \times n$  matrices requires  $2n-1$  time using cross-wired mesh network by using  $n^2$  processors. Multiplication process requires  $O(n)$  amount of time. And we need to multiply 'n' number of matrices that are organized in the form complete binary tree. A total step required to multiply 'n' numbers of matrices is  $\log n$ . Our process requires  $O(n \log n)$  time to multiply 'n' number of matrices with  $\log(n)$  number of step and  $n^2$  number of processors to multiply every two matrices.

**Time complexity =  $T(n) = O(n \log n)$**

Just imagine to multiply two matrices in a sequential machine requires  $n^3$  time and to multiply 'n' number of matrices how much time does it requires? It will be  $O(n^4)$  time.

## 2.2 Comparison between sequential and our approach



**Fig 8. Sequential versus parallel to multiply 'n' number of matrices**

### Conclusion

Performance of an application merely depends upon the time and space complexity. With the advent of available architectures or resources, programmers are concentrating on execution time i.e., the execution speed of applications. A parallelization is an approach, which plays a major role in the improvement of performance of applications. If we use uniprocessor system to increase the performance of applications, we have to run the system at higher clock speeds that consume lots of power and further it generates a huge amount of heat and by making our programs parallel can eliminate these facts. We have identified parallel modules for multiplying set of matrices with the given dimensions using an architecture mesh network and its performance is compared with sequential approach.

### Future Work

While this framework provides a new scenario to identify parallel modules. After identifying parallel modules according to our approach, we have considered only mesh network for execution of those modules. For this approach, we have designed an algorithm that can be further extended for practical implementation. Other interconnection topologies can also be considered for processing in place of the mesh network, further its performance can be compared with the existing approaches.

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# Relationship between Gainful Employment and Locus of Control in School: Views and Perspectives

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## Abstract

Employees are the most important component of any organization. For any educational organization it is pertinent to maximize the effectiveness of their teachers and improve their experience of work. The development of positive school environment and educators sense of personal responsibility towards their job can enhance their efficiency. With this regard, Gainful Employment and Locus of Control play a significant role in uplifting overall teaching performance among educators'.

Gainfully employed people always look forward to going to their work instead of dreading it. They find growth in the areas of their talent and feel productive and satisfied in their profession, it explains the construct Gainful Employment. The construct Locus of Control can be defined as the level to which individuals believe that their actions control their life events and success (internal locus) or are dependent upon outside forces (external locus).

In a teachers' life the teaching and other school related activities occupies large part and has a great impact upon their overall personality therefore gainful employment is an important criteria to boost their talent and skill in the area of education. Educators also require a sense of control upon their teaching and other school related activities. Therefore the accurate understanding and cognizance of Locus of Control can enable the teachers to practically reflect and take charge of their classroom teaching and improve their interaction with the students.

Locus of Control is an established concept of psychology whereas Gainful Employment is a comparatively new concept that was conceptualized in 2007 by Snyder and Lopez. Both the concepts depict relevance in almost every profession, specifically teaching and corporate professionals. This paper aims to provide theoretical links between Gainful Employment and Locus of Control within the domain of school education, in context of teachers.

## Keywords

*Gainful Employment, Locus of Control*

## Introduction

Gainful Employment is a positive psychology concept that explains work as a means to enrich oneself, where employees feel productive and satisfied in their profession. This type of work is not merely limited to income, but also entails other benefits that an employee derives from his job. With this regard, employees that are gainfully employed give value to their occupation and this positive aspect of their work helps in understanding that, how well the employees are contented and in harmony with the value system of their profession. In relation to work, a bold statement was first made by Sigmund Freud that the individual's ability to work and to love signifies a healthy life (O' Brien, 2003). In the perspective of profession, teaching plays a vital role in spreading education. The positive school environment along with self-driven and responsible teachers, provide a pertinent pathway for imparting quality education to their students. The importance of the gainfully employed teachers can not only be evaluated by their teaching competence and overall job satisfaction, but also by the positive feedback gathered from their students, co-workers and senior's about their teaching as well as execution of other school related duties. In the field of positive psychology the concept of gainful employment was

defined by Snyder and Lopez (2007). This concept is very relevant in the area of teaching as this type of work provides eight benefits:

1. Variety in duties performed
2. A safe working environment
3. Income for the family and oneself
4. A purpose derived from providing a product or service
5. Happiness and satisfaction
6. Positive engagement and involvement
7. A sense of performing well and meeting goals
8. The companionship and loyalty to coworkers, bosses and companies

## Conceptualizing Gainful Employment and Locus of Control

Gainful employment signifies positive aspect of professional work. In relation to the importance of progressive side of work, a statement given by Henry (2004) defines it, The centrality of work to well-being is not surprising when you think of the number of benefits it offers, notably: an identity, opportunities for social interaction and support, purpose, time filling, engaging challenges, and possibilities for status apart from the provision of income. (p.270)

Nowadays with regard to teaching work, teachers' role in a school is not just limited to effective instruction delivery in a classroom, but has extended beyond pedagogy or effective instructional delivery. School teachers are also found involved in various leadership roles of day to day school activities and events that are organized for the students, they are engaged in facilitating the teaching of their colleagues and are also seen involved in the educators' professional development programs for upgrading their quality of teaching. Here gainfully employed teachers' benefit more because their sense of satisfaction and happiness in the work drives them to perform better in the workplace i.e. school.

It can be evaluated by the usage of Gainful Employment Measure that was developed by Snyder and Lopez (2007). It is a significant tool specifically for the teachers, to assess whether they are gainfully employed professionals. This measure is useful for analyzing the components of gainful employment among school teachers that can be worked upon and improved by the school administration with respect of providing safe working environment, income and variety in duties assigned to them. Other domains like positive engagement, happiness and satisfaction etc., can be enhanced by means of intervention programs for the teachers.

Studies assert that the chances of overall satisfaction of an individual will be higher with life, if the individual is happy at work (Hart, 1999; Judge & Watanabe, 1993). Happiness and satisfaction is one of the benefit derived from gainful employment and psychologists prefer placing it at the center amongst the eight benefits because of its vital role (Amick et al., 2002; Kelloway & Barling, 1991). Gainfully employed teachers are able to perform better because they are happy educators and have a sense of efficiency while delivering a lecture, discussion or organizing any school activity. According to Peter Suchy with regard to gainful employment, an employee works to enrich himself in an organization or a company. In context of teachers it stretches the skills and talents of educators that improve their performance and then they are better able to meet the goal of their educational organization.

Gainful employment results in work involvement and engagement among the school teachers. This work involvement has been operationally defined by Kanungo(1977) as "a generalized cognitive (or belief) state of psychological identification with work, in so far as work is perceived to have the potentiality to satisfy one's salient needs and expectations". It enables the educators to understand the academic and emotional needs of their students and consequently provide them better learning experiences. Studies reveal that this engagement manifests the employee circumstances in which they "know what is expected of them, have what they need to do their work, have opportunities to feel something significant with coworkers whom they trust, and have chances to improve and develop" (Harter et al., 2002, p.269).

Gainful employment allows the teachers to fully embrace teaching, as the potential source of calling in their professional life. The purpose of teaching is their underlying driving force that enables them to show commitment in their work and brings passion in their field of education. In Research done by Amy Wrzesniewski along with her

colleagues( e.g., Wrzesniewski, McCauley, Rozin, & Schwartz, 1997) have explained the employees perception of work as a calling. This notion of work as a calling is the purpose that an employee derives from his job that makes him gainfully employed. Martin Seligman (2002) describes, Individuals with a calling see their work as contributing to the greater good, to something larger than they are, and hence the religious connotation is entirely appropriate. The work is fulfilling in its own right, without regard for money or for advancement. When the money stops and the promotion end, the work goes on. Traditionally, calling were reserved to very prestigious and rarified work – priests, supreme court justices, physicians, and scientists. But there has been an important discovery in the field: Any job can become a calling, and any calling can become a job. (p.168)

Gainful Employment also encompasses variety in job duties. When the employees maintain variety in the activities of their work, then it not only brings satisfaction in their professional arena but also contribute in overcoming boredom at work. The maxim "variety is the spice of life" is important for teachers in the school to overcome repetitiveness of the day to day school activities. It also sustains their interest and motivation in creating new ways to teach and provide improved learning experiences to their students.

In the area of work, income is an important component for the fulfillment of employees' needs and their family, but is considered to be an overrated source of happiness. Two survey studies reveal that people comprehend, their amount of money making to be unrelated to the happiness and meaning in life in any major degree (King & Napa, 1998). According to Peter Suchy, for employee money is very essential, but gainfully employed workers understand that it is not everything. According to him, gainfully employed individuals work in order to enrich them professionally. This also holds true in the case of gainfully employed school teachers, as their zeal and enthusiasm in teaching and school activities is independent of the amount of income they receive.

Gainfully employed professionals also perceive that their job gives them chance to interact with people and develop bonding with each other. The Gallup organization by means of Vital Friends Assessment surveyed 1,009 individuals to assess the effects of friendship on productivity, satisfaction and happiness (Rath, 2006). This work of Gallup researchers confirmed in the book called Vital Friends that in the workplace a sense of community is a factor that contributes to satisfaction and happiness on the employee's job.( Mahan, Garrard, Lewis,& Newbrough, 2002; Royal & Rossi, 1996). The companionship that school teachers develop over the years of teaching with other teachers simply boosts their engagement, happiness and performance in the school environment.

Locus of control is the second variable used in this paper, is a useful means to gain understanding about the potentialities and limits of the school teachers and to uplift their sense of responsibility and personal control. The internal-external control dimension of this concept is significant in knowing individual's behavior in context of reinforcement. With regard to teachers, it was found by Stockard and Lehman (2004) that the level of control that teachers exercised over

the work environment significantly influenced satisfaction. Studies have also found evidence that those high external control teachers possibly to suffer burnout more (Farber, 1991; Kyriacou, 1987; Rotter, 1996). Scott, Cox and Dinham (1999), have indicated that when teachers had greater control upon their work then they were found more satisfied. Rotter describes, "The effect of reinforcement following some behavior ... is not a simple stamping in process but depends upon whether or not the person perceives a causal relationship between his own behavior and the reward" (1966, p. 1).

To performance, locus of control is found to be related (Spector, 1982; Spector & OConnell, 1994). According to Phares, Locus of control is "the belief regarding internal or outside forces have control over their success". It was indicated by Locke(1983) and Spector(1982) that the appearance of more motivation, better performance on job and expression of higher levels was found among individuals with the orientation towards internal locus of control than the individuals with external locus of control. In a study by Bulus' (2011) with regard to prospective teachers' indicated that, high level of internal locus of control plays role in goal orientation of mastery level( goals to enhance competence in teaching and mastering task of teaching) and achievement in academics. Findings suggests that in high external control among teachers are more chances to suffer burnout(Farber, 1991; Kyriacou, 1987; Rotter, 1966).

Studies by Phares(1957) gave an early indication of usefulness of knowledge of subject's perception of control for the prediction of the type of judgments the subject would make in a task given as a response to failure and success. Study of James and Rotter (1958) showed confirmation to the findings of Phares' that the manner in which individuals would respond to the outcome of their performance is predicted by perception of control. In a finding by Phares(1968) in the area of decision making, the externals and internals were compared in their usage of information. Despite the fact that the externals and internals might have equivalent funds of information, it was concluded that as compared to externals, internals use of information in a better manner. Study by Rotter and Mulry(1965) have asserted that as compared to externals, internals give more attention to decisions about the matters that are skill-related. The findings made it clear that when the task is considered skill demanding then in decisions more time was deliberately spent by the internals as compared to externals.

#### **Gainful Employment and Locus of Control in Teachers**

The role of gainful employment in making individuals feel productive and satisfied in their work significantly determines how they feel about themselves. In context of teaching, the morale of the teachers can be sustained by means of gainful employment as it facilitates the expression of positive individual-group relationship in terms of companionship and loyalty to coworkers and seniors. It also promotes higher probability of attaining job satisfaction and a sense of performing well as an educator in a course of action. It influences teachers' life in a positive manner; as a result the importance of gainful employment in the teaching profession cannot be undermined.

With respect of teaching and learning process, the role of "locus of control" is equally significant in the field of education. Locus of control deals with an individual's views about himself in relation to the happenings of his life, and the interpretation drawn from those interactions that occur between his own self and his life experiences. It elucidates the extent to which an individual's behavior is contingent upon the reinforcement. This concept became prominent with the monograph publication by Rotter (1966). In the monograph, the scale of locus of control (I-E Scale) was presented that was developed by him to evaluate one's generalized expectancies for external or internal control of reinforcement. It is derived from social learning theory. Locus of control is internal as well as external. The Internal control involves generalized expectancy in which individuals have perception that one's own actions causes the positive or negative events and are potentially under one's control. On the other hand, the External control involves generalized expectancy, where one's perception regarding positive or negative events is beyond one's control and is not related to individual's behavior. The cognizance of locus of control can promote acceptance of responsibility among school teachers with regard to their vital role in shaping students overall performance and successful leadership among school administrative authorities for improved school functioning.

#### **Theoretical links between gainful employment and locus of control**

In this paper the researcher attempts to illustrate the theoretical links between gainful employment and locus of control. As pointed out earlier, the first concept i.e. gainful employment explains the work that leads to healthy life of the employees by enabling them to stretch their talents and strengths where they feel satisfied and productive in the job. On the other hand the second concept of this paper i.e. locus of control describes one's beliefs regarding the extent to which they can control or cause events in their life.

Studies have revealed that internal locus of control among individuals' results in:

- Improved performance
- Satisfaction with the work
- Happiness in the job
- Goals achievement
- Engagement in the work
- Commitment towards work, creating work life balance
- Better social adjustment and adaptability with others

These benefits depict theoretical and empirical association with the second concept i.e. gainful employment. The following five benefits of gainful employment shows relationship with the benefits derived from internal locus of control are mentioned below:

- Happiness and Satisfaction
- Sense of Performing Well and Meeting Goals
- Engagement and Involvement
- Deriving Purpose in Providing a Product or Service
- Companionship and Loyalty to Coworkers and Company

The conceptual understanding of locus of control shows that individuals with internal locus of control experience happiness and satisfaction in their job. Likewise theoretical knowledge of gainful employment also describes the fact that gainfully employed individuals are happy and satisfied in their workplace. This indicates that an increase in either one of them will result in the increase of other. Empirically also, with regard to happiness, a study by Shubina (2017) shows a significant correlation between happiness and internal locus of control. Argyle (2001) and Myers (2001) have also indicated that there exists a direct relationship between perceiving of happiness and internal locus of control.

Another study by Devin, Ghahramanlou, Fooladian & Zohoorian (2012) found that happiness and internal locus of control are positively related among teachers. No positive relationship has been found between external locus of control and happiness in any studies. With regard to satisfaction among the workers, the studies have revealed that the employees with internal locus of control exhibit greater satisfaction in the job than the employees with external locus of control ( Gangai, Mahakud & Sharma, 2016; Spector, 1982). Similarly gainfully employed individuals demonstrate good satisfaction in their job. Satisfaction is one of the characteristic of gainful employment, the findings claim that it plays the key role in the professional domain of the individuals ( Amick et al., 2002; Kelloway & Barling, 1991). Theoretically the concept locus of control explains that individuals with internal locus of control perform better in job. It is because they take charge of their roles and responsibilities instead of blaming outside factors i.e. circumstances and people. Similarly gainful employment also results in performing well and meeting goals.

Empirically in context of performance, studies have indicated that the employees with internal locus of control perform well in the workplace as compared to workers with external locus of control (Mali, 2013; Spector, 1982). Likewise gainful employment also results in performing well in profession and also enables the employees to meet their respective goals of the job, which is indicated by the gainful employment model by Snyder and Lopez (2007).

With regard to meeting goals, a study by Coburn (1990) indicates that the individuals with internal locus of control are more motivated in meeting goals than the individuals with external locus of control. The study claims that the presence of goals, on the individuals with external locus of control adds pressure to them which creates a feeling of helplessness among them whereas it is not the case of individuals with internal locus of control. Similarly, gainful employment also allows the individuals to meet the desired goals expected from him. Peter Suchy with regard to this suggest that the employee need to evaluate what he or she has to offer to the organization and also determine what more is needed from him or her. It facilitates the workers to meet the goals of their organization. Snyder and Lopez (2007) have also described, meeting goals and performing well as one of the component in determining gainfully employed individual.

Conceptually individuals with internal locus of control are more engaged in work as compared to individuals with external locus of control. These individuals have engagement in their work. Theoretically gainful employment also results

in engagement and involvement in work. The studies have practically confirmed this theoretical viewpoint.

Merwe (2003) in a research study found that there exist a positive relationship between internal locus of control and engagement. The study suggests that engaged individuals have an internal locus of control. It also asserts that these individuals are less prone to burnout and use active coping strategies whereas it is not the case of individuals with external locus of control. In context of gainful employment it has been demonstrated that gainfully employed individuals are involved and engaged in their work. Snyder and Lopez (2007) have described engagement and involvement as one of the important benefit derived from gainful employment. According to Rabinowitz and Hall (1977) involvement in work and internality go together. This work involvement according to Kanungo (1977) is “ a generalized cognitive (or belief) state of psychological identification with work, in so far as work is perceived to have the potentiality to satisfy one’s salient needs and expectations”.

With regard to deriving purpose in the work and its services, the theoretical viewpoint of locus of control indicates that the individuals with internal locus of control derive purpose and meaning in their work. This fosters commitment towards their job. In theory, gainful employment also enables the individuals to derive purpose in their job. Empirically in context of locus of control, Johnson et al. (1968) in a finding indicated that internals in one case showed pain tolerance in order to actively do what they considered correct; and in another case it was found that for the sake of maintaining proper behavior, they manifested willingness to risk rejection at social level, as construed by them. Another study by Crowne and Liverant (1963) also indicates that individuals with internal locus of control trust their judgments more than individuals with external locus of control, when the stakes of success is of some value to them. It is because externals showed more confidence on the consensual judgments than the self-independent judgments. In another study Midlarski (1971) claims that help is more likely given by internals to other individual than the individuals with external locus of control.

All these findings indicate that the acts of internals are driven by purpose and meaning even to the extent of tolerating discomfort and are not influenced by the consensual judgments of others. This also enhances internals ability to commit to the work assigned to them by taking personal responsibility and in doing so quality performances are given by them.

