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ICASETM - 2021

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27TH - 28TH MAY 2021

DUBAI, UAE

ORGANIZED BY

INSTITUTE FOR ENGINEERING RESEARCH AND PUBLICATION (IFERP)

3rd International Conference on Applied Sciences, Engineering, Technology and Management

ICASETM-2021

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Dubai, UAE

27th & 28th May, 2021

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Editorial

We cordially invite you to attend the **3rd International Conference on Applied Sciences, Engineering, Technology and Management (ICASETM-2021)** which will be held on **27th & 28th May 2021** -Virtual Conference. The main objective of **ICASETM-2021** is to provide a platform for Researchers, Students, Academicians as well as Industrial Professionals from all over the world to present their research results and development activities in relevant fields of Science, Engineering and Technology. This conference will provide opportunities for the delegates to exchange new ideas and experience face to face, to establish business or research relationship and to find global partners for future collaboration.

These proceedings collect the up-to-date, comprehensive and worldwide state-of-art knowledge on cutting edge development of academia as well as industries. All accepted papers were subjected to strict peer-reviewing by a panel of expert referees. The papers have been selected for these proceedings because of their quality and the relevance to the conference. We hope these proceedings will not only provide the readers a broad overview of the latest research results but also will provide the readers a valuable summary and reference in these fields.

The conference is supported by many universities, research institutes and colleges. Many professors played an important role in the successful holding of the conference, so we would like to take this opportunity to express our sincere gratitude and highest respects to them. They have worked very hard in reviewing papers and making valuable suggestions for the authors to improve their work. We also would like to express our gratitude to the external reviewers, for providing extra help in there view process, and to the authors for contributing their research result to the conference.

Since March 2021, the Organizing Committees have received more than 60 manuscript papers, and the papers cover all the aspects in Applied Sciences, Engineering, Technology and Management. Finally, after review, about 14 papers were included to the proceedings of **ICASETM -2021**.

We would like to extend our appreciation to all participants in the conference for their great contribution to the success of **ICASETM -2021**. We would like to thank the keynote and individual speakers and all participating authors for their hard work and time. We also sincerely appreciate the work by the technical program committee and all reviewers, whose contributions made this conference possible. We would like to extend our thanks to all the referees for their constructive comments on all papers; especially, we would like to thank to organizing committee for their hard work.

Acknowledgement

IFERP is hosting the **3rd International Conference on Applied Sciences, Engineering, Technology and Management (ICASETM -2021)** this year in month of May. The main objective of ICASETM -2021 is to grant the amazing opportunity to learn about groundbreaking developments in modern industry, talk through difficult workplace scenarios with peers who experience the same pain points, and experience enormous growth and development as a professional. There will be no shortage of continuous networking opportunities and informational sessions. The sessions serve as an excellent opportunity to soak up information from widely respected experts. Connecting with fellow professionals and sharing the success stories of your firm is an excellent way to build relations and become known as a thought leader.

I express my hearty gratitude to all my Colleagues, staffs, Professors, reviewers and members of organizing committee for their hearty and dedicated support to make this conference successful. I am also thankful to all our delegates for their pain staking effort to make this conference successful.

Er. R. B. Satpathy
CEO (Chief Executive Officer)
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Keynote Speaker

Prof. Govardhan Aliseri

Rector (Pro Vice-Chancellor) and EC Member,
Jawaharlal Nehru Technological University Hyderabad,
Telangana, India

Biography

Prof.A.Govardhan is presently the Rector and Executive Council Member, Jawaharlal Nehru Technological University Hyderabad (JNTUH), India. He has 26 years of Teaching and Research experience. Areas of research include Databases, Data Science, Information Retrieval Systems and Cyber Security.

Served and held several Academic & Administrative positions including, Principal (JNTUHCEH), Director (SIT), Director of Evaluation, Principal, Head of the Department, Chairman and Member on several Boards of Studies of various Universities and Students' Advisor. Recipient of 32 International and National Awards including A.P. State Government Best Teacher Award 2012, Bharat Seva Ratna Puraskar, CSI Chapter Patron Award, Bharat Jyoti Award, Int'l Intellectual Development Award and Mother Teresa Award for Outstanding Services, Achievements, Contributions, Meritorious Services, Outstanding Performance and Remarkable Role in the field of Education & Service to the Nation. Past Chairman of CSI Hyderabad Chapter.

Keynote Speaker

Prof. Saad Al

Professor,
Al Hikma University College,
Iraq

Biography

Professor Dr. Saad Mohammed Khaleefah Completed PhD in Communications and Computer Engineering from the University of Technology(IRAQ). Reviewed tens of Researches inside and outside Iraq , such as (Al-Mustansirya University, Technology university and Al Qadisiah University) , outside Iraq such as (United kingdom – London , Switzerland –zurich , Denmark – Copenhagen). Participated in several conferences in Iraq and around the world. Participation in the evaluation of research for more than 50 scientific search for the scientific upgrade and conferences. Translated books such as Transistor circuits approximation, Mobil communication Engineering, The international Book in decrypting titled((Applied Cryptography)).

Keynote Speaker

Dr. Robert Eberhart, Ph.D.

Associate Director of Research on Entrepreneurship and Society,
Stanford University,
California

Biography

Dr. Robert Eberhart, Ph.D. is an Associate Director of Research on Entrepreneurship and Society at Stanford University, California.

Robert Eberhart led research at Stanford's Project on Japanese Entrepreneurship (STAJE) from 2013 to 2016 that he founded with Prof. William Miller. During his tenure, STAJE became a prominent of research forum for work examining Japanese entrepreneurship and its lessons for entrepreneurship research in Silicon Valley and the world.

Robert Eberhart joined the Leavey School of Business in the Fall of 2013 as an Assistant Professor of Management. Professor Eberhart came to Santa Clara from Stanford University, where he spent the last five years as a research scholar directing research on Japanese entrepreneurship. He also has an appointment as a visiting Professor at Kobe University, and is a Research Associate at Columbia University's Center for Japanese Economy and Business. He is also an Editorial Board Member of Organization Science from 2016 to Present.

From 2020, He is acting as an Associate Director of Research on Entrepreneurship and Society at Stanford University, California. Directing a research initiative on how entrepreneurship is changing the world around us.

Keynote Speaker

Prof. Pastor Arguelles Jr.

Dean, College of Computer Studies,
University of Perpetual Help System DALTA,
Philippines

Biography

Pastor Arguelles Jr. is a Dean of the College of Computer Studies at University of Perpetual Help System Dalta in the Philippines. Twenty years successful ICT lecturing experience and 12 years of them as an effective Educational Manager and Administrator with a reputation for creative academic policies, curriculum designs, passionate instructions, and an excellent classroom management skill. An entrepreneur individual; experienced Software Engineer with passionate skills in Database Management System; and IT Consultant with respected background in business analysis and development. Enthusiastic individual successfully organized and tied up in different IT related organizations. Deeply committed to high quality education for students.

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PAPERS

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Can Cloud Computing be the Pillar to Future Technology?

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[2] University of Information Technology & Communications, Baghdad, Iraq
[3] College of Engineering, Abu Dhabi University, Abu Dhabi, UAE

Abstract—Cloud Computing plays an important role as a source of remote computer services. It is believed that this area would be one of the pillars for the future of technology. Although there are various benefits for Cloud computing services, this paper shows the major challenges that impact the demand and the problems that arise on providers and the users' sides. The paper also provides solutions to those problems, but it also shows that with technology development these solutions can't be enough in the long run as attackers are always finding new ways to attack.

Index Terms— Cloud computing, Computer Services, Security

I. INTRODUCTION

Cloud computing is known as remote computer services which are available on demand. These services are easily accessed and managed through the network [1] without the constant need of the provider. They can be data storage capacity, servers' resources, databases, and software. These services help users in analyzing big data, storing information, and testing and developing applications. Cloud computing provides various features to the users such as the speed of the services, redundancy, scalability, usability, and recovery. They also help hosts in creating the back end and front end of user-friendly applications [2]. Cloud computing is offered in three different types. The first type is private, the second type is private and the third is hybrid. Private cloud computing is given to a specific entity on a private network. For this type of computing, the host can maintain it and they can physically locate it in the organization itself. While as for public cloud computing, this type is offered for the public, maintained by the provider, and physically located in the provider's centers. The last type is hybrid, it is a mix of private and public computing. Where the entity can ask for private cloud computing for sensitive content, and at the same time also use the public cloud for other content.

The aim is to keep all information easily accessed, secured, and private however these are the problems of cloud computing today. The main problem is Maintenance or downtime in other words. In case of downtime, if there is any interruption on either side, then the service won't be accessible. Another challenging issue is security since the cloud can be accessed from any network. It is difficult to maintain the security of the cloud as the provider doesn't have control over the network it is being accessed from. Providers can protect the cloud from their center however it is not always the solution to the threats that are found on the network. Lastly, the common and first problem users might face is the pricy side of cloud services. The cost of maintaining an in-house server can be expensive to ensure security, and the third-party service mainly the public cloud computing type can be cheap at the beginning, but then the prices start to vary from time to time.

In the following literature review, we have briefly described the impact of cloud computing and the issues.

II. ARCHITECTURE OF CLOUD COMPUTING

There are two end entities for Cloud computing. The first entity is the user who is connected through the internet or intranet to the second entity which is the cloud. The use of the internet or intranet depends on the type of cloud computing used. For public cloud computing, the connection is made through the internet, but for private cloud computing, the connection is made through the intranet [3]. In both cases, the process of sending and receiving requests is the same. Requests are sent by the user to the cloud and in return, the services are provided by the cloud.

A representation of the architecture is shown in the figure below. Figure 1 shows the different layers the cloud computing architecture has. The first layer is the hypervisor it is a service that builds and operates the virtual machines. The central layer is the Operating system it is the administrator of the cloud, in other words, it is the middleware that connects the VMM to the shared hardware. The shared hardware is any physical hardware located at the provider's side that provides services to the users [4].

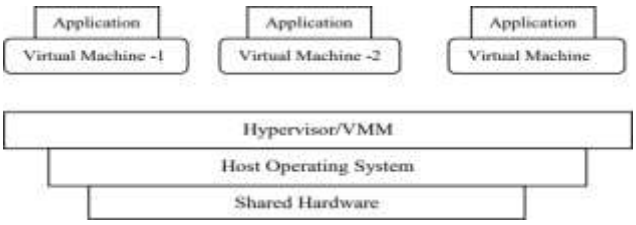

Figure 1: Architecture of Cloud Computing

III. MOTIVATION

Like all IT infrastructures, cloud computing is vulnerable and can be subject to conventional external attacks (viruses, spyware, intrusions, denial of service, etc.). To cope with this, the user company must ensure that the provider has, of course, all the necessary IT security tools (from firewalls to software intrusion detection systems, to automation and Network monitoring) to ensure data security. However, it must also ensure that the provider is also prepared to respond to new threats, particularly those that are referred to as "persistent" by organized groups. The latter exploit, in fact, very sophisticated systems and are thus able to identify and repeatedly all the faults of the equipment and applications existing in the Cloud. The customer company must therefore be vigilant in ensuring that the supplier is able to detect in real time, via a monitoring cell, all the persistent threats targeting the services delivered.

IV. PROBLEM DOMAIN

A. Vulnerable Areas that Need to be Guarded

Cloud computing has security and availability challenges. Accessing the cloud solely relies on the internet connection, that's why it can be always accessible, for the user needs adequate internet connection at all times. The moment users have access to the internet, the security problem arises. This can be due to the type of platform offered or the user. Public cloud computing is an external service resource, so the connection is exposed to intrusions and information theft during sending and receiving requests. Nevertheless, even if the provider takes necessary precautions to prevent these problems, but if the user doesn't take responsibility for protecting their private data, then these vulnerabilities will always be present. The most common problems between users are the absence of confidentiality where they might leak information without intending to, and the tendency to overlook the importance of logging out or disconnecting from the devices which are connected to a public network and can be accessed from outside. That's why in some cases of inactivity, the connections disconnect automatically.

The other challenge that targets cloud computing is the extent of the trust or interest people can put in it. Although Cloud computing has many advantages, some companies have no interest in switching to cloud computing for various reasons. First, when opting into cloud computing, organizations save their information in the cloud. The problem here is that the information is saved in data warehouses that aren't located in the same country. This information can be sensitive to the country. Saving it in a data warehouse that is located in an unknown territory is a risk that the organizations aren't willing to take. In most cases, the provider doesn't disclose the location of the warehouse, and the organizations don't have physical access to their data.

Second, Internet connection also plays a vital role in the decision-making process. Accessing the cloud requires an adequate and stable internet connection, but not in all cases the business can have this type of internet connection. For example, the work can be remote, so not all employees have the required connection to access, and the cloud will be exposed to different network connections thus compromising the security of the cloud. Another example is the internet speed and rate given to the business. Interruptions occur and the speed might not be enough hindering the accessibility to the cloud. Third, as mentioned previously, the cloud computing packages are on the pricy side. Companies give importance to the cost of the storage and if it is worth it to opt into the services of cloud computing. Fourth the ability to get compatible services, optimize them if needed, and show sustainability. Some of the web applications cannot be adjusted to run on the organization's devices thereby their performance is slow. Sustainability is necessary since the services should endure and be useful over a long period of time and changing providers because of the unsustainable services takes a lot of time and requires processing again.

Businesses are also wary about the cloud's security and redundancy. They usually require having regular computer security tests to protect their data, they also look into the storage size given to their data and how many disks are used, and they consider even the security of the premises of the data warehouse. The hacking events which targeted big companies such as Facebook and Twitter discouraged the organizations since the providers are usually those big tech companies. Lastly, there is also the employee productivity factor. Businesses should make sure that employees will benefit from the cloud and be productive. The cloud's role is to help employees reduce time on the tasks given to them, but if they spend more time trying to figure out how to get the data from the cloud or how to access it then the businesses will opt out of the service. From the provider's side, it is important to give clear terms and conditions of services.

B. Problems and Implementation of Solutions

The location of data centers. Some hosts have several data centers. It is, therefore, necessary for the client company to be able to know where its data are geographically located. Ideally, it should even be able to choose the location of the latter to decide by which legislation the data will be governed. Guarantees of audits and contracts. The chosen provider

must be able to demonstrate through various audits that all the safety rules are optimal and up to date. This allows the client company to ascertain the provider's seriousness. In terms of the contract, a reversibility agreement must be included to ensure that customers can take back their data and infrastructure at any time.

Securing data at the time. Data is vulnerable when it's in motion. Therefore, streams are highly secured by trusted web hosts. Using an encryption system, a firewall arsenal, and dedicated links between the content creation points and the cloud, the host ensures the integrity of the data. All the

transfers from the Cloud thus guarantee a non-modification of the data via various protocols when they are in transit. The latter can also be monitored and archived as a log, a third- party monitoring tool. Several parameters are thus verifiable as the exact moment of the transmission of the flow, if the data has been modified, and by whom.

V. CLOUD COMPUTING SECURITY VULNERABILITY

The security topic in cloud computing contains vast areas to be tackled and talked about. Cloud computing providers ensure to deliver secured services. The services should withstand information theft, masquerading attacks, and data loss.

Figure 2 shows the four main topics are discussed with regards to security problems. First, Data Problems include data availability, integrity, confidentiality, and location. Second, secrecy. Third, malicious applications. Lastly, the source of security problems which includes two sides: the user and the provider.

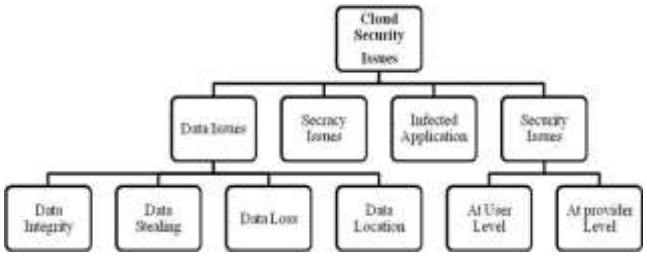

Figure 2: Security Problems in Cloud Computing

Data Problems: Data saved on the cloud can contain sensitive and private information. The problem is that the cloud is vulnerable, for it is accessible from any place and any network.

Integrity is making sure that the data is not altered by intruders. It is an issue for providers and users. Users have the option to update, remove, and add data, but data can be invaded by and altered by intruders. That's why methods to ensure integrity should be implemented.

Confidentiality is preventing unwanted access to the data. Intruders can access the data of users which is supposed to be private and not accessible by anyone other than the user.

Confidentiality is a challenge where the providers choose to obtain servers from different providers and offer them to the users. This is beneficial for the provider as it is cheaper and it doesn't take space, but at the same time, the data can be stolen from the 3rd party server, so the only user suffers at the end. Availability of the data is when the users have access to their saved information. Redundancy is important to keep protect the data in case of damage happening such as disk corruption, fire, or natural disasters at the data warehouse. That's why the location of the data warehouse is vital, and it should be told to the users. If cloud providers face any situation where they might shut down their services, the users use some of their saved data

Secrecy Problems: Just like how providers prevent data stealing by implementing confidentiality methods, secrecy is also obtained by ensuring confidentiality. When only authorized people can access the information, the providers guarantee users that everything saved by them in the servers is secured. It is the server provider's responsibility to protect the data from illegal intrusions

Malicious Applications: Users can upload infected applications on the cloud, and this affects all other users in the cloud. That's why with the full access the service providers have on the server they work on methods to monitor and maintain the activities of the users.

Source of Security problems: Cloud computing has two entities: the provider and the users. Both sides cause security vulnerabilities if the correct measures are not taken. It is the providers' responsibility to protect their servers from external intrusions. The solutions aren't always effective as attackers and intruders always create new ways to breakthrough. Providers should test on regular basis and develop new solutions continuously. However, it is also the users' responsibility to monitor their activities on the cloud and avoid all the threats that they face.

VI. SOLUTIONS TO CLOUD COMPUTING VULNERABILITIES

The usage pattern of the customer. The cloud provider should look at the traffic between the client and the server. This traffic can reveal suspicious activities. One of the suspicious activities can be, customers using services from countries or locations different than usual. Another kind of suspicious activity is time. For example, users using a service in different periods than usual.

Two-factor authentication. Cloud providers should do two-factor authentication for administrative users. This prevents attackers from impersonating admirative users, and from stealing passwords. Administrative user's login can also be

limited to a specific IP address, so attackers from a different IP address cannot log in.

Make sure to keep a backup of the database and most important system configuration. Make sure that this configuration is compatible with different cloud providers, so in case the current cloud provider comes under attack then the company can quickly move to a different cloud without any downtime. The secondary cloud provider should be in standby mode with the database backup and system configuration. Make sure these two cloud providers are independent of each other.

When using the cloud service for database and storing business's critical information, make sure to encrypt first then upload to the cloud. When the data is needed, decryption should happen locally. This comes in handy if the cloud provider is under attack and the attackers get administrative privileges. Like this, attackers even with administrative privileges cannot make use of stolen databases.

Use honeypots to find mysterious use of cloud infrastructure. Honeypots deployed on virtual machines in the cloud can catch attacks. This method can be used to find new attack vectors used by hackers.

Vet cloud provider by an independent organization. Cloud providers should be audited by an independent organization. Results from this audit can reflect the security standards followed by the cloud provider.

A legally binding contract should be created between the company and the cloud provider making it clear that the cloud provider will be held responsible for security attacks. These attacks can originate from employees of the cloud provider, or due to weak security policy followed by the cloud provider.

The company should have an internal policy and training in place for any cloud security attacks. They should be prepared to handle any attacks on the cloud. This should be done by creating policy to handle situations like these, and by training a team with appropriate tools and knowledge to minimize the effects of such cloud security attacks.

Make sure there is a secure line of communication between the client company and the cloud provider. When a company is under attack on its cloud infrastructure it's important to have a secure line of communication between the company and cloud provider. This is important because usually, attackers take over the company's account in the cloud infrastructure. Then attackers change the configuration to lock out the company from their account. This type of scenario can be avoided by having a secure independent line of communication between the company and the provider.

Access control lists should be in place to manage the cloud. One user should not have control over the whole cloud infrastructure. Each user should have limited privilege over what action can be performed on the infrastructure. A Security procedure like this one can protect the infrastructure when one of the user's passwords is compromised. Without the above explained, security implantation attackers can use a single compromised account to take over the whole cloud infrastructure of a company. Another vector of attack can also come from the company's employees or insider attacks. Which would be successful if Access control lists are not implemented.

Auto-lock when suspicious activity is found. Cloud providers should look for suspicious activity on their infrastructure. Appropriate actions should be taken to quarantine this activity and prevent it from causing further damage. Corresponding customers should be contacted to resolve the issue. Cloud providers should take preventive measures to minimize the attack and then communicate with the customers. Cloud providers should not wait for customers to scan for attacks on their cloud accounts.

Data compartmentalization. Cloud providers should take measures to compartmentalize or separate the Data of the cloud customers. If the cloud provider gives no or less importance to separating the data of customers, attackers can use Virtual machines on the cloud provider's infrastructure, and with the use of sophisticated methods, they can escape from their provided virtual machine. As a result, attackers can access data of other Virtual machines running in the same environment of the cloud provider.

VII. CONCLUSION

Cloud security is a problem with no one right solution. The Combination of the above explained solutions can be used to harden the security of the cloud. Every cloud provider has different business models thus trade-offs must be made in security solutions. When companies look for cloud providers, it's good to look for companies that provide all necessary elements rather than to go with the cheapest cloud providers. A secondary cloud provider should be in standby mode with database backup in case the primary cloud provider comes under attack. Apart from this, it is wise to have at least a smaller cloud or server to maintain the critical information and backups rather than having all the information on the hosts outside.

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Blue Ocean Strategy: An investigation on Food Industry in the UAE

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Abstract—Today's business environment is highly competitive and uncertain, forcing companies to continually adapt their strategies just to survive. The businesses that most people have grown up with are also facing tremendous changes; moreover, the pace of both reconstructions of business models, as well as the use of advanced technology, has increased. Every step taken by businesses today is being questioned, therefore, it becomes challenging for many to keep up with new demands as well as sustaining in the market due to intense competition.

The level of competition a business faces is an important indicator of its success in building its market share; indeed, the most reliable sign of success is when a firm no longer has any formidable competitors left in an existing market—this indicates true victory. Thus, in the light of dynamic markets and fierce competition, it has become customary for companies to continuously alter their business models and strategies. Over the years, many new business models have emerged, many of which have left their imprint. The Blue Ocean Strategy (BOS) is one such paradigm; created and published by W. Kim Chan and Renee Mauborgne, the book became an instantaneous success and was accepted all over the world.