Empirically gainfully employed individuals are also driven by purpose, as the sense of giving services through their work gives them the impetus to continue doing their work with passion and enthusiasm. Amy Wrzesniewski and her colleagues (e.g., Wrzesniewski, McCauley, Rozin, & Schwartz, 1997) in their research have described work as calling, where the employees in an organization from all the status i.e. highest to the lowest can recognize their work as a calling and have a sense of purpose in providing services. In this case workers for their own sake bring commitment and passion to the work. Here the employees are gainfully employed where work is perceived with purpose.

With regard to companionship and loyalty to coworkers and bosses, the theory of locus of control asserts that internal locus of control results in better social adjustment with people and situations as compared to external locus of control. Similarly the theory of gainful employment also suggests that the gainfully employed individuals have better companionship with the fellow workers, seniors and loyalty towards them and their organization.

Empirically a study by Bahrainian and Yari (2014) shows that internal locus of control and social adjustment is positively correlated. This study asserts that the adjustment ability is greater among individuals with internal locus of control than the ones with external locus of control. Another study by Jain and Singh (2015) also suggest that internal locus of control results in better adjustment with the surrounding environment as compared to external locus of control. These findings indicate that internals are better able to adjust in the company of others than the externals.

Similarly empirical findings in context of gainful employment confirm the importance of companionship at the workplace. Vital Friends Assessment developed by Gallup Organization where 1,009 people were surveyed with regard to effects of workplace friendships on their productivity, happiness and satisfaction (Rath, 2006). Vital Friends book presented Gallup researchers work and gave confirmation regarding the employees' community sense at the workplace as the contributing factor to their satisfaction and happiness on the profession (Mahan, Garrard, Lewis, & Newbrough, 2002; Royal & Rossi, 1996). These studies reveal that the individuals with best friends at their area of work are physically and psychologically seven times more engaged on their job (Rath, 2006).

The conceptual understanding and empirical findings indicates that an increase in either one of them (internal locus of control or gainful employment) will result in the increase of the other.

### Significance of relating gainful employment and locus of control

The significance of relating locus of control and gainful employment lies in the fact that on the common elements of both the constructs, an intervention training program can be conducted among the teachers in a school environment. It can result in an increase of both internal locus of control and gainful employment. The related elements of both the concepts are happiness, satisfaction, engagement and involvement, deriving purpose, sense of performing well and companionship at the workplace.

With regard to internal locus of control, findings have revealed that it is of changeable disposition (Manichander, 2014). This indicates that the internal locus of control can be induced and maintained among individuals. An increase in the internal locus of control among school teachers can enhance their gainful employment due to theoretical and empirical association between the two.

In a school setting, sensitivity towards students' needs is manifested by the teachers who take responsibility in the teaching learning process, derive a sense of purpose in the field of education by giving value to their students' academic interest. Their locus of control is internal and they perceive

teaching as a calling. In context of gainful employment, gainfully employed educators teach in order to enrich their skills in teaching. These professionals have a growth mindset in the area of education. Findings indicate that for gainfully employed professionals the value of their job is not just limited to income. Income is important but is not everything for them. With regard to gainfully employed individuals' happiness, purpose, satisfaction, performance, companionship cannot be compromised.

Two survey studies suggest the understanding of people revealing that they perceive their amount of money making has no relation in any major extent with the meaning and happiness in life (King & Napa, 1998). In a teaching job, to increase the meaning, happiness and the above mentioned elements it becomes important to raise the educators' gainful employment and internal locus of control. For this reason to enhance both gainful employment and internal locus of control among these professionals, an intervention programme can be designed and conducted in schools, with reference to the relationship between the two constructs.

In the field of education, it can uplift educators' sense of responsibility, purpose, passion and commitment, enabling them to become cognizant about students potentialities and conflicts, by giving more emphasis to student centered approach with the usage of effective methods in teaching.

### Conclusion

The above discussion comprehends the relationship between gainful employment and locus of control with regard to school teachers, as they paly a very significant role in students school life. The internal locus of control and gainful employment positively influences their teaching abilities and empowers them to provide improved learning experiences to the students. Therefore the importance of understanding this association between the two constructs lies in knowing the common elements between them and thereafter planning, designing and conducting an intervention programme on those common elements. It can enhance teachers' internal locus of control and gainful employment and also enable them to experience growth in the area of their talents and strength by elevating their efficiency in teaching. The relationship between these two constructs can practically benefit schools and overall raise the quality of education in it.

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# A Review Article on using Business Value Oriented Delivery at Status Global as a flexible Holistic Approach to Team Growth and Project Success

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## Abstract

Being a Global Technology Consulting firm, we are always focused in creating impactful results and empowering our clients to achieve more. With Technology, Solution and People as our three pillars of commitment and success, we strongly emphasize on BVOD.

The Business Value Oriented Delivery is a novel extension for Organization Management with focus on optimization and enhancing the Business Value of our Products and Services. We rely on adding value, attention and centralizing our efforts to the Organization Culture, team dynamics, client interactions, relationship between client and us, human resources and relations, work processes, employee interactions, attitude, skill, and maturity levels, reducing waste, knowledge harvesting, asset management, re-usability of our products, innovation, modernization, creativity and satisfaction of our end users and clients.

We as an Organization, believe in fostering a culture where our Team Members are proactive and aligned with the short-term and long-term goals of the company bringing higher levels of contribution, efficiency, productivity gains and shared responsibility of client deliverables. A culture of mutually evolving, growing and respectful team improving its personal and professional qualities, eliminating impediments on its own, optimizing processes, managing work, and removing waste in terms of time, effort, resources, communication wherever possible.

Every aspect of management at Stratus involving people, project, program, priorities, conflicts, resources, product, services, vendor has its prime attention to Business Value being driven and achieved.

## Keywords

*Stratus Global, Business Value, Delivery, Team, Program Management*

## Program Management at Stratus Global

At Stratus, one of the core and crucial activities performed is to analyze project dependencies because the whole program and all projects are interconnected based on dependencies. We believe that knowing the dependencies between projects really helps various teams get the big picture and deliver business value with excellence. Planning and communication become easier, and it will make logical sense at an early stage in project development, so the Teams know where to focus their efforts. It's also critical that project managers have an idea of where to look for the optimization of processes and increase the business value of projects. Our three sound fundamentals of work and adherence in this direction include – Knowledge Management, Asset Management and Cross-Skill Management of our Team Members.

We make sure that every slice of information and knowledge within Stratus is harvested and made accessible to our complete workforce for reference and re-utilization across projects using Confluence and SharePoint as our tools. Artifacts can include excel documents, word sheets, presentations, team recordings, tools, utilities etc. which are then preserved as Assets within our repository. This

stimulates a culture of knowledge sharing between the team members, strongly encourages cross-communication and promotes productivity gains by applying existing references for a new Business Client. Team members do not hesitate to push technical suggestions and recommendations to Business Users which have been already tested and validated and are absolutely expected to work when implemented, in return reducing waste and channelizing efforts in other needed project areas and aspects.

We currently have approximately 50+ internally cultivated tools and assets which have been extensively utilized across projects reducing waste and delivering value to our client base.

We trust that cross-skilling or cross-training allows team members to pick up different mindsets, act as a better support system for other team members within the project or across projects and appreciate their challenges. It assists team members to help balance the workload, appreciate, and respect the contributions of the other team members and drive collaboration and decision-making choices that incorporate the various project perspectives.

Stratus, as an organization fosters that healthy and cross-functional teams lead more business value and avoid sprint fatigue maintaining the team velocity, cohesiveness, and motivation. >70% of our workforce across the shores is cross-skilled and trained which helps us drive dynamic client goals.

**Prioritizing projects and milestones for realization by business value and dependencies by Stratus Global**

Based on the dependencies between projects and their business value, prioritization is the needed step to be performed carefully. Prioritization ensures clarity on the projects' importance of implementation and requires planning, investment, and general focus. Along with the delivery of milestones which includes design phase-completion, test completion, product demonstration to consumers.

**How Stratus Global Establishes people-and-business-oriented culture**

With our Business Value-Oriented Delivery Model, we are focused to develop a people-and-business-oriented culture in which everyone in the organization is perceived and treated as a human being and a business partner at the same time. The culture supports formal and friendly relations equally because this helps people to relate to each other openly and positively. At the same time, all responsibilities are taken seriously.

Our People-and-business-oriented culture includes:

- Treating everyone as a person and a business partner at the same time.
- Respecting others' emotions, feelings, and peculiarities.
- Respecting others' time and responsibilities.
- Accepting and following organizational strategies and missions.
- Business etiquette.
- Positive and supportive attitude.



**Figure 1 – Dimensions of Organizational Culture**

The Company strongly aligns that this mutually evolving culture needs to be spread across all offices, departments, teams, individuals, and even to external interested parties that

may need to understand it and align their interactions with the requirements. A culture of this kind that involves personal and business relations may not be easy to establish and understand and may need time and effort.

**Aligning Employees with Stratus' strategies at Stratus Global**

We are an organization of great people with diverse knowledge, expertise, skills, and personalities and the understanding of our organizational culture may depend on many factors like experience, skills, culture, age, or cognitive perceptions. Different employees may have different perceptions about us including priorities and processes. These differences may become a reason for conflicts, low motivation, productivity decline, information loss, and may cause delays in communication. Aligning the workforce, employees and team members with Stratus' strategies may be considered as initial risk management but we know that Awareness, agreement, and commitment from the entire organization, offices, departments, teams, or individuals is essential for achieving the organizational goals and motivating our workforce achieve their respective goals. We perceive this as a symbiotic and mutually growing relationship and association where we as an organization ensure and support our employees to accomplish their aspirations while aligning with our Vision to assure optimal solutions are found, presented, and agreed upon.

**Participation in decisions at Stratus Global:**

Stratus participates in fast and reliable decisions making across different stages of project delivery and product development. Various individuals, teams, and external organizations may need answers to questions about every aspect of the project. A frequency of response and solutions may eliminate waste and speed up the work of entire team and organization. For efficient and swift decision making, we extensively rely on our well-prepared, trained and professionally knowledgeable team members and trust their judgement.

**How Stratus Global performs Motivation Management:**

Motivation is considered as a total result of someone's perception, self-confidence, beliefs, emotions. Stratus participates in improving the perception and self-confidence of individuals and employees inside the organization, discusses beliefs, and supports individuals in managing their emotions. We understand that Motivation is a factor, which enhances work, speed, communication, and participation in activities. We may still need to train people or organize their activities, so the desired level of commitment can be achieved with time. All the project deliverables and Organizational goals are carried out by our employees and hence its extremely vital for us to spread a noticeable people-oriented culture, ensure Organizational stability, meaningful work with a general sense of stability and sense of purpose.



**Figure 2: Motivation Management**

We take time and efforts to define clear responsibilities and realistic objectives for our workforce helping them attain professional and personal development, acknowledgment, and recognition. We gracefully conduct various motivational initiatives to reward our employees and announce their achievements. Every Leader of the company is expected to comply with positive management style and transparency. Stratus firmly accepts that its our foremost responsibility to provide a healthy and modern working environment to our taskforce to keep them motivated and regularly aligned with the defined objectives and goals. We have highly well-defined and clearly laid bonus system and social packages for our employees to applaud them for their performance and deliverables where we do not let them wait for a Year to finish to perform their performance evaluation but pro-actively congratulate them as and when they walk an extra mile for us.

**How Stratus Global Conducts Personal Development Management:**

We consider that Personal development is essential for both people and organization, and it’s our constant endeavor to create plans for personal development of our employees that contain clear objectives, definitions, and instructions for our team members. This exercise is significant to increase self-confidence and commitment, develop new skills, enhance motivation, communication and productivity with Improved behavior, work-life balance and A better understanding of Stratus processes and management, objectives, and mission to apply knowledge and expertise across the organization, develop mature reactions and adaptation to changes and support initiatives of others.

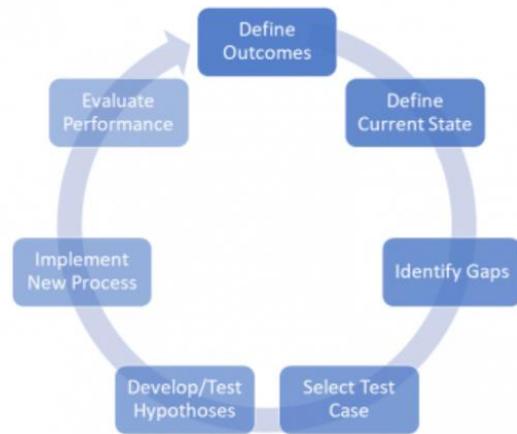
**Product Optimization Practices at Stratus Global:**

Optimization practices are needed in every developing product and even in a complete and ready-to-use product. The product optimization practices at Stratus are:

**Pre-release optimization practices-** During the development process, the entire product or its parts may be tested, validated, and agreed to be produced based on the users' and different stakeholders' feedback. Depending on our general practices and goals, repetitive analysis of the end-results may be applied. Stratus believes that the human factors, cognitive biases, and other typical and natural occurrences may often come up during sessions of validations, testing, and providing feedback. Careful users’ observations can be a tool to differentiate between the users’ feedback and their real actions to gather more realistic data. Misalignments between users' feedback and their actual

behavior should be recorded and may be used for future optimization. Before an optimization action takes place, the Stratus Team discusses the misalignments with the users who provided the feedback to find common points with their feedback and the observations to avoid waste and product degradations.

**Post-release optimization practices -** Once a product is in a real-world environment, expeditious statistics and feedback gathering are very important, so everything planned during the development stages can be matched against a real-world situation where significant access to real users is available.



**Figure 3: Process Optimization Strategy**

If pre-release optimization actions take place and the product or some parts of it are improved and defined as satisfying, the real-world environment provides fast, and extensive knowledge about the way users use the product. Misalignments between the prognosis and the real usage may get identified. Stratus plans and executes post-release optimizations if the noted misalignments get evaluated as harmful for the product, the users, the organization, the profits, or for other third parties. Typical post-release optimizations may be implemented based on the following major reasons:

- User tasks and needs defined and validated before the product release don’t provide a satisfying outcome.
- Users are experiencing difficulties using the product.
- Harmful users' actions.
- The product is consuming too many resources.

**Waste Management at Stratus Global:**

Any activity that does not return business value, valid outcome, desired results, or requires too many resources can be considered as waste for products, projects, organizations, and other external parties. Major causes of waste may include:

- Too much planning
- Incorrect or not validated planning
- Non-productive research
- Wrong sourcing and recruiting

- Inadequate analysis and processing of data or information
- Poor communication
- Wrong production
- Poor production
- Poor testing
- Supply or delivery delays
- Overwork or perfectionism
- Poor or excessive documentation
- Rejection of completed work that could be approved

Stratus considers any possible waste, monitor its occurrence, and take the necessary elimination measures quickly. Waste remains to be a regular topic in our risk management. Each identified waste may need a specified reduction approach or multiple approaches. Stratus collaborates and agrees on ways to deal with different waste situations. All possible waste is added to the project risk list and assigned to team leads/members, and subject to monitoring, discussion, and prevention practices.



**Figure 4: Managing Business Success**

We direct our efforts to entirely remove a wasteful process or activity if it does not provide any value and continue Educating our teams, individuals, or other parties when needed for reducing waste.

#### Stratus Global Execution Strategy:

Executing includes all activities between planning and closing the project. Executing is not a specific activity. It is a mix and groups of activities that are needed to complete the project and add business value. During the entire executing phase, Stratus and its teams focuses on activities, paying specific attention to:

- Waste management
- Decisions making
- Defects analysis
- Observation and optimization
- Support

These activities are the most essential for providing speed, quality, and covering the scope of the project.

#### Time Management at Stratus Global:

At Stratus, Time Management is a continuous process. Our Teams consider the following multiple factors while working on estimates of required completion time of a given effort (task, item or initiative that needs work):

- Previous time consumption of a similar activity
- Current knowledge of scope and requirements
- Relational effort points
- Teams' velocity

Adequate and optimum time planning, and management can help reduce waste and ensure successful project delivery meeting timelines and hence, bring value needed to the client.

#### BVOD At Stratus Global – THE CONCLUSION

BVOD is a knowledge creating process with a high level of information being shared during the whole cycle and work progress during product development. It has a clear positive effect on synchronization, communication, productivity, and transparency at both intra and inter department levels within the Teams and at the Organization level.

We have observed that our managers and leaders focus on hiring flexible people with good social skills. Stratus environment makes inexperienced developers more attractive offering more flexibility and quality of work. It helps communicate visions and goals more evidently instead of just listing the project requirements.

The Co-operation gets better because all the teams can count on planned delivery dates and hence act on their own. The implementation of Business Value driven delivery in our organization has led to higher visibility, highly visible individual productivity, less time wasted because of blockers and increased team socialization. BVOD uses an empirical approach to project development where interaction with the work environment and the teams is not only allowed but encouraged to a greater extent. With the changing scope, technology, and functionality, BVOD at Stratus ensures continuous information sharing and feedback which keeps the performance and the trust high. Its application in our organization has generated a strong culture with well-defined roles, responsibilities, and relationships.

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# Predicting the Split Tensile Strength of Chikoko-Cement Concrete using Visual Basic Software

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## Abstract

This study illustrates how the osadebe's regression model was implemented on the visual basic software and used in speculating the split tensile strength of chikoko-cement concrete. 25 selected mix proportions of concrete produced from portland cement, chikoko mud, river sand and granite chippings were studied. A model was developed using the first 15 mixes and their accompanying 28 days split tensile strength. The leftovers were applied in model validation. T-statistics was adopted in testing the correctness of the model at 95% confidence level. A 2.26 critical t-value was obtained from table while calculate t-value was 1.43. Seeing that the critical t-value is higher than the calculated one, the model is said to be fit. Standard deviation of 0.0767 was obtained between the observed and predicted values. Since this value is close to 0, the predictions made are close to the mean value. Consequently, the regression model can serve as a useful tool for forecasting. Best strength of 2.117MPa was obtained from mix TR1. While, the least strength of 1.165MPa was obtained from mix TR4. The visual basic software was used to write a program for implementing the model. This made the process of mix design quite easy, and very user friendly.