This study analyzes the applicability of the BOS in the context of Middle-East country; specifically, it investigates the impact of introducing the BOS in the UAE food industry and the channels of its action. To achieve this, the study first conducted an in-depth exploration of BOS, the tools and frameworks used to create a successful BOS, and the prevailing position of the food industry in the UAE. The study used qualitative data in the form of in-depth interviews to provide answers to the research questions.

The preliminary findings indicate that applying the BOS model to the UAE food industry could lead to profit maximization and long term survival, therefore, firms are already exploring ways to apply the BOS to their respective operations. After analyzing the data, it was found that the BOS creates several opportunities for innovation and creativity. The business can explore a new and uncontested market space with the help of the BOS if executed correctly. Applying the BOS for the first time does entail risks since the innovative idea needs to succeed in the market; therefore, success depends on the type of product offered.

The study of the Blue Ocean Strategy is new and the applicability of the BOS to the food industry in the UAE has not been previously researched. Existing studies have tended to study both the BOS and food industry individually, but, the gap exists since no study has yet explored a combination of the two. As a result, the ideas presented in this study could create an opportunity for future researchers to pursue research on various aspects of food and other related industries.

Index Terms— Blue Ocean Strategy (BOS), Competitive market, UAE market, Food Industry, Competitive Advantage

I. INTRODUCTION

Businesses have been evolving for centuries and competition has been the heart of it. In recent times, it is impossible to separate competition from strategy and all the relative terms used to achieve success in business. The term 'strategy' is not a concept that originated from business rather from the military. Strategy is about confronting an opponent who is either strong or weak and is controlling certain piece of land. These days' strategies are built to win over the market share and customers similar to preparing plans at the Warfield. The problem though is that when your opponent is equally strong and has a similar attack strategy, then they cancel each other out or trigger retaliation. Therefore, a company should look for an innovative strategy that will support the business to achieve competitive advantage i.e. Instead of tit-for-tat behaviour where both parties are fighting for a very small piece of share and eventually leading to unnecessary bloodshed. A strategy where success comes from 'blue oceans' of uncontested market places rather than from battling competitors (Madsen and Slåtten, 2019).

As a new paradigm challenges existing notions of the market and businesses, the Blue Ocean Strategy (BOS) first proposed in 2004 by W. Chan Kim, a South Korean business theorist, and Renee Mauborgne, an American economist and business theorist. The research was conducted on 108 firms over 30 years and it identified trends in successful firms. The research emphasized the search for a low-cost and a differentiated strategy simultaneously (Butler, 2008). BOS encourages businesses to create their own territory in the market, create new market share, and produce unique products that have never been produced before. This novelty then becomes the product's Unique Selling Proposition. The BOS needs firms to raise the standard of activities higher than the industry standard. The chances of success are when companies using this strategy offer consumers higher value/benefits than their competitors. It is important that firms need to

reduce inefficient activities or processes which are adding on to the costs. The key is to focus on those one or two areas where the firm can offer excellent quality and deliver the promise to its customers.

The UAE market has been growing significantly and has made tremendous improvements. The government has developed infrastructure, including roads, bridges, communications and housing, as well as world-class tourism projects such as 'The Palm' to attract investors from around the world. The government invested in construction, tourism, financial services, education and manufacturing. New business has been flourishing in this market (Butler, 2008). According to Focus Economics Report (2020), the UAE is the largest U.S. Consumer food export market in the Middle East and the 20th largest overall. The UAE also imported US$424.6 million of U.S. processed foods in 2019, an increase of 6%. The UAE is the 2nd largest U.S. export market for processed foods in the Middle East after Saudi Arabia.

The aim of this study is to understand what is Blue Ocean Strategy? And if it can be successfully applied to the food industry in the UAE. The research provides an in-depth understanding of the frameworks and tools used to create a successful BOS strategy, in addition to sharing an overview of the UAE food market and deriving answers to specific research questions regarding the applicability of the BOS to the UAE's food industry.

Blue Ocean Strategy

The Blue Ocean Strategy – How to Create Uncontested Market Space and Make the Competition Irrelevant was developed in the form of a book written by W. Chan Kim and Renee Mauborgne in the year 2004. The authors believe that, striving to compete is a poor business strategy or in other words, it is a Red Ocean Strategy (ROS). The authors drew their conclusion through a study of 108 new and existing businesses across 30 different industries; 92 of those businesses adopted Red Ocean Strategy and aimed to outperform their competitors, while the remaining 16 businesses adopted the Blue Ocean Strategy and searched for new and untapped market segments which they can dominate and eliminated competition totally. When the authors analysed the collective profits of the 108 companies across several years, 92 red-ocean businesses accounted for 39% of the total profit; this highlighted that 61% of the profit was generated by only 16 businesses applying the Blue Ocean Strategy. Further investigation also highlighted that, the blue-ocean businesses went on to dominate their respective markets for 10-15 years after their initial launch (Kim & Mauborgne, Blue Ocean Strategy, 2015).

The BOS is a concept that enables businesses to be innovative in their products and service offerings, thereby improving sales and realizing revenue growth. The frameworks and tools used in the BOS supports to create an unchallenged market that is distinct from the Red Ocean (the competitive market) and attracts more consumers. Unlike the Red Ocean businesses Blue Ocean type businesses focus on innovation, creativity and uniqueness. Therefore, many businesses are adopting the strategy and have seen success; for example, the plush toy animal business 'GUND', competed based on the same factors such as price, quality, cuteness, availability, and plushness for many years. Among these companies, 'GUND' was known to make really soft and huggable stuffed toy animals, eventually leading the company to dominate the market which means they were clearly in the Red Ocean. However, in 1971, one of the competitors "Build-A-Bear Workshops," developed an innovative Blue Ocean Idea of "Knowledge Intensive Logic," and they started offering customers a more customized experience. The company offered services such as, create your own teddy bears and were charged around $60-$100 depending on the accessories and the number of bears. Thus, Build-A-Bear turned the tables and explored an untapped market, where the customers were the ones who were adding value to the products, not the company (Sheehan and Vaidyanathan, 2009). Build-A-Bear used the 'Value Creation Tools' which instantly gave them a profit as well as revenue boost—in fact, in its first 10 years, the company sold almost 50 million bears and even today, is quite a success globally.

Red vs Blue Ocean

There are two types of market spaces, namely; Red Oceans and Blue Oceans. In the Red Oceans, there are a set of boundaries and competitive rules that are known to all. Companies will use possible tactics to defeat their competitors and obtain a larger share of current demand. Once the market space is crowded, the opportunity for profit and growth gradually diminishes. The products become like any other goods, and the fierce competition runs bloody hence it is called Red Ocean. The Blue Ocean, however, refers to an intact or new territory/market, in which demands, profitability and growth are created initially. The majority are from the players of the Red Ocean that crossed the Blue Ocean during the expansion process of the existing company. In Blue Oceans, competition is insignificant, because unlike the case in the Red Ocean, the rules are not set, but are to be designed (Kim & Mauborgne, Blue Ocean Strategy & Shift Tools: Red VS Blue Ocean Strategy, 2004-2020).

Value Innovation

Value innovation is used to create new markets instead of competing for an existing market share. It acts by creating new demands and changing the market paradigm to make competition irrelevant (Kim & Mauborgne, Blue Ocean Strategy & Shift tools: Value Innovation, 2004-2020). The concept of value innovation is at the heart of all Blue Ocean businesses.

It is called value innovation because it encourages businesses to focus on making the competition irrelevant by creating a jump in the value of the business as well as for

customers/buyers, which results in creating a new market space (Ogbogu-Asogwa et. al., 2017). According to the authors, for the success of "market-shaping innovation," new customers need to be created, rather than increasing the share of existing customers (Alam & Islam, 2017). When a business wants to create a Blue Ocean, they mostly focus on lowering their cost and increasing buyer value.

Strategy Canvas

It is a tool that helps companies understand how they compete for the factor's customers consider when choosing offerings. A strategy canvas is essentially a graph that shows how companies, compare each other on the key customer purchase criteria. In Figure 1, the x-axis shows the range of factors that companies typically consider and invest in. The y-axis shows the offering levels to the customers corresponding to the factors available (Kim & Mauborgne, Blue Ocean Strategy & Shift Tools: Strategy Canvas, 2004-2020)

Four Action Framework

It is a tool used to create buyer value elements to create a new value curve or strategic profile. In order to break the exchange between differentiation and low cost in creating a new value diagram, there are 4 important questions. (Kim and Mauborgne, 2015).

Create: new industry factors need to be created to produce value and generate a market where the idea has not been implemented.

Reduce: factors that need to be reduced way below the industry standards.

Eliminate: factors that have been used to compete in the industry for a long period of time should be eliminated.

Raise: factors that need to increase or raise way above the industry standards.

In addition to the Four Action Framework; it makes sure that companies not only ask the right questions but also actively work on them. It helps companies in many different ways; for instance, filling the grid is a very difficult challenge and companies have to study each and every factor in detail. This helps them to realize all the assumptions they had made unknowingly when competing in the market (Kim & Mauborgne, 2015).

The Blue Ocean Strategy is based on the Six Path Framework

In order to win, companies need to learn not to compete with each other. The Six Path Framework helps managers identify all the risks companies face and assists them to find various ways to address these risks.

The Blue Ocean Strategy has a powerful tool in the form of Pioneer, Migrators, and Settlers map (PMS), it enables companies to plot their current and planned portfolios to enable businesses to achieve growth alongside profit. **Pioneer** are the uncommon goods and services that increase profit, these sets of goods and services do not have any competition and can therefore have the market all to themselves. **Migrators** are goods and services that have value, however, they are not creative or unique. They are in the middle of the Red and Blue Ocean, they have a chance of increased profit in case of any changes. **Settlers** are those goods and services that work according to the industry rules and regulations, lack uniqueness, lower chances of high profits and very few customers (Layton, 2009).

For businesses to build a Blue Ocean Strategy there is a sequence to be followed it starts with Buyer Utility, Price, Cost and finally, Adoption.

1. **Buyer Utility:** what makes the product/service unique and irresistible for people to buy? What would be the reason for it? (Lim, 2019)

2. **Price:** how well are the products/services priced, can it get the attention of people and potential buyers, is it affordable and is it worth buying? (Cheng, 2020)

3. **Cost:** there should be a target cost that needs to be met and if it cannot be reached then either forget the idea or make a few changes in the business model and try to get to the target cost.

4. **Adoption:** what are the factors stopping the Blue Ocean idea to be initiated in the market? Those factors need to be found and worked upon to close the gaps. (Kim & Mauborgne, 2015).

Once a business model is prepared the next step would be to execute it, however, it can be a very rough ride and this happens in both Red and Blue Ocean Strategies, although, it might be more challenging in the Blue Ocean since the business has to start from a brand new status quo (Kim & Mauborgne, 2004-2020). The first one is the **Cognitive Hurdle** which is making employees understand and experience the customer's point of view so that they can eventually be able to respond positively to the changes. Therefore, it would be better to start this model with a small team of employees (Butler, 2008). The second is the **Resource Hurdle** the higher the shift in the strategy the greater number of resources needed to execute the plan, but at some point, the resources can become scarce and that can be a hurdle. The **Motivational Hurdle** is another issue that can be faced by businesses implementing the Blue Ocean Strategy. Motivating older employees or members of the management to agree to accept a new strategy would be another challenge, without them it will not be possible to implement. Lastly, **Political Hurdle** might crop in if there are no appropriate regulations and procedures maintained, this will lead to objections if the senior management does not agree with the workings of the strategy.

There is a need for every business to change their strategy on intervals for greater success, however, it requires a higher level of resources and it is time-consuming at the

same time. Managers or leaders must recognise the need for a transformational approach to gain long term success. This demands for a transformational leadership which focuses to change the internal factors of the company, for instance, people, process, behaviour and activities for a better productivity level at optimum use of resources and time (Kim & Mauborgne, 2004-2020). The management should recognise the importance of a fair process for the entire delivery network, which means engaging people throughout the process for their valuable inputs. The Blue Ocean Strategy requires transparency with the people involved in the process and setting clear goals, authority, accountability and responsibility for every member (Kim & Mauborgne, 2004-2020).

The Food Industry in the UAE

The food industry is one of the biggest industries in the UAE due to the increased level of economic developments and diversification.

Domestic production is quite low in the UAE market due to the geographical location and the climatic condition of the UAE. It has a scarcity of water sources and has intense heat (Shahin and Salem, 2014). This scarcity results in higher food import activities, according to the UAE- Entry Handbook (2019). It was found that around 90% of food requirements are imported which include poultry, rice, dry fruits and milk **(Commission)**, this gives many exporters a wider market base for their products.

The UAE has a diverse cultured population, therefore the demand of consumin multinational cuisines have eventually increased, according to the study conducted by Euromonitor named 'Food Sector opportunities in the UAE' forecasted that the food consumption in the country will be 59.2 million tons by the end of 2021. The reason for this increase would be the tourism market, increase in people's income due to the economic development, increase in population (more expatriates) and also the change in people's eating and dietary habits. However, the chances of this happening may differ due to the COVID-19 pandemic (a health hazard faced by the world since the last quarter of 2019). The economic development is at a standstill and people are trying to survive, therefore, their spending and purchasing patterns are quite different compared to 2018. In order to meet the new changes in people's eating option there is a wide range of products available for the consumers to choose from, for instance, organic products which would include fruits and vegetables, vegan items as well as vegetarian options.

Organic farming has become a new trend in the UAE market and many consumers are moving in this direction since it is a healthy option as well as it is known to be eco-friendly. Organic agriculture promotes the use of renewable resources which means sustainable for the future generation (Al-Taie et al., 2015). Using Organic Farming, it is possible for a Blue Ocean idea to be developed, as an existing or new business can use the organic vegetables and fruits to make natural flavouring for the food industry, this would be a benefit for both the producers as well as the consumers as healthy eating is the trend in the market and also natural flavoring will not be harmful to health. It gives the UAE a chance to own a natural flavouring company that uses home (UAE) grown fruits and vegetables to create the final product.

Snacks are quite popular in the UAE and they come in the forms of potato chips, corn chips, roasted nuts and much more, they are easy to find and consume. Over the years, the snack market has evolved from being unhealthy junk to more of a healthy snack. A few years ago people started changing their eating habits in a more health-giving and wholesome way. This was a major opportunity for many snack production companies to change their business models in order to fulfil the new health concerns of the consumers (Hess et al. 2016). There have been several changes, one such change is the ingredients that reduce sodium and sugar. Second has been in packaging, there has been a revolutionary change in the listing of the details such as health benefits, ingredients used and its quantity is mentioned as well. Every piece of information printed on the packaging needs to state the truth so that consumers are well informed about what there are eating and how much they are consuming (Ainsworth and Plunkett, 2014).

At the beginning of this revolution, one of the challenges many snack manufacturers faced was to create a healthy version of their snacks particularly, flavouring. Although it was an expensive process many experiments were done in order to find a way to make healthy flavouring. There are many flavouring companies that provide natural food flavours made of real fruits and vegetable, for instance, dried beetroot powder or paprika as a colouring and flavour component. People these days would prefer to buy healthy snacks if they are nutritious as well as tasty. This behavioural change in the consumers has been a revolutionary change not only in the market but in the industry as well (Harris et. al., 2009, Center, 2019).

Quality and hygiene are the most important factors and they are given utmost importance in the UAE food industry. There are specific food safety rules, regulations and standards that need to be followed and there are authorities to make sure these rules and standards are maintained, such as 'Emirates Authority of Standardization and Metrology' (ESMA). There are regulations for other aspects of the food industry as well, for instance, packaging, containers as well as labelling, the producers have to follow the guidelines provided regarding the material used, appropriate shape and size as well as what information should be put on the labels of products such as production and expiry date are mandatory for all products (Hamza, 2019). There are severe penalties such as heavy fines or closure of business for not following the guidelines and procedures maintained by the authorities.

The Corona Virus which began by end of 2019 and was declared a pandemic by World Health Organisation

(WHO), created a void around the world. The only way to reduce the exponential growth of the virus was to follow the guidelines set by WHO i.e. maintaining physical distancing and lockdown in places. Throughout the year 2020, people were requested to stay home stay safe, this resulted in the closure of businesses, education institutions, travel and social gatherings. Most countries and workplaces adopted work from home (WFH), however, it was not the same for the food industry as it was not possible to work from home. It was required for the food industry to follow the Food Safety Management Systems (FSMS) which is based on the Hazard Analysis and Critical Control Point (HACCP) rules which helped them contain food contamination and be able to manage food risks (Organization, 2020). People who worked directly when handling food products needed to be more cautious and well aware of the precautions that need to be followed. Training and written guidelines were provided and staff members were expected to exercise a high level of precautions (Organization, 2020). Many businesses have been facing challenges since the pandemic is still very strong in 2021. UAE has been a great economy among many other countries and has been very supportive to both the locals and residents. The UAE government has established many framework support systems in the federal part as well as each emirate has issued various "Corona Packages" (Boggs, 2020).

II. METHODOLOGY

Data collection is one of the crucial parts of the research as it forms the final representation of the research. This paper utilized qualitative methodology by interviewing individuals who are working in the food industry and secondary data was collected with the help of authentic and well-known sources, particularly the book "Blue Ocean Strategy, *How to create uncontested market space and make the competition irrelevant"* written by W. Chan Kim and Renee Mauborgne. The professionals interviewed worked in the food industry; one in snack manufacturing and the other producing flavouring for the food industry. Due to the Corona Virus Pandemic, it was difficult to have a face to face interview, therefore, the data collection process was done on video conference via the zoom app. In this study, the semi-structured interview method was chosen as it was appropriate to get professional, on-topic responses as well as practical examples.

This was a standardized open-ended interview where the interviewees were able to give open-ended answers, which facilitated comparisons of responses between the respondents. Each interviewee was given a brief introduction about the topic with the help of the BOS book as well as some introductory videos before the interview was conducted. The questions prepared mainly focused on the knowledge of BOS, which strategy do they follow? What would be the future of BOS if brought to the UAE food markets? and related questions were asked.

Data Analysis

In this section, the data will be analysed using thematic analysis based on the interview conducted with food industry professionals, respondent A is the CEO of a snack manufacturing company and respondent B is a food technologist at a flavouring company who provides flavours to the food industry. The interview saw several themes emerging, which can be considered positive for the implementation of Blue Ocean Strategy in the UAE food industry.

The interview began with **leadership and work philosophy** related question for which Respondent A said the philosophy his business follows is to "*provide unique products to the consumers*", to "*emulate good hygiene practice*" for high-quality products they provide and lastly to give their customers "*value for money*" so that they can attract them and they can be loyal to the brand. Whereas, respondent B said that, their company targets medium and small-sized companies because they "*strongly believe that those companies which are small today they are going to become big and if you catch them at the beginning and if you serve them, if you help them to grow their business by providing good quality products and reasonable services to them and if they need a sample we need to be quick that if they want an order we should be quick in shipping those orders.*" Their philosophy is "*to be able to serve our customers quickly and be their local flavour partner*". This clearly highlights that both the respondents are keen on supporting innovation in both capturing and developing the right market.

When asked about what differentiates the leadership style of Respondent A's company is that they "*try as much as possible not to emulate the competitors, we try and create recipes and experiment with different types of shapes and sizes and [the] texture of the product so that we become unique by itself and we go into [the] uncharted territory where people have not gone and when I say so we experiment in terms of packaging or products generally, the people are normally doing we are a bit different than what they do and that keeps us going and that has been our forte in our success during the last many years of our operations*." While respondent B said, "*we are kind of lean management where I am heading the operation and then we have department heads who are looking at the product sales marketing and anybody can come to me and ask and we can do the solution or answers to them instead of waiting for approvals from many layers of the management*". This suggests that both the companies understand that using the right leadership style will support the effective working of the organisation. Also, the leaders are keen on service leadership instead of authoritative style. The main principle of innovation is flexibility and openness which shows in both the leaders interviewed.

The respondents were asked about their **knowledge of the Blue Ocean Strategy** to which respondent A's response was " *having been read about BOS the strategy is for*

companies to evolve a place in the market by themselves, for our self there are no readymade rules for creating a market situation scenario, you explore the market and create a situation to meet your goals wherein you try and avoid the competition and the competitors as much as possible and try ***to create new vistas, avenues & new markets to put in your products*** *and to ensure that your service, provide them and make better margins than what the others are been offered*." According to respondent B, "*when we started the business we were more like a normal business, let's say that we were more into the red ocean, we were trying to compete with the same number of players in the business and we were trying for a limited market share*" however, "*after I read about BOS we changed our management strategy, instead of competing in an existing pile of the business we decided to make unique products where nobody has developed that kind of flavours which we can offer to the customer*." Respondent B mentioned that they also came up with the idea of **customizing flavours** for instance "*one particular snack manufacturer does not have, let's say an Indian flavour and we offer flavours like masala or mango pickle and the company launches the product maybe initially, we get less volume but if the products fit and are a success then they will continue with us and our share of the business with one particular customer will be strong so this is a kind of a BOS which we have started implementing in our business*". This resonates that both respondents and their businesses have a good grasp of the knowledge of Blue Ocean Strategy in fact respondent B has already started using this strategy.

The respondents were also asked to **compare between Red and Blue Ocean Strategy**, to which respondent A believed that, Blue Oceans and Red Oceans have been in the market for a long period of time. He mentioned "*both are two diverse viewpoints Blue Ocean works on not a set parameter, it goes and works independently and individually depending upon the markets, you tap, but red ocean works in a straight-set of patterns and are more into a crowded building rather than making economic research.*". He also mentioned that their company is using both the Red and Blue Ocean but more emphasis is on the BOS. According to respondent B "*Red Ocean is something that you cannot avoid basically, when you start as a company, we cannot escape from Red Ocean initially the first 2-3 years of business*".

Therefore to understand the system better, Red Ocean has to be used, but when the company is stronger and believes it can stand in the market, they can shift to a Blue Ocean Approach. According to respondent B believes that "[their business is] *60% at the red ocean, but you know from nothing to you know we're able to shift our business into BOS from last three years and we were successful to make it 40% of our revenue coming from BOS which is a little bit of comfort*".

The respondents were also asked to make **Opportunities & Threats Prediction** for which respondent A said that "*in Blue Ocean the opportunities are immense any and every new idea put into practice will obviously be a novel idea and a menu mechanism to put things into the consumer's viewpoint in a different manner and to ensure that the customers are very much attracted to the type of newness you bring to the products*". Whereas respondent B's view was that there are many opportunities and if BOS is followed in the correct manner it will work wonders for the business "*if you are following your BOS properly, you are giving the customer value of the product, you are doing your basic right giving them as a service and making the requirement that the customer will not switch over to your competitor for at least 2-3 years in the business*".

The next question asked was about **Effects & Impacts of using BOS in UAE, will it work?** Respondent A expressed that it is a big risk since any innovation needs to be tested in the market and chances are that it might work or not, "*success depends upon the types of products you offer it's a risk but the risk has to be taken into a calculated manner so that in case of any adverse reversals we are able to sustain those*" and Respondent B believed that the UAE market has already started adapting to a BOS by providing examples of Laban "*for instance Laban people all around the world prefer salty or sweet Laban now a niche has been created by these people they started the mint Laban*", also snacks "*in snacks if you see before in this market the flavours were all basic like cheese, barbecue, nacho cheese, chilli, tomato ketchup, salt and now you can find many products which are based on the local taste profiles for instance yoghurt with labneh, yoghurt with mint, Arabian spices, masala flavour targeting the Asian population*".

When asked about which other industry the Blue Ocean Strategy might work, respondent A believed that it will especially work for the Fast-Moving Consumer Goods (FMCG), as they would provide new and innovative products. It would be a different league of doing business and in that the supplier or the manufacturer would be the ultimate beneficiary. According to respondent B, he thinks BOS will work best for the health care industry due to the coronavirus situation. He also believed that the BOS will work very well for any aspect of the food industry, giving an example of "*Biscuit companies such as National Biscuits Oman or Tiffany are launching savoury crackers which are not their forte and is creating a new segment in the biscuit industry*."

III. CONCLUSION

To conclude this discussion, it was clear that Blue Ocean Strategy is a new and a possible strategy and those businesses who are ready to take the risk and innovate will taste success. With the help of the interviewees, it was clear that it is better to learn the rule of the games and therefore to start with the Red Ocean Strategy. Once the company feels that they are strong enough, they can make a strategic move to the Blue Ocean. The strategy requires improving existing products to a substantial level and introducing new ventures, such behaviour will create loyal

consumers and a sustainable place in the market. Customization is one factor suggested by respondent B where consumers are given a chance to create new flavourings that are not available in the local market and can get it in any quantity required and delivered to them quickly. The opportunities of using the Blue Ocean Strategy are immense as every new and innovative idea can bring higher chances of success and learning for the businesses.

A study combining BOS and UAE's food industry has not been done before, therefore, the opinions and ideologies of food industry professional and expertise were the main sources of information to make an important contribution in this direction. The information gathered made it convenient to foresee what would be the future of BOS in the UAE food industry and will it be successful. The results of the interview prove that the Blue Ocean Strategy would be a success. This study gives future researchers an opportunity to look at different aspects of the food industry and be able to relate them to BOS.

Disclaimer:

This work is an extract of the work submitted in the form of a thesis to Modul University, Dubai and Vienna, therefore, there is a possibility that there will be similarity to the work submitted.

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Development of an Information Technology-Enabled Learning Environment for Bataan Peninsula State University

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Abstract— The research Information Technology-Enabled Learning Environment for Bataan Peninsula State University was developed to provide an easier and faster process of submission of class requirements and ratings of student works which will help the faculty members to manage their classes efficiently via intranet and an internet-based connection. It is capable of allowing the students to submit soft copies of their requirements such as major course output, laboratory exercises, case studies, and other projects. Faculty members are allowed to validate currently enrolled students, create classes, accept students in listed classes, post announcements through the content feeds, and maintain grading system per course and its rubrics of assessment. Finally, the application allows students to check announcements, requirements, and projects posted by the faculty member through the content feeds. The system was developed using PHP as the programming language, Apache for the webserver, MySQL as the Database Engine. It passes the user's acceptability evaluation based on ISO 2510102011 with sub-criteria such as effectiveness, efficiency, satisfaction, freedom from risk, and context coverage.

Index Terms— management system, learning environments, intranet-based systems, content management

I. INTRODUCTION

Bataan Peninsula State University (BPSU in its mission to develop graduates who are competitive continually provides relevant, innovative, and transformative knowledge-based programs and services to its stakeholders. Vital in this role is the roster of qualified and competitive faculty members who make up the academic council of the university.

According to the Chapter 2 of the BPSU code, the duties and responsibilities of each faculty member is to identify the learner needs, prepare and follow a course syllabus based on the needs identified, facilitate the learning process through the active engagement in classroom tasks and activities, develop students' analytical and creative thinking skills through purposive activities with focus on higher-order thinking skills, and design alternative and innovative models of teaching for all types of students.

Currently, there are different learning tools which are used by the faculty members to aid them with stated responsibilities. Among them are Facebook pages, Google classroom and Facebook group chats. These technologies although very useful are not at all integrative in nature where its information can be used for other purposes and normally, would only be valid in a particular class.

In this manner, there is a need to develop an intuitive learning environment where the faculty members can control the contents of a learning tool in the aspect of class requirements, due dates, tasks and class activities. There is a need to provide a way for the faculty members to post lessons and announcements. There must be a way for the students to submit the soft copies of their requirements online. This will be beneficial to the students as well as the faculty members. This kind of learning environment will enable the students to maximize their potential and familiarize themselves with the use of technology.

II. MARKET POTENTIAL

In the report titled "Philippines IT Industry – By Hardware Market (Computer Sales and Peripherals Sales, By IT-BPO Market (Contact Center, Software Development, Transcription, Animation and Other BPOs), By Software Market (Software Development and Software Publishing) and By Antivirus Market (Enterprise Customer and Retail Customer)" highlights the overall market size for hardware, IT-BPO, software solutions in the Philippines. Market segmentations were also gained focus specifically by its types such as contact centers, software development, transcription and others. It covers the overall comparative landscape, scenarions, growth drivers, trends and regulation which affects the market as a whole. The report concludes with future projections for all the segments and analyst recommendations highlighting the major opportunities and cautions. [1]

As mentioned, in the past, software development in the Philippines became one of the more well-known sub-sectors in the IT and IT-ES industry. In comparison with other countries in the region, it is known that the critical factors that fueled its development are its cultural and western-accent similarities specially with the US; cost competitiveness and good knowledge in terms of IT background; thus establishing a more useful resource. The major players operating with the country includes IBM, Accenture, Genpact, UST Global, Pointwest, ExistGlobal and others. In the specified forcast period, the software

market in the Philippines is expected to grow owing to the increasing number of software-centric startups within the country.

All in all, projects involving software development and software as a service will be very beneficial to the university as a whole since projects involving this is a welcome strategy to any organization in the country.

III. REVIEW OF LITERATURE

Robinson, Molenda & Rezabek pointed out that the meaning of intellectual and technical development of educational technology such as the following (1) Educational technology as the theory and practice of educational approaches to learning. (2) Educational technology as technological tools and media that assist in the communication of knowledge, and its development and exchange. (3) Educational technology for learning management systems (LMS) such as tools for student and curriculum management, and education management information systems (EMIS). (4) Educational technology as back-office management, such as training management systems for logistics and budget management, and Learning Record Store (LRS) for learning data storage and analysis. (5) Educational Technology itself as an educational subject, such courses may be called "Computer Studies" or Information and Communications Technology. [2]

Yuvienco specified the four key areas to address the challenges in education where ICT can be applied. These are the following: teaching and learning, communication, governance planning, and decision-making as well as process and operations. [3]

According to Campanotti, CSM or Content Storage Management is a method for the improvement of traditional mecia archive technology used by different media companies and content owners to store and protect valuable file-based media assets. It focuses on active management ot contents and media assets regardless of fotmat, type, interfaces and sources. These media files often contains video, images or sounds. A CSM system may be directed manually but is more often directed by upper-level systems, which may include media asset management (MAM), automation, or traffic. [4]

Moreover, in the Handbook of Classroom Management: Research Practice and Contemporary Issues (2006), Evertson and Weinstein characterize classroom management as the actions taken to create an environment that supports and facilitates academic and social-emotional learning. Toward this goal, teachers must (1) develop caring, supportive relationships with and among students; (2) organize and implement instruction in ways that optimize students' access to learning; (3) use group management methods that encourage students' engagement in academic tasks; (4) promote the development of students' social skills and self–regulation; and (5) use appropriate interventions to assist students with behavior problems. [5]

In addition, Agustin describes network software as a system or a software which operated over a network instead of running on individual computers. It may perform tasks that are supplemental to end-user software or may totally replace it such as a network-based antivirus software supplementing a desktop version of it. Another example is a network messaging server which enables end-user computers to send messages to other computers in the network back and forth. The common goal of every network software is to increase productivity and improve security for network users. [6]

Moreover, PJ Web Solution specified that network-based systems have evolved due to improvements in security and technological advances and, in many cases, it offers significant advantages compared to traditional software-based applications. [7]

Since, the learning environment will be used by the faculty and the student, a need for a network-based system is more appropriate. This will ensure that there will be cohesiveness on the data being processed and transmitted.

Likewise, Sun Microsystem pointed out that the client-server model is a distributed application structure that partitions tasks or workloads between the providers of a resource or service called servers, and service requesters. [8]

Furthermore, the Journal of Computer Engineering and Information Technology mentioned that the Database Management System is a collection of computer software allowing an interface between users and databases. It is used to analyze the data using software applications. Furthermore, it is responsible for preserving the integrity and safeguarding the stored data and also to retrieve the information in case of system failure. Defining, creating, querying, updating and administration of databases are done by general-purpose DBMS which is a software system. [9].

Moreover, Online Thinkers website emphasized that in website creation, the designers should focus on the objective of attracting visitors and make them stay longer. It is important that the end-users attention are taken and that users are enticed to browse and access the website. Photography plays a main role in sustaining visitors to the website. Likewise, creating websites and maintaining it became a main tool in the success of a business. The importance of having an online presence is highly recognized but the importance of having a good website design is still a rather subjective concept [10].

Likewise, Smashing Magazine pointed out that the actual usability and utility and not its visual designs determines the success and failure on a website. Since the visitor of the page is the only person who clicks the mouse and therefore decides everything, user-centric design has become a standard approach for successful and profit-oriented web design. [11]

As a summary, the study intends to provide an easier and faster process of submission of class requirements and ratings of student works which will help the faculty members to manage their classes efficiently via intranet and an internet-based connection.

IV. METHODOLOGY AND MATERIALS

The study was conducted at Bataan Peninsula State University that will be beneficial to both faculty members and students.

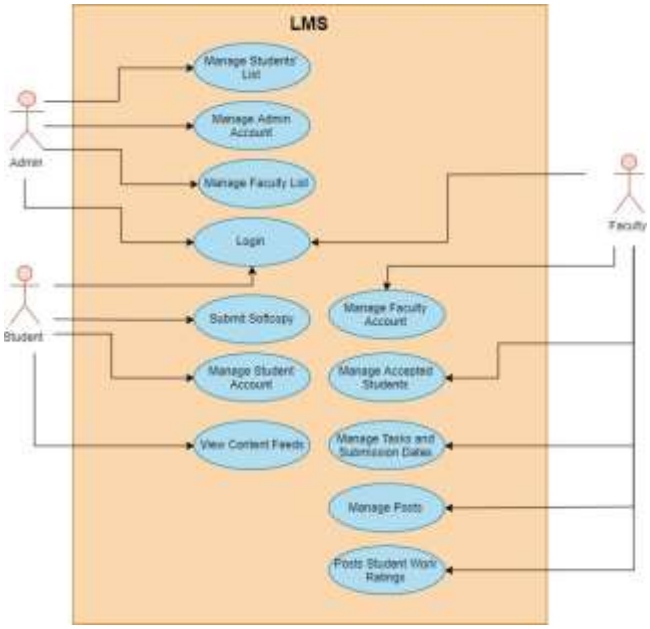

Fig. *1.* Use Case Diagram

Fig. 1 shows the Use Case Diagram of the Developed System where it has three actors involved which includes the administrator which can control and manages user accounts. He will manage the students' list. Another actor is the faculty where he has the capability to manage accepted students, manage tasks and submission dates, and manage posts as well as post student work ratings.

Furthermore, the last actor is the student where he has the capability to submit a copy of activities and other requirements and manage student account as well as view content feeds.

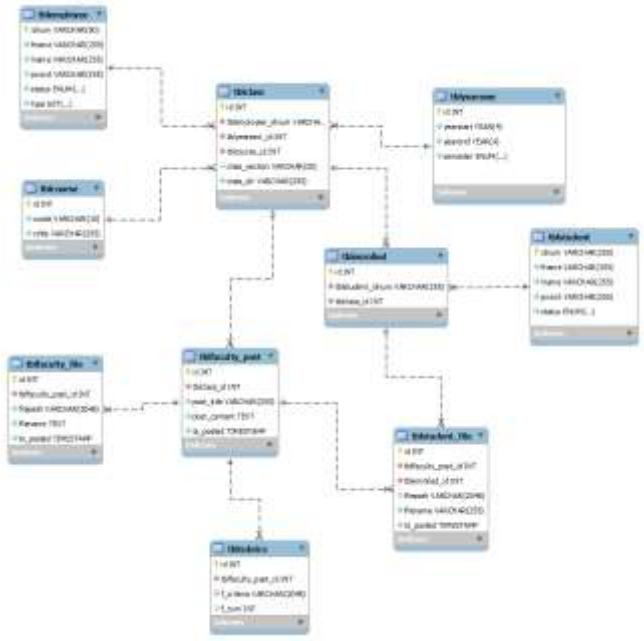

Fig.2. Entity Relationship Diagram

Figure 2 shows the Entity Relationship Diagram of the Developed System where it comprises different tables such as table employees, where it handles all the details about the employees, table class where it holds the details about employee, course, section, and sem. In addition, the table course where it handles the details about the course code and course description. Moreover, it includes a table faculty post where it handles the details about the post title and posts content. Furthermore, table student file where it includes the details about the table faculty post, file path, filename and file posted. It also includes a table for table rubrics where it contains details about faculty posts and criteria as well as table year semester where it includes the details of year start, year-end and semester.

V. DISCUSSION OF RESULTS AND FINDINGS

The survey instrument used in the study adheres to the standard of ISO 25010:2011 which focuses on different criteria in terms of Effectiveness, Efficiency, Satisfaction, and Freedom from risk as well as Context Coverage.

Each criterion was assessed using the five (5) point Likert scale with the corresponding rating.

Table 1. Likert's Scale

Numerical Rating	Equivalent
5	Highly Acceptable
4	Very Acceptable
3	Acceptable
2	Moderate Acceptable
1	Not Acceptable

Table 1 shows the Likert scale which was used as a basis of numerical rating and verbal interpretation of respondent's evaluation.

The researchers conducted several testing procedures to guarantee the efficiency of the system. System modification was also performed to ensure that the system fulfilled the needs of the organization. The selected respondents of the system were composed of Faculty members, students from Bataan Peninsula State University and IT experts that will validate the acceptability of the system according to its intended purpose. The suggestions and comments from the target respondents were very helpful and were used as a basis for improving the system's capabilities and user interface.

Prior to the evaluation, the system was presented to the target respondents. They were given the opportunity to use the system and assess the functionality of the system. The results were based on the data gathered from the questionnaires answered by a group of respondents. Each criterion of the software quality factors enumerated on the survey is illustrated in this section. Also, its calculated mean and equivalent descriptive ratings were also discussed. The characteristics of the evaluation tool were based on ISO 25010 using Acceptability testing.

Table 2. Summary of Project Evaluation

Software Quality Factor	Average Mean	Descriptive Interpretation
A. Effectiveness	4.74	Very Acceptable
B. Efficiency	4.75	Very Acceptable
C. Satisfaction	4.68	Very Acceptable
D. Freedom from Risk	4.70	Very Acceptable
E. Context Coverage	4.81	Very Acceptable
OVERALL MEAN:	**4.82**	**Very Acceptable**

The table provided a summary of the project evaluation. The overall findings achieved a mean of 4.82 with a descriptive interpretation of Very Acceptable in terms of the characteristics of ISO 2510. This manifests that the system is Very Acceptable to the needs of the target end-users.

To achieve this end, the suitability of the developed system was evaluated. The analysis of the study findings identified the following:

1. Effectiveness criterion got a mean of 4.74 with a descriptive interpretation of Very Acceptable. The findings ascertained that the accuracy and completeness of the system with which the end-user achieve specified goals**.**
2. Efficiency criterion got a mean of 4.75 with a descriptive interpretation of Very Acceptable. The findings showed that the system had delivered the performance of the system according to its intended purpose.
3. Satisfaction criterion got a mean of 4.68 with a descriptive interpretation of Very Acceptable. The findings revealed that the end-users are satisfied with the result of the system and have strong confidence in its behavior as its intended purpose.
4. Freedom from Risk criterion got a mean of 4.70 with a descriptive interpretation of Very Acceptable. The findings proved that similar the system has the capability to mitigate the potential risks based on its efficient operation.
5. Context Coverage criterion got a mean of 4.81 with a descriptive interpretation of Very Acceptable. The findings indicated that the system can be used with ISO 25010 characteristics using acceptabilitytesting.

VI. RECOMMENDATIONS

The following are based on the limitations of the study which can be improved and recommended to the future researchers for further improvement of the project.

1. Include a mobile application that can be used in uploading the files to the system.
2. Include support for other mobile operating system
3. Further research is needed on its effectiveness of its usage based on performance criteria of ISO 25010-2011.
4. There must be a separate evaluation once the system is being implemented. It should adhere to the standards of ISO 25010 specifically for "Acceptability testing" which focuses on the effectiveness and efficiency of the system.

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The Relation between Gender and Road Accidents in the Sultanate of Oman

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Abstract— This paper examines the gender relation with road accidents in the Sultanate of Oman, exploiting an exclusive database taken from the latest literature as well as by using the ROP`s official database. Also, consider other features like weather and lighting conditions. It was found that the role of gender in vehicle accidents depended on the age of the driver and skill in driving. Furthermore, that gender`s collision involvement was more among male drivers in fatal crashes than those of female drivers. However, crashes involving male drivers are due to lots of features such as speeding, recklessness, and anxiety behavior. The study also examined the moderating effect of age, driving skills, and driver behavior on the relationship between gender and fatal and road accidents. Although the gender prerequisite in road accidents converges with age, there is mixed evidence for the reasonable impact of driving skills and driving behavior on the relationship between gender and road accidents. This study has significant implications for how to best design the most favorable policies and strategies to improve road safety among drivers from different genders.

Index Terms— gender, accidents, fatal injuries; drivers` behavior

I. INTRODUCTION

Globally, road accidents are among the leading causes of death. Since the nineties of the previous century, there has been a 45% increase in road traffic injuries (World Health Organization, 2018). The number of road traffic fatalities around the world has as well increased, reaching over 1.30 million in 2016 (World Health Organization, 2018). Other statistics have demonstrated that, worldwide, a person is killed every 22 seconds in a road accident (World Health Organization, 2018). In response, worldwide agencies have called to take urgent action to improve and develop international road safety. In 2011, several international agencies like the UN, WHO, and the World Bank,

launched a worldwide plan, called: "the Decade of Action for Road Safety." This initiative has aimed to encourage countries to apply good quality road safety practices, to minimize road injuries and deaths. The Sustainable Development Goal which was adopted in 2016, likewise called for a 50% lessening in the number of road traffic deaths by 2020 (Passmore et al., 2019).

In general, road Traffic Accidents mostly can be attributed to human, vehicular, and environmental factors. When considered alone, human factors account for about 56%, and together with the other factors (vehicular and environmental) about 94% of automobile accidents (Horvath et al,014). Human factors in driving can be seen as being composed of two separate components, driving style and driving skills (Miller et al,2018).

Bulky literature exists that seek out to recognize the factors that contribute to traffic accidents. This literature has examined the role that demographic factors that have played an explanation for the differences in road accidents; in which, several studies have paid attention to the gender of the driver (see, e.g**.,** Bergdahl, 2015; Horvath et al.,2012; Laapotti et al., 2015; Møller and Haustein, 2014**;** Magnusson and Patterson,2014**).**

These studies which have examined gender differences in traffic accident rates have tended to conclude that men have a higher prospect of being involved in accidents more than females(Pratt and Bell; 2019, Hsu et al.,2015; Frost and Sullivan,2015; Guo e al,2016 and Skorich et al,2013).

The existing literature, however, as pointed out by Pratt and Bell (2019) that the cumulative data of studying fatal traffic accidents caused by genders, was very limited. However, to consider the diverse trends in fatal road accidents is evenly vital to understand the trends in the relationship of gender in non-fatal road accidents given the considerable emotional, health, and economic costs about gender. However, from a strategic perspective, comprehending the dynamics of gender differences in accidents is imperative because it facilitates the couture of efficient road safety campaigns directed at male and female drivers by age group (Gneezy et al.,2019)**.**

1.2 Aims

This researching paper aims to examine the effect of gender on driver behavior and accident contribution in the Sultanate of Oman. The influence of the driver's gender on road traffic crashes is explored in this paperwork. However, the specific objectives for this study are:

1- To determine the relationship between gender`s age and road accidents.

2- To determine the relationship between the gender`s driving experience and its contribution to road crashes.

3- To identify the gender`s educational level and its relationship in promoting more road safety.

4- To examine the differences in driving behavior, skills, behavior, and performance concerning gender and determine its impacts on RTCs.

II. PROBLEM STATEMENT

Road accidents are considered one of the top issues since they are leading cause to deaths of lots of people in the Sultanate of Oman, specifically, among the young people from different genders, and in particular the young males(ROP,2016). This shows that hundreds of people die or become disable yearly because of accidents-related activities and wrong driving attitudes among the two genders. Over million and a half, the vehicle is registered in the country, and this increases the rates and probabilities of committing accidents on the roads especially in the major cities in the Sultanate as Muscat and Sohar ROP,(2016). Despite an immense economic burden exerted by road accidents, the primary causes of accidents concerning the gender of the drivers have not been descriptively investigated or analyzed yet to identify the main reasons behind such hazardous phenomena. Also to draw a clear image of the causes of such crashes Bigelow, (2013). This study intends to shed the light closely and realistically to understand the relation of gender in causing road accidents in different regions in the Sultanate of Oman. Such a study will help in minimizing the loss of lives among drivers from different genders through road accidents.

1.4 Significance of the Study

This study is very imperative since the Sultanate of Oman still suffers from high rates of road accidents, and this will expose it to lose lots of souls and costs it a lot financially. Therefore, this study is vital to be conducted to figure out the main causes of road accidents concerning gender, and come up with new constructive ideas in cooperation with the road policymakers in the country to design effective, and practical strategies that will effectively help them to formulate new strategies to lessen the rates of accidents and deaths among the drivers.