## Keywords

*Chikoko-cement concrete, mix-ratio, split tensile strength, visual basic software.*

## I. INTRODUCTION

According to Manasseh [1], concrete is a mixture of cement, fine aggregate, coarse aggregate and water in a definite proportion to produce a particular value of strength and it is used to carry load. Concrete is the most widely used and the most durable construction material in the world [2]. The increasing population of Nigerians in recent times has raised the demand for the construction of more public facilities and amenities. This has led to a hike in the need for more concrete, and invariably, more cement. The making of cement is followed by many negative consequences. The cement production process releases quite a large amount of carbon dioxide into the atmosphere. This generates higher temperature of the earth, leading to increased rainfall intensity that is causing flooding, landslides, and erosions in many parts of the world. The rise in the release of carbon dioxide has also resulted to very distorted climatic condition. With very high winds emanating from the seas, the occurrence of tsunamis has risen; tornados and wide fires in various part of the earth are now common experiences. In addition, energy needed for the calcinations of clinker in cement making is very high and expensive [3].

Cement is the most important and the most expensive of all the construction materials in the world. The recent increase in price of cement in Nigeria is a source of concern. Nigeria has abundance of the natural building and construction materials such as sand, laterite, timber, bricks etc. However, most citizens of Nigeria are still having issues of securing decent

shelters for themselves. The negative development of higher prices of building material and especially cement has denied many Nigerians, especially the low-income earners, the opportunity to afford decent shelters of their own [4], [5]. This situation calls for an immediate need to explore into the potentials of using natural cement replacement material such as chikoko, in order to reduce the release of carbon dioxide into the air, drop the energy requirement for making cement thereby decreasing the cost of concrete production. The use of laboratory trial mixes is laborious and most times, results in uneconomical concrete mix ratios [6], [7].

Chikoko is a type of clay found in the marine environment of the Niger-delta area of Nigeria [8]. It has been used as a natural pozzolan and is found to produce no negative effects on the strength and quality of concrete [9]. Some researchers have worked with chikoko in the making of concrete. According to Otoko [10], 30% replacement of cement with chikoko would have no adverse effects on the strength properties of concrete. In the long run, chikoko-cement concrete structures may show signs of structural failure due to improper selection of the mix ratios. Ottos and Nyebuchi (2018)[11] worked on the compressive strength of chikoko blended cement concrete and had a maximum compressive strength of 26.38N/mm<sup>2</sup> at 12 days of curing and 10% replacement. Onwuka and Sule [9] developed a regression model for predicting the flexural strength of concrete produced from chikoko. They found that an ultimate flexural strength of 4.933Mpa was attained at 5.3% cement replacement with chikoko for a mix proportion of

0.947:0.053:2.1:4.2 (portland cement: chikoko: river sand: granite chippings) at water-cement ratio of 0.526.

In this paper, the split tensile strength of chikoko-cement concrete is predicted using Visual Basic software.

The visual basic software is a programming language app that is supplied by Microsoft. It is a graphical user interface development tool that presents syntax that is more simple than other languages. It provides an observable domain that makes it easy to understand. It contains common qualities such as string processing and computation and is distinguished by a drag-and-drop feature that let programmers build a user interface that is easy to use, even for developers with the slightest experience (Visual Basic, 2019)[11]. The software is user-friendly and quick to use.

## II. MATERIALS AND METHODS

### A. Materials

The cement used as binder for this study is ordinary portland cement having properties conforming to BS EN 197, part 1 (2000)[12]. The water used was fresh, free from any form of impurities and drinkable. The fine aggregate was obtained from Otamiri River in Imo State. It was washed and sundried for two weeks before it was used for concreting. The grading of fine aggregate was carried out according to the provisions of BS 882, part 2 (1996)[13]. The granite used as coarse aggregate was obtained from Crushed Rock Industry in Port Harcourt, Rivers State. It was properly washed and sundried for two weeks in order to remove dirt. The wet chikoko was obtained in bags from the mangrove swamps of Eagle's Island in Port Harcourt, Rivers State. It was exposed to sun for three weeks, ground and sieved to obtain fine particles close to cement. Oxide composition test was carried out on the chikoko to determine its suitability for use as cement replacement material in concrete production. The results obtained are presented in Table 1.

### Methods

#### Split tensile strength

Cylindrical concrete specimens of dimension 150mm diameter and 300mm high were produced and tested for split tensile strength after 28 days of curing in water. The production of the test specimens involved filling molds in three layers and compacted with a tamping rod according to the requirements of BS EN 12390, part 6 (2000)[14]. The cylindrical specimens were removed from the molds after 24 hours of casting. They were transferred to a curing tank and allowed to cure for 28 days. After curing, they were weighed and tested for split tensile strength using a universal compression machine. A compressive force was applied to the cylindrical concrete specimen in a way that made the specimen fail due to the tensile stresses induced in the test specimen. The specimen finally failed by splitting along the loaded diameter. The maximum load at failure of the test specimen was recorded. Three replicates were produced per mix ratio, giving a total of seventy-five (75) test specimens. Equation (1) was used to determine the actual split tensile

strength value from the failure load obtained. The selected mix ratios for both the trial (TR) and control (C) points are presented in Table 2. The results of the split tensile strength test are shown in Table 6.

The split tensile strength,  $(f_{spl})$  of chikoko-cement concrete was obtained using (1):

$$f_{spl} = \frac{2P}{\pi L \phi} \quad (1)$$

(Where  $f_{spl}$  = split tensile stress; P = load at failure; L = length of cylindrical specimen and  $\phi$  = diameter of the cylindrical specimen

### Regression Model Development

According to Obam and Osadebe (2006)[15], the response function for a 5-component mixture is given by a polynomial function as follows:

$$\begin{aligned} Y = & \alpha_1 z_1 + \alpha_2 z_2 + \alpha_3 z_3 + \alpha_4 z_4 + \alpha_5 z_5 \\ & + \alpha_{12} z_1 z_2 + \alpha_{13} z_1 z_3 + \alpha_{14} z_1 z_4 + \alpha_{15} z_1 z_5 \\ & + \alpha_{23} z_2 z_3 + \alpha_{24} z_2 z_4 + \alpha_{25} z_2 z_5 + \alpha_{34} z_3 z_4 \\ & + \alpha_{35} z_3 z_5 + \alpha_{45} z_4 z_5 \end{aligned} \quad (2)$$

Where,  $Y$  = Split tensile strength corresponding to an  $i$ th observation point;  $z_i, z_j, z_{ij}$  = predictor variables;  $\alpha_i, \alpha_{ij}$  = coefficients of the regression model

Let  $S_i$  and  $z_i$  be the actual ratio and fractional portions of the mixture.

Assume the mixture to have a total volume,  $S$ , Then:

$$S_1 + S_2 + S_3 + S_4 + S_5 = S \quad (3)$$

Dividing both sides of (3) by  $S$  yields:

$$S_1 / S + S_2 / S + S_3 / S + S_4 / S + S_5 / S = 1 \quad (4)$$

Let:

$$S_i / S = z_i \quad (i = 1, 2, 3, 4, 5) \quad (5)$$

Equation (4) now changes to:

$$z_1 + z_2 + z_3 + z_4 + z_5 = 1 \quad (6)$$

Where  $z_1, z_2, z_3, z_4$  and  $z_5$  = Fractional portion of water, cement, chikoko, sand and coarse aggregate respectively

**Table I: Oxides of chikoko**

CaO	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	SO <sub>3</sub>	TiO <sub>2</sub>	ZnO	LoI
9.85	41.21	10.15	2.31	5.02	1.97	8.17	0.08	0.72	0.09	6.51

Source: (Onwuka and Sule, 2017)

**Table II: Selected mix ratios for trial and control mixes**

Observation point	Water-cement ratio	Cement	Chikoko	Sand	Granite chippings
TR1	0.526	0.947	0.053	2.1	4.2
TR2	0.566	0.919	0.081	2.02	4.04
TR3	0.589	0.823	0.177	1.91	3.82
TR4	0.611	0.889	0.111	2.16	4.32
TR5	0.596	0.846	0.154	2.15	4.30
TR6	0.546	0.933	0.067	2.06	4.12
TR7	0.557	0.885	0.115	2.01	4.01
TR8	0.568	0.918	0.082	2.13	4.26
TR9	0.561	0.8965	0.1035	2.12	4.25
TR10	0.577	0.871	0.129	1.96	3.93
TR11	0.588	0.904	0.096	2.09	4.18
TR12	0.581	0.882	0.118	2.08	4.17
TR13	0.6	0.856	0.144	2.03	4.07
TR14	0.592	0.835	0.165	2.03	4.06
TR15	0.603	0.8675	0.1325	2.15	4.31
C1	0.560	0.896	0.104	2.010	4.020
C2	0.575	0.886	0.114	2.057	4.113
C3	0.578	0.894	0.106	2.137	4.274
C4	0.573	0.895	0.106	2.048	4.095
C5	0.581	0.876	0.124	2.080	4.160
C6	0.569	0.884	0.116	2.045	4.090
C7	0.552	0.909	0.091	2.033	4.065
C8	0.577	0.866	0.135	2.078	4.156
C9	0.564	0.905	0.095	2.058	4.116
C10	0.578	0.885	0.115	2.068	4.136

*Derivation of regression coefficients*

The vector of the predictor variables for nth observation

points  $y^{(n)}$  is given by:

$$z^{(n)} = [z_1^{(n)}, z_2^{(n)}, z_3^{(n)}, z_4^{(n)}, z_5^{(n)}] \tag{7}$$

The response  $Y^{(n)}$  as a function of the predictors,  $Z_i^{(n)}$  at nth observation points is given by:

$$Y^{(n)} = \sum_{i=1}^5 \alpha_i z_i^{(n)} + \sum_{1 \leq i < j \leq 5} \alpha_{ij} z_i^{(n)} z_j^{(n)} \tag{8}$$

Where  $1 \leq i \leq j \leq 5$  and  $n = 1, 2, 3, \dots, 15$

In matrix notation, (8) is given as:

$$[y^{(n)}] = [z^{(n)}][\alpha] \tag{9}$$

Applying (9), the constant coefficients  $\alpha_i$  are obtained as:

$$[\alpha] = [z^{(n)}]^{-1} [Y^{(n)}] \tag{10}$$

The actual proportions  $S_i^{(n)}$  and their corresponding fractional portions  $z_i^{(n)}$  are presented in Table 3. The  $z^{(n)}$  matrix is

obtained from  $z_i^{(n)}$  values for the trial mix ratios. The  $z^{(n)}$  matrix and  $z_i^{(n)}$  matrix inverse are shown in Table 4 and Table

5 respectively. The  $z^{(n)}$  matrix for the control mix ratios is shown in Table 6. The value of  $Y^{(n)}$  matrix is obtained from Table 7.

According to Obam and Osadebe (2007)[16], the number of experimental points needed for regression model development is given by:

$$N = \frac{(q+n-1)!}{n!(q-1)!} \tag{11}$$

Where  $n, q$  = Degree of the regression model and number of concrete component materials respectively

For this study,  $q = 5, n = 2$ . Substituting for  $q$  and  $n$  in (11) gives fifteen (15) experimental points. This implies that fifteen (15) mix ratios (experimental points) are required for a 2-degree regression model development which is used in this study.

Table III: Values of actual mix ratios  $S_i$  and their corresponding fractional portions

$S_1$	$S_2$	$S_3$	$S_4$	$S_5$	Response	$Z_1$	$Z_2$	$Z_3$	$Z_4$	$Z_5$
0.526	0.947	0.053	2.1	4.2	$Y_1$	0.06721305	0.121006745	0.006772289	0.268335972	0.536671944
0.566	0.919	0.081	2.02	4.04	$Y_2$	0.074219677	0.120509939	0.010621544	0.264882947	0.529765893
0.589	0.823	0.177	1.91	3.82	$Y_3$	0.080475365	0.112446902	0.024184965	0.260964256	0.521928512
0.611	0.889	0.111	2.16	4.32	$Y_4$	0.075515072	0.109873812	0.013718777	0.266972352	0.533919986
0.596	0.846	0.154	2.15	4.30	$Y_5$	0.074064869	0.105132347	0.019137567	0.267180316	0.534484901
0.546	0.933	0.067	2.06	4.12	$Y_{12}$	0.070671019	0.120761557	0.008672005	0.266631806	0.533263612
0.557	0.885	0.115	2.01	4.01	$Y_{13}$	0.07362222	0.1168701	0.01518717	0.264773503	0.529547006
0.568	0.918	0.082	2.13	4.26	$Y_{14}$	0.071433194	0.115347573	0.010303378	0.267642807	0.535273049
0.561	0.8965	0.1035	2.12	4.25	$Y_{15}$	0.070686656	0.112959042	0.013041005	0.267750099	0.535563198
0.577	0.871	0.129	1.96	3.93	$Y_{23}$	0.077283269	0.116561236	0.017263945	0.26296385	0.5259277
0.588	0.904	0.096	2.09	4.18	$Y_{24}$	0.074886541	0.115034507	0.012215986	0.265958564	0.531904402
0.581	0.882	0.118	2.08	4.17	$Y_{25}$	0.074140194	0.112614616	0.014993929	0.266062486	0.532188775
0.6	0.856	0.144	2.03	4.07	$Y_{34}$	0.077870956	0.111095897	0.018689678	0.264118816	0.528224653
0.592	0.835	0.165	2.03	4.06	$Y_{35}$	0.077118263	0.108616355	0.021541701	0.264219534	0.528504146
0.603	0.8675	0.1325	2.15	4.31	$Y_{45}$	0.074791952	0.107509558	0.016420768	0.26707605	0.534201672

Table IV :  $z^{(n)}$  matrix for trail mixes

$Z_1$	$Z_2$	$Z_3$	$Z_4$	$Z_5$	$Z_1Z_2$	$Z_1Z_3$	$Z_1Z_4$	$Z_1Z_5$	$Z_2Z_3$	$Z_2Z_4$	$Z_2Z_5$	$Z_3Z_4$	$Z_3Z_5$	$Z_4Z_5$
0.06	0.12	0.00	0.26	0.53	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
7213	1006	6772	8335	6671	8133	0455	8035	6071	0819	2470	4940	1817	3634	4008
05	745	289	972	944	232	186	679	358	493	463	925	249	497	388
0.07	0.12	0.01	0.26	0.52	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
4219	0509	0621	4882	9765	8944	0788	9659	9319	1280	1921	3842	2813	5626	0325
677	939	544	947	893	209	328	527	054	002	028	055	466	932	951
0.08	0.11	0.02	0.26	0.52	0.00	0.00	0.02	0.04	0.00	0.02	0.05	0.00	0.01	0.13
0475	2446	4184	0964	1928	9049	1946	1001	2002	2719	9344	8689	6311	2622	6204
365	902	965	256	512	205	294	194	387	524	622	244	411	823	686
0.07	0.10	0.01	0.26	0.53	0.00	0.00	0.02	0.04	0.00	0.02	0.05	0.00	0.00	0.14
5515	9873	3718	6972	3919	8297	1035	0160	0319	1507	9333	8663	3662	7324	2541
072	812	777	352	986	129	974	436	006	334	27	824	534	729	875
0.07	0.10	0.01	0.26	0.53	0.00	0.00	0.01	0.03	0.00	0.02	0.05	0.00	0.01	0.14
4064	5132	9137	7180	4484	7786	1417	9788	9586	2011	8089	6191	5113	0228	2803
869	347	567	316	901	614	421	675	554	977	294	652	181	74	845
0.07	0.12	0.00	0.26	0.53	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
0671	0761	8672	6631	3263	8534	0612	8843	7686	1047	2198	4397	2312	4624	2185
019	557	005	806	612	342	859	141	283	245	872	744	232	465	04
0.07	0.11	0.01	0.26	0.52	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
3622	6870	5187	4773	9547	8604	1118	9493	8986	1774	0944	1888	4021	8042	0210
22	1	17	503	006	236	113	213	426	926	106	212	16	321	016
0.07	0.11	0.01	0.26	0.53	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
1433	5347	0303	7642	5273	8239	0736	9118	8236	1188	0871	1742	2757	5515	3261
194	573	378	807	049	645	003	58	263	47	948	447	625	121	981
0.07	0.11	0.01	0.26	0.53	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
0686	2959	3041	7750	5563	7984	0921	8926	7857	1473	0244	0496	3491	6984	3397
656	042	005	099	198	697	825	359	172	099	795	706	73	282	099
0.07	0.11	0.01	0.26	0.52	0.00	0.00	0.02	0.04	0.00	0.03	0.06	0.00	0.00	0.13
7283	6561	7263	2963	5927	9008	1334	0322	0645	2012	0651	1302	4539	9079	8299
269	236	945	85	7	233	214	706	412	307	391	783	793	587	973
0.07	0.11	0.01	0.26	0.53	0.00	0.00	0.01	0.03	0.00	0.03	0.06	0.00	0.00	0.14
4886	5034	2215	5958	1904	8614	0914	9916	9832	1405	0594	1187	3248	6497	1464
541	507	986	564	402	536	813	717	481	26	412	361	946	737	531

0.07 4140 194	0.11 2614 616	0.01 4993 929	0.26 6062 486	0.53 2188 775	0.00 8349 269	0.00 1111 653	0.01 9725 924	0.03 9456 579	0.00 1688 536	0.02 9962 525	0.05 9932 234	0.00 3989 322	0.00 7979 601	0.14 1595 469
0.07 7870 956	0.11 1095 897	0.01 8689 678	0.26 4118 816	0.52 8224 653	0.00 8651 144	0.00 1455 383	0.02 0567 185	0.04 1133 359	0.00 2076 347	0.02 9342 517	0.05 8683 592	0.00 4936 296	0.00 9872 349	0.13 9514 07
0.07 7118 263	0.10 8616 355	0.02 1541 701	0.26 4219 534	0.52 8504 146	0.00 8376 305	0.00 1661 259	0.02 0376 151	0.04 0757 322	0.00 2339 781	0.02 8698 563	0.05 7404 194	0.00 5691 738	0.01 1384 879	0.13 9641 119
0.07 4791 952	0.10 7509 558	0.01 6420 768	0.26 7076 05	0.53 4201 672	0.00 8040 85	0.00 1228 141	0.01 9975 139	0.03 9953 986	0.00 1765 39	0.02 8713 228	0.05 7431 786	0.00 4385 594	0.00 8772 002	0.14 2672 472

Table V: Inverse of  $z^{(n)}$  matrix of the trial mixes

Z <sub>1</sub>	Z <sub>2</sub>	Z <sub>3</sub>	Z <sub>4</sub>	Z <sub>5</sub>	Z <sub>1</sub> Z <sub>2</sub>	Z <sub>1</sub> Z <sub>3</sub>	Z <sub>1</sub> Z <sub>4</sub>	Z <sub>1</sub> Z <sub>5</sub>	Z <sub>2</sub> Z <sub>3</sub>	Z <sub>2</sub> Z <sub>4</sub>	Z <sub>2</sub> Z <sub>5</sub>	Z <sub>3</sub> Z <sub>4</sub>	Z <sub>3</sub> Z <sub>5</sub>	Z <sub>4</sub> Z <sub>5</sub>
6886 1.88 734	8339 1.05 78	9356 .830 938	3585 .275 594	141. 8630 848	-151 583. 542	5082 4.56 129	-314 33.8 9793	-625 1.99 463	-558 90.5 9649	3461 2.02 133	6883 .617 923	-116 13.0 2714	-230 9.33 3517	1426 .276 382
1417 .537 624	2467 .210 281	2531 .776 741	1521 9.10 693	711. 2766 514	4250 .284 477	4297 .382 545	-977 0.75 8848	-194 3.33 7219	5557 .916 002	-126 53.1 7904	-251 6.45 6702	-128 02.1 4894	-254 5.79 5133	5780 .184 632
2446 0.84 99	5522 3.97 81	3117 2.00 764	8114 .437 185	400. 0677 064	-739 78.0 0843	5710 6.22 897	-277 91.2 8067	-552 7.50 1822	-832 80.2 1351	4058 1.72 919	8070 .867 617	-313 47.8 9137	-623 3.74 759	3029 .477 063
2043 1811 6	6864 4689 8	1328 9906 3.7	3725 0968 6.6	3580 1633 4	-749 1351 71.9	3299 3907 6.5	5519 1811 4.2	-541 0274 36.3	-604 3359 40.7	-101 2238 772	9921 9469 5.5	4461 2180 2.1	-437 2387 96.4	-730 3876 68.7
5073 1986 .81	1704 3320 9.4	3324 8863 .52	9272 6776 .03	8958 2309 .62	-186 0035 87.8	8223 3482 .32	1372 1321 2.8	-134 8548 27.1	-150 6189 08.4	-251 6462 12.7	2473 0349 4.7	1113 3063 1.3	-109 3971 06.7	-182 2833 22.8
-900 92.6 9381	-571 28.5 2872	-216 35.8 2023	-335 81.9 3103	-149 2.04 5384	1432 11.6 885	-908 01.3 9295	1093 38.2 428	2174 6.64 636	7078 9.29 429	-853 51.4 2743	-169 74.6 3195	5415 2.90 492	1076 8.68 321	-129 48.9 8849
-175 418. 9591	-274 347. 0075	-746 89.2 729	-224 92.6 3951	-102 3.18 8948	4394 65.4 863	-232 898. 6329	1241 06.2 024	2468 3.90 237	2876 53.3 305	-153 482. 7544	-305 24.5 5231	8139 5.17 737	1618 6.00 438	-861 3.09 5675
-211 8889 06.1	-701 6621 80.3	-135 1386 79.8	-370 2019 52.5	-358 4672 02.7	7712 9659 3.9	-338 8155 25	-560 3068 02.8	5513 0665 8.3	6161 2362 8.1	1020 2206 48	-100 3761 982	-448 4694 97.9	4411 8511 7.1	7285 8008 4
-470 6266 7.06	-162 9766 78.5	-321 4268 6.42	-938 8353 2.43	-893 5698 9.58	1751 8797 3.1	-778 7511 4.03	-132 9797 09.6	1297 2300 4.6	1448 1641 3.9	2476 0996 8.4	-241 5288 62	-110 1436 45.2	1074 2655 9	1831 8596 5.7
-140 83.1 3954	-810 86.7 9542	-159 24.3 3948	-110 7.11 5161	-43.7 9980 248	6759 7.15 573	-299 84.7 2891	-789 9.56 6103	-157 1.16 9013	7189 8.48 811	1896 6.46 982	3772 .033 796	-841 8.89 5548	-167 4.15 4381	-440. 4441 056
-203 2402 88.4	-689 0559 71.3	-131 7399 40.8	-377 2882 29.5	-357 0020 65.1	7485 0680 6.7	-327 4920 90	-553 7907 74.7	5388 1019 4.7	6027 6313 0.3	1020 5992 22	-992 9208 07.9	-446 8453 12.9	4346 7823 5.3	7340 1789 1.5
-512 7118 8.03	-169 1368 56.3	-338 3243 3.28	-903 6546 1.89	-900 9073 2.69	1863 1029 7.8	-834 6100 8.03	-136 2664 15.1	1359 6552 9.8	1513 9198 1.8	2474 9802 0.8	-246 9340 67.8	-110 9469 60.6	1106 8174 5.3	1804 5754 8.1
-199 8707 27.7	-674 1873 63.6	-128 8590 58.8	-375 9967 40.6	-357 2521 99.3	7342 2350 2.7	-321 1940 25	-548 2390 88.4	5345 1127 1.4	5896 6843 4.2	1007 7993 42	-982 4947 37.7	-441 1742 52.8	4300 4869 1.7	7330 1695 2
-529 8475 2.73	-176 6246 33.7	-353 1636 2.06	-909 9916 6.45	-899 6514 4.08	1935 4472 2.9	-866 8359 6.57	-139 0086 72.6	1381 2167 1.5	1580 6240 0.8	2538 0326 2.2	-252 1659 36.5	-113 7495 53.5	1130 0306 6.9	1809 6269 4.1
-458 6719 48.1	-154 0965 914	-299 0951 77.5	-836 9439 94.3	-805 7713 95.7	1681 7091 31	-741 6092 65.6	-123 9514 785	1216 1060 39	1358 3610 13	2273 2930 47	-223 0203 273	-100 3174 771	9840 4948 0.1	1642 4318 15

Table VI: z<sup>(n)</sup> matrix for control mix ratios

z1	z2	z3	z4	z5	z1z2	z1z3	z1z4	z1z5	z2z3	z2z4	z2z5	z3z4	z3z5	z4z5
0.07 4252	0.11 5978	0.01 3736	0.26 5388	0.53 0647	0.00 8612	0.00 102	0.01 9706	0.03 9401	0.00 1593	0.03 0779	0.06 1543	0.00 3645	0.00 7289	0.14 0827
0.07 4287	0.11 2006	0.01 5855	0.26 5951	0.53 1901	0.00 8321	0.00 1178	0.01 9757	0.03 9513	0.00 1776	0.02 9788	0.05 9576	0.00 4217	0.00 8433	0.14 1459
0.07 3858	0.11 4746	0.01 5057	0.26 5447	0.53 0893	0.00 8475	0.00 1112	0.01 9605	0.03 9211	0.00 1728	0.03 0459	0.06 0918	0.00 3997	0.00 7994	0.14 0924
0.07 2157	0.11 8824	0.01 1895	0.26 5752	0.53 1373	0.00 8574	0.00 0858	0.01 9176	0.03 8342	0.00 1413	0.03 1578	0.06 314	0.00 3161	0.00 6321	0.14 1213
0.07 3861	0.11 0855	0.01 7281	0.26 6001	0.53 2002	0.00 8188	0.00 1276	0.01 9647	0.03 9294	0.00 1916	0.02 9488	0.05 8975	0.00 4597	0.00 9194	0.14 1513
0.07 2887	0.11 6955	0.01 2277	0.26 596	0.53 192	0.00 8525	0.00 0895	0.01 9385	0.03 877	0.00 1436	0.03 1105	0.06 2211	0.00 3265	0.00 653	0.14 147
0.07 4274	0.11 3724	0.01 4778	0.26 5741	0.53 1483	0.00 8447	0.00 1098	0.01 9738	0.03 9475	0.00 1681	0.03 0221	0.06 0442	0.00 3927	0.00 7854	0.14 1237
0.07 3571	0.11 3817	0.01 4355	0.26 6086	0.53 2171	0.00 8374	0.00 1056	0.01 9576	0.03 9152	0.00 1634	0.03 0285	0.06 057	0.00 382	0.00 7639	0.14 1603
0.07 5051	0.11 2577	0.01 5497	0.26 5625	0.53 125	0.00 8449	0.00 1163	0.01 9935	0.03 9871	0.00 1745	0.02 9903	0.05 9806	0.00 4116	0.00 8233	0.14 1113
0.07 3149	0.11 4837	0.01 463	0.26 5795	0.53 159	0.00 84	0.00 107	0.01 9443	0.03 8885	0.00 168	0.03 0523	0.06 1046	0.00 3889	0.00 7777	0.14 1294

### III. RESULTS AND DISCUSSIONS

The results of the laboratory investigation of the split tensile strength of chikoko-cement concrete at 28 days are presented in Table 6. Density of the concrete fell within the limit 2400Kg/m<sup>3</sup> to 2465Kg/m<sup>3</sup>. This shows that the concrete produced is normal weight in nature. Highest

and lowest split tensile strengths obtained are 2.117N/mm<sup>2</sup> and 1.165N/mm<sup>2</sup> respectively. Optimum replacement of Portland cement with chikoko was at 5.30%.

Table VII

Observation point	Replicates	Chikoko Content (%)	Mass (Kg)	Density (Kg/m <sup>3</sup> )	Average density ρ (kg/m <sup>3</sup> )	Load at failure (KN)	Split tensile strength (N/mm <sup>2</sup> )	Average split tensile strength (N/mm <sup>2</sup> )
TR1	A	5.30	12.9	2432.952	2426.666	116	1.641	2.117
	B		12.8	2414.092		173	2.447	
	C		12.9	2432.952		160	2.263	
TR2	A	8.10	12.6	2376.372	2401.519	120	1.697	1.565
	B		12.8	2414.092		120	1.697	
	C		12.8	2414.092		92	1.301	
TR3	A	17.70	13.2	2489.533	2432.952	97	1.372	1.485
	B		12.8	2414.092		110	1.556	
	C		12.7	2395.232		108	1.528	
TR4	A	11.10	12.5	2357.512	2439.239	70	0.990	1.165
	B		13.4	2527.253		91	1.287	
	C		12.9	2432.952		86	1.216	
TR5	A	15.40	12.8	2414.092	2407.806	91	1.287	1.466
	B		12.6	2376.372		110	1.556	
	C		12.9	2432.952		110	1.556	
TR6	A	6.70	12.4	2338.652	2401.519	128	1.811	1.829
	B		13	2451.812		130	1.839	
	C		12.8	2414.092		130	1.839	
TR7	A	11.50	12.8	2414.092	2414.092	140	1.980	1.924
	B		12.8	2414.092		130	1.839	
	C		12.8	2414.092		138	1.952	
TR8	A	8.20	12.6	2376.372	2426.666	118	1.669	1.603
	B		13.2	2489.533		118	1.669	

	C		12.8	2414.092		104	1.471	
TR9	A	10.35	13	2451.812	2426.666	120	1.697	1.726
	B		13	2451.812		126	1.782	
	C		12.6	2376.372		120	1.697	
TR10	A	12.90	12.6	2376.372	2414.092	120	1.697	1.650
	B		12.8	2414.092		120	1.697	
	C		13	2451.812		110	1.556	
TR11	A	9.60	12.6	2376.372	2432.952	100	1.415	1.438
	B		13	2451.812		100	1.415	
	C		13.1	2470.673		105	1.485	
TR12	A	11.75	13.2	2489.533	2451.812	110	1.556	1.518
	B		13	2451.812		102	1.443	
	C		12.8	2414.092		110	1.556	
TR13	A	14.40	13.2	2489.533	2451.812	100	1.415	1.419
	B		12.8	2414.092		101	1.429	
	C		13	2451.812		100	1.415	
TR14	A	16.55	12.6	2376.372	2426.666	117	1.655	1.608
	B		13.4	2527.253		112	1.584	
	C		12.6	2376.372		112	1.584	
TR15	A	13.25	13.4	2527.253	2445.526	100	1.415	1.424
	B		13.2	2489.533		100	1.415	
	C		12.3	2319.792		102	1.443	
Check points for model validation								
C1	A	10.37	12.6	2376.372	2432.952	150	2.122	2.004
	B		13.4	2527.253		125	1.768	
	C		12.7	2395.232		150	2.122	
C2	A	11.37	13.4	2527.253	2464.386	130	1.839	1.792
	B		13	2451.812		110	1.556	
	C		12.8	2414.092		140	1.980	
C3	A	10.60	13	2451.812	2439.239	110	1.556	1.485
	B		13.4	2527.253		110	1.556	
	C		12.4	2338.652		95	1.344	
C4	A	10.55	12.8	2414.092	2439.239	110	1.556	1.697
	B		13.4	2527.253		125	1.768	
	C		12.6	2376.372		125	1.768	
C5	A	12.38	13	2451.812	2426.666	115	1.627	1.674
	B		12.8	2414.092		120	1.697	
	C		12.8	2414.092		120	1.697	
C6	A	11.63	12.8	2414.092	2407.806	125	1.768	1.792
	B		12.5	2357.512		125	1.768	
	C		13	2451.812		130	1.839	
C7	A	9.10	12.5	2357.512	2420.379	140	1.980	1.914
	B		13	2451.812		126	1.782	
	C		13	2451.812		140	1.980	
C8	A	13.45	12.6	2376.372	2401.519	124	1.754	1.669
	B		12.8	2414.092		114	1.613	
	C		12.8	2414.092		116	1.641	
C9	A	9.50	13	2451.812	2464.386	116	1.641	1.773
	B		13.2	2489.533		130	1.839	
	C		13	2451.812		130	1.839	
C10	A	11.52	12.6	2376.372	2414.092	114	1.613	1.669
	B		12.8	2414.092		120	1.697	
	C		13	2451.812		120	1.697	

Regression model development

Substituting the values of  $y^{(n)}$  from the test results of Table 7 into (10) yields the coefficients values as follows:

$$\begin{aligned} \alpha_1 &= 3768.667019; \alpha_2 = -453.5976405; \alpha_3 = -1980.686327 \\ \alpha_4 &= -178149672.70; \alpha_5 = -44419063.68; \alpha_6 = -9516.501852 \\ \alpha_7 &= -5255.1033; \alpha_8 = 178570707.2; \alpha_9 = 44203090.16 \\ \alpha_{10} &= 5219.843051; \alpha_{11} = -179069680.80; \alpha_{12} = 43960837.44 \\ \alpha_{13} &= 43960837.44; \alpha_{14} = 44820512.13; \alpha_{15} = 400481440.70 \end{aligned}$$

Substituting the obtained coefficients into (1) yields;

$$\begin{aligned} y &= 3768.66z_1 - 453.59z_2 - 1980.687z_3 \\ &- 178149672.7z_4 - 44419063.68z_5 - 9516.50z_1z_2 \\ &- 5255.10z_1z_3 + 178570707.2z_1z_4 + 44203090.16z_1z_5 \\ &+ 5219.84z_2z_3 + 179069680.8z_2z_4 + 43960837.44z_2z_5 \\ &+ 43960837.44z_3z_4 + 44820512.13z_3z_5 \\ &+ 400481440.7z_4z_5 \end{aligned}$$

(12)

**Table 8: t-statistic test for compressive strength results**

Control Point	$y_{obs}$	$y_{pred}$	Difference ( $d$ )	$d - \bar{d}$	$(d - \bar{d})^2$
C <sub>1</sub>	2.004	1.825	0.179	0.144	0.020736
C <sub>2</sub>	1.792	1.663	0.129	0.094	0.008836
C <sub>3</sub>	1.485	1.586	-0.101	-0.136	0.018496
C <sub>4</sub>	1.697	1.671	0.026	-0.009	8.1E-05
C <sub>5</sub>	1.674	1.644	0.03	-0.005	2.5E-05
C <sub>6</sub>	1.792	1.731	0.061	0.026	0.000676
C <sub>7</sub>	1.914	1.905	0.009	-0.026	0.000676
C <sub>8</sub>	1.669	1.693	-0.024	-0.059	0.003481
C <sub>9</sub>	1.773	1.757	0.016	-0.019	0.000361
C <sub>10</sub>	1.669	1.644	0.025	-0.01	1E-04
$\Sigma$			0.35		<b>0.053468</b>

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## APPENDIX

### Basic computer program for the split tensile strength model

Private Sub STARTMNU\_Click ()

Cls

Text1.Text = ""

Print " The program was written by"

Print: Print

Print " Samuel Sule"

Print:

WWW = InputBox ("CLICK OK. TO CONTINUE"): Cls

WWW = InputBox ("CLICK OK. TO CONTINUE"): Cls

WWW = InputBox ("CLICK OK. TO CONTINUE"): Cls

' CIVIL ENGINEERING DEPARTMENT, UNIPORT

CT = 0: YMAX = 0: KK = 0

ReDim X (15), A(5, 5), Z(5), N(15), B(5, 5)

Rem \*\*\* COEFFICIENTS OF STRENGTH REGRESSION \*\*\*

A1 = 3768.667019: A2 = -453.5976405: A3 = -1980.686327: A4 = -178149672.7: A5 = -44419063.68

A6 = -9516.501852: A7 = -5255.1033: A8 = 178570707.2: A9 = 44203090.16: A10 = 5219.843051

A11 = 179069680.8: A12 = 43960837.44: A13 = 177353023.7: A14 = 44820512.13: A15 = 400481440.7

Rem \*\*\* COEFFICIENTS OF COST REGRESSION \*\*\*

B1 = 2265.675402: B2 = 110601.7498: B3 = 8997.318852: B4 = -10884814.86: B5 = -2695531.403

B6 = 426.6085824: B7 = 2507.859103: B8 = 11074825.54: B9 = 2623581.3994: B10 = 475.8113044

B11 = 10863714.99: B12 = 2727684.015: B13 = 10717948.94: B14 = 2801697.126: B15 = 24479808.71

Rem \*\*\* DECISION FOR CALCULATING MIX RATIOS GIVEN STRENGTH OR OTHER WISE \*\*\*

10 QQ = InputBox("WHAT DO YOU WANT TO DO? TO CALCULATE MIX RATIOS GIVEN DESIRED STRENGTH OR CALCULATING STRENGTH GIVEN MIX RATIO?", " IF STRENGTH OF CONCRETE IS KNOWN TYPE 1 ", "Type 1 or 0 and CLICK OK.")