1.5 Scope

The study was conducted to target the relation of the genders in road accidents in the Sultanate of Oman. It was carried out in all main regions of Oman. About 280 respondents will be randomly chosen from different regions and genders from different regions in Oman. The targeted population of the study was from different genders, educational levels, driving experiences, and ages. The study was conducted within a period which is from September 2020 to April 2020.

III. LITERATURE REVIEW

Many studies have been conducted to study the gender`s relationship in road accidents in different countries internationally. The followings are some of these studies:

2.1 Driving behavior

The literature, in general, suggests that young drivers from the two genders are more likely to undervalue the risk of being involved in a crash and to overestimate their capabilities as drivers. In particular, this study aimed in this section to study in depth an amount of literature that targeted the relationship of gender in road accidents and relate them to the general aims of this study. Thus, the study, in particular, will focus on many factors related to gender which are: the drivers` behavior, skill and style in driving, and the driver`s age.

Drivers` behavior is governed by the maturity of the drivers whether they are males or females; however, this refers to the mentality and stability of the psychological conditions of the drivers while driving(Abojaradeh,2013). Aggressive driving always is related to young males, but this is found not to be an absolute reality since lots of researchers found that women are leaned to be masculinized in their driving behavior and that this phenomenon is more present in the youngest generations of drivers. As stated by Romano (2014) “The increase in the number of women concerned with fatal collisions could be described by raise in traffic revelation. However, this could similarly be associated with the changes in the role of women in the community, which differently lead women to behave the same as men”. However, “it was more found that dangerous driver habits could be attributed just to young female drivers and not to older females overall.” (Wiesenthal,2013).

Abojaradeh and Jrew,(2012) focused on the behavior of the driver`s faults on the traffic safety in Jordan. They went through conducting a questionnaire to figure out the major reasons for the traffic accidents and their impact. It was discovered that there is a direct association between the driver`s behavior and the gender of the driver. Thus they found that young who drive aggressively commit more driving faults to expose them to accidents rather than females who, in general, show more positive behavior in driving slowly.

Bener et al.,(2016) explained that driving behaviors are grouped into three categories: lapses, errors, and violations. Driver aggression has been defined as any behavior intended physically, emotionally, or psychologically harms another driver within the driving environment. Driver aggression represents a potential danger to all roadway users due to its traffic violations and traffic collisions). Under the conditions of stress, drivers are more likely to reveal mild forms of driving aggression and rage at others Lajunen et al.,(2014). They also reported that the increased incidence of aggressive driving on roads was due to a steady increase in vehicles and road congestion that caused road wraths and stress among drivers. Bener et al.,(2015) illustrated in a study in Qatar that road traffic accidents and injuries of drivers from different genders and ages were high, and it was found out the human behavioral factors were the main causes of RTAs.

However, enormous studies conveyed that individual characteristics such as age and gender are related to driving behavior (Bener and Crundall,2015; Waller et al., 2014; Novoa, 2014; Gneezy et al.,2019). Men and women exhibit different driving behaviors that influence their attitudes and safety. This translates that the differences between male and female drivers in terms of crash tolls are obvious in a wide range of countries (Mesken et al.,2017), whereas a few studies have described similar rates between the genders(Wiesenthal,2013). The present article pursues a similar approach to explore the gender and age-related differences in driver behavior of male and female drivers, and their relation to road accidents as well.

Jacobsen and Rutter (2012) stated that men and women differ in terms of risky behavior and involvement in accidents, including road crashes. However,(Cordellieri et al., 2016,andOlabarria and Novoa, 2014)stated that there are differences among genders in road safety attitudes and perceived risk. Also, they agreed that there is an excess of risky behaviors or violations in males road users compared to their female counterparts**.**

In his report, Al-Balbissi (2013) identified 2/3 of victims of RTAs as males and almost twofold higher RTAs than females. Other studies dependably witnessed that males are unreasonably involved in traffic accidents**.** However, the findings showed strong differences in the presence of accidents and the dangerous conduct of both sexes in favor of females. While males are often considered expert drivers, they often conduct dangerous conduct, including transgression of speed, careless overtaking, nonsenses to use a seatbelt, and driving under the influence of alcohol Bachoo, et al,(2013).

Ulleberg and Rundmo, 2013; Teese and Bradley, 2018 considered the gender aspect as an important variable to risky driving behavior in young drivers. The researchers have reported thatAs far as road traffic risk behavior, males are more ready to take hazards than females. Besides, (Whissell and Bigelow, 2013; Oltedal and Rundmo, 2016; Yagil,2018) have all agreed that the rate of men's involvement in fatal road accidents is twice as high as women's and, previously. However, Evans (2015) females have a 25 percent lower risk of involvement than a man in an accident on the road published. Moreover, males are implicated in road crashes as a result of their breach of traffic legislation according to other writers (i.e., violations of speed limits and driving after drinking: (Skorich et al,2013; Passmor et al,2019; Møller and Haustein, 2014), Female is involved in traffic crashes because of judgment mistakes, as LeVine and Jones have shown (2012). It has also been reported that females take less risk than males when driving. (Ebbesen and Haney, 2013; Katz et al., 2015).

Previous studies from different developed and developing countries consistently showed consent that males are disproportionately involved in traffic accidents (Robertson et al.,2014; Frost and Sullivan,2015; Defoe et al.,2015). Other studies also documented clear variations in the accident involvement and risky driving behaviors between the two genders in favor of females (Cordellieri et al.,2016; Celik, and Oktay,2014). While males are often considered expert drivers, they often conduct dangerous conduct, including transgression of speed, careless overtaking, seatbelt failure, and driving under the influence of alcohol. Berdoulat et al.,(2013). Male drivers also tend to have lower attention, impatience, and risk perception than females Beatton et al.,(2018).

Similarly, a study by Waller et al. (2014), has been designated that men have a higher number of crashes than women and they incur their first crash earlier in their driving career. These study findings confirmed that men and young drivers were at higher risk for road traffic accidents than females and drivers of older age.

A study by Norris et al. (2016) attributed a greater level of crash proneness to higher driving speed among young males and less regard for traffic laws. Also, it was reported in the USA that higher accident rates for male drivers were committed from their tendency to disregard the speed limits.

On the other hand, a study by Sagberg et al.,(2015) found that lapses were more often reported by females than males. Correspondingly Wiesenthal et al. (2014) reported that female drivers are equally likely as male drivers to exhibit aggressive behaviors towards other drivers. However, it was reported that culture plays a key role in determining the gender difference in their aggressive driving behavior**.** Thus, the psychology literature suggests that these findings of misjudged behaviors in driving can be attributed to inherent behavioral differences between genders, such that males are less concerned about the consequences of risks associated with road accidents Cordellieri et al.,(2016)

The results of a study by Gneezy et al.,(2019) identified that there are three main factors in the attitude that govern road safety issues that characterize our sample. The first factor is “approach to road regulations and reckless driving” in which drivers defend dangerous conduct in environmental conditions. The second-factor concerns “Drogen and alcohol negative behavior,” and the third factor is “Tolerance to pace.” Concerning Driver Behavior (i.e., violation and intervals), two main factors also emerged: “Errors in inattentive driving” and “Driving violations.” Thus these differ in accordance to the gender, as the study revealed that males show more aggressive attitudes on roads and negative behavior than females.

Studies results showed that young men are more likely to consider various aggressive driving accept such as speeding, traffic violations, drugs, and alcohol while driving. Furthermore, There is no distinction between individual regions as regards the negative attitude towards traffic law. In reality, men are much more likely to have little regard for road rules in all regions WHO,(2013).

Stimulatingly, for the tolerance toward speeding and negative attitude toward drugs and alcohol, it was found a gender difference in all regions. Kelley-Baker and Romano,(2015) stated that females driving behavior since females are less involved in alcohol-related crashes and speeding-related crashes than males. Moreover, many of the gender differences were mostly due to gender differences in alcohol intake. This way, gender effects are irrespective of changes in gender roles or their driving behavior.

Furthermore, as observed from the findings of Ma and Yan,(2014), The conduct of men seems to commend the risk for young men to accept road abuses and to reinforce their alcohol consumption. These aspects and complexities that could increase careful driving behavior must undoubtedly be taken into account in preventive programs.

Kelley-Baker and Romano (2015) stated that in the USA, the occurrence of women involved in fatal vehicle accidents is rising, whereas it is declining among men. Romano et al. (2008) observed that this intensification might be generally due to an increase in Traffic disclosure and a rise in the riskier conduct of women, particularly in young female drivers. Further, many gender-based gaps in alcohol consumption were shown to be either non-existent or largely explained by sex variations in alcohol consumption. Therefore, the role of gender as an extrapolative factor in hazardous driving behavior justifies more investigation. Generally speaking, socio-cultural dynamics create diverse opportunities for learning in males and females. In the past, one negative significance of these dynamics was to be included in the so-called stereotype hazard in which people are or sense themselves to be at risk of settling down undesirable stereotypes about their group Inzlicht and Schmader, (2012).

The educational system, messages blowout by mass media and society, in general, subsidize to the dispersion of understood information regarding gender roles in young people (Rolandelli, 2014) It also showed why young drivers' reckless older drivers' behaviors. It is also conceivable that multiple surveys have indicated that male drivers are more disposed to experience collisions which have triggered changes in the self-belief of women and men and their views of driving behaviors. This is consistent with the above results in the commonality of females engaged vehicle crashes are on the rise (Gneezy et al.,2019; Kelley-Baker and Romano, 2015 and Defoe et al.,2015). In this research, we investigated gender-related effects on road safety attitudes.

2.2 Driving Skill & Style

According to Laapotti (2013), the main reason for gender differences in non-fatal injuries and deaths per accident is driving style and driving skills. In terms of driving style, male drivers are, on average, more likely to engage in risky driving practices (Passmore et al,2019), which increases the probability of fatal accidents for males. Specifically, evidence shows that men are more likely to drive under the influence of alcohol and drugs and significantly exceed speed limits(see, e.g. Constantinou et al., 2011; Fergusson et al., 2013; Sivak, 2013).

As many studies have found a collaborative impact of gender and age on driving behavior, this study`s sample included only young drivers aged 18–22 years. We focused on young drivers since, as proved by (Miller et al,2018; Bachoo et al., 2013; and Massie et al,2015), are more prospective to underestimate the risk of being involved in a crash and to overestimate their aptitudes as drivers. A plausible clarification of this propensity might be found in a general tendency toward risky behavior irrespective of the driving situation (e.g., Adanu et al,2018; Bachoo, et al,2013). For such a reason, it is necessary to get to investigate both the attitude toward risk and the risk perception for better thoughtful whether the presence of hazardous behaviors could be correlated to a shortfall in the real risk perception.

In terms of driving skills, the literature suggests that male drivers are, on average, more skillful and able to perform more difficult maneuvers than female drivers (Massie et al., 1995). Studies find that females are involved in more accidents overall, as well as non-fatal accidents. This finding implies that while they take fewer risks, they commit more minor driving errors than males (see, e.g., Berdoulat et al., 2013; Blockey and Hartley, 2015; Ma and Yan,2014). Overall, females are more likely to be involved in non-fatal injury crashes resulting from driving errors than males, while men are more likely to be involved in fatal crashes resulting from risky driving behaviors, such as driving under the influence of alcohol and drugs and driving with excessive speed.

Laapotti et al. (2013) found that although females have a greater safety orientation than males, young female drivers show more problems in vehicle handling and mastering traffic situations. While differences in driving style and driving skills suggest that we should expect gender differences in rates of non-fatal injuries and deaths per accident, exposure is important in conjecturing whether the gender gap in fatal and non-fatal traffic accidents is converging or diverging. Exposure refers to the amount of time that people spend driving (Laapotti, 2013).

The likelihood of having a fatal or non-fatal traffic accident is positively correlated with the amount of time spent driving, holding other factors constant. Historically, men typically drove more miles than women, but the gender gap in the rate of driving has reduced worldwide, with an increase in the number of female drivers around the world (Insurance Institute for Highway Safety, 2019). In the UK, between the early nineties and 2010, the number of female drivers grew by 23 percent, representing a 2.6 million increase compared to only a 9 percent (1.4million) increase in the number of male drivers. In the US, in 1963, males represented over60 percent of all drivers; however, by 2005, they had become a minority. Similar trends exist in other parts of the world including Australia, Canada,

Germany, and Ireland, among others(see, e.g., Frost & Sullivan, 2015; Le Vine and Jones, 2012; Sivak, 2013). A major reason for these trends is that female enrolment in higher education and labor force participation rates have increased, particularly in the last decade, so women now spend more time driving to, and from, university and work (Sundström and Stafford, 2014).

Gender differences in driving behavior also influence interactions between road users. Generally, women have more cautious driving habits than men, resulting in a lower overall crash involvement, even when corrected for exposure (Al-Balbissi, 2013). Men are statistically significantly more often involved in crashes involving right-of-way violations than women.

2.3 Age of Driver`s Gender

Existing studies suggest that age plays an important role in the prevalence of accidents given that age is associated with experience, the level of exposure to different driving conditions, and the propensity towards risk-taking (Defoe et al., 2015).

(Dejoy, 2013) designated that the inability of females to undertake more difficult maneuvers compared to male drivers, and that females commit more minor driving errors than males, suggest a higher probability of non-fatal accidents for females. As people get older, though, differences in driving skills between men and women will decline with greater driving experience. Hence, the gender gap in non-fatal accidents can be expected to congregate with age. Young males tend to be more optimistic in judging their driving skills than young females and are, hence, are more likely to underestimate risks that result in fatal accidents.

However, due to generational changes in attitudes towards risk, over time female drivers become more risk-seeking and are more likely to engage in aggressive and risk-taking driving behavior (Kostyniuk et al., 2016). The psychology literature suggests that women act more like men and, thus, become less safe when older because of stereotype threat, which refers to the negative influence a stereotype about a group can have on performance in areas relevant to the stereotype. When women are negatively stereotyped as less confident and optimistic drivers, over time, it is likely to produce stereotype threats that make them more inclined to risk as they get older (Skorich et al., 2013; Yeung and von Hippel,2018). Reinforcing this trend are genetic differences in lifespan. Because there are more older women than older men, there are older female drivers than older male drivers (Baker et al., 2003). Higher exposure suggests that older female drivers have an increased likelihood of being in a fatal accident. At the same time, evidence suggests that older male drivers become safer drivers than older female drivers and, thus, older male drivers less likely to be involved in fatal accidents (Stamatiadis and Deacon, 2015).

Lajunen et al.,(2014) argued that younger drivers are very different from older drivers, and perception of risk deliberates the influence of aging on the drivers` behavior is also crucial since old drivers are keen to drive slowly and also they are not willing to take risks contrary to their counterparts of young people from the two genders. However, a study found that females seemed to be more risk-averse in different domains except for the social risk. On the other hand,(Massie et al.,2014) opposed this result as they demonstrated that not only males can sense the risk, but also do the females who showed as well concern about road risks.

Sivak (2013), on the other hand, argued that risk perception differs by gender, as he argued that female drivers from different ages can rate the hazard of risk on roads as riskier than males do. Thus risk perception engrosses deliberation of features as the perceiving the controllability of voluntariness and hazard associate with perilous conditions. However, the results of this study exhibited that the main difference is in terms of emotions; undeniably, females seem more worried than males concerning risk perception as a cognitive assessment.

In most EU countries, the ratio of road accidents between male and female fatalities increases with age, and such ratio reaches a peak between the ages of 30–44. This reflects a specific gender development in the travel behavior of men and women in Europe. As regards the road user type, the proportion of passengers' or pedestrians' fatalities is higher for females than the males, while the opposite is true for drivers (Berdoulat et al.,2013; Frost and Sullivan,2015).

IV. MATERIALS AND METHODS

This was a cross-sectional study, carried out in different regions in the Sultanate of Oman. A well-designed questionnaire was applied on 285 motor vehicle drivers from different regions, levels of education, driving experience, and genders. Besides, taking official data concerning the accident rates over the last five years from the ROP`s General Directorate of Traffic in Muscat. Ethical approval was obtained from the review committee and local authorities before the inauguration of the study. According to the respondents, every participant was given a voluntary consent form after a thorough explanation of the procedure involved.

All drivers consented to participate in the study, but eventually, about 15 of them did not show any response, and so they were dismissed from the study. Subjects were interviewed using a standard semi-structured self-administered questionnaire. The questionnaire was divided into five sections to ease administration. Section A asked questions on socio-demographic characteristics including age (names were excluded to ensure confidentiality), marital status, gender, and age. Section B focused on driving experience and questions were asked about the number of years of active driving, year of commencement of driving. Section C obtained RTA history by asking about the number of road traffic accidents sustained while

driving, since the commencement of the driving experience, and in the last 5 years. The cause of the accident, association with poor sight, intake medications when RTA occurred, was also documented.

The data generated were coded, entered into a personal computer using facilities in the Statistical Package for Social Sciences (SPSS) version 10.0. Frequency tables and proportions were used for data summarization and presentation of qualitative data. Means and standard deviations were used for quantitative data, while odds ratios were calculated as estimates of the relative risk of distrusted variables.

V. RESULTS

4.1.1 Gender

Table 6 : Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	242	60.3	60.3	60.3
	Female	159	39.7	39.7	100.0
	Total	401	100.0	100.0	

The table above (table 6) illustrates the total frequencies of 401 respondents males and females who were targeted to answer the questionnaire. The majority were males with a percentage of 60.3% (N=242), while the rest were females with a percentage of 39.7% (N=159).

4.4.1.2 Age group

Table 7: Age group

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-24	56	14.0	14.0	14.0
	25-34	145	36.2	36.2	50.1
	35-44	139	34.7	34.7	84.8
	Above 45	61	15.2	15.2	100.0
	Total	401	100.0	100.0	

The total frequencies who answering the survey with different age groups are shown in table 7 above. The total number of the respondent is 401. The majority of respondent age was from 25-34 years represented by 36.2% (N=145). Then the second aspect of age goes for 35-44 years with 34.7% (N=139). However, the third group age comes for those who were above 45 years old with 15.2% (N=61). The last group age was for the young group age which is 18-24 with 14% (N=56).

The results showed that there is a mutual relation between the increasing of severe accidents and the gender of the driver, as most deadly accidents are associated with male young drivers more than female drivers. The results meet with lots of studies discussed in the literature as they argued that male drivers, in particular, the young drivers are showing more aggressive behavior in driving unlike females, and this leads them to commit lots of severe accidents throughout the world in general, and in Oman in particular.

VI. CONCLUSION

The study concluded that there is an immense relation between road accidents in terms of the gender of the driver. In different regions of Oman, young males are contributed to road accidents more than females. This conclusion of this study meets with lots of the literature which mostly revealed that males behavior in driving is more aggressive, and this attitude contributed to increasing the number of accidents, in particular, fatal deaths and injuries among male drivers. According to the limitation of the study, the procedure in carrying out the questionnaire on the population of the study took a long time, and this is due to the exceptional circumstances of Covid-19, and the repetitive locking up procedures implemented by the government. Also, the availability of accurate data concerning the statistics of the accident was either limited or needed official permissions to be taken and studied.

The study recommended that more preventive procedures are required to minimize the rates of accidents among drivers. The primary recommendation is to carry out more effective campaigns to target the young males in particular and teach them the hazards of aggressive driving. Also installing more speed monitoring devices on roads, and intensive patrols on roads are to be applied effectively. Road laws need to be amended well to promote more road safety, especially, in areas of license issuing which is to be for people over twenty-one.

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Digital Voltage Selection Schemes

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Abstract— This paper presents various voltage selection schemes including synchronization used in DEWA transmission network (132kV and above), it is mainly focusing on digital voltage selection scheme and how the digital VSS is differing from the conventional voltage selection schemes with detailed processes and diagrams including advantages and disadvantages of each synchronization and VSS scheme. The digital VSS is a simplified and optimized solution that significantly reduces overall engineering, installation, testing, commissioning, operation, maintenance and troubleshooting time including less probability of failure rate. Additionally, as part of continuous process improvement strategy in DEWA, future enhancement on digital VSS by using the latest communication technology in substation automation is suggested for improvement.

Index Terms— A digitally simplified and optimized solution for busbar voltage selection that reduces the overall process time and enhance the reliability of transmission network

I. INTRODUCTION

In 2017 - as a part of innovation and continuous process improvement, a detailed study to look for optimized solution in order to resolve the complexity and limitation in the conventional existing hard wired Voltage Selection Scheme (VSS) was carried out. A working team was formed with participation from different fields (Engineering, Commissioning, Maintenance, Protection, Projects, SCADA and Operations). The working team carried out a detailed study in coordination with OEMs, consultants and contractors on the conventional VSS scheme(s) deployed in 400/132kV & 132/33/11kV substations. Accordingly, an optimized solution for future DEWA projects was concluded.

II. INTRODUCTION

The term synchronization is the process of allowing connection of two different power sources by ensuring the corresponding two voltages (magnitude, frequency and phase angle) are within stipulated limits. In a transmission network, the synchronization process is achieved by comparing the incoming and running voltages prior to close the circuit breaker of any feeder. Generally, the bus and line voltages are taken directly from respective VTs. However, priority scheme which is capable to select the appropriate busbar running voltage from one of the line VTs up on the selection of busbar disconnectors is incorporated in DEWA. A detailed analysis has been performed in DEWA transmission network (400kV & 132kV) to optimize the requirements for deriving the busbar voltage without using the bus VT. Synchronization can be achieved by voltage selection hardwire circuit through synchro check relay or digitally by programming bay control units.

III. ABBREVIATIONS

AC : Alternating current
BCPU : Bay Control and Protection Unit
BCU : Bay Control Unit
BI : Binary Input
BO : Binary Output
CB : Circuit Breaker
DBLL : Dead Bus - Live Line
DEWA : Dubai Electricity and Water Authority
DLDB : Dead Line - Dead Bus
DLLB : Dead Line - Live Bus
DS : Disconnector
GIS : Gas Insulated Switchgear
GOOSE: Generic Object Oriented Substation Event
HMI : Human Machine Interface
IEC : International Electro Technical Commission
IP : Internet Protocol
IVT : Interposing Voltage Transformer
LCC : Local control Cubicle
LDC : Load Dispatch Center
LLLB : Live Line - Live Bus
MCB : Miniature Circuit Breaker
OEM : Original Equipment Manufacturer
SCADA: Supervisory Control and Data Acquisition
SCMS : Substation Control and Monitoring System
TCC : Transmission Control Center
TCP : Transmission Control Protocol
VSS : Voltage Selection Scheme
VT : Voltage Transformer
Δf : Difference between line and bus voltage Frequencies

ΔV : Difference between line and bus voltage Amplitude

Δφ : Difference between line and bus voltage Phase Angles

IV. METHOD OF SYNCHRONIZATION

The synchronization process is achieved by various methods such as:

- Traditional method using bus VT
- Conventional hardwired VSS without using bus VT
- Digital VSS without using bus VT

The process, advantages and disadvantages of each method are illustrated in the following sections.