If QQ <> 1 And QQ <> 0 Then EE = InputBox("No Way! You must ENTER 1 or 0", "CLICK OK and do so"): GoTo 10

If QQ = 0 Then GoTo 100

Rem PUT IN THE VALUE OF STRENGTH DESIRED HERE

YY = InputBox("WHAT IS THE DESIRED STRENGTH OF CONCRETE?"): YY = 1 \* YY

Rem \*\*\* Here is where the Actual Strength and Cost are calculated \*\*\*

For Z1 = 0.066 To 0.081 Step 0.0001

For Z2 = 0.1 To 0.1211 Step 0.001

For Z3 = 0.0067 To 0.0242 Step 0.0001

For Z4 = 0.26 To 0.269 Step 0.0001

Z5 = 1 - Z1 - Z2 - Z3 - Z4

Rem \*\*\* The Binary Predictors will be calculated here \*\*\*

Z6 = Z1 \* Z2: Z7 = Z1 \* Z3: Z8 = Z1 \* Z4: Z9 = Z1 \* Z5: Z10 = Z2 \* Z3

Z11 = Z2 \* Z4: Z12 = Z2 \* Z5: Z13 = Z3 \* Z4: Z14 = Z3 \* Z5: Z15 = Z4 \* Z5

Z23 = Z2 + Z3

Rem CALCULATING ACTUAL STRENGTH

YACT = A1 \* Z1 + A2 \* Z2 + A3 \* Z3 + A4 \* Z4 + A5 \* Z5

YACT = YACT + A6 \* Z6 + A7 \* Z7 + A8 \* Z8 + A9 \* Z9 + A10 \* Z10

YACT = YACT + A11 \* Z11 + A12 \* Z12 + A13 \* Z13 + A14 \* Z14 + A15 \* Z15

Y = YACT

Rem CALCULATING ACTUAL COST

CCC = B1 \* Z1 + B2 \* Z2 + B3 \* Z3 + B4 \* Z4 + B5 \* Z5

CCC = CCC + B6 \* Z6 + B7 \* Z7 + B8 \* Z8 + B9 \* Z9 + B10 \* Z10

CCC = CCC + B11 \* Z11 + B12 \* Z12 + B13 \* Z13 + B14 \* Z14 + B15 \* Z15

If Z1 / Z23 < 0.52 Then GoTo 30

If Z1 + Z2 + Z3 + Z4 + Z5 <> 1 Then GoTo 30 'Or Z1 + Z2 + Z3 + Z4 + Z5 < 1

If Y > YY - 0.05 And Y < YY + 0.05 Then GoTo 20 Else GoTo 30

20 Text1.Text = Text1.Text + CStr("Split tensile Strength" & vbTab & Format(YACT, "0.00#") & ",") & vbTab

Text1.Text = Text1.Text + CStr("Cost of concrete" & vbTab & Format(CCC, "0.00#") & ",") & vbTab

Text1.Text = Text1.Text + CStr(" WATER =" & vbTab & Format(Z1 / Z23, "0.00#") & ",") & vbTab

Text1.Text = Text1.Text + CStr(" CEMENT =" & vbTab & Format(Z2 / Z23, "0.00#") & ",") & vbTab

Text1.Text = Text1.Text + CStr(" ASH =" & vbTab & Format(Z3 / Z23, "0.00#") & ",") & vbTab

Text1.Text = Text1.Text + CStr(" SAND =" & vbTab & Format(Z4 / Z23, "0.00#") & ",") & vbTab

Text1.Text = Text1.Text + CStr(" COARSE AGG =" & vbTab & Format(Z5 / Z23, "0.00#") & ",") & vbTab

30

Next Z4, Z3, Z2, Z1

70 'Print "Sorry! Desired Strength is outside the range of the model"

111 GoTo 222

100 Rem \*\*\* Here is where the INPUT of the Principal Predictors will be made \*\*\*

Cls

Z1 = InputBox("What is Water/Cement ratio"): Z1 = Z1 \* 1

Z2 = InputBox("What is Cement value"): Z2 = Z2 \* 1

Z3 = InputBox("What is Ash value"): Z3 = Z3 \* 1

Z4 = InputBox("What is Sand value"): Z4 = Z4 \* 1

Z5 = InputBox("What is Coarse Agg value"): Z5 = Z5 \* 1

Z23 = Z2 + Z3

TZT = Z1 + Z2 + Z3 + Z4 + Z5

Z1 = Z1 / TZT: Z2 = Z2 / TZT: Z3 = Z3 / TZT

Z4 = Z4 / TZT: Z5 = Z5 / TZT

Rem \*\*\* The Binary Predictors will be calculated here \*\*\*

Z6 = Z1 \* Z2: Z7 = Z1 \* Z3: Z8 = Z1 \* Z4: Z9 = Z1 \* Z5: Z10 = Z2 \* Z3

Z11 = Z2 \* Z4: Z12 = Z2 \* Z5: Z13 = Z3 \* Z4: Z14 = Z3 \* Z5: Z15 = Z4 \* Z5

Rem CACCULATING ACTUAL STRENGTH

YACT = A1 \* Z1 + A2 \* Z2 + A3 \* Z3 + A4 \* Z4 + A5 \* Z5

YACT = YACT + A6 \* Z6 + A7 \* Z7 + A8 \* Z8 + A9 \* Z9 + A10 \* Z10

YACT = YACT + A11 \* Z11 + A12 \* Z12 + A13 \* Z13 + A14 \* Z14 + A15 \* Z15

Rem CACCULATING ACTUAL STRENGTH

CCC = B1 \* Z1 + B2 \* Z2 + B3 \* Z3 + B4 \* Z4 + B5 \* Z5

CCC = CCC + B6 \* Z6 + B7 \* Z7 + B8 \* Z8 + B9 \* Z9 + B10 \* Z10

CCC = CCC + B11 \* Z11 + B12 \* Z12 + B13 \* Z13 + B14 \* Z14 + B15 \* Z15

```
Text1.Text = Text1.Text + CStr(" Split tensile st Strength"  
&vbTab& Format(YACT, "0.00#") & ",") &vbTab  
Text1.Text = Text1.Text + CStr("CCC" &vbTab& Format(CCC,  
"0.00#") & ",") &vbTab  
Text1.Text = Text1.Text + CStr(" WATER =" &vbTab&  
Format(Z1 / Z23, "0.00#") & ",") &vbTab  
Text1.Text = Text1.Text + CStr(" CEMENT =" &vbTab&  
Format(Z2 / Z23, "0.00#") & ",") &vbTab  
Text1.Text = Text1.Text + CStr(" ASH =" &vbTab&  
Format(Z3 / Z23, "0.00#") & ",") &vbTab  
Text1.Text = Text1.Text + CStr(" Sand =" &vbTab&  
Format(Z4 / Z23, "0.00#") & ",") &vbCrLf  
Text1.Text = Text1.Text + CStr(" COARSE AGG ="  
&vbTab& Format(Z5 / Z23, "0.00#") & ",") &vbCrLf  
222  
End Sub  
Private Sub STOPMNU_Click()  
End  
End Sub
```

#### PROGRAM OUTPUT

```
SPLIT TENSILE STRENGTH (Desired strength: 2.055/mm2)  
tensile strength 1.50, WATER = 0.522, CEMENT =  
0.869, ASH = 0.131, SAND = 2.103,  
COARSE AGG = 4.206  
tensile strength 1.496, WATER = 0.524, CEMENT =  
0.877, ASH = 0.123, SAND = 2.102,  
COARSE AGG = 4.205  
tensile strength 1.504, WATER = 0.525, CEMENT =  
0.94, ASH = 0.06, SAND = 2.102, COARSE  
AGG = 4.204  
tensile strength 1.496, WATER = 0.537, CEMENT =  
0.931, ASH = 0.069, SAND = 2.139,  
COARSE AGG = 4.279  
tensile strength 1.502, WATER = 0.534, CEMENT =  
0.868, ASH = 0.132, SAND = 2.119,  
COARSE AGG = 4.24  
tensile strength 1.50, WATER = 0.526, CEMENT =  
0.87, ASH = 0.13, SAND = 2.081, COARSE  
AGG = 4.163
```

# Social Media Use and Knowledge Sharing Practices among Undergraduates in Federal University OYE-EKITI

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## Abstract

This study investigated social media use and knowledge sharing practices among undergraduates in the Federal University Oye-Ekiti. The study highlighted the potential advantages and consequences of social media use for knowledge sharing by undergraduates. The study adopted the descriptive research design. The population of the study comprised eight thousand three hundred and fifty six (8,356) Science and Education undergraduates from which three hundred and eighty (380) was selected through random sampling technique. The research instrument used was a semi-structured questionnaire. The questionnaire was subjected to both validity and reliability test and Cronbach's alpha coefficient of 0.7 and above was considered valid for the study. Data collected were analyzed using descriptive mean, median, standard deviation and relative importance index with the aid of statistical package for social sciences (SPSS) version 22. Findings from the study revealed that 48.6% showed that social media usage of the respondents made use of the social media daily. The findings also revealed that providing answers to improve understanding of other students ranked first with (R11=0.820). The results also revealed the factor militating against knowledge sharing is afraid mismatch would offend colleagues and only sharing when others share their knowledge with one both ranked 1st and 2nd (0.8). The study further revealed that more than 90% of the student made use of social media and also shared knowledge with their colleagues through it. In conclusion, sharing of knowledge through social media platforms has been hindered by a lot of factors such as lack of time, not showing off, lack appreciation, lack of sharing culture, afraid that one might provide wrong information, poor power supply and poor network connection, therefore the state government and other private organizations should help solve the problems of financial constraints facing the institution so that necessary adjustment and service quality can be delivered.

## I. INTRODUCTION

Globally, Creating a knowledge-based economy in this 21<sup>st</sup> century requires shifting administrative tenets and philosophy, changing people's behaviours and work processes and providing people with access to relevant knowledge for enhanced performance. Every organisation is endowed with its own tacit and explicit knowledge possessions in its various units, departments and divisions. The tacit knowledge are the proficiency and abilities attained through involvement while explicit knowledge comprise of information putative in handbooks and other print and non-print guidebooks that aid announcement among human society (Opele, & Okunoye, 2019); (Razmerita et al., 2016); (Zhao et al., 2017); (Rosaline & Kehinde, 2014). Management of knowledge in organisations has become a prerequisite for sustainable progress all over the world. In many countries, the identification of critical knowledge assets in organisations and the ability to utilize such diverse knowledge remains a challenge in many organisations cutting across public and private enterprises.

Knowledge management (KM) plays a significant role in addressing most human capital anxieties in organisations. Accordingly, one-way organisations can ensure effective management of its diverse knowledge assets is to increase propensity for knowledge sharing among its employees (Awogbami, Popoola A., 2020). The success of knowledge management initiative in organisations depend on how well organisations are able to effectively engage their employees (knowledge workers) to create new knowledge, learn from each other, engage in knowledge sharing practices and effectively utilising relevant knowledge to gain competitive advantage. Knowledge-sharing involves the creation and exchange of know-how, undertakings, opinions or understanding of ideas and hands-on applications, thereby improving learning and expertise (Tate & Igeria, 2020). To share knowledge means to learn, understand, extend and repeat the information, the ideas, the views and the resources with one another, connected with a specific ground, an activity through which knowledge (i.e. information, skills, or expertise) is exchanged among people, friends, members of a family, a community, an organisation or collaborative parties (Santoro et al., 2018). Knowledge sharing provides organisation members with knowledge needed for effective performance (Irizarry, 2020), promote collaboration, cooperation and apply their collective intelligence

(Liebowitz, 2001). In certain context, employees hoard their acquired knowledge to save time, conserve power and reduce the chances of being fired by their employers (Razmerita et al., 2016).

Knowledge sharing is the foundation of common learning and intellectual development. It involves the creation and exchange of expertise, happenings, opinions or understanding of ideas and hands-on applications, thereby improving learning and expertise. Moser (2017) argued that sharing of knowledge is associated with cost and benefits. He acknowledged the significant personal cost involves in acquiring knowledge and developing expertise. It is believed that the cost might be loss if expertise is shared with others. In other word, once the knowledge is shared, it can be used by others regardless of whether they actively participate in the sharing process or not. Hence, it is possible that the one sharing more may eventually receive less benefits, while the one who contributed less may receive more benefits in the end. This suggests that, not only can the expert knowledge be used by others without acknowledging its source, but can also be lost as a consequence of sharing their knowledge. Accordingly, sharing knowledge between individual and collective interests can either aid or weaken the performance and effectiveness of the organisation at large (Moser, 2017). He maintained that in organisations, knowledge workers are more favoured because of their centrality to achieving the organisational goals. This disparity in pay and other benefits is because expertise is associated with higher status, social recognition and consequently the benefits of expert power.

Moser, (2017) further posits that the social dilemma of knowledge sharing is particularly pronounced in the case of experts who due to their superior knowledge, have a higher ability to contribute to the group outcome than non-experts.

#### Methods and Techniques of Knowledge Sharing

Literature (Young, 2010) have identified a number of knowledge sharing methods and techniques employed in organisation.

IT methods and techniques of knowledge sharing	Non-IT methods and techniques
<b>Brainstorming:</b> This referred to a group creativity performance in which efforts are made to find a finish for a specific problem by gathering a list of thoughts instinctively donated by its members. It is a way of helping a group of people to generate new and unusual ideas. It involves generating a large number of solutions to a problem (idea) with a focus on the quantity of ideas.	<b>Knowledge bases (e.g.wikis):</b> Wikis are usually shared via online platform 'shared online writing space' that support team up writing among multiple users. Wikis are normally topic-specific and may incorporate content in the form of audio, images, text, video, and web links. Wiki consumers have the ability to add, delete and modify any content collaboratively (Sharp & Whaley, 2018)
<b>Learning and idea capture:</b> A key aspect of knowledge	<b>Blogs:</b> A blog is a simple 'journal style' website that

management (KM) at the personal and team level is to 'collectively and systematically' capture the learning and ideas that are taking place. The process of writing is a creative process that forces and disciplines the individual to develop and organize his/her knowledge faster.	contains a list of entries, usually in reverse chronological order. The entries are typically short articles or stories, often relating to current events. Besides, the entries could be photographs, videos, audio recordings, or a mixture of all the types. The content of a blog may be created by a single author or, in the case of some of the more popular blogs, a whole collection of writers.
<b>Peer assist:</b> A peer assist is simply a process where a team of people who are working on a project or activity call a meeting or workshop to seek knowledge and insights from people in other teams. Peer assists are part of a process of "learning before doing", in other words gathering knowledge before embarking on a project or piece of work, or when facing a specific problem or challenge within a piece of work.	<b>Social network services:</b> A social network is a group of people who share a common area of interest. Social networks can be very powerful knowledge-sharing tools. Social network services are online systems that support general social networking. A well-targeted network can provide its members with access to highly relevant knowledge, connections, and advice.
<b>Storytelling:</b> Storytelling is the conveying of events in words, images and sounds by improvisation or embellishment. Stories or narratives have been shared in every culture and in every land as a means of entertainment, education, preservation of culture in order to instil moral values. Many organisations utilize storytelling to transfer experts' knowledge to younger people. Some organisations use storytelling to share lessons learned from project to colleagues who were not participating in the project	<b>Voices and voice-over internet protocol (VOIP):</b> In very simple terms, the internet is now capable of sending both audio and video signals between computers, using nothing more than a broadband connection and some low-cost equipment, such as a webcam and a headset. This capability is often referred to as Voice-over Internet Protocol (VOIP). VOIP offers a free or very low cost means of calling people anywhere in the world, provided that they have a suitable Internet connection. When combined with video calling, the service offers a significantly richer form of communication.
<b>Learning review:</b> This is a technique used by a project team to aid team and individual learning during the work process. The	<b>Advanced search tools:</b> Search engines are set of methods aimed at improving the ranking of a website in search of engine listing.

<p>purpose of a Learning Review is for team members to continuously learn while carrying out the project. Learning review can be conducted immediately by appointing a facilitator, meeting formats, lessons learned and workshop.</p>	<p>Getting the right information can be a hit-and-miss affair. Knowing how to use the search tools to narrow down the options is an important skill for any knowledge worker. Search engines attempt to solve the problems of finding useful information. Three most popular advanced search tools (engines) include Google, Yahoo and Microsoft</p>
<p><b>Collaborative physical workspace:</b> Physical workspace in this context referred to the situations in which people actually work or simply the physical aspects of our office. In real life, when people share or create knowledge, they usually interact with other people through face-to-face communication, discuss, dialogue, or simply just ask a question. In simple term, the physical workspace is where such human interactions take place and it can support knowledge sharing practices if well-designed.</p>	<p><b>Building knowledge clusters:</b> The term 'Knowledge Cluster' refers to a group that as a result of coming together in this new way; create, innovate and disseminate new knowledge. Knowledge clusters represent a group of companies in the same industry sector, e.g., high technology knowledge cluster, biotechnology knowledge cluster. Different individuals, teams, and organisations can now come together, virtually on the Internet, to better communicate, collaborate, learn, and share knowledge through the cluster</p>
<p><b>Knowledge café:</b> A knowledge café is a way to have a group discussion, to reflect and to develop and share any thoughts and insights that will emerge, in a very non-confrontational way. A knowledge café suspends all judgment and normally leads to developing deeper insights and sharing than usual. Running a knowledge café requires a process to make it work effectively.</p>	<p><b>Expert locator:</b> This referred to a computerised programmes that imitate the reasoning processes of experts in solving different problems. Expertise Locator (Expert Locator, Who's Who) is an information technology (IT) tool that enable effective and efficient use and/or share of existing knowledge by connecting people who need particular knowledge and people who own the knowledge.</p>

The above methods and techniques of knowledge sharing takes place in an ecosystem of knowledge management. It is critical that this concept be operationally delineated. Of late, social media platforms has made sharing of knowledge among people much easier. Several authors have examined the concept of social media use in the pursuit of academic goal and have reported different results. Al-Bahrani, Patel

and Sheridan (2015) suggested incorporating social media in the classroom, their findings exposes that undergraduates make maximum use of Facebook, YouTube, Instagram, and Twitter to exchange knowledge among one-another. Other scholars have equally agued that social media use can promote communal relationship between students and lecturers (Bryer & Zavattaro,2011; Brooks, 2015; Cooke, 2018). In a related study, Chan, Chu, Lee, Chan and Leung, (2013) found that blogging and Facebook have gained increasing recognition as tools to support online information sharing and management. Conversely, Dabbagh and Kitsantas (2012) recommended that social media should be seen as a self-regulated teaching support for knowldge sharing.