V. TRADITIONAL SYNCHRONIZATION METHOD USING BUS VT

This synchronization scheme is commonly used in most of the power utilities worldwide. The traditional scheme has two different ways for synchronization closing of a circuit breaker either from local control panel through a common synchro check relay or from HMI in BCU/SCMS for remote operation. The line voltage, bus voltage and busbar disconnector (open/close) status inputs are playing vital role in the process of synchronization.

The CB close command from local or remote will enable a sync select relay to extend incoming line voltage input to synchro check relay and for BCU it is directly extended from line VT. The running bus voltage for BCU/ common synchronization relay is extended from bus VT via sync select relay and auxiliary contacts of busbar disconnectors based on the selection of busbar (bus 1 or bus 2). The close command will also initiate sync start input to local sync relay and for BCU sync it will be considered from sync start binary input.

The extension of line and bus voltages through sync select relay with sync start input will start the comparison of electrical parameters (ΔV, Δφ, Δf) in case of LLLB condition either in synch check relay or in BCU and the permissive output will be extended to the CB closing circuit. For other conditions (DLDB, LLDB, DLLB) the feedback for closing the circuit breaker will be given by verifying the healthiness of voltage whether it is dead or live and without comparing electrical parameters (ΔV, Δφ, Δf). The dead and live voltage setting limits are at the discretion of the utilities. If any of the above conditions is not satisfied, the synchro check fail signal will be reported to local and remote alarm systems, further it will block the CB close operation. Further, in all the cases the synchro check process will not be initiated in BCU or common synchro check relay if a sync block alarm (VT MCB Trip / sync auxiliary relay failure) persists. Moreover, sync selection can be activated only in one feeder at a time.

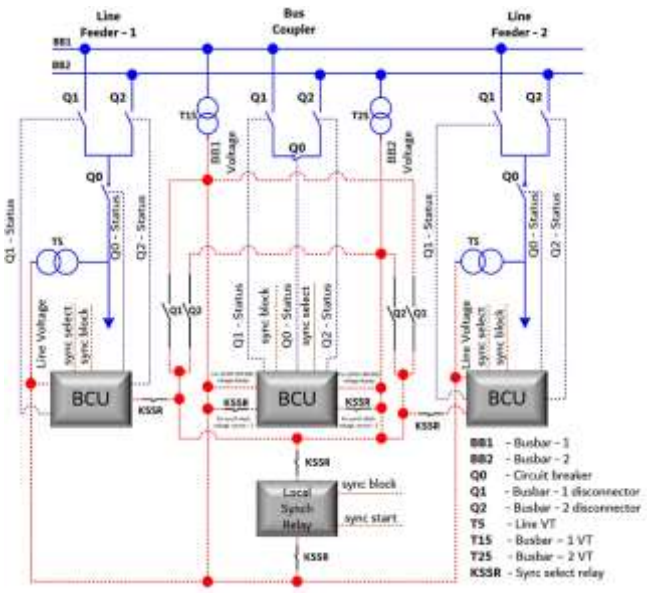

Figure1: Traditional Synchronization Method Using Bus VT

VI. DRAWBACK OF USING BUS VT

The major drawbacks of using busbar VT are as follows:

a) **Network Reliability:** In case of bus VT failure; bus coupler, bus sections and feeders connected with the busbar will be tripped. Further, relevant busbar will be under outage until the replacement of faulty VT, which in turn can affect the reliability and availability of the network.

b) **Cost:** The cost of the bus VTs is high.

VII. NECESSITY OF VSS

The main purposes of voltage section scheme are listed below:

a) To derive the busbar voltages from the line VTs by means of bay voltage selection through auxiliary contacts of busbar disconnectors.

b) To synchronize two different sources in transmission network.

c) To measure and display the busbar voltages in LCC panel and SCADA system.

VIII. CONVENTIONAL VSS

The voltage synchronization process by conventional VSS involves two methods for closing a circuit breaker either by synchro check relay for local operation or from HMI in BCU/SCMS for remote operations.

In absence of bus VT, the bus voltage is derived from line VTs of the energized feeders with the help of auxiliary relays, timers, auxiliary contacts of busbar disconnectors and sync select relay in all the feeders involved in VSS.

The CB close command from local or remote operation will enable the sync select relay for few seconds, within this time the line voltage and bus voltage (derived) will be extended to the local synchro check relay or BCU respectively for comparing the electrical parameters, the process of synchronization will be similar to traditional synchronization method as explained in section V.

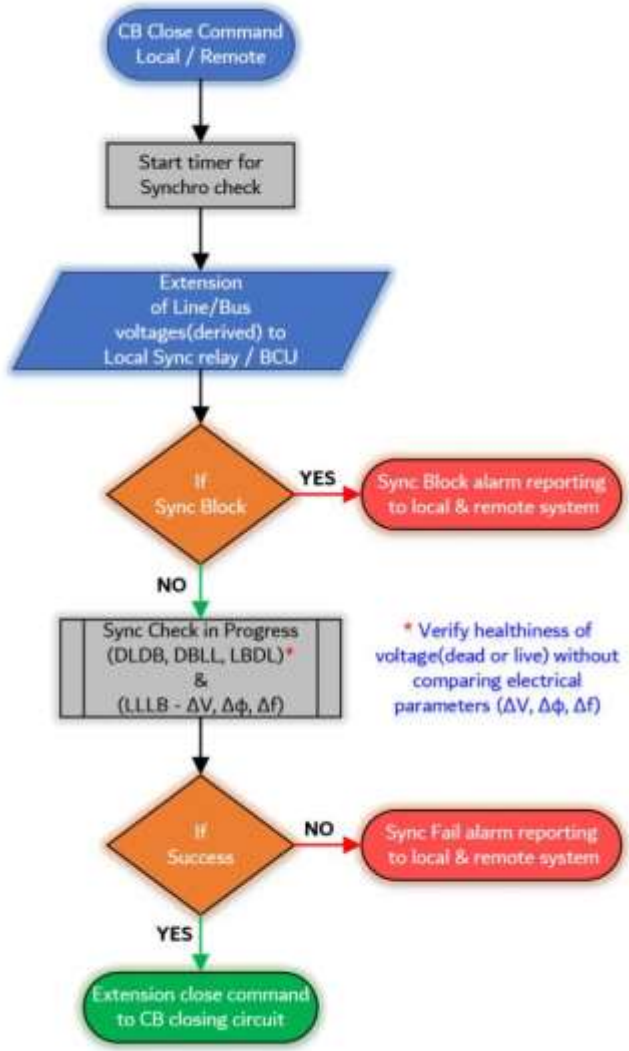

Figure 2: Process Flow chart for Conventional VSS

IX. DRAWBACK OF CONVENTIONAL VSS

- Conventional voltage selection scheme is hard-wire based, due to that huge number of auxiliary relays and timers are required to achieve the VSS functionality.
- IVTs and local sync relays are used for the functionality of VSS.
- Any failure (VT MCB trip and VSS auxiliary relay faulty) in energized feeder that is involved in VSS, will subsequently block the synchronization function for the entire substation.
- Due to complex nature of hard wired scheme, it requires more time for maintenance and trouble shooting.
- Overall processing time of synchronization is comparatively high due to sync select relays and timers.
- Separate panels are required to accommodate the voltage selection schemes (in 400/132kV substations).

X. DIGITAL VSS

DEWA recently adopted and introduced a new VSS replacing conventional VSS which was used earlier in its 400kV and 132kV networks. DEWA carried out extensive study on the new VSS including necessary performance tests in the laboratory with the assistance of OEMs. DEWA also arranged detailed technical discussions with OEMs, contractors and consultants in order to achieve effective, simplified, optimized and reliable VSS calling it digital VSS. This new digital VSS has now been successfully implemented in 400kV and 132kV transmission networks.

The digital VSS is attained electronically, inside the programmed BCU for each respective feeder with the help of auxiliary relays, auxiliary contacts of circuit breakers / busbar disconnectors. BCUs in all the associated feeders are programmed with an algorithm to create a reflection of bus voltages, accordingly auxiliary relays will be enabled by means of BCU binary outputs to extend the desired VT secondary voltage of any feeder connected to bus. Meanwhile, paralleling of VT secondary circuit will be avoided at any case.

The synchronizing process is achieved by comparing two voltages (line and bus voltages). The line voltage can be extended directly from line VT. Due to the absence of busbar VT, the busbar voltage is derived from the existing line VT of an energized feeder along with busbar disconnector and circuit breaker status. The same shall be used as running voltage for the feeder ready for CB sync closing from Local BCU as well as from SCADA. Further, the derived running voltages are also used for measurement purpose in local LCC and remote SCADA systems.

The following conditions are being checked during synchronization process:

i. DLDB, LLDB, DLLB.

For the above conditions the CB closing will be directly executed only by verifying the healthiness of voltage whether it is dead or live and without comparing other electrical parameters (ΔV, Δφ, Δf).

ii. LLLB.

a. Comparison between voltage amplitudes (ΔV)

b. Comparison between phase angles (Δφ)

c. Comparison between frequencies (Δf)

The setting limits for the above conditions will also be subjected to the discretion of utilities.

The following conditions will directly block the synchronization function and VSS operation:

i. Single and two phase voltage failure.
ii. Tripping of VT MCB.
iii. VSS – auxiliary relay failure.
iv. Over and under voltage.
v. Mismatch in close status of bus coupler and bus sections (if applicable)

The failure of BCU or any associated components of VSS in a particular bay will not hinder the extension of bus voltage and thereby allowing closing operation of circuit breaker in all other bays.

VSS fail/anomaly or BCU fail signal from any energized feeder (involved in VSS) is hard-wired to binary input in all BCUs for alarms. However, the soft logic in the BCU shall ensure that this anomaly signal will not block synchronization for new feeder as long as the bus (running) voltage is available from other energized feeder. *The advantage for this logic is to avoid blocking synchronization for the entire substation in case of VSS failure in one particular feeder, as is the case in conventional VSS scheme*.

In case of any failure or abnormality in VSS, the same is communicated to local, SCMS and control centers (TCC/LDC).

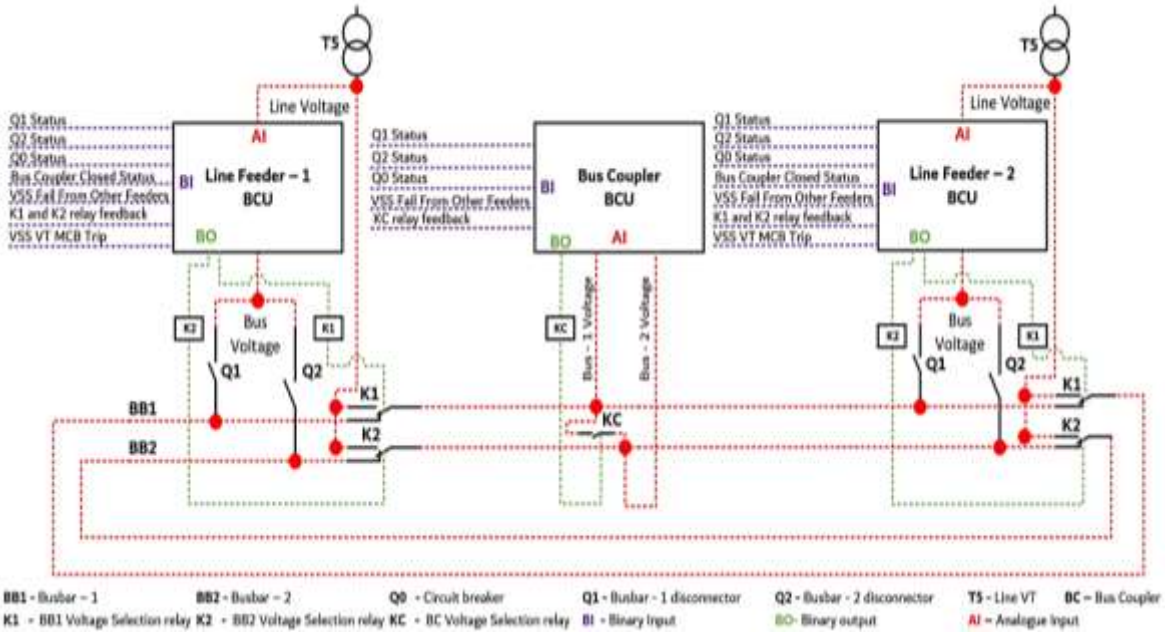

Figure 3: Process Flow chart for Conventional VSS

XI. ADVANTAGES OF DIGITAL VSS

- Digital VSS schemes are purely BCU based software programs; due to that a huge number of auxiliary relays, timers, IVTs, and control wirings are not required. Hence requirement of dedicated voltage selection panels are eliminated in 400/132kV system.
- Requirement of common synchro check relay is eliminated.
- The failure rate is very low due to less components; further it increases the reliability and availability of the system.
- Easy for operation, maintenance and troubleshooting.
- Overall processing time of the synchronization is reduced significantly.
- VSS failure in one bay will not block synchronization of entire substation.

XII. IMPROVEMENT FOR FUTURE

The hardwire scheme is still present in all the above VSS and synchronization schemes for the communication of binary inputs, binary outputs and VT secondary voltages between BCUs and voltage selection relays. Accordingly, there is a scope for further enhancement to fully digitalize the scheme using digital communication protocols (IEC 61850 / GOOSE messaging / TCP/IP) in order to achieve simplified communication methods. Furthermore, DEWA is embarking on implementation of full Digital Substation with redundant integrated bay control and protection units (BCPU) in its transmission substations wherein the digital GOOSE messaging between IEDs (BCPUs) will be deployed for all operational interlocks, VSS, synchronization and protection functions. The availability of main/backup BCPUs and communication channels will ensure complete redundancy in all aspects.

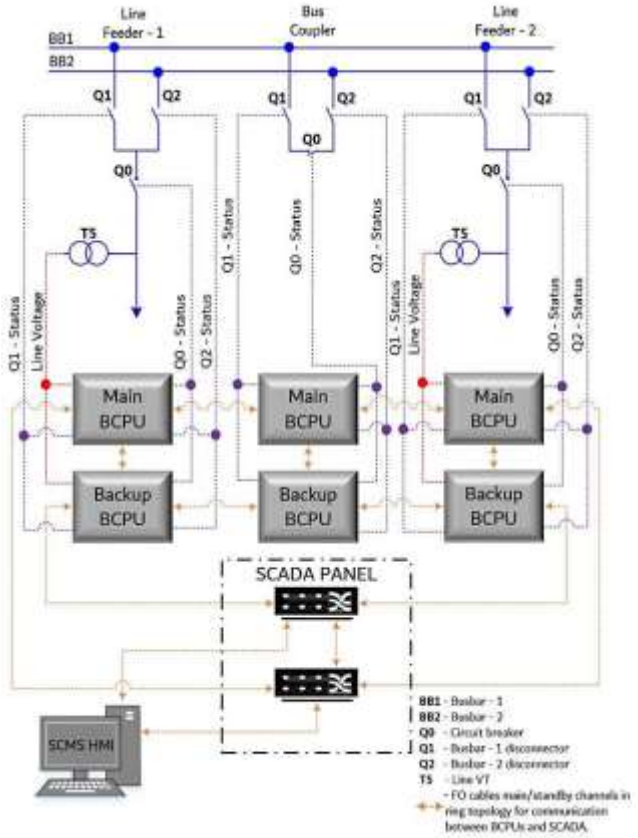

Figure 4: Digital VSS Future Improvement Block Diagram

XIII. CONCLUSION

The voltage selection and synchronization scheme has been implemented to avoid the use of bus VT. The digital version of voltage selection schemes has been adopted in DEWA transmission network (400kV & 132kV) to accomplish simplified and optimized scheme and to reduce overall engineering, installation, testing, commissioning operation and maintenance including troubleshooting time with less probability of failure rate in components. The new VSS is incorporated with the use of available resources within existing BCUs.

In Future, advanced technologies are expected to come up for improvement and innovative solution of existing processes. We shall be ready to adopt the changes and new enhancements in technology because ***"The Change is the only way to improve".***

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Hybrid MAC Protocol for Channel Allotment in Heterogeneous Cognitive Radio Networks

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Abstract— Cognitive radio (CR) is an emergent wireless communication technology. Due to its nature it meets scarcity spectrum, the CR has been provides a keen solution to challenge spectrum scarcity issues by permitting spectrum sharing. The existing static channel allocation system leads to spectrum scarcity. The existing CR medium access protocol CR-MAC protocols have issues like delay, packet collision, and quality of services (QoS) during channel choice randomly. We propose a novel hybrid MAC protocol in light of channel quality approach. The channel quality indicator (CQI) is adopted with each channel in cognitive radio network (CRN). The TDMA based slotted cognitive function (SCF) is used to maintain transmission control. Distributed coordination function (DCF) is used to manage the packets transmission. The priorities are assigned based on the channel weights respectively. The proposed system has minimized the congestion and delay using NS-2 simulation.

Index Terms— CQI, CCC, SCF, DCF, Priority, CRN

I. INTRODUCTION

The wireless communication system is ever-growing demand for great data rate and immense connectivity has required to emerging latest technologies to achieve the great efficiently exploit a finite radio frequency spectrum. The CR has been considered as a shrewd answer for handle the range shortage issue by permitting spectrum sharing [1]. The primary characteristics of CRN are wireless users, random access capability and cognitive radio functionality [2]. The existing static spectrum allocation approach leads to spectrum scarcity. According to CR intelligence, limited spectrum availability and the unused wireless spectrum band, the CRN utilizes these elements to assemble a system to allow its secondary users (SUs) to share and access authorized remote range band with its primary users (PUs) with no mediation with these clients and with no destitution in their QoS [1]. Generally, the idle or free licensed channels are detected by SUs and then it can access the available channels [2]. During the transmission, PUs are occupied the licensed channels and SUs are defer transmission, and voyage to other available channels [3]. In view of the radio nodes that grasps the fitness to make intelligent decision for fluctuating the parameters of transmission, physical layer and those of MAC layer allowing for the deviations in the atmosphere, the capability of cognitive function, CRNs have been strongly recommended [4], [5].

The licensed spectrum should be accessed by SU through the methods such as overlay, underlay or interlace its sign with the present signal [5]. The main objective of the CRs is to reach good existing spectrum the intelligent cognitive functionality and the aptitude of reconfigurable, the problem of the multichannel hidden, sensing error, selection of CCC, delay of sensing the channel, the primary users of interference and the problem of network coordination might cause the MAC protocol to grieve from grave performance degradation [6].

The CR-MAC protocol design could have two methods are institutionalization endeavours prompting the formulation of the IEEE 802.22 working group and application explicit conventions. The prior procedure is particularly focused on framework based systems, in which a brought together coordinator or base station deals with the range designation and sharing among the CR clients. The CR clients, be that as it may, could take an interest inside the range detecting capacity and bear the cost of channel data to the focal controller. The institutionalization endeavours cause consistency in structure and arrangement, consequently allowing various autonomous CR administrators to exist together. On the other hand, application or states of affairs specific protocols are optimized for a particular type of atmosphere, or user specified application goal [7].

Recently, the wireless communication systems seek the better reliability and best QoS levels. For the most part continuously application, divergent clients are plausible to endure different dimensions of deferral for each administration, rendering important to consider the effect of QoS requirement in remote framework's investigation. A satisfactory metric that examines the measurable QoS ensures under time-fluctuating channel conditions is the viable limit metric [8]. In CRN, the architecture of the spectrum sharing mechanism offers the range sharing administration between Primary Networks (PNs) and Secondary Networks (SNs). In underlay approach, the higher need is doled out to PUs. In CRN, the significant job of dynamic range sharing is to permit both PNs and SNs to impart synchronously on the equivalent recurrence with appropriate impedance control to have PNs. In explicit, it is normally basic that a specific impedance temperature limit because of SUs' transmissions must be kept up at every

essential beneficiary. Along these lines, control designation for SUs ought to painstakingly be performed to meet stringent impedance prerequisites in this range sharing model [9].

The SUs should cooperate with all nodes to perform spectrum sensing, cooperative spectrum sensing problems has recently expanded much importance due to its ability fading and interference [10].

In [11] multi-constraint QoS mindful MAC convention (MQ-MAC) for a group based psychological radio sensor organize has created. The information channel and a reinforcement channel are designated to SUs through the separate cluster head (CH) by utilizing dynamic divert needs in MQ-MAC convention. The CHs used to framing the channels into ideal and moderate channels and distribute them among the quantity of hubs standing to their traffic needs. At that point the channels states are portrayed as positive or negative channel. The CH and its individuals are utilized CCC for channel state, is static which prompts clog. In [12] a dynamic asset assignment and need based planning for heterogeneous administrations in CRN has been created. The Secondary Base Station is the most in charge of asset distribution for SU. The SUs in SNs are ordered into four arranged

SU with Minimum-Rate Guarantee (MRG) SU with Minimum Delay Guarantee (MDG)

SU with Minimum-Rate and Delay Guarantee (MRDG) SU with Best Effort Service (BES)

For every approaching bundle streams, the parcels need is determined on the administration type and lining delay. The target capacity of channel quality pointer is evaluated for each stream by increasing the need with channel gain. At that point the streams are put away in the diving request of postulations target esteems, and after that allotted to the individual classification of SU.

As an extension to this work, we propose to plan a channel quality based hybrid MAC protocol CRNs. The remainder of this paper sorted out as pursues, in area II we examined about the related work, in area III Channel quality based hybrid MAC convention is presented, in segment IV Dynamic CCC methodology is presented, in segment V proposed algorithm, in segment VI reproduction results are talked about and in segment VII conclusion.

II. RELATED WORK

They investigated the joint ideal detecting and appropriated Medium Access Control convention plan issue for CRN.

They investigated the designing problem of cooperative optimal sensing and MAC protocol for CRN. Then, they formulated throughput maximization algorithm to boost the complete throughput of the auxiliary system to accomplish noteworthy execution additions of the ideal detecting and convention setup [9].

They proposed TDMA based vitality proficient psychological radio multichannel MAC convention called ECR-MAC for remote Ad Hoc systems [13]. They built up a multi-obliged QoS mindful MAC convention, MQ-MAC, for a group based CRSN. In MQ-MAC, and organized as for the desperation of their produced information packets [11].

They proposed MAC convention with the crash free access to the present information channels and further they introduced the arrangement of reservation of free channels by secondary's for stretched out periods to expand usage without influencing risky obstruction to primaries [14]. They proposed a parallel detecting plan with consecutive channel choice request as a component of MAC convention and they assessed the vitality effectiveness and throughput of the framework [15]. They proposed a lowest ID clustering algorithm and generic algorithm for fairness improvement [16].

They presented an Antenna selection (AS) scheme; specifically, they exhibited a joint transmit and get numerous AS strategy for underlay CR condition, thus keeping up the multiplexing benefit of Multiple Input Multiple Output (MIMO) systems[17]. They proposed an agreeable and a non-helpful multichannel (MC)- MAC convention and the reasonable multichannel (FMC)- MAC convention for subjective radio impromptu system (CRAHN). Besides a scientific model by Markov chain is developed for FMC- MAC and the presentation measures are determined [18].

III. CHANNEL QUALITY BASED HYBRID MAC PROTOCOL

In this paper, we propose to design a channel quality based MAC (CQHMAC) protocol for CRNs. Channel Quality Indicator (CQI) used to find every channel quality in the presented networks [19]. The best quality of channel is preferred as the CCC and dynamically changed in all round. The control of the transmission controlled by Omni-directional TDMA based Slotted Cognitive Function (SCF) and the information transmission is constrained by directional receiving wire based Distributed Co-ordination Function (DCF) [20]. Different weighted values with the channels are assigned to the SUs based on their category [12]. The highest weighted channels are allotted to SU with higher priority.

Channel Quality Indicator

The channel quality indicator (CQI) is utilized to quantify the channel quality amid the correspondence. The CQI is adjusted with each sub diverts in the system. The usefulness of CQI of any sub channels are characterized utilizing signal- to-impedance in addition to clamour proportion (SINR) distinguished by the SU-BS amid channel allotment and getting to access.

The CQI is calculated as

$$CQI = \log_2(1+SINR) \quad (1)$$

The SINR is calculated as

$$SINR = \frac{\rho_{signal}}{\rho_{i+\sigma}} \quad (2)$$

Where ρ_{signal} is an incoming signal power, ρi is the power of the interference and σ is the noise respectively.

If ρi = 0, then the SINR is reduced to Signal-to-Noise Ratio (SNR).

IV. DYNAMIC COMMON CONTROL CHANNEL SELECTION

We considered G be the cognitive radio, amid the correspondence the CQI is utilized to gauge channel quality and channel allotment to SU. The CQI can rely upon G area and the spatial circulation of neighbouring Gs and clamour at the season of the estimations.

Common control channel (CCC) is proposed as the token ring system to ensure a reasonable and dispute free medium access for all ring-taking an interest Gs. Token ring convention ensures most extreme inactivity for the system through a token holding time (Tho) parameter.

Tho denotes to the most extreme period that each ring contributing hub is admissible to transmit before passing the token. Considering N ring contributing nodes which are accessing the medium, the network layer can upper bounded by the maximum token rotation time (Tro). Considering N ring partaking hubs which is getting to the medium, the system layer is upper bounded by the maximum token rotation time (Tro)

$$T_{ro} = NT_{ho} \quad (3)$$

Note: N is announced within the tokens

Thus, the estimation of CQI for one direct can be performed in limited time, as it is ensured that a given Gj can attends every ring-participating neighbor within one Tro period.

In addition, for multiple available channels, the time required by G to scan a set Q of spectrum opportunities,

$$T_{sc} = QCTho \sum_{geG} N_g \quad (4)$$

$$MR_k \geq MR_k^{\min} \forall k \in K_A \quad (6)$$

$$MR_k \geq MR_k^{\min} \forall k \in K_A \quad (5)$$

The best effort service can be calculated as

$$\frac{MR_k}{\sum_{i \in KB} MR_i} = \delta_k \forall k \in K_B \quad (6)$$

$$\frac{MR_k}{\sum_{i \in KB} MR_i} = \delta_k \forall k \in K_B \quad (6)$$

Where, δk, ∀k∈KB is the predetermined value.

The stream with most astounding target work is apportioned to the MRDG, trailed by MRG and MDG. The stream with least target work is doled out to BE

Directional Antenna based Distributed Co- ordination Function (DCF).

In this procedure, a reception apparatus list number (Z) is included RTS and CTS message positions. This causes neighbour hubs to hinder its Network Allocation Vector (NAV) in relating radio wire headings amid information transmission.

At the point when the directional RTS and CTS messages are communicated, the hub will start its information transmission and sit tight for affirmation in directional receiving wire. Likewise, hubs inside the system will communicate its application information in their chose real channels. With directional receiving wires, interface total throughput gets improved with insignificant channel conflict delays.

The main advantages of this technique are as follows:

- Data transmission with directional reception apparatuses limits hub and system vitality utilization with obstruction concealment.
- The D_REQ and D_RES in SCF task discovers impact free information channel for directional transmission.

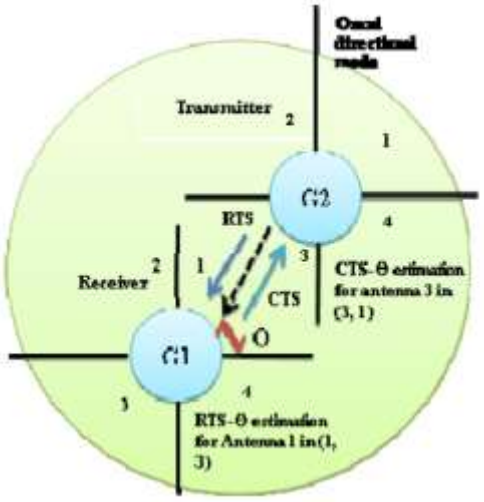

Figure1. AOA Estimation

V. PROPOSED ALGORITHM

STEP :1 Define the sub channels with weight K1: Minimum-Rate-Guarantee-with- SU K2: Best-Effort-Service-with – SU
STEP :2 SU send the request to SU-BS for sub- channels
STEP :3 SU-BS checks δk, n values and ask BS about the sub-channel
If (δk, n = 1)
Request Terminated Else
STEP :4 For communication single half duplex radio transceiver is used for communicating in opportunistic PU free channel.
STEP :5 N numbers of directional antennas are used.
STEP :6 Then calculate antenna coverage distance Coverage area = 2π/k radians
STEP :7 GPS is embraced to CR for identification of the location information.
If (GPS = Threshold value)
STEP :8 The TDMA based slotted cognitive function is used to control the transmission traffic.
If (SCF = ON)
Then location information transmitted to all neighbors.
If (CR-Transmitter = Location- Information)
Then identified closed channels Avoid overlap
Else
Request Terminated.
STEP :9 TDMA-based-SCF provides strict node synchronization during cognitive control message exchange through TDMA-MAC.
If (Control Channel = Available) then
Channel access and synchronization take place
Else
Request Terminated
STEP :10 Check the channel quality at SU-BS If (CQI = Threshold Value) then Channel Selected
Else
Request Terminated
STEP :11 Priority queue is assigned to each SU STEP :12 Each node is equipped with one
transceiver which is used to control data transmission.
STEP :13 If (CCC = Enable)
Then PU free channel list is identified. Else
Request Terminated.
STEP :14 The highest priority channels are broadcasted to its neighbors then
Priority queue is updated for each transmission
Else
Request terminated STEP :15 Check CQI at SU-BS
If (queue size Threshold value) Then
Request Terminated
STEP :16 Check the allocated transmission power to the channel
If (Transmission power < Total Power) Then
Data transmission takes place Else
STEP :17 Power allocation take place for selected sub-channel with SU
STEP :18 Data transmission takes place. STEP :19 Check CQI at SU-BS
If (CQI Threshold) then Request terminated
Else
STEP :20 Goto STEP: 8

VI. SIMULATION RESULT

The proposed CQHMAC Protocol is simulated in NS2 and compared with Interference Aware Hybrid MAC (IAHMAC) [20] and Cognitive MAC with mobility support (CMMAC) [21] protocols. The simulation settings are summarized in Table 1. The performances of these protocols are evaluated in terms of the metrics CBR-throughput, EXP- throughput, Video-throughput, packet delivery ratio.

In 50 nodes scenario, the data sending rate and number of secondary transmissions are different.

In this experiment, the data transmission rate is varied from 100 to 500kb.

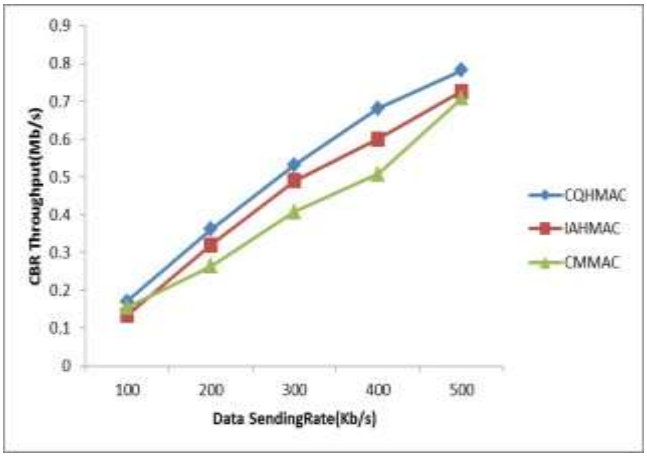

Figure 2. CBR-Throughput for varying rate

Figure 2 shows the CBR-Throughput measured for CQHMAC, CMMAC and IAHMAC when the rate is varied. The rate is increased from 100 to 500Kb, throughput of CQHMAC increases from 0.17 to 0.7, the throughput of IAHMAC increases from 0.13 to 0.72 and the throughput of CMMAC increases from 0.15 to 0.7. Henceforth the throughput of CQHMAC is 12% of higher once compared to IAHMAC and 18% of higher than CMMAC.

Figure 3 shows the EXP-Throughput measured for CQHMAC and IAHMAC when the rate is varied. The rate is increased from 100 to 500Kb, the throughput of CQHMAC increases from 0.10 to 0.36, the throughput of IAHMAC increases from 0.06 to 0.33 and the throughput of CMMAC increases from 0.08 to 0.28. Hence the throughput of CQHMAC is 17% of higher when compared to IAHMAC and 21% of higher than CMMAC.

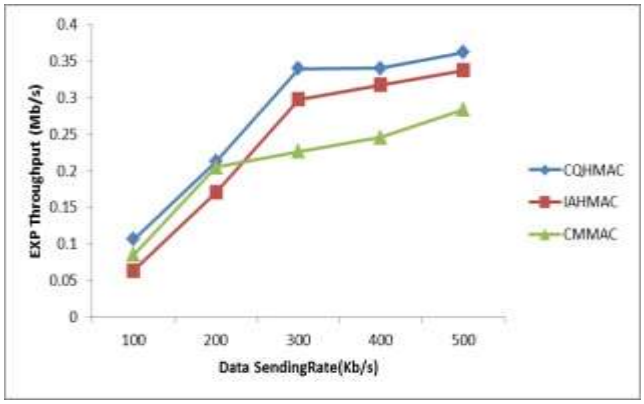

Figure 3. EXP Throughput for varying rate

Figure 4 shows the video-throughput measured for CQHMAC and IAHMAC when the rate is varied. The rate is increased from 100 to 500Kb, the throughput of CQHMAC increases from 9.2 to 9.3, the throughput of IAHMAC decreases from 3.1 to 2.9 and the throughput of CMMAC goes from 2.35 to 2.44. Hence the throughput of CQHMAC is 68% of higher when compared to IAHMAC and 75% of higher than CMMAC.

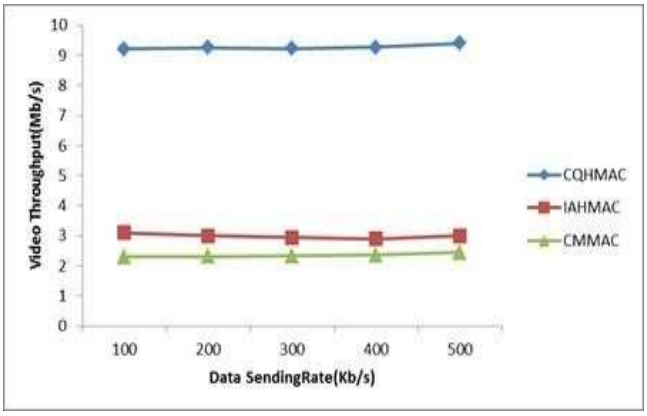

Figure 4. Video Throughput for varying rate

VII. CONCLUSION

In this paper, we have proposed to structure a channel quality based MAC convention psychological radio systems. Here a channel quality indicator (CQI) is utilized as an utility capacity for each channel. At that point a channel with best CQI is picked as the CCC and progressively changed in each round. Omni-directional TDMA based Slotted Cognitive Function (SCF) is utilized for control transmission and directional radio wire based Distributed Co-ordination Function (DCF) is utilized for information transmission The channels with higher loads are doled out to higher need SU. By simulation results, we have shown that the proposed technique minimizes congestion and delay.

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A study on the Impact of Procurement in Promoting Effectiveness of Logistics Operations of Retail Organizations in the UAE

Arun Karthik Banasthali

Abstract— The retailing business has been expanding globally and many multi-national chains are getting established in almost all the countries of the world. From customer's point of view, multitude options are available as all the brands in the global market is available everywhere. The market place has become market space and to link the customers, meta-marketers got established. In the wake of this retail market explosion, the retail sales organizations have been constrained by complex limitations imposed in the form of price wars, discounts, offers etc. Many of the retailers have adopted everyday low price strategies to attract massive customer traffic with the expectation to promote cross selling. Since price wars are rampant, it is difficult for retailers to earn better margin of profit as it can be found that their costs have been increasing whereas the prices are falling. In order to maintain and sustain the market share, firms are forced to reduce the cost by resorting to various operational measures related to procurement, inventory decisions and logistics management. Hence, in this paper an attempt is made to explore the impact of procurement and its various elements in promoting effectiveness of logistics operations in retail organizations in the UAE.

Index Terms— Retailing, Multi-National Chains, Global Market, Market Place, Market Space, Customers, Meta-Marketers, Price-Wars, Discounts, Offers, Every Day Low Pricing, Customer-Traffic, Cross Selling, Market Share, Procurement, Inventory Decisions, Logistics Management

I. INTRODUCTION

The economic outlook from global perspective signals that the integral part of economic growth is the structural transformation of economies through a gradual shift from primary sector to manufacturing sector and finally to the tertiary sector (Noland, Park and Estrada, 2012). One of the fastest growing sectors in service industry has been retailing which is projected to reach a figure of 30 trillion USD by the end of the year 2023 (Deloitte, 2019) and the retailing that comprises of various activities such as grocery stores, restaurants, clothing, bookstores, stationery, toys, technology products etc., has been growing at exponential rate by permeating to sub-urban centers and even rural centers from urban spots during the last two decades (Kearney, 2019). The world's top ten retailers grabbed 31.6% of the total revenue during the year 2017 which is around 0.9% increase as compared to 2016 and the top three retailers maintained their top position with Walmart in number one position while Amazon gearing up to number two position (Deloitte, 2019). In the Middle East also, the same trend is visible as retailing has been growing at a rate of 3.9% over the past few years due to the increasing per capita income, population growth, higher consumer spending and opening up of the market (Government.ae, 2018). In a country like UAE which is one of the leading economies in the Middle East and Africa region, the retail industry has been growing at a rapid momentum during the last two decades due to the development of infrastructure, opening up of the market and immigration of various nationalities across the world in search of employment opportunities. Of late, the competitive scenario has undergone rapid change due to heavy competition in between the global players in this market along with many local retail chains and many retailers adopt various cost controlling techniques to promotion operational effectiveness in the market place irrespective of their size (Wilson, 2011; Eckel, 2009).

II. BACKGROUND OF THE STUDY

The developed countries of the world such as Western Countries and the US have been witnessing unprecedented trend in the development of retailing activities since 1990s onwards as a part of urban dynamics by focusing on retail formats restricted within urban pockets of all these countries (Espinosa, 2011; Massad, Víctor, Mary and Joanne, 2011). Gradually the retail formats got percolated to the semi-urban and rural pockets through infrastructural building in these countries (Reardon, Henson, and Berdegué, 2007). The same trend has been witnessing in the other parts of the globe since 2000 onwards due to the liberalization and globalization trend that started during 1990s (Reardon, Timmer, Barrett and Berdegue, 2007). The retailing trend acquired strong accelerated momentum after the development of logistics across the world which enabled organizations to move goods and services across the globe within limited time span with higher level of accuracy in delivery (Manners-Bell, 2017). In order to generate these results in logistics and to connect it with retailing, development of technology has played a significant role as organizations around the world has been adopting various new technological tools to enable logistics to perform all the activities accurately within restricted time, cost and effort. All these trends got developed through

various stages in the development of retailing in the world and the assimilation of retailing with logistics and technology got developed during these stages. In the United Arab Emirates, the people habitation is only in the urban centers and as urban centers are focus of attention of shopping malls and modern infrastructure, the retail formats are getting more and more favorable opportunities to flourish; it is possible to witness internationally renowned retail brands in all types of products. Due to the strategic location of the country, availability of most modern infrastructure and as it is one of the leading economies in the Middle East, the country has gradually evolved as a logistics hub. Since the success of retailing depends upon the effective management of logistics that comprises of the movement of goods throughout the supply chain system by way of procurement, materials handling and physical distribution system, firms have been found to focus on each element in the logistic system to generate operational efficiency and thereby create competitive advantage. Among the various elements of the logistics system, procurement can be considered to be very crucial, as an effective procurement system can generate far reaching effects on the overall operational performance of the retailers as it enable them to reduce various costs and thereby able to compete on the basis of price (Mentzer, Stank, and Esper, 2008).

III. RETAILING AND LOGISTICS

The retailing and logistics are interconnected as it works together to make the product available to the ultimate customers. It is estimated that on an average nearly 50% of the sales income in a business firm is spent on logistics operation (Chunawalla, 2009) and nearly 70% of the annual business turnover of transport firms depends upon logistic (Burnhan and Anderson, 2009).

3.1. Retailing

The term 'retail' is derived from the French term which means "to cut again". Practically, retailing is a disbursing function where the bulk is cut into small lots and then sell it to the customers. It can be treated as a socio-economic system that interlink people together in a process of exchange of goods and services for considerations which are minute and thus integrate the need of different actors in the system such as consumers, manufacturers, agriculturists etc which not only satisfy the day to day requirements of life but also creates new lifestyle and thus prosperity of the community (Rudrabasavaraj, 2010). Thus it consists of activities involved in selling directly to the final consumers of a product for personal use and it embraces direct interface with the ultimate customers through sales activities of the producer or manufacturer, either through directly owned stores or through distribution system that supply goods to house to house or through direct mail order business activities. Thus it involves direct first hand transaction with the ultimate consumers or customers (Ramaswamy and Namakumari, 2002; Berman and Evans, 2001; Dhotre, 2010; Amit & Kameshvari, 2012).

3.2. Logistics

Logistics is that part of supply chain system which plans, implements and controls the forward and backward flow and storage of goods and services and information in between the point of origin and point of consumption, so as to meet the customer requirements effectively and efficiently (CSCMP, 2020). This implies that the right product, at the right location in right time and in right condition is made available to the target customers. The table shows the logistics dimensions of a retail concept.

Table 1: Various Components of Logistics Management
Logistics Management

Materials Management		Physical Distribution Management
Procurement Activities	**Inventory Decisions**	
1.Material Specifications	1.Raw Materials	1.Finished Goods Inventory
2.Value Analysis	2.Warehousing	2.Outbound Transportation
3.Supplier Research	3.Packing Materials	3.Field Inventory
4.Negotiation	4.Assembly	4.Sales to Customers
5.Buying		5.Customer Service
6.Quality Assurance		6.Reverse Logistics
7.Inbound Transportation (Buying)		

The table 1 shows the various elements in logistics management which are inter-related to each other. From the above, it is clear that the logistics is very closely linked to cost, time and service (Fernie, Fernie and Moore, 2013). These elements become remarkably expensive if not managed effectively. Holding stock involves various types of hidden costs, developing a distribution center need heavy investment and transportation involves high level of risk due to unforeseen situations. Among the three different areas mentioned in the table, the procurement is the gateway which enables the products to enter the system. If procurement activities are not streamlined, monitored and properly controlled, it will breed various inefficiencies in the system in the form of cost escalation, quality deterioration, delay in delivery which ultimately leads to decreasing margin and increasing customer dissatisfaction (Kotler and Keller, 2012).

IV. LITERATURE REVIEW

Traditionally logistics has been considered as an operational factor and thus treated as outcome of the strategy of a company (Sandberg, Abrahamsson and Kihlén, 2011). Scholars and researchers focused on development of logistics strategies without giving any attention to profitability and growth (Abrahamsson and

Rehme, 2010; Schramm-Klein and Morschett, 2006). Of late, experts in the field have realized the importance of various components of logistics such as procurement, inventory decisions and physical distribution management in promoting the operational efficiency and effectiveness of logistics so that the firm can develop sustainable competitive advantage through generation of better margin of profit and improved customer satisfaction (Schramm-Klein & Morschett, 2006). In logistics, one of the major components that creates an interface between external supply system with the internal processes has been the procurement process (Humphreys, Lo and McIvor, 2000). The successful fulfillment of the entire operational activities that follows procurement depends upon the effectiveness by which the procurement and its related components are managed by logistics system (Möller, Kristian and Pekka Törrönen, 2003). The logistics system can fulfill its core goals of customer satisfaction and high profit margin by a well synchronized integration of various components of procurement, inventory decisions as well as physical distribution management system.

V. RELEVANCE OF INDUSTRY AND COUNTRY SELECTION

The retail sector in UAE is one of the fastest growing segments of business in the UAE, with an annual retail turnover of $56.60 billion in 2016 which is expected to exceed $71 billion by the end of 2021 with a CAGR of 4.9% (www.dubaichamber.com). The sector accounts for 11% of the country's GDP. Even the e-commerce market has been gaining strong acceptance in the entire GCC which is expected to achieve $41.50 billion by 2020 with a market share of 53% for UAE followed by KSA (14%), Oman (12%) and Qatar (10%) (Alpen Capital 2017). According to CBRE Group study on global retailing, Dubai has the presence of 62% of the international retailers whereas it is 55.3% in Shanghai, 51.7% in London and 46.3% in New York. Since UAE has emerged as a major global retail center, we can see the presence of almost all the famous retailers in the country now. Since the Govt., has been following a liberal policy towards opening up the market for global players, the market has become highly competitive due to the rivalry between existing competitors, threat of entry of global players, strong threat of substitute products manufactured locally, customer bargaining power as well as supplier leverage (Porter, 1990). The existing retailers are competing by offering massive price discounts which is a regular feature of the UAE market now. Majority of the retailers go for price discounts up to 70% to 80% on weekdays. Along with this, new retailers are entering the market with economies of scale in global operations. Substitute products are entering the market as majority of the leading retailers have developed own brands for almost all the FMCG products now. Customer leverage is experienced in the supply chain system wherein almost all the leading retailers negotiate for consignments sales and vendor managed inventory (VMI). The overall impact of this strong competitive trend has eroded away the profit margin of almost all the supply chain partners who are involved in the movement of logistics in the retail system. Due to the decreasing margin of profit in retailing, majority of the retailers have been found to focus on promoting operational efficiency by maintaining strong control over procurement and its related activities.