## II. Methodology

This study investigated Social Media Use and Knowledge Sharing Practices among Undergraduates in the Federal University Oye-Ekiti. The study highlighted the potential advantages and consequences of social media use for knowledge sharing by undergraduates. The study adopted the descriptive research design. The population of the study comprised eight thousand three hundred and fifty six (8,356) Science and Education undergraduates from which three hundred and eighty (380) was selected through random sampling technique. The research instrument used was a semi-structured questionnaire. The questionnaire was subjected to both validity and reliability test and Cronbach's alpha coefficient of 0.7 and above was considered valid for the study. Data collected were analyzed using descriptive mean, median, standard deviation and relative importance index with the aid of statistical package for social sciences (SPSS) version 22.

## III. Results

**Research Question 1:** What kinds of knowledge is commonly shared among undergraduates in FUOYE?

**Table 1 Knowledge shared among students**

Knowledge shared	RII	Ranks
Providing answers to improve understanding of other students	0.820	1 <sup>st</sup>
Providing personal books and lecture notes	0.817	2 <sup>nd</sup>
Assisting other students in database search , software usage etc.	0.756	3 <sup>rd</sup>
Providing examination related materials	0.740	4 <sup>th</sup>
Sharing URL of relevant websites	0.737	5 <sup>th</sup>
Expressing own opinion	0.701	6 <sup>th</sup>

### Field survey, 2021

Table 1 showed the common knowledge shared among the undergraduates considered in this survey. Relative importance index was used to rank the knowledge as observed by the respondents. Providing answers to improve understanding of other students and Providing personal books and lecture notes both ranked 1<sup>st</sup> and 2<sup>nd</sup> with RII of 0.820 and 0.817 respectively which falls under high level of

importance ( $0.8 \leq RI \leq 1$ ) which implies that they are both the topmost form of knowledge shared by the students. Other form such as assisting other students in database search, providing examination related materials, sharing url of relevant websites and expressing own opinion which ranked 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> respectively falls under high medium importance levels i.e. ( $0.6 \leq RI \leq 0.8$ ) which means they were also means of knowledge commonly shared on very moderate level.

**Research Question 2:** Which social media do students use for knowledge sharing in FUOYE?

**Table 2: Social media used**

Social media	RII	Ranks
WhatsApp	0.848	1 <sup>st</sup>
Instagram	0.753	2 <sup>nd</sup>
Facebook	0.750	3 <sup>rd</sup>
YouTube	0.730	4 <sup>th</sup>

**Table 3 Knowledge sharing constraints**

Statements	Mean	STAD	RII	Ranks
Afraid mismatch would offend	3.72	0.895	0.925	1 <sup>st</sup>
Only share when other share their knowledge with me	4.11	1.077	0.822	2 <sup>nd</sup>
Afraid other perform better	3.97	1.069	0.793	3 <sup>rd</sup>
Lack of relationship	3.92	1.023	0.783	4 <sup>th</sup>
Don't know what to share	3.85	1.037	0.771	5 <sup>th</sup>
Lack of time	3.80	1.050	0.760	6 <sup>th</sup>
Don't show off	3.67	1.009	0.734	7 <sup>th</sup>
Lack appreciation	3.64	1.084	0.727	8 <sup>th</sup>
Lack of sharing culture	3.61	0.951	0.721	9 <sup>th</sup>
Afraid provide wrong information	3.59	0.829	0.719	10 <sup>th</sup>
Shy	3.52	1.020	0.705	11 <sup>th</sup>

#### Field survey, 2021

As shown in Table 3 which presented the factors militating against knowledge sharing as observed and rated by the students. Afraid mismatch would offend colleagues and Only sharing when others share their knowledge with one both ranked 1<sup>st</sup> and 2<sup>nd</sup> which means they were considered as the top factors hindering knowledge sharing among the students. They also both falls under high level of importance ( $0.8 \leq RI \leq 1$ ). other factors such as being afraid that others would perform better, lack of relationship, not knowing what to share, lack of time, not showing off, lack appreciation, lack of sharing culture, afraid that one might provide wrong information and being shy were also recognized as factors hindering the sharing of knowledge at a medium high level with RII ranging from ( $0.6 \leq RI \leq 0.8$ ).

#### IV. Discussion of the findings

It was discovered from the findings of this study that most of the undergraduates in faculties of science and education, FUOYE make use of the social media daily. This is in line with the findings of Valdez (2020) who restated that students make use of social media on a regular basis. Adebola and

Twitter	0.695	5 <sup>th</sup>
Telegram	0.666	6 <sup>th</sup>

#### Field survey, 2021

Table 2 revealed the media through which the undergraduates considered shared knowledge shared among themselves. Relative importance index was used to rate the social media used as observed and verified by the respondents. WhatsApp ranked 1<sup>st</sup> with RII of 0.848 which falls under high level of importance or usage. Other social media platforms used for sharing knowledge listed in table 1.2 such as Instagram, Facebook, YouTube, twitter and telegram falls under medium high level of usage i.e. ( $0.6 \leq RI \leq 0.8$ ).

**Research Question 3:** What are the challenges/factors militating against knowledge sharing among undergraduates in faculties of science and education, Fuoye?

Yahya (2019) also supported the fact in their findings that undergraduate students of ObafemiAwolowo University make use of social media in their day-to-day activities. In addition, findings from the study indicate that undergraduate students spend an average of 2 to 3 hours daily on social media platforms. This may explain the extent of Internet addiction among undergraduates. The finding is in keeping with the study by Talaue, Alsaad, AlRushaidan&AlHagail (2018) which revealed that students spend on average 1 to 3 hours per day on social media. Similarly, Hashem& El-Badawy (2015) indicated that 50% of students spend 1 to 3 hours studying a day and 33% spent that same amount of time on social media per day.

This research revealed that providing answers to improve understanding of other students, providing personal books and lecture notes, assisting other students in database search, software usage, providing examination related materials, sharing URL of relevant websites and expressing own opinion are the kinds of knowledge that are commonly shared among undergraduates in faculties of science and education FUOYE. This finding is consistent with Ali, Yaacob, Endut, and Langove (2016) that social influence is a leading factor

convincing students for the academic use of social media. The finding is also supported by Harden (2012) who submitted that social influence is positively related to intention to use and share knowledge in the workplace. The explanation for this result is because positive effect of social influence resulted to positive attitude of the respondents to using social media for knowledge sharing.

The findings of this research revealed that whatsapp, instagram, facebook, youtube, twitter and telegram are the social media that students use for knowledge sharing in faculties of science and education, FUYOYE. This corroborates the findings of Bryer and Zavattaro (2011) that blogs, wikis, interacting platforms (Facebook, Twitter, Whatsapp), media (audio, photo, video, text) distribution tools, and virtual worlds are social media that students use for knowledge sharing. It also agrees with the findings of Alexa (2017) that the most popular and commonly known social media sites (SMSs) in the western world are Facebook, Whatsapp, Twitter, Instagram, Snapchat, Youtube, and Google. Also, Wiley & Sisson (2006) stated that more than 90% of tertiary school students use social platforms. The findings from the study also support Kaya & Bicen (2016) who disclosed that Facebook and WhatsApp were mostly used by students. Hashem & El-Badawy (2015) noted that the social media types used by students include Snapchat, Facebook, Instagram, Twitter and YouTube. As such, the study results are validated.

This research found that lack of relationship, ignorance of what to share, lack of time, lack of appreciation, fear of providing wrong information and shyness are the challenges/factors militating against knowledge sharing among undergraduates in faculty of science and education, FUYOYE. This corresponds with the findings of O'Keeffe & Kathleen (2011) who disclosed that online harassment and cyber bullying are some of the challenges militating against knowledge sharing. Also, Fodeman & Monroe (2009) and Hashem, & ElBadawy (2015) noted that writing and spelling skills deficiency and anti-social behavior of colleagues are some factors militating against knowledge sharing among undergraduate students. Overall, The findings revealed more than 90% of the student made use of social media and also shared knowledge with their colleagues through it. The findings also revealed that students providing answers to improve understanding of other students and provision of personal books and lecture notes were the common knowledge shared among the students considered during this survey.

## V. Conclusion

Relative index analysis was used to determine the relative ranking of each items or criteria and its ranking analysis revealed that all criteria were highlighted either "high" or "high medium" or "medium" which enabled the researcher to cross compare the relative importance of the criteria as perceived by the respondents. The results of this analysis can be very useful to the university bodies or any institution to carry out necessary adjustment to the library services. Sharing of knowledge through social media platforms has

been hindered by a lot of factors such as lack of time, not showing off, lack appreciation, lack of sharing culture, afraid that one might provide wrong information, poor power supply and poor network connection.

## VI. Recommendations

1. The state government and other private organizations should help solve the problems of financial constraints facing the institution so that necessary adjustment and service quality can be delivered.
2. The staffs should be more equipped through giving them more training in any aspects where there seems to be faulty.
3. The government and school authority should improve the level of social media utilization by introducing free Wi-Fi to students for easier access to the internet.
4. The lecturers should use the social media platforms commonly used by undergraduates as a medium to pass knowledge.
5. Students should learn to share knowledge with others to improve knowledge sharing.

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# Important Aspect Storyline for Mobile Video Games

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## Abstract

Story is an image from a journey, in Story we follow the characters on a journey they go through some obstacles. Like for example a Hero, Villain, Retrieve Village and many more. Sometimes in video games story can be boring and flat because there's no special in it like flat character expression, boring plot, messy dialogue. Now as the mobile memory increased developer can add many things a variation gameplay mechanic and storyline. In this article we going to discuss why storyline in video game is important to player this day and this paper will contain: (1) Story of Video Games (2) Why storyline in Video Games is important (3) Important aspect that makes storyline good in video games, such as plot, dialogue, character, environment, and add-on; And in the end I will tell you the most important aspect from the 5 aspect that I mention above

## Keyword

*Aspect, Mobile Video Games, Research Article, Storyline.*

## I. INTRODUCTION

Globally, Game is an application composed of synthetic regulations that involve players with the intention to entertain [1] Who doesn't play video game in this era? Everyone plays video games, from a toddler – old age. You can play anytime and everywhere. According to Eko Priyantoro, "Video games have become a lifestyle for urban people, not just for entertainment sometimes we can make money through video game and it called e-sport. Video game presence can be found everywhere from your device, malls, even sometimes in the street" [2]

Video game is an electronic game that involves interaction with user interface or input device you can play it with a keyboard joystick controller motion sensor, or smartphone. In the first, video game is so simple we just control up and down to gain a score nowadays video game is more complicated their have a better graphic, level design, complicated gameplay, and storyline.

There's a lot important aspect that video game need either its immersion the music, addictiveness, visual, or the story all of them make the game perfect but now I just want to share how the storyline in video games work. A video game story is crucial as it allow the gamers experience more involved and more immersed in the game. It offers the whole thing in the game and allows the participant to recognize what they want to do. The benefit of video games is that not like with different sorts of story, the gamer lives the whole experience, and share the successes and setbacks of the main character. Sometimes with a good story we can feel every aspect in the game that we need in real life, we can be someone else in video games experience it without actually feel it in real life sometimes story teach us some valuable lesson from video game we know what we should do and we shouldn't do.

Just like with any story game or storytelling out there there's no mystery components to what makes a very good game. One video game may have turn-based combat, 100 hours game play or game can be 20 minutes long and have nothing but choices especially mobile video games. You can't write a lot of huge blocks of textual content for mobile video games, because visual media doesn't work that way, and it even greater so won't any person searching right into a small screen. Storytelling in mobile video games is all approximately organically attractive gamers without making them feel stressed over a big text, slowly revealing content material in small bits via game surroundings.

According to Ricardo Casañ-Pitarch "Video games that longitudinal gamified teaching materials based on storylines and played through tailored- designed videogames can raise player interest" [3]

And also, Yang Liu, Daniel Holden, Dongping Zheng said that "Story can be connected between storyline and in the real world "[4] if you can make it relate sometimes storyline can be relate to other story sometimes, they give us vision, answer, or even learn something valuable through a storyline. That's why storyline is important in video games not only make game more addictive but can give us some lesson that we can choose in real life

## II. METHODOLOGY

We use smartphone to talk with friends and family, for work or maybe to play video games for entertainment, [5]

Then how to make a good storyline? a lot of various aspect that matters.

First is plot. Plot is the chain of connected events that make up a narrative or story itself the plot can ruin a game sometimes we don't need the plot like some indie games but for AAA+ game we surely do. We need strong plot it has to be memorable, and plot has to be the foundation some

concrete. In mobile video games we can't make a lot of scripts and text to make a game the player we will be bored if it was all text, yet a plot should be simple and meaningful and its involving lots of gameplays. According to Octavianus Frans, Jonata Witabora "Video games is an energetic and co-innovative media where in storyline flows from the plot made through developers and to the gamers interactions within side in the videogame itself [6] just trying to be simple not too much and don't too less that's the key. But if you don't want the plot it's okay Konstantinos Papangleis , Melvin Metzger, Yiyeng Sheng, Hai-Ning Liang, Alan Chamberlain, Ting Cao said "If you didn't use plot means that the player capable of make their very own tale to the game itself both from game and virtual reality "

Second is Dialogue the conversation between two or more character. In mobile video games is better have a minimal dialogue. Just keep it minimal like always but have a key to something in the story or the plot, but that doesn't mean you didn't add something flavors in it like for example: you need to put the jokes in it, or if the character angry you caps lock all the word sometimes it's necessary and sometimes it doesn't. When writing dialogue, it's good to keep in the mind that some gamers, no matter how great the dialogue is they want to get back to the action as fast as they can. But doesn't mean you should waste your video games dialogue the game design must be very selective about where, when and how they use their valuable dialogue. Mathilde Janier, Mark Snaith, Katarzyna Budzynska, John Lawrence and Chris Reed said " Dialogue may be effortlessly model and formalized to outline a mediation dialogue game" [8] Hannu Korhonen " Story is an crucial a part of the game and it's far used to create a premise or fiction of a game or it can offer a theme that give a taste to the game the story tale also can direct selection or choice that they made in game "[9] That's why you need dialogue that on point the vocabulary is important too in dialogue find a translator or something else if your English is bad for example like this one  
Avoid these mistranslations it's okay if you make one or two mistake but its better find better translator

Third is character. Characters are the most important asset. A good character is the one who can relate to gamers. Character must have individual unique, main character he/she must have a lot of charisma, unique with a strong motivation and solid backstory. A good video game character has a personality (despite the fact that it's unlikeable), and their backstory has enough detail that the gamer can get an awesome feel of who they're and what they need. Even mysterious protagonists reveal enough information to ignite interest in the gamer, making them need to discover more. Martin Delhove, Tobias Greitemeyer said "Antagonist character yielded greater delinquent behaviours while as compared to play as a heroic character "[10] "video games can offer significant tales and characters in a traditional experience or video games can offer significant stories through permitting the gamer from the story as well. [11] KiTeok Nam, Taesuk Kihl said "Game characters can connect and interact between developers game and player through personality in game "[12] Character must be

designed with each shape and distinctive personality, and uniqueness, particular and suitable to the context.[13] Video games allow gamer to apprehend and doubtlessly pick out with the motives on their character [14] video games are frequently quite concerned with growing vibrant and believable characters, telling private stories, or conveying emotional reports using interplay to enhance the narrative.[15] Backstory also important to a character it will inform the character's actions and provide the character with motivation

Fourth is Environment since its mobile video games we can't make many things in the game, we must make it stable, so it looks fine both frame per second (fps) and gameplay. Best story games are told through interacting with surrounding environments. Like walking through some traps object scribbled walls, secret letter, etc. Key to expertise the atmosphere of production, isn't just designers themselves however the wider exercise of game design. [16] That Video games give us an environment where failure is awaited or maybe it memorializes. [17]

This is from game called Grand Thief Auto San Andreas Mobile that it's not empty environment there's a cop, civilian, and gang members. You can shoot the civilian and get arrested by the cop or even started a gang war  
And the last one is add-on you will need an update if u want to make a sequel in your game like for example if support character have an interest from the player, you should make their own story like now it's called DLC (Downloadable Content). As the company game maintains to grow, increasingly more game developers have proposed routine sales models that offer constant income streams from their games.[18] Sometimes they using loot boxes, for my perspective its very bad that using this because some gamer might be hate it One element of the attraction of the loot box in a few video games is the special availability of item from inside loot boxes[19] this will impact the game that you make and the story itself. Story games and non-story games are the same but not quite the same each proportion interface that form sensemaking That offers upward thrust to a player's interpretation of the sport in a ludo-logical and narrative purpose sense, and as a consequence each have want of narrative design [20]

### III. CONCLUSION

Of all aspects that describe above the most important is character. Characters can bring a game to life. Character can reflect the player itself. Characters also can provide their own lessons. Starting from the character background, character personality and the appearance of the character. Like characters who have handsome or beautiful faces or non-human characters such as aliens, ogres, or demi-humans. However, characters cannot stand alone in a game. That's why other aspect also important. And next is plot. The plot will be very concerned because it is included in the core story game. Plot can help explain the background of a character. Trough plot we know what the main goal in video game. For Example the main character who need survive in the forest where the main character must return to the village and pass

various obstacles. Then after plot there's a dialogue, dialogue is very influential with character expressions, characters with flat expressions will be very boring to played. Dialogue is the key to uniqueness in character which can reflect the personality of each character. Next is environment, the environment in the game world cannot flat without objects or obstacles around it. For Example, I mentioned earlier, When in the forest there will be many obstacles at every step, like fallen trees, leaves, and also animals that hunt them. A good environment will make the game beautiful. The last one is add-ons, why add-ons are the last ones? Because actually these add-ons are optional if you want to use it or not, but usually add-ons are the addition of certain content in a game. Add-ons can be include in new characters or it can be a new plot or even new environment.