VI. RESEARCH PROBLEM

Price competition is rampant in UAE retail industry, irrespective of the fact that whether the retailing firm is big or small. It can be found that the retailing industry has gradually become more and more oligopolistic in the country due to the emergence of large retailers, which are local firms as well as international entities. Since the competitive framework resembles to the Five Force Model of Michael E. Porter, it is difficult for small firms to survive, majority of the firms focus on competing on price war. The big retail entities reduce prices on holidays and weekends to grab the market share and the reduction of price forces them to satisfy with decreasing margins (KPMG, 2018). Hence, many retailers focus on reducing the operations costs by focusing on procurement and inventory maintenance related areas. Firms follow various methodologies such as branding own products, vendor managed inventory (VMI), global procurement etc., to reduce the cost and thereby maintain fair margin of profit. So the research topic is an attempt to study the impact of procurement and its various elements on the effectiveness and efficiency of the overall logistics operation of the retail chains that operate in the UAE.

VII. RESEARCH QUESTION

Question 1:

Is there any existence any relationship between procurement and the overall performance of the logistics operations of the retail chains in the UAE?

Question 2

What is the impact of procurement and its various components on overall cost and time of the logistics operations of the retail chains in the UAE?

Question 3

By improving procurement operations, is it possible for a retail chain to improve its performance in the form of better customer service and improved margin of profit?

VIII. OBJECTIVES OF THE STUDY

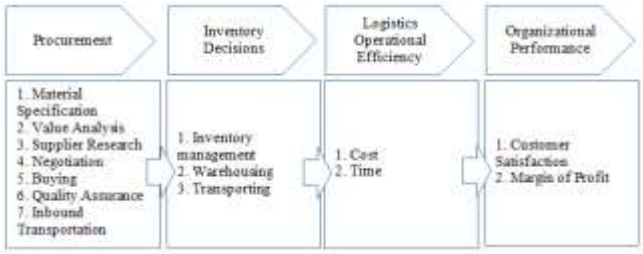
UAE has been witnessing unprecedented transformation in the field of retailing, as giant retailers are gradually taking control over the market by utilizing economies of scale in operations and technology application. The market rule is framed on the basis of the old adage of the survival of the fittest. The overall aim of the study is to find out the role of procurement and its impact on overall performance of the retail chains that operate in a country like UAE. The major objectives are:

1. To find out the impact of procurement and its various elements on cost and time of logistics operations of the retail chains.
2. To establish relationship between procurement and overall performance of the retail firms.

IX. MODEL OF THE STUDY

Based on the objectives of study and research, a conceptual model is postulated to examine the relationship between procurement and the logistics performance of the retail chains. The performance of the logistics operation is measured in terms of cost reduction and time savings. The model framed is provided in the figure 1.

Figure 1. Conceptual Framework of the Study



The conceptual model of the study is outlined in figure 1. The model attempts to trace out the relationship between the procurement activities and inventory decisions to explore the impact of these variables on cost and time taken by the retail chains in managing the operational activities related to logistics. By linking relationship between these variables, the study attempts to find out the impact of these variables on the performance of the retail chains by measuring the customer satisfaction as well as the margin of profit earned by the firms. The primary focus of the study is on the logistics operation of the hypermarket chains in the country. A brief outline of the various components considered in the study are furnished below.

Seven variables are considered in procurement. Out of the variables, material specification is not an important factor for the hyper-market chains as they are procuring branded goods manufactured by reputed organizations. The only area where the retailers gives importance is certain local products and food materials. There are strict government regulations are implemented for the sale of products that are consumed by people. The other six elements are important as the retailers has to give priority to these factors due to its importance in business operations. Value analysis is of utmost importance as the procurement department has to consider whether the product generate value to the company during the course of its procurement and storage and distribution to various branches of the outlets that are located in different parts of the country. The supplier research, negotiation and buying is crucial as many of the major retailers give primary importance to these variables as it can influence the margin of profit through price bargaining, developing contractual relationship for establishing VMI (vendor managed inventory) etc. Quality assurance is important in the case of many products as the government scrutiny and monitoring is very high in the country in connection with the quality standards. The last element of procurement, the inbound transportation, is of crucial importance due to its impact on cost of transportation. It has been found that many retail chains depend upon FOB pricing while procuring the goods from other countries of the world.

In the case of inventory related decisions, the most important factors considered are the management of the inventory, maintenance of warehousing and utilization of internal transport network by the retailers to distribute the products to different branches located in different parts of the country. This aspect is very crucial as these retailers have been maintaining well established warehouses in the free zones and many of the retailers are found to implement most modern inventory management system through automation. In the operational efficiency area, two major factors are considered, the cost and time consumption by various activities related to logistics operations. The impact of procurement and inventory decisions are analyzed by looking at its influence on cost management and time management by linking it with movement of goods, flow of money, flow of information and the return merchandize management.

X. SCOPE OF THE STUDY

The scope of the study is vast in the sense that we live in a world of globalization and retail organizations are operating in a borderless world, as retailing has taken the non-spatial approach through the application of online business, e-procurement, e-retailing etc. Customers' expectations have been increasing and instant satisfaction of requirements has become a need of the retail system now. Both individuals as well as business units expect to get goods faster, more flexible with the lowest delivery cost etc. Manufacturing is becoming more and more customized and retailers are competing to retain the customers. Hence the scope of this study extends to all the various activities related to procurement of goods, maintenance of inventory levels, adoption of modern supply chain system, application of modern technology in procurement and inventory related activities, physical distribution management, the link between stock maintenance and customer service, quick response system etc.

XI. IMPORTANCE OF THE STUDY

The study is important as the information provided will enable the firms and its stakeholders to have a deeper insight into the various aspects of procurement, inventory decisions, the influence of cost and time on operational efficiency, improvement of customer service, implementation of quick response system, minimization of distribution cost, management of physical distribution, management of product lines, application of modern logistics and supply chain system etc. The study also will

impart information on adoption of operational measures to ward off the problem of contraction of product life cycles.

XII. RESEARCH METHODOLOGY

The study is an empirical study conducted to explore the association of procurement on inventory decisions through its impact on elements such as cost and time, so that the firms that operate in the retail industry can reap better margin of profit and improved customer satisfaction. The methodology adopted in this study is based on 'research onion' developed by Saunders et al., (2009). The onion offers an exhaustive explanation of the important layers or stages that are to be followed to formulate an effective research methodology (Bryman, 2012). The layers of the research onion are philosophy of research, approaches to research, strategy, time horizon, choices and methods of data collection and these elements provide requisite information to conduct a research study.

12.1. Research Philosophy

In this research study, it is proposed to use "positivism research philosophy" coupled with interpretation as the researcher assumes that the research problem is going to be addressed in objective manner with quantitative data which is value free. Positivism depends on observation and quantity (Easton, 2000) and hence in this project researcher has used positivism because the researcher emphasizes on methodology to enable quantification and replication of observations for statistical interpretations (Denzin and Lincoln, 2011) based on data collected through questionnaire.

12.2. Research Approach

Research approach is a plan that consists of various steps of making broad assumptions, detailed method of data collection, analysis and interpretation (Creswell, 2014). In this research study, a deductive approach is applied by developing certain hypothesis related procurement and its various elements, inventory related areas of logistics as well as the performance of the organization in the form of better customer satisfaction and higher margin of profit. Here the researcher is using deductive approach which helps to formulate a set of hypotheses to design research strategy to test the hypothesis and through this the hypothesis is tested using various quantitative statistical tools such as correlation, mean, median and mode, standard deviation etc. The hypothesis is based on the relationship between procurement practices, inventory related decisions, its effect on cost and time of operation of logistics and finally its impact on customer satisfaction and organizational profitability.

12.3. Research Design

Since the study focuses on exploring the relationship between procurement, inventory decisions, cost and time and its ultimate impact on organizational profitability and customer satisfaction, it is pertinent to consider only the characteristics of the phenomenon without assessing why it happens or occurs. Apart from this, the generalization made from the study is applicable to the whole retail firms that operate in the UAE as well in different countries of the world. In addition to this, since the study focuses only on single sample group which is the staff employed in the retail industry without any comparison with other industries, the descriptive design can be treated as the best design application for such a study (Brinkmann, Jacobsen & Kristiansen, 2014). Historical

12.4. Collection of Data

The data needed for the study is collected by way of two different sources such as primary source as well as secondary source. The primary data is sourced from the samples selected for the study in which a detailed questionnaire is used to derive information on topics related to procurement, inventory management, warehouse management as well as distribution management of the selected retail chains that exists in the country. The secondary data is obtained from sources such as textbooks, journals and magazines, database of selected retail chains, data maintained by chamber of commerce and other related governmental agencies in UAE. The secondary information is used to develop the theoretical and conceptual frameworks in the literature review also.

12.5. Sampling

The sampling strategy is chalked out based on a rigorous sampling plan so as to avoid undue bias in the sample selection. The universe of the study is the total staff that is employed in selected seven hypermarket chains in the country which amounts to a total staff strength of 16470 people. Out of this total population, a sample of 300 staff members are selected to derive information related to various areas such as procurement, inventory management, operations and distribution management.

12.6. Questionnaire

A comprehensive questionnaire was designed to elicit information from the primary respondents. The distribution of questions in the questionnaire is broadly divided into four broad areas based on the conceptual framework of the study mentioned earlier. The four broad areas are procurement, inventory decisions, operational efficiency and organizational performance. In order to collect information on procurement and its seven various components, 70 questions were asked. In inventory decision area of logistics management, 30 questions were designed which is distributed as 10 questions each on three different components such as inventory management, warehouse management as well as transportation management. In order to derive information on operational efficiency of logistics operations, 20 questions were employed to derive information on cost and time. For collecting information on organizational effectiveness, 20 questions were used for the two components such as organizational profitability and customer satisfaction. Thus the total number of questions in the questionnaire is 140 which enabled the researcher to

obtain a detailed information on various aspects of logistics operation and its impact on organizational performance.

12.7. Scaling Technique

For this research work, a 5 point Likert scale is used which enabled the respondents to provide freedom to select own opinion as well as well as it was found to be easier for the researcher to conduct the survey by saving time and effort. The scale and rating is furnished in table 2.

Table 2: Likert Scale

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

The questionnaire is validated by content validity and face validity as the researcher adopted a trial initially during the month of July-August 2020 to assess the relevance of the questions.

12.8. Research Ethics

Utmost care and vigilance is adopted to fulfill all the ethical considerations and thereby safeguard the interests of all stakeholders who comes under the ambit of the sample and collection of information. The following factors are given importance to ensure fulfillment of ethical considerations:

1. Voluntary nature of participation in the survey by the respondents
2. Strict confidentiality of the information given by the respondents
3. Avoiding collecting sensitive information from informants
4. The information collected has been used only for ethical purpose by keeping confidentiality.

XIII. ANALYSIS OF DATA

The collected data is classified, tabulated and coded to make it highly structured so that further statistical treatment is possible to derive information from the data. The analysis of data is furnished in two different broad headings which is furnished under the following part of the content of the study.

13.1. Validity and Reliability Check

To check the reliability and internal consistency, the Cronbach's Alpha coefficient is used. The coefficient is based on correlation variables and higher value shows higher consistency and reliability. A value of 0.7 is considered to be an internationally accepted standard but studies relating to human behavior and psychology consider a value less than 0.7 is also valid. The Cronbach's alpha values of the different categories of questionnaires in the survey are furnished in table 3.

Table 3: Data on Validity and Reliability Check.

Sl. No.	Description of Variables	No of Items	Cronbatch's Alpha Values
I	PROCUREMENT		
(i)	Material Specification	10	0.697
(ii)	Value Analysis	10	0.537
(iii)	Supplier Research	10	0.689
(iv)	Negotiation	10	0.763
(v)	Buying	10	0.721
(vi)	Quality Assurance	10	0.890
(vii)	Inbound Transportation	10	0.770
i to vii	**Total Items Under Procurement**	**70**	
II	INVENTORY DECISIONS		
(i)	Inventory Management	10	0.788
(ii)	Warehouse Management	10	0.804
(iii)	Transportation Management	10	0.722
i to iii	**Total Items Under Inventory Decisions**	**30**	
III	LOGISTICS OPERATIONAL EFFICIENCY		
(i)	Cost	10	0.885
(ii)	Time	10	0.816
i to ii	**Total Items Under Logistics Efficiency**	**20**	
IV	ORGANIZATIONAL PERFORMANCE		
(i)	Customer Satisfaction	10	0.664
(ii)	Margin of Profit	10	0.736
i to ii	**Total Items Under Organizational Performance**	**20**	
I+II+III+IV	**Grand Total of Items**	**140**	

The result indicates that one variable stands relatively below acceptable value which is value analysis that shows a Cronbatch's Alpha value of only 0.537 that is below the threshold value of 0.700. There can be possibility that the

respondents might not have properly understood the concept of value analysis and its relationship with procurement.

Table 4: Summary Statistics on Different Variables Under Study

Sl. No.	Description of Variables	Mean	Standard Deviation	Number of Items
I	PROCUREMENT			
(i)	Material Specification	3.665	0.437	10
(ii)	Value Analysis	3.732	0.389	10
(iii)	Supplier Research	4.561	0.562	10
(iv)	Negotiation	4.667	0.499	10
(v)	Buying	4.516	0.504	10
(vi)	Quality Assurance	3.489	0.457	10
(vii)	Inbound Transportation	4.675	0.592	10
i to vii	**Mean Value of Procurement**			
II	INVENTORY DECISIONS			
(i)	Inventory Management	4.569	0.298	10
(ii)	Warehouse Management	4.478	0.488	10
(iii)	Transportation Management	4.625	0.487	10
i to iii	**Mean Value of Inventory Decisions**			
III	LOGISTICS OPERATIONAL EFFICIENCY			
(i)	Cost	4.662	0.587	10
(ii)	Time	4.524	0.483	10
i to ii	**Mean Value of Logistics Efficiency**			
IV	ORGANIZATIONAL PERFORMANCE			
(i)	Customer Satisfaction	4.234	0.393	10
(ii)	Margin of Profit	4.762	0.410	10
i to ii	**Mean Value of Organizational Performance**			
I+II+III+IV	**Grand Total of Items**			140

The mean values and the mean of the aggregates show that all the values are above 4 which is rated as 'good' in the studies. Hence, it can be stated that there is high degree of agreement among the respondents in providing answers to the questions in the questionnaire. In addition to this, the standard deviation values are less which implies that there is lesser dispersion of the data from its central tendency.

13.2. Correlation between Procurement Practices and Inventory Decisions

The relationship between different variables is explained by using Pearson's Correlation Coefficient values.

Table: 5: Correlation Between Procurement Practices and Inventory Decisions

Sl. No:	Procurement Practices	Inventory Decision Areas		
		Inventory Management	Warehouse Management	Transportation Management
(i)	Material Specification	0.885	0.365	0.660
(ii)	Value Analysis	0.567	0.330	0.330
(iii)	Supplier Research	0.665	0.567	0.550
(iv)	Negotiation	0.789	0.669	0.489
(v)	Buying	0.774	0.598	0.662
(vi)	Quality Assurance	0.783	0.662	0.278
(vii)	Inbound Transportation	0.770	0.772	0.799

An analysis of correlation between various elements of procurement practices and inventory decisional areas show that the correlation is not uniform in between all the variables under analysis. In the case of material

specification and inventory management, the correlation value is very high which shows that inventory management becomes easy if the procurement is done strictly as per the material specification stipulated by the contracts. In the case of value analysis, supplier research, negotiation, buying, quality assurance and inbound transportation, there is strong positive correlation exists with inventory management. Since all these variables are very closely linked to inventory system and inventory management, it can be confirmed that the procurement practices are very important to management the inventory system effectively. The same is applicable to warehousing system, but the correlation level between material specification and value analysis shows poor correlation with warehouse management. This can be mainly due to the fact that many of the products are supplied in the format of Vendor Managed Inventory (VMI) and hence, the issue of warehousing is not a major issue. In addition to this, many of the suppliers supply on the basis of Return Merchandize Acceptance (RMA) so that unsold items will be taken back by the suppliers. In the case of relationship between value analysis and quality assurance, the correlation values show that it is 0.330 and 0.278 respectively with transportation management and this weak correlation is because the concept of value analysis and quality assurance is not directly related to transportation. The retail firms procure finished goods and these goods are standardized and hence, the question of value analysis and quality assurance is not a major concern.

Table 6: Correlation between Inventory Decision Areas and Logistics Operational Efficiency.

Sl. No.	Inventory Decision Areas	Logistics Operational Efficiency	
		Cost Reduction	Time Savings
(i)	Inventory Management	0.789	0.899
(ii)	Warehouse Management	0.833	0.767
(iii)	Transportation Management	0.811	0.844

All the components of inventory decision areas such as inventory management, warehouse management and transportation management has got strong positive correlation with cost reduction and savings of time in operations. A well-structured management system in inventory and transportation can reduce cost and time utilization appreciably.

Table 7: Correlation between Logistics Operational Efficiency and Organizational Performance

Sl No.	Operational Efficiency	Organizational Performance	
		Customer Satisfaction	Margin of Profit
(i)	Cost Reduction	0.576	0.851
(ii)	Time Savings	0.788	0.667

From the table it is obvious that cost reduction and time savings can enhance customer satisfaction of the retail outlets. These elements of operational efficiency can also promote margin of profit for the company.

XIV. FINDINGS

From the analysis, it can be found that organizational performance in the form of better customer satisfaction and enhanced margin of profit can be achieved by effectively managing the procurement system and inventory decision areas through better operational efficiency in the form of lower costs as well as savings of time. Thus better management of logistics can pave way for the enhancement of profit as well as better customer satisfaction in retail logistics system. Many of the retail companies have been found to operate with lesser margin of profit and delay in responding to the customers' complaints. By linking the procurement with inventory decision areas, a firm can develop a strong physical distribution system and thereby promote the efficiency and effectiveness of the organizations. Since competition is high and price war is rampant in retailing in the UAE, firms can create competitive advantage by managing the logistics effectively and thereby reduce cost and increase profitability.

XV. CONCLUSION

The research study is an attempt to explore the intriguing relationship that exists between procurement, inventory decisions and physical distribution management, which are considered as the core operating areas of logistics function. The study focusses on the procurement activities of retailing organizations that operate in the UAE. Since the retail market has become highly competitive due to the entry of global players, price-wars are common. A retail entity can survive only if they are able to contain and control the costs so that sufficient margin can be generated in its operations. For containing the costs, the most important variables are the logistics variables. Hence, the study can be treated as an attempt to explore the linkage between the various aspects of logistics and its ultimate impact on organizational performance of the retail outlets in the UAE.

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Assessment of Fluoride in Groundwater and Surface Water in Gorakhpur District, Uttar Pradesh, India

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Abstract— Fluorine is the most electronegative and most reactive halogen. Fluorine is 17th most common element on earth crust found in the form of fluoride. Concentration of fluoride below 1 mg/l are believed beneficial in the prevention of dental carries or tooth decay, but above 1.5mg/l, it increases the severity of the deadly diseases fluorosis, which is incurable in India.

The whole study was conducted in Gorakhpur region to know about the concentration of fluoride, mainly in rural areas of the district. We have collected 64 drinking water samples from 9 blocks of the district in which we took 6 number of ground water samples from each block so total 54 number of samples were collected from the groundwater source and 8 number of samples were taken from surface water source. Out of 54 ground water samples, 36 numbers of samples were taken from India Mark-II hand pumps and rest 18 number of samples were taken from shallow depth hand pumps and tested to determine the concentration of fluoride.

From our assessment we came to know that in this region the concentration of fluoride in groundwater ranges between 0.004 to 1.42mg/l, minimum value is found in the surface water source and the maximum value is found from the ground water source.

The samples collected from both ground water and as well as surface water were taken from potable sources i.e. they are used for drinking purposes in daily routine. After the testing and analyzing the samples it is come to know that surface water has quite lower levels fluoride compare to ground water.

The conclusion of this work is to give information about the concentration of fluoride in groundwater and surface water of the district.

I. INTRODUCTION

Higher concentration of fluoride is found around in 25 countries and India is one of them. In India 230 district of 20 states are facing high fluoride levels. In which Andhra Pradesh, Gujarat, Rajasthan are severely affected states. Punjab, Haryana, Madhya Pradesh and Maharashtra are moderately affected states and Tamil Nadu, West Bengal, Assam, Bihar and Uttar Pradesh are mildly affected states. In Uttar Pradesh approximately 50% of the population is affected with fluorosis either by bone fluorosis or dental fluorosis.

Fluoride is beneficial for human teeth and bones if it is present up to a certain limit but excessive consumption of fluoride through drinking water, food products causes dental ,skeletal and non-skeletal fluorosis.Due to some minerals like fluorite, apatite, muscovite, hornblende, tremolite, topaz, etc. fluoride is found in ground water.

For the assessment of fluoride concentration 64 samples were collected from 9 blocks of Gorakhpur district and they are Chargawan, Bhathat, Shahjanwa, Jangal kaudia, Khorabar, Sardar Nagar, Brahmpur, Uruwa, and Gola. In all these 9 blocks there Are 4 blocks which are Chargawan, Shahjanwa, Sardar Nagar and Brahmpur in which 100% samples having fluoride concentration below 1mg/l. According to the study, concentration of fluoride in groundwater ranges between 0.018 to 1.42mg/l.Minimum concentration is found in Jangal Kaudia and maximum concentration is found in Uruwa. On the other hand concentration in surface water were found very less. It ranges between 0.004 to 0.397mg/l, Minimum concentration is found in Ghaghara River and maximum concentration is found in Rohini River.

II. STUDY AREA

Gorakhpur a city in Purvanchal region of Uttar Pradesh in India along the banks of Rapti river,a tributary of Ghaghra river.(Latitude 26°13'N & 27°29'N and Longitude 83°05'E &83°56'E) The total area covered by the city is approx. 226.6 km^2 i.e. around 87.5 m^2.The average annual temperature goes up to 26 °C (79 °F), climate here can be considered as Humid Subtropical Climate.

Demographically, city holds population of approx 7.75 lakhs (as per 2020 Census).

There are 19 blocks in Gorakhpur from which we covered about 9 blocks , we took approx six samples from different locations of each block., namely- 1) Chargawan-Basharatpur,Ramjanki Nagar,Rapti Nagar, BRD College,ITI Chargawan, Fatima By-Pass, 2) Bhathat-Ataraulia, Bhathat Sadar, Chakia(Bela Road), Kharkhandi

Mohalla, Pokhar Bhinda, Samstpur (Muria), 3) Sahjanwa- Luchui, Jura Kodri, Narwali(Bishunpura), Telawra, Manjharia, GIDA ,4) Jangal Kaudia- Railway Crossing, Bariarpur(Shishu Mandir), Deehghat, Mehdariya, Rampur, Ramjanki Mandir (Dohariya) ,5) Khorabar- Jangal Sikri, Rampur Nauka Tola, Azad Market, Gaur Harijan Tola, Nanda Nagar, Mohaddipur, 6) Sardar Nagar- Devkali, Saraiya,Telhnapar,Mahua Bujrg, Sonbarsa Bazar, Azad Chak. 7) Brahmpur- Primary Health Centre,Ragho Patti Padri,Star Brick Factory,Nayi Bazar,Piplahiya,Jungal Rasoolpur NO.2,8) Uruwa- Uruwa Bazar,Lohra Meera,Amorha,Mahui Bujurg, Barpuruwa,Konee Bujurg,9) Gola- Lamatiya (Nevada) Abrus, Atarara, Gola Bazar, Madria,Tehsil Gola.

III. MATERIAL AND METHODS

Fluoride and fluorine are different chemical compounds but fluoride is chemically related to fluorine. When fluorine amalgamates with minerals in rock or soil then salts are deployed and then fluoride are forged from these salts. All the samples were tested at room temperature in the laboratory. For the testing of samples, Ion Selective Electrode Method was opted because main advantage of this method is, real time ion monitoring.

Meaning of real time ion monitoring is monitoring the change of activity of ion with time.

IV. SAMPLE COLLECTION AND ANALYSIS

Total 62 number of samples were collected from the 9 blocks of Gorakhpur district and analysed. 6 groundwater samples were collected from each block. Rest 8 number of surface water samples were collected from 4 rivers. Around 67% ground water samples were collected from India Mark-II hand pumps and rest 33% were taken from shallow depth hand pumps. Average distance between location of ground water samples were 2 to 3 km. Most of the groundwater samples were collected from village areas and hand pumps were the major source of samples. All 62 samples were tested within two days after collection. 250 to 500 ml of water samples were collected in high density polyethylene bottles (HDPE). All bottles were washed with distilled water before sampling.

V. RESULTS AND DISCUSSION

Total 62 samples were collected from groundwater sources as well as from surface water sources and tested and results are discussed below.

Fig. 1 is showing that 63% of the samples having fluoride concentration below 0.5 mg/l, 24% of samples having fluoride concentration 0.5 to 1 mg\l and 13% of the samples having fluoride concentration 1 to 1.5 mg/l. There no samples which have fluoride concentration greater than 1.5 mg\l.

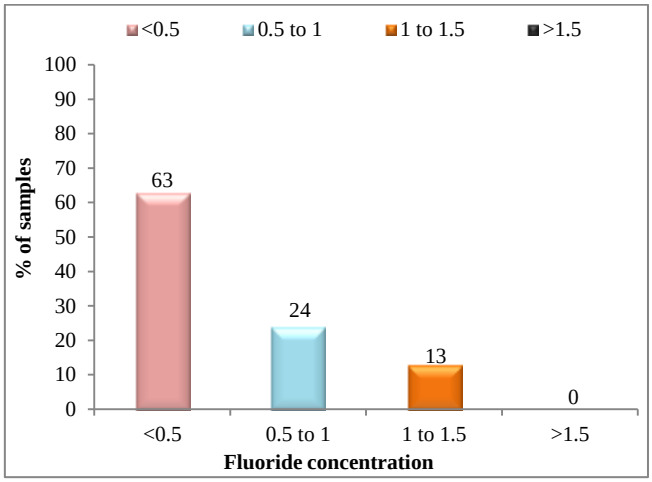

Fig. 1. Fluoride concentration of total samples

Fig. 2 shows the minimum, maximum and average concentration of the groundwater samples of all blocks.

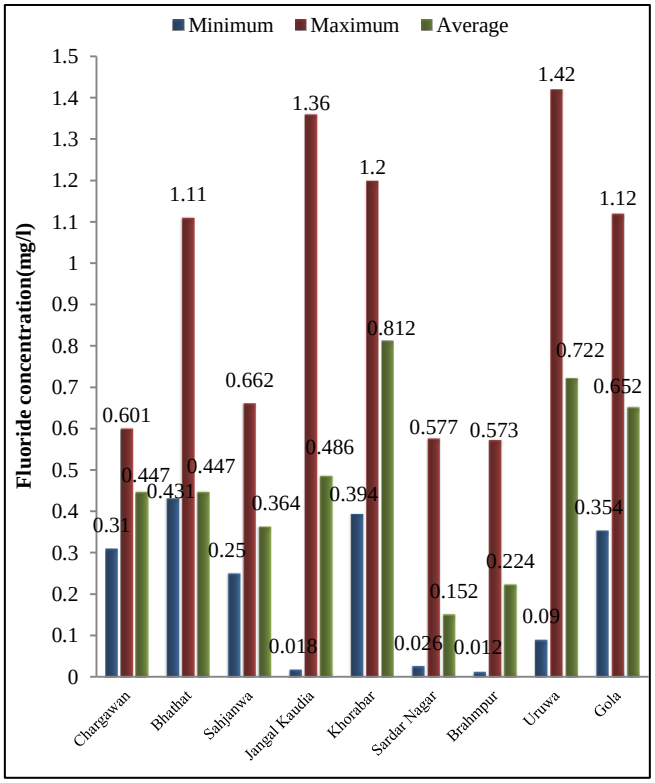

Fig. 2. Min-Max-Avg fluoride concentration in groundwater samples of each block

Fig.3. shows the concentration of fluoride in groundwater samples of each block.

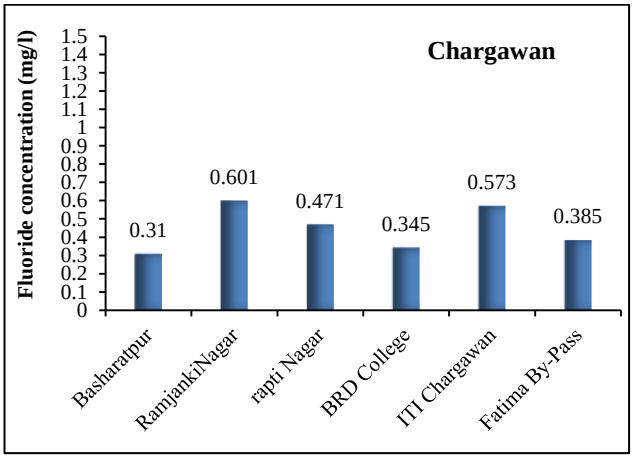

Fig.3.1. Fluoride concentration in Chargawan

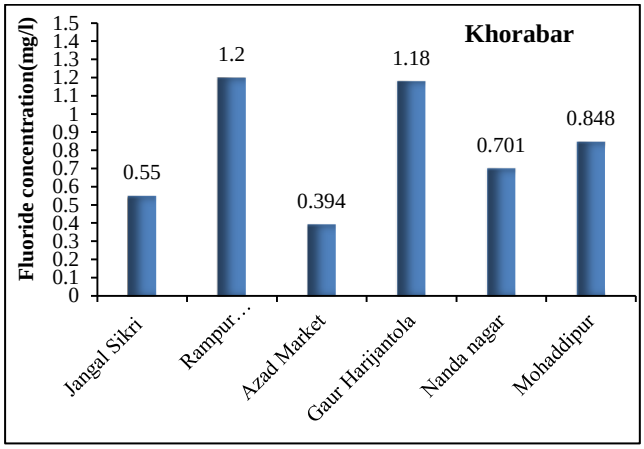

Fig.3.5. Fluoride concentration in Khorabar

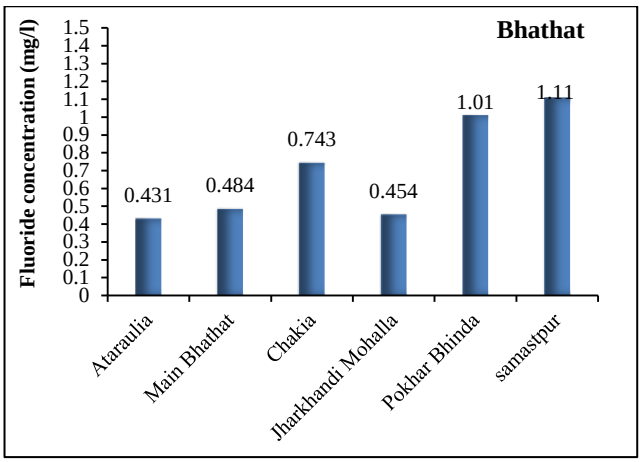

Fig.3.2. Fluoride concentration in Bhathat

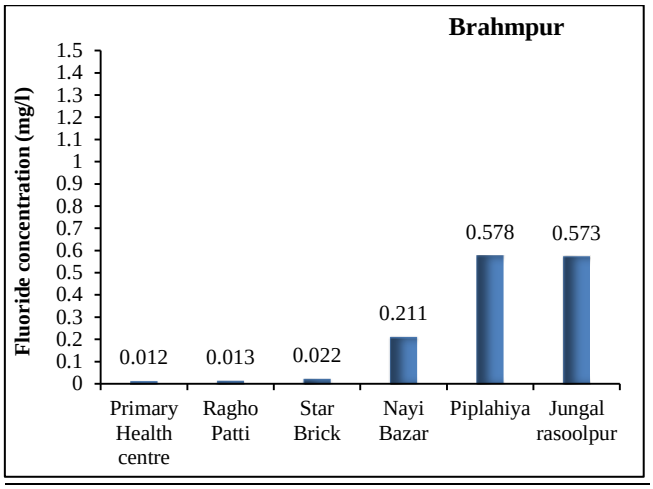

Fig.3.7. fluoride concentration in Brahmpur

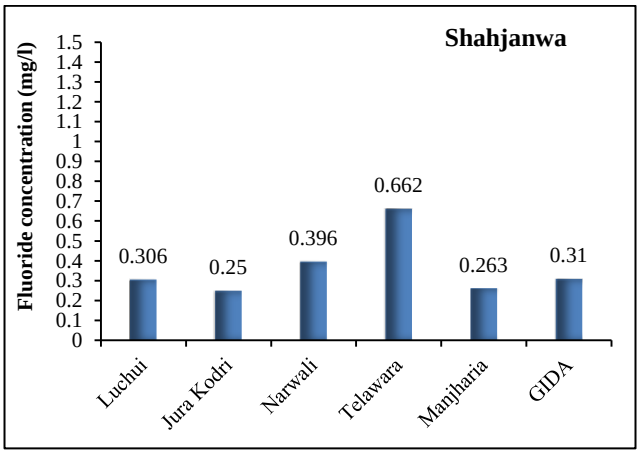

Fig.3.3 Fluoride concentration in Sahjanwa

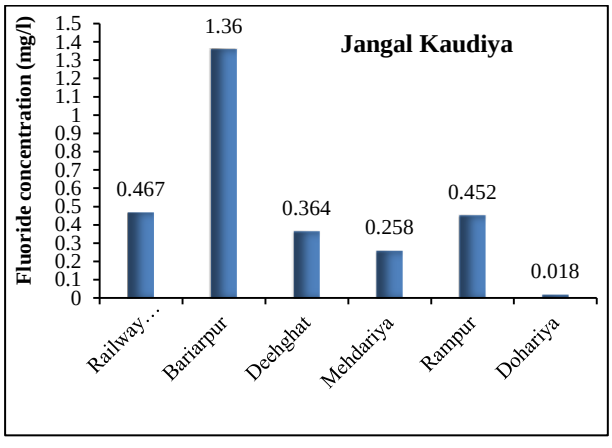

Fig.3.4. Fluoride concentration in Jangal Kaudiya

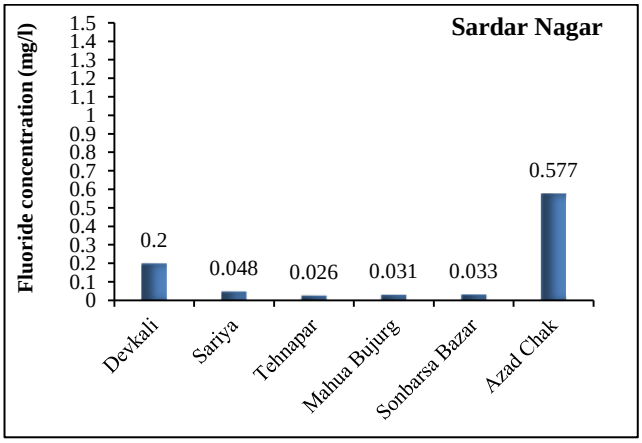

Fig.3.6. Fluoride concentration in Sardar Nagar

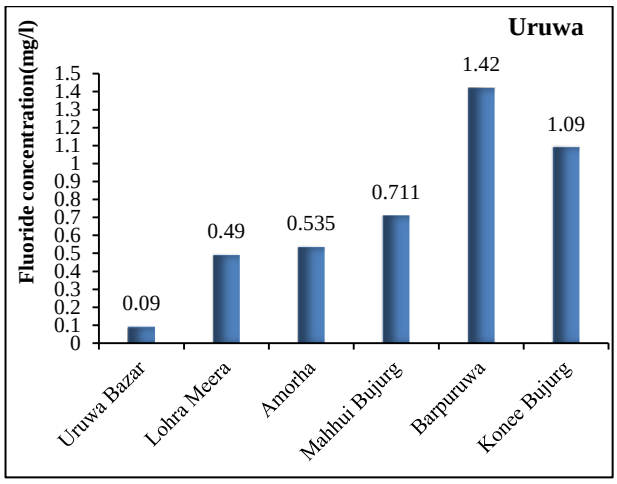

Fig.3.8. Fluoride concentratioin Uruwa

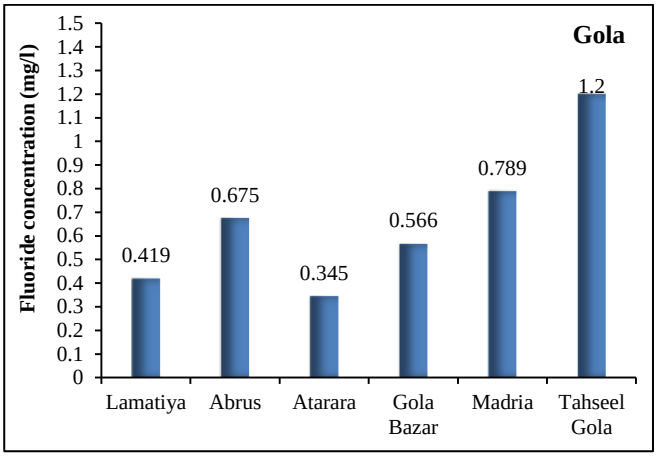

Fig.3.9. Fluoride concentration in Gola

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A Novel Framework for Credit Card Fraud Detection

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Abstract— Credit card fraud is the challenge of predicting fraudulent transactions based on specific rules. In this paper, Various classification algorithms are implemented on an imbalanced dataset concerning the performance analysis to detect fraud in the credit card. In this study, the dataset is sourced from Kaggle. There are 284,807 transactions, out of which 17% of transactions are fraudulent. Various classifiers that are logistic regression, naive Bayes, AdaBoost, and voting classifiers that are combinations of all mentioned above algorithms are refined. The AI model needs significant historical data to prepare the model. For this, a huge amount of information is given to the model as Training data, While dealing with a lot of information, the model's execution time is expanded, which influences execution. In this study, the voting classifier is applied for the expectation analysis which is a mix of different AI calculations.This voting based classifier increases the complexity of the prediction analysis and also increases execution time. In the future, a hybrid classification model will be designed to detect credit card scams.

Keywords— Naive Bayes, Credit card, Logistic regression, random forest, majority voting

I. INTRODUCTION

Credit cards are commonly utilized to purchase several goods and access several services in our daily lives.[1] Credit card fraud is defined as a fraudulent transaction fake exchange by an unapproved individual for his advantage The approved cardholder and the card supplier are uninformed of the exchange right now of its realization[23]. From providing a successful payment method, the cards are provided by the cardholder to the merchant during the purchasing method's execution based on a physical card. By stealing a credit card, a fraudulent attack has been conducted through the attacker. The credit card company can also face a massive loss if the cardholder is not aware of losing it. For performing any fraudulent In online transactions, the attacker requires fewer data. The internet and telephones are used for purchasing products and services online. For reducing the rate of successful credit card fraud, it is essential to introduce fraud detection methods. This method is proposed based on the purchase information of the particular cardholder. It is possible to know that the card is stolen with recognizing patterns [1].

fraud has been expanding definitely with the movement progression of state-of-art technology and worldwide communication.[5] Fraud can be checked two ways: prevention and detection. Anticipation of information is the place where a layer of assurance is shaped to evade any assaults from untouchables. It attempts to prevent misrepresentation from happening in any case. Conversely, extortion discovery helps in distinguishing and cautioning when it has been executed. In this way, discovery comes into the scene once the avoidance has effectively fizzled. Thus, location should constantly be running as nobody can anticipate when a penetrate may happen to the security given by extortion counteraction strategies.[9]

II. MACHINE LEARNING ALGORITHMS FOR FRAUD DETECTION

- Logistic Regression (LR) is a kind of generalized linear model. It is not apposite to implement a simple linear regression if the variable is binary, which will be predicted because of normality assumptions. [2].
- Decision Trees (DT) has a tree structure in which test is denoted through every node on a feature, and every branch is employed to reveal a result obtained in testing. Hence, the observations are split into mutually exclusive subgroups by the tree [3]
- Neural Networks (NN) is an experienced innovation that has a set up hypothesis and perceived application regions. Various neurons are formed in these organizations. The weight is a mathematical worth that is identified with each association[3].
- Support Vector Machines (SVM) has utilized a straight model for applying nonlinear class limits. Information vectors are planned in a nonlinear manner into a high-dimensional component space. The improvement of an ideal isolating hyperplane is completed inside a novel space[4].
- Bayesian belief network (BBN) facilitates a demonstration of the dependencies among subsets of features. Every node is used to show an attribute in this graph, and probabilistic dependence is demonstrated by every arrow [5].
- K-nearest neighbor (KNN) is carried in the systems which are executed for detection. The KNN is proved efficient in CCFD systems with the utilization of supervised learning schemes. [6].
- Hidden Markov Model (HMM) is different from the standard statistical Markov model as it contains invisible states; however, a visible form is produced

through every state at random. A hidden Markov model is represented as the most straightforward dynamic Bayesian network [7].

- Artificial neural networks (ANN) are initially constructed to impersonate the nature of the human brain. A NN is the relationship of rudimentary items perceived as the straightforward neuron[8].

III. LITERATURE REVIEW

KuldeepRandhawa et al. [15] suggested a method in which ML was utilized to detect credit card fraud. At first, the execution of standard models was done, which was followed by hybrid models. The AdaBoost and majority voting techniques were carried out in these models. The model's efficacy was evaluated using a publicly available dataset, and the other dataset was carried out from the financial institution to analyze fraud. For quantifying the robustness of the algorithms, the insertion of noise was done to the data sample. The outcomes obtained after the experiments revealed that the higher accuracy rates were provided through various voting methods to detect the CCF. There was about10% and 30% noise added in sample data so as the hybrid models were evaluated. When 30% noise was added, a good score of 0.94 was obtained from various voting techniques. Therefore, it demonstrated that much stable performance had been acquired using the voting technique when the noise was available.

Abhimanyu Roy et al. [16] suggested DL topologies detect fraud from money's online transaction. The ANN was employed to carry out this approach and the in-built time and memory elements in long-term and short-term memory and various other parameters. There were 80 million online exchanges utilizing Mastercards and pre-marked as false and legitimate contingent on the viability of these components, which had been used while identifying extortion.The distributed cloud computing environment of superior performance has been implemented for these elements. According to their account, the researchers suggested a study in which an efficient guide to suggested parameters' sensitivity analysis for detecting the fraud had been offered. A framework was also proposed by researchers for the parameter alteration of DL topologies to detect fraud. Thus, the financial institution for reducing the losses was facilitated in it when fraudulent activities were avoided.

ShiyangXuan et al. [17] presented two types of Random Forest classifiers that were utilized for training the behavior attributes included transactions- normal and abnormal. Comparing these two RFs, which had distinguished their classifiers, performance while detecting fraud in credit cards was carried out. The data was extracted from an e-commerce company, and the analysis of the presented model's efficiency was done. The author employed the B2C dataset to detect and recognize fraud in credit cards. Thus, the outcomes proved that superior results were obtained from suggested RF on a small dataset; however, some issues were present, such as imbalanced data, which became less efficient than any other dataset.

Deshen Wang et al. [18] recommended a novel technique in which any of the two previously existing methods can improve detecting frauds. No prevention and applying ML detection models to perform all transactions are these two strategies. It is seen that the performance of no method is up to the mark when there is a high fraud rate as well as the secondary verification compensation rate. None of these strategies individually provides benefits to the merchants. It is possible to adopt a different approach when there is very little compensation needed so that the incentivized consumers can accept the secondary verification for all transactions. As there is a removal of the advantage through which the secondary guarantee is being applied when the merchant can consider less fraud rate, the two strategies mentioned above. As all the false positive drops are removed when all the transactions are accepted, the first approach can be used. Otherwise, the second approach is preferred.

Johannes Jurgovsky et al. [19] studied that the fraud detection issue can also be called the sequence classification task. The Long Short-Term Memory (LSTM) networks are deployed here. The traditional feature aggregation techniques are integrated, and the conventional retrieval metrics are used for reporting the results achieved. In the offline transactions in which the cardholder is available physically at the merchant, the accuracy of detection is better in the LSTM approach than the traditional RF classifier. For the manual feature aggregation techniques, the performance of sequential and non-sequential processes is better. Integration of these two techniques is suggested since various frauds are detected by analyzing both approaches' true positives.

Alex G.C. de Sá. et al. [20] proposed an enhanced BNC algorithm called Fraud- Bayesian Network Classifier. The taxonomy of the knowledge related to BNC algorithms is created, and the most pleasing element combination within the dataset is identified by HHEA, which further generated