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# Important Aspect Storyline for Mobile Video Games

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## Abstract

The motive of the proposed studies is to look at the structural conduct of monopole towers with and without camouflaged with 35m and 30m heights of tower with fundamental wind speed of 44.44m/s, as consistent with contemporary modern code ANSI/TIA-222-H. most research and studies have shown handiest structural conduct of monopole towers with other kind of lattice towers. The proposed studies may be very crucial because the civil engineer is confronted with the hard assignment of designing and building telecommunication towers to aid all hundreds in open climate with a high degree of reliability. Freestanding lattice towers are commonly used all over the international. in step with current surveys, cell towers within the world are probably to grow very swiftly due to the advent of 5G technology, which calls for more antennas on towers. the present monopole towers are already occupied through many antennas without sufficient structural capability to support the extra load at the towers. on this research, new disguised designs for monopoles are investigated to enhance the structural potential and behavior of monopoles to withstand the brand-new masses. Environmental and economic pressures have caused the look for stepped forward layout techniques to make verbal exchange towers greater environmentally pleasant and price effective. because monopole structures have smaller dimensions and require much less space for installation, they may be used as a appropriate alternative for lattice towers. some researchers have found of their look at that pole have better lateral displacements and decrease structural potential than 4 legged towers. in this proposed observe, a new disguised engineering design is evolved to analyze the structural conduct of monopole towers. This observe will assist determine the lateral displacement (inclination) of monopoles, the burden wearing capability of monopoles, and the outcomes of wind speeds for 35 m and 30 m tall monopoles with and without camouflage underneath the influence of wind masses.

## Keyword

*Staad pro V8i, Ts Tower, monopole tower, antenna masses, fundamental wind pace, lateral displacement (tilt), monopole potential, camouflaged cladding*

## I. INTRODUCTION

With the sudden and exponential increase in mobile phone use, the telecommunication enterprise and telecommunication towers have acquired loads of exposure in current years. In recent times, all people have a cell telephone, and the want for telecommunication offerings has risen. Telecommunication towers are the best way to boom community reach and reliability.

The towers that guard the panel antenna telecommunication gadgets, platforms, and their foundations are analyzed and designed via civil engineers. many of the devices, including mounts, antennas, and different additives, are mounted at the tower, which necessitates civil engineering experience. carried out loads consisting of wind load, dead load, and creation power of structural metallic individuals on superstructure, which includes ties and base, are utilized in tower structural estimates. Telecommunication towers are divided into various classes relying on their structural motion, cross-phase, section kinds applied, and tower placement. primarily based on their structural action, they're called Monopole, Self-guide, or Guyed Towers. Monopoles are the most fee-powerful for heights below fifty-five meters

and are a viable alternative for room constraints. As a end result, monopole towers are in excessive call for within the telecommunications enterprise.

maximum preceding examine has focused on structural pastime of 3-legged and four-legged lattice towers, guyed towers, and researchers have not given Monopole towers enough time. due to the current problems in locating land for the construction of traditional lattice towers, monopole towers are gaining prominence for connectivity purposes around the world, and its look at is vital inside the modern-day situation.

Monopole towers will accommodate both antennas at heights of 30 to 50 meters, extending the structures attain. Monopole towers are versatile amongst systems due to their multipurpose use in contact, lights, and different fields. shape research can help a shape painting better and last longer. a radical exam of a monopole the use of modern-day technology will bring about an improvement in its structural capability.

**REVIEW ON PREVIOUS RESEARCH**

there may be currently a lack of research available regarding the monopole structural conduct and capacity to face up to new masses with new camouflaged technology this situation calls for greater in-intensity analysis that's to be researched upon.

**II. LITERATURE REVIEW**

Following are some theories and research carried out till now: Riy Joseph ISSN2395-0095 & jobil vargese 2005 observed in their study that Telecommunication towers are tall structures installed at a specific height usually designed for supporting parabolic antennas. The structure engineer has the difficult task of planning and installing telecommunication towers that can reliably accommodate all loads in open air. Lattice towers that stand alone are often seen all around the world. According to recent surveys, the number of cell towers will possibly exceed 5 lakhs by 2020. Land for the construction of these traditional lattice towers is very challenging to come by in densely populated metropolitan areas. The steep rise in land valuation has necessitated the creation of an environmentally friendly alternative to traditional lattice towers. Environmental and economic stresses have prompted researchers to look for new ways to build contact towers that are both environmentally friendly and cost efficient. Monopole systems may be seen as a better alternative to lattice towers since they have reduced dimensions and need fewer room for construction. The study of monopole mobile towers is the focus of the study. ANSYS finite element program is used for the study. The ANSYS model is used to predict monopole behavior when they are used as a coordination tower. The efficiency of the monopole tower is assessed using finite element results.

M.Pavan kumar,P.Markhandrya Raju,M.Navyal and GT Naidu(2017): The two popular forms of telecommunication towers used in the building industry are monopole and self-supporting towers. For simple wind speeds of 33m/sec, 47m/sec, and 55m/sec, this paper compares Monopole and Self-Support style Towers with different heights of 30m, 40m, and 50m. STAAD(X) Tower program, which is specifically designed for analyzing Telecommunication Towers, is used to accept dead loads and wind loads when examining the antenna. Self-Support Towers have smaller lateral displacements than Monopole Towers of the same height with the same volume of building, according to this report. This is due to their increased stiffness. However, for a given tower height, wind speed, and loading, the steel quantity needed for Self-Support Towers is roughly 2 times that of Monopole Towers. However, due to their rigidity, Self- Support Towers have more load carrying capacity than Monopoles. For towers of height below or equal to 40m, Monopoles might be preferred. But, with the increase in height beyond 50m, Self-Support Towers are recommended. This is because, in case of any unexpected and abnormally high wind speeds during cyclones, the structural rigidity will be intact.

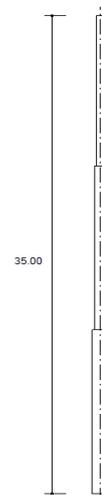
**III. OBJECTIVE AND SCOPE OF THE STUDY**

The objective of this study is to compare the performance of Monopole with and without camouflaged with respect to lateral displacements and. Analysis and design of Monopole with and without camouflaged were performed using STAAD(V8I) Tower software for basic wind speeds of 44.44m/sec with 35m height of tower. The problem is assumed to be a linear-static problem and analysis was performed for basic wind speeds of 44.44m/sec with 35m and 30m heights of tower. Further, for the scope of study considered. Comparison of lateral displacements at the top of towers and structural capacity of monopole is made between the similar sized Monopole with and without camouflaged towers to validate the results by a suitable software simulation/statistical package.

**IV. RESEARCH METHODOLOGY**

**DESIGN SPECIFICATION**

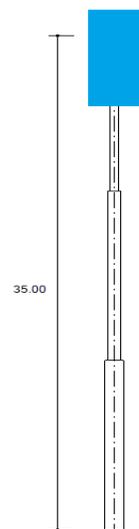
Sct.	Length (m)	Overlap (m)	Top Dia (mm)	Bot Dia (mm)	Thick (mm)
3	11.00	0.00	475.0	475.0	5.000
2	12.00	0.00	725.0	725.0	5.000
1	12.00	0.00	1000.0	1000.0	5.000



**Figure 1.**

**DESIGN SPECIFICATION**

Sct.	Length (m)	Overlap (m)	Top Dia (mm)	Bot Dia (mm)	Thick (mm)
3	11.00	0.00	475.0	475.0	5.000
2	12.00	0.00	725.0	725.0	5.000
1	12.00	0.00	1000.0	1000.0	5.000



**Figure 2.**

**Figure 1&2. Geometrical configuration of monopole without camouflaged and monopole with camouflaged (height = 35m and basic wind speed = 44.44m/sec.)**

Sectional properties of 35m height monopole tower				
Section No.	Elevation above base (m)	Top Dia.(mm)	Bottom Dia.(mm)	Thickness T (mm)
For basic wind speed of 44.44 m/sec				
1	11	475	475	5mm
2	12	725	725	5mm
3	12	1000	1000	5mm

**DESIGN SPECIFICATION**

Sct.	Length (m)	Overlap (mm)	Top Dia (mm)	Bot Dia (mm)	Thick (mm)
3	6.00	0.00	475.0	475.0	5.000
2	12.00	0.00	725.0	725.0	5.000
1	12.00	0.00	1000.0	1000.0	5.000

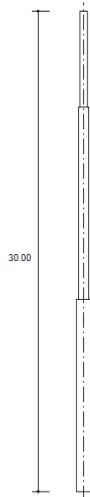


Figure 3.

**DESIGN SPECIFICATION**

Sct.	Length (m)	Overlap (mm)	Top Dia (mm)	Bot Dia (mm)	Thick (mm)
3	6.00	0.00	475.0	475.0	5.000
2	12.00	0.00	725.0	725.0	5.000
1	12.00	0.00	1000.0	1000.0	5.000

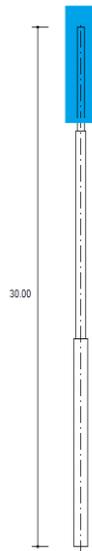


Figure 4.

Figure 3&4. Geometrical configuration of monopole without camouflaged and monopole with camouflaged (height = 30m and basic wind speed = 44.44m/sec.)

Sectional properties of 30m height monopole tower				
Section No.	Elevation above base (m)	Top Dia.(mm)	Bottom Dia.(mm)	Thickness T (mm)
For basic wind speed of 44.44 m/sec				
1	6	475	475	5mm
2	12	725	725	5mm
3	12	1000	1000	5mm

**Material properties**

Standard: (High tensile) ASTM-A572 GRADE 50 OR EQUIVALENT

Tensile Strength: Fu = 490 N/mm<sup>2</sup>

Yield Strength: Fy = 345 N/mm<sup>2</sup>

**Anchor Bolt**

ANCHOR BOLT: ASTM A572 GRADE 50 OR EQUIVALENT.

Properties:

Min.yield strength in N/mm<sup>2</sup> = 448 N/mm<sup>2</sup>

Min tensile strength in N/mm<sup>2</sup> = 345 N/mm<sup>2</sup>

**Geometry of monopole**

A Steel Shaft flange connection is considered in design for both Monopole Tower and Camouflaged Monopole Tower were considered for STAAD(V8I) analysis. Fig. 1 shows geometrical configuration of Monopole with and without camouflaged for 35m and 30m heights subjected basic wind speed of 44m/sec.

**Research design**

Step 1: to conduct literature review on structural behavior of monopole with and without camouflaged after referring many journals and internet references.

Step 2: to investigate the structural behavior of telecommunication monopole towers that have been camouflaged and those that have not. STAAD PRO V8I structural analysis software was used to create 3D computer models for each structure, and these models were used to analyze towers under wind loads.

Step 3: Following the preparation of two versions, wind analysis will be carried out using the most recent code for antenna towers, ANSI/TIA-222-H Structural Standard for Antenna Supporting Structures and Antennas, which is highly respected and widely utilized by both local and international tower designers for their designs and structural parameters.

Basic wind speed = 160 Km/hr. (44.44m/s) (3sec-Gust).

Ultimate Wind Speed:201.6 Km/hr (55.99m/s)

Limiting Monopole deflection to 4.0 degree under operational wind speed = 120 Km/hr (33.33m/s).

Exposure category: C.

Structural class: II.

Topographic Category: I.

**Load Combination**

According to ANSI/TIA-222-H, Minimum design load combinations for structures

1.2 D.L + 1.0 W.L (for section design )

1.0 D.L + 1.0 W.L (for serviceability)

Wind load

Wind load on the monopole without camouflaged and monopole with camouflaged structure concealing the following Loads was used for the structural analysis and design of towers under wind loadings. And design of steel member as per LRFD.

Step 4: comparative study is evaluated after analyzing two models with and without camouflaged to investigate the lateral displacement (tilt of monopole) and monopole structural capacity finally, the results of analysis under wind loads were compared.

PROPOSED LOADING							
SL. NO.	DESCRIPTION	NO'S	SIZE (m)	ELEVATION (m)	WEIGHT / UNIT (kN)	Total Weight (kN)	Remarks
1	30 PORT ANT	3	2.769x0.469	35	0.7	2.10	
2	5G ANT	3	0.860x0.395	35	0.6	1.80	
3	RRU	24	0.48x0.356	35	0.25	6.00	
4	HP	2	0.6	35	0.18	0.36	

**WIND LOAD CALCULATION AS PER ANSI/TIA-222-H**

Cross Section	CIRCULAR
Type of Tower	Pole
Height of Tower, h	35 m
Basic Design Wind Speed, V	44.44 m/s
Ultimate Wind Speed, V <sub>ult</sub>	55.99 m/s
Exposure Category	C
Z <sub>g</sub>	274 m
a	9.5
K <sub>zmin</sub>	0.85
K <sub>c</sub>	1
Topographic Factor	Category 1
K <sub>a</sub>	1
Ground Elevation Factor, K <sub>e</sub>	1
Rooftop wind speed-Up Factor, K <sub>s</sub>	1
Wind Direction Probability Factor, K <sub>d</sub>	0.95
Risk Categorization of structure	II

Description	Surface Type	Height above ground level @ base of structure, z	Size of Appurtenances			NO'S	Velocity Pressure Coefficient, k <sub>z</sub>	Aspect Ratio, (L/W)	C	Force coefficient, C <sub>a</sub>	Projected area of component of the Appurtenance, A <sub>a</sub>	Velocity pressure, q <sub>z</sub> (N)	Gust effect factor, G <sub>H</sub>	Effective Projected Area, (EPA) <sub>A</sub>	Design Wind Force, F <sub>A</sub> (kN)
			Length, L (m)	Dia. (D) / Width (W), m	Depth, D (m)										
Dia. 1.000mm Pole	Round	0.000	12.00	1.000	1.0000	1	0.850	12.00	51.620	0.60	12.000	1551.758	1.1	7.200	12.290
Dia. 0.725mm Pole	Round	12.000	12.00	0.725	0.725	1	1.040	16.55	41.397	0.60	8.700	1898.621	1.1	5.220	10.902
Dia. 0.475mm Pole	Round	24.000	11.00	0.48	0.48	1	1.204	23.16	29.182	0.60	5.225	2198.019	1.1	3.135	7.580
30 PORT ANT	Flat	35.000	2.769	0.469	0.469	3	1.303	5.90	29.975	1.35	1.299	2378.753	1.1	1.755	13.776
5G ANT	Flat	35.000	0.86	0.40	0.40	3	1.303	2.18	25.245	1.20	0.340	2378.753	1.1	0.408	3.204
24-RRU	Flat	35.000	0.48	0.356	0.356	24	1.303	1.35	22.753	1.20	0.171	2378.753	1.1	0.205	12.864
MW-0.60 DIA	Flat	35.000	0.60	0.60	0.6	2	1.303	1.20	38.347	1.262	0.360	2378.753	1.1	0.360	1.884

Description	Surface Type	Height above ground level @ base of structure, z	Size of Appurtenances			NO'S	Velocity Pressure Coefficient, k <sub>z</sub>	Aspect Ratio, (L/W)	C	Force coefficient, C <sub>a</sub>	Projected area of component of the Appurtenance, A <sub>a</sub>	Velocity pressure, q <sub>z</sub> (N)	Gust effect factor, G <sub>H</sub>	Effective Projected Area, (EPA) <sub>A</sub>	Design Wind Force, F <sub>A</sub> (kN)
			Length, L (m)	Dia. (D) / Width (W), m	Depth, D (m)										
<b>35m MONOPOLE WITH CAMOUFLAGED</b>															
CAMOUFLAGED	Round	35.000	5.00	2.200	2.2000	1	1.303	2.27	140.606	0.50	11.000	2378.753	1.1	5.500	14.391

**WIND LOAD CALCULATION AS PER ANSI/TIA-222-H**

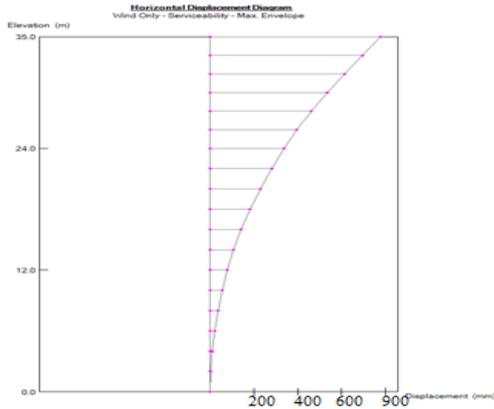
Cross Section	CIRCULAR
Type of Tower	Pole
Height of Tower, h	30 m
Basic Design Wind Speed, V	44.44 m/s
Ultimate Wind Speed, V <sub>ult</sub>	55.99 m/s
Exposure Category	C
Z <sub>g</sub>	274 m
a	9.5
K <sub>min</sub>	0.85
K <sub>c</sub>	1
Topographic Factor	Category 1
K <sub>d</sub>	1
Ground Elevation Factor, K <sub>e</sub>	1
Rooftop wind speed-Up Factor, K <sub>s</sub>	1
Wind Direction Probability Factor, K <sub>d</sub>	0.95
Risk Categorization of structure	II

Description	Surface Type	Height above ground level @ base of structure, z	Size of Appurtenances			NO'S	Velocity Pressure Coefficient, k <sub>z</sub>	Aspect Ratio, (L/W)	C	Force coefficient, C <sub>a</sub>	Projected area of component of the Appurtenance, A	Velocity pressure, q <sub>z</sub> (N)	Gust effect factor, G <sub>H</sub>	Effective Projected Area, (EPA) <sub>A</sub>	Design Wind Force, F <sub>A</sub> (kN)
			Length, L (m)	Dia. (D) / Width (W), m	Depth, D (m)										
Dia. 1.000mm Pole	Round	0.000	12.00	1.000	1.0000	1	0.850	12.00	51.620	0.60	12.000	1551.758	1.1	7.200	12.290
Dia. 0.725mm Pole	Round	12.000	12.00	0.725	0.725	1	1.040	16.55	41.397	0.60	8.700	1898.621	1.1	5.220	10.902
Dia. 0.475mm Pole	Round	24.000	6.00	0.48	0.48	1	1.204	12.63	29.182	0.60	2.850	2198.019	1.1	1.710	4.134
30 PORT ANT	Flat	30.000	2.769	0.469	0.469	3	1.262	5.90	29.499	1.35	1.299	2303.904	1.1	1.755	13.344
5G ANT	Flat	30.000	0.86	0.40	0.40	3	1.262	2.18	24.845	1.20	0.340	2303.904	1.1	0.408	3.102
24-RRU	Flat	30.000	0.48	0.356	0.356	24	1.262	1.35	22.392	1.20	0.171	2303.904	1.1	0.205	12.480
MW-0.60 DIA	Flat	30.000	0.60	0.60	0.6	2	1.262	1.20	37.739	1.20	0.360	2303.904	1.1	0.360	1.824
<b>30m MONOPOLE WITH CAMOUFLAGED</b>															
CAMOUFLAGED	Round	30.000	5.00	2.200	2.2000	1	1.262	2.27	138.377	0.50	11.000	2303.904	1.1	5.500	13.939

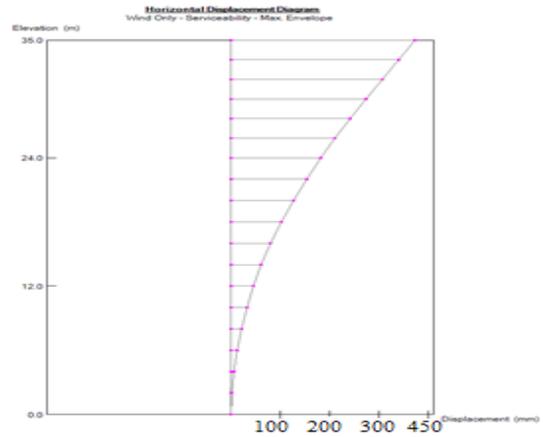
**V. RESULTS AND DISCUSSIONS**

Results of monopole without camouflaged and with Camouflaged monopole towers of 35m height. A comparison of lateral displacements and structural capacity between monopole without camouflaged and monopole with camouflaged towers was performed and the results are presented in Fig. 5 to Fig. 12.

Lateral displacement of 35m monopole without camouflaged tower and with camouflaged at 33.33m/sec operational wind speed



(Fig.5)



(Fig.6)

**Figure 5 and Figure 6 Lateral Displacement Vs Height for Monopole without camouflaged tower and with camouflaged (Height = 35m and operational wind speed = 33.33m/sec)**

From Fig. 5 it was observed that for a 35m tower height without camouflaged with 33m/sec operational wind speed, lateral displacement for Monopole Tower without camouflaged is more than allowable displacement.

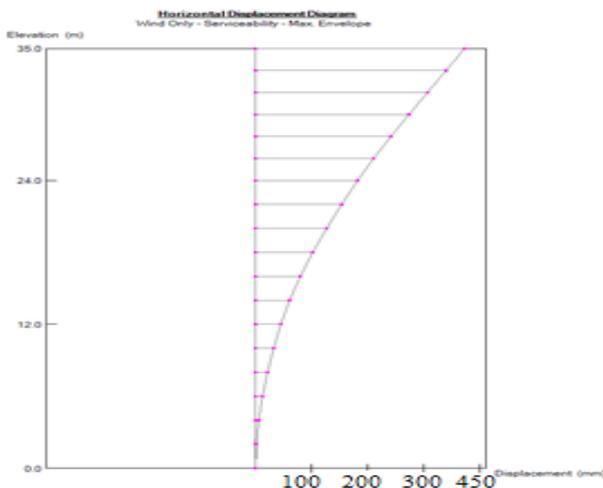
At top of Monopole structure without camouflaged		35	m		
MAXIMUM HORIZONTAL DISPLACEMENT	ALLOWABLE HORIZONTAL DISPLACEMENT	Maximum tilt angle(33.33m/s operational wind speed)		Allowable tilt angle	
849. mm	525mm	2.80 Deg		4.00 Deg	

displacement for Monopole Tower with camouflaged is less than allowable displacement.

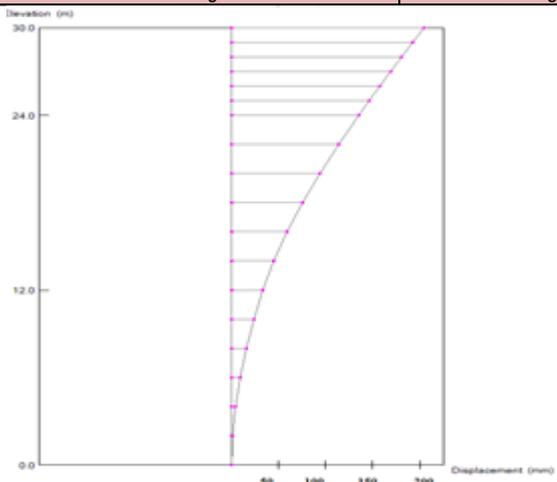
From Fig. 6 it was observed that for a 35m tower height with camouflaged with 33m/sec operational wind speed, lateral

At top of Monopole structure with camouflaged		35	m		
MAXIMUM HORIZONTAL DISPLACEMENT	ALLOWABLE HORIZONTAL DISPLACEMENT	Maximum tilt angle(33.33m/s operational wind speed)		Allowable tilt angle	
361. mm	525mm	1.05 Deg		4.00 Deg	

Lateral displacement of 30m monopole without camouflaged tower and with camouflaged at 33.33m/sec operational wind speed



(Fig.7)



(Fig.8)

**Figure 7 and Figure 8 Lateral Displacement Vs Height for Monopole without camouflaged tower and with camouflaged (Height = 30m and operational wind speed = 33.33m/sec)**

From Fig. 7 it was observed that for a 30m tower height without camouflaged with 33m/sec operational wind speed, lateral displacement for Monopole Tower without camouflaged is less than allowable displacement.

At top of Monopole structure without camouflaged		30	m
MAXIMUM HORIZONTAL DISPLACEMENT	ALLOWABLE HORIZONTAL DISPLACEMENT	Maximum tilt angle(33.33m/s operational wind speed)	
435. mm	450mm	1.55 Deg	
		Allowable tilt angle	
		4.00 Deg	

From Fig. 8 it was observed that for a 30m tower height with camouflaged with 33m/sec operational wind speed, lateral displacement for Monopole Tower with camouflaged is less than allowable displacement.

At top of Monopole structure with camouflaged		30	m
MAXIMUM HORIZONTAL DISPLACEMENT	ALLOWABLE HORIZONTAL DISPLACEMENT	Maximum tilt angle(33.33m/s operational wind speed)	
181. mm	450mm	0.57 Deg	
		Allowable tilt angle	
		4.00 Deg	

Structural capacity of 35m monopole in terms of moment without camouflaged tower and with camouflaged at 44.44m/sec basic wind speed.

(Table-1) Monopole Capacity according TIA-222-H

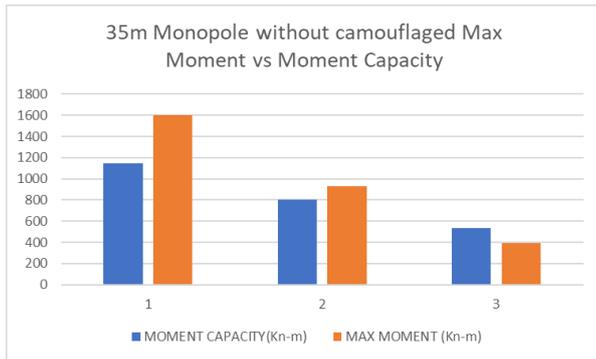
Pole shape section	=	ROUND
Yield strength, $F_y$	=	345 N/mm <sup>2</sup>
Elastic Modulus, E	=	200000 N/mm <sup>2</sup>
0.114 E / $F_y$	=	66.087
0.448 E / $F_y$	=	259.71
0.0714 E / $F_y$	=	41.391
0.309 E / $F_y$	=	179.13
$\phi_c$	=	0.9
$\phi_f$	=	0.9
$\phi_v$	=	0.9

Elevation (m)	Outer Diameter of Pole (mm)	Wall Thickness of pole (mm)	Inner Diameter of Pole (mm)	Pipe Area (mm <sup>2</sup> )	Factored Axial Load (kN)	Factored Shear Load (kN)	Factored Bending Moment (kN-m)	Plastic Section Modulus, Z (mm <sup>3</sup> )	Elastic Section Modulus, S (mm <sup>3</sup> )	$F_y$	D/t	$\phi_c * P_n$	$\phi_f * M_n$	$\phi_v * V_n$	Interaction Equation
0.00-12.00	1000	5	990	15629	55.48	62.5	1604.07	4950166.7	3868477.67	268	200.00	3768.41	1148.94	1884.20	1.396
12.00-24.00	725	5	715	11310	38.19	50.21	927.81	2592041.7	2021809.87	282	145.00	2873.22	804.83	1436.61	1.153
24.00-35.00	475	5	465	7382.7	25.68	39.31	390.7	1104541.7	858438.126	310	95.00	2058.38	536.75	1029.19	0.728

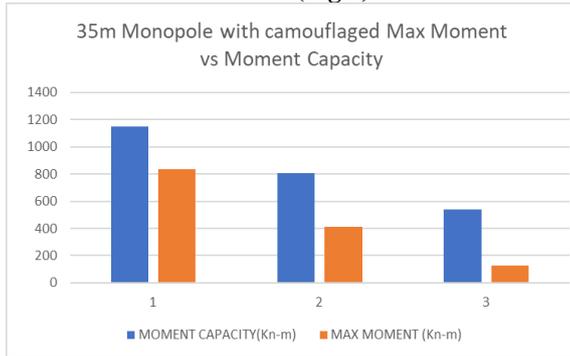
(Table-2) Monopole Capacity according TIA-222-H

Pole shape section	=	ROUND
Yield strength, $F_y$	=	345 N/mm <sup>2</sup>
Elastic Modulus, E	=	200000 N/mm <sup>2</sup>
0.114 E / $F_y$	=	66.087
0.448 E / $F_y$	=	259.71
0.0714 E / $F_y$	=	41.391
0.309 E / $F_y$	=	179.13
$\phi_c$	=	0.9
$\phi_f$	=	0.9
$\phi_v$	=	0.9

Elevation (m)	Outer Diameter of Pole (mm)	Wall Thickness of pole (mm)	Inner Diameter of Pole (mm)	Pipe Area (mm <sup>2</sup> )	Factored Axial Load (kN)	Factored Shear Load (kN)	Factored Bending Moment (kN-m)	Plastic Section Modulus, Z (mm <sup>3</sup> )	Elastic Section Modulus, S (mm <sup>3</sup> )	$F_y$	D/t	$\phi_c * P_n$	$\phi_f * M_n$	$\phi_v * V_n$	Interaction Equation
0.00-12.00	1000	5	990	15629	73.48	44.72	943.5	4950166.7	3868477.67	268	200.00	3768.41	1148.94	1884.20	0.821
12.00-24.00	725	5	715	11310	56.19	32.43	480.56	2592041.7	2021809.87	282	145.00	2873.22	804.83	1436.61	0.597
24.00-35.00	475	5	465	7382.7	43.68	21.53	156.78	1104541.7	858438.126	310	95.00	2058.38	536.75	1029.19	0.292



(Fig.9)



(Fig.10)

(Table-3) Monopole Capacity according TIA-222-H

Pole shape section	=	ROUND	
Yield strength, $F_y$	=	345	N/mm <sup>2</sup>
Elastic Modulus, E	=	200000	N/mm <sup>2</sup>
0.114 E / $F_y$	=	66.087	
0.448 E / $F_y$	=	259.71	
0.0714 E / $F_y$	=	41.391	
0.309 E / $F_y$	=	179.13	
$\phi_c$	=	0.9	
$\phi_f$	=	0.9	
$\phi_v$	=	0.9	

Elevation (m)	Outer Diameter of Pole (mm)	Wall Thickness of pole (mm)	Inner Diameter of Pole (mm)	Pipe Area (mm <sup>2</sup> )	Factored Axial Load (kN)	Factored Shear Load (kN)	Factored Bending Moment (kN-m)	Plastic Section Modulus, Z (mm <sup>3</sup> )	Elastic Section Modulus, S (mm <sup>3</sup> )	$F_y$	D/t	$\phi_c * P_n$	$\phi_f * M_n$	$\phi_v * V_u$	Interaction Equation
0.00-12.00	1000	5	990	15629	52.08	58.08	1304.9	4950166.7	3868477.67	268	200.00	3768.41	1148.94	1884.20	1.136
12.00-24.00	725	5	715	11310	34.79	45.79	680.92	2592041.7	2021809.87	282	145.00	2873.22	804.83	1436.61	0.846
24.00-30.00	475	5	465	7382.7	22.28	34.88	196.9	1104541.7	858438.126	310	95.00	2058.38	536.75	1029.19	0.367

(Table-4) Monopole Capacity according TIA-222-H

Pole shape section	=	ROUND	
Yield strength, $F_y$	=	345	N/mm <sup>2</sup>
Elastic Modulus, E	=	200000	N/mm <sup>2</sup>
0.114 E / $F_y$	=	66.087	
0.448 E / $F_y$	=	259.71	
0.0714 E / $F_y$	=	41.391	
0.309 E / $F_y$	=	179.13	
$\phi_c$	=	0.9	
$\phi_f$	=	0.9	
$\phi_v$	=	0.9	

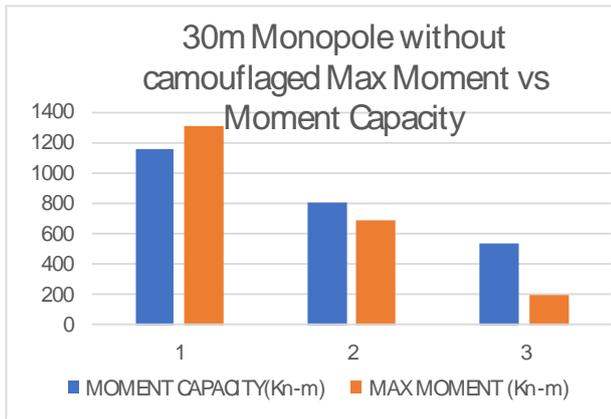
Elevation (m)	Outer Diameter of Pole (mm)	Wall Thickness of pole (mm)	Inner Diameter of Pole (mm)	Pipe Area (mm <sup>2</sup> )	Factored Axial Load (kN)	Factored Shear Load (kN)	Factored Bending Moment (kN-m)	Plastic Section Modulus, Z (mm <sup>3</sup> )	Elastic Section Modulus, S (mm <sup>3</sup> )	$F_y$	D/t	$\phi_c * P_n$	$\phi_f * M_n$	$\phi_v * V_u$	Interaction Equation
0.00-12.00	1000	5	990	15629	70.08	37.42	656.71	4950166.7	3868477.67	268	200.00	3768.41	1148.94	1884.20	0.572
12.00-24.00	725	5	715	11310	52.79	25.13	281.46	2592041.7	2021809.87	282	145.00	2873.22	804.83	1436.61	0.350
24.00-30.00	475	5	465	7382.7	40.28	14.22	45.36	1104541.7	858438.126	310	95.00	2058.38	536.75	1029.19	0.085

Table 1 (fig.9) and Table 2 (fig.10) Structural steel Pole Moment capacity Vs Max Pole bending Moment for Monopole without camouflaged tower and with camouflaged (Height = 35m and basic wind speed = 44.44m/sec)

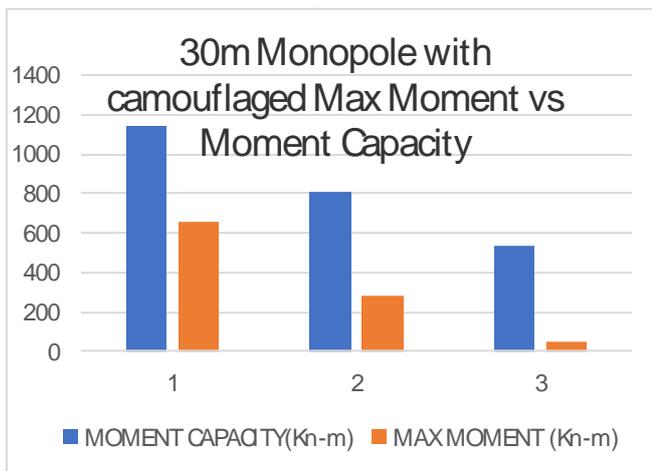
From Table 1 (fig.9) it was observed that for a 35m tower height monopole without camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is more than Pole Moment capacity and interaction equation stress ratio is more than 1 from elevation (0 to 24m) height of tower that means monopole without camouflaged is not safe.

From Table 2 (fig.10) it was observed that for a 35m tower height monopole with camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is less than Pole Moment capacity and interaction equation stress ratio is less than 1 throughout its height that means monopole with camouflaged is safe.

Structural capacity of 30m monopole in terms of moment without camouflaged tower and with camouflaged at 44.44m/sec basic wind speed.



(Fig.11)



(Fig.12)

**Table 3 (fig.11) and Table 4 (fig.12) Structural steel Pole Moment capacity Vs Max Pole bending Moment for Monopole without camouflaged tower and with camouflaged (Height = 30m and basic wind speed = 44.44m/sec)**

From Table 3 (fig.11) it was observed that for a 30m tower height monopole without camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is more than Pole Moment capacity and interaction equation stress ratio is more than 1 from elevation (0 to 12m) height of tower that means monopole without camouflaged is not safe.

From Table 4 (fig.12) it was observed that for a 30m tower height monopole with camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is less than Pole Moment capacity and interaction equation stress ratio is less than 1 throughout its height that means monopole with camouflaged is safe.

## VI. CONCLUSIONS

From the study it can be concluded that monopole without camouflaged have higher lateral displacements than allowable displacement compared to Monopole with camouflaged have lesser lateral displacements than allowable displacement of same height and same amount of loading because they have camouflaged at the top.

it was observed that for a 35m tower height monopole without camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is more than Pole Moment capacity and interaction equation stress ratio is more than 1 from elevation (0 to 24m) height of tower that means monopole without camouflaged is not safe whereas for 35m tower height monopole with camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is less than Pole Moment capacity and interaction equation stress ratio is less than 1 throughout its height that means monopole with camouflaged is safe. it was observed that for a 30m tower height monopole without camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is more than Pole Moment capacity and interaction equation stress ratio is more than 1 from elevation (0 to 12m) height of tower that means monopole without camouflaged is not safe whereas for 30 tower height monopole with camouflaged with 44.44m/sec basic wind speed, structural steel Max Monopole Moment is less than Pole Moment capacity and interaction equation stress ratio is less than 1 throughout its height that means monopole with camouflaged is safe. But due to camouflaged at the top, Monopole with camouflaged have more load carrying capacity than Monopole without camouflaged because all antennas are covered inside camouflaged and there is no wind exposure to antennas. Based on the above-mentioned observation & conclusions, it is recommended to adopt Monopole with camouflaged as they are having more structural capacity and lateral displacement for monopole Tower with camouflaged is less than allowable displacement.

Improvement: A future study can be extended for the comparative analysis of Monopole camouflaged communication tower with other lattice towers.

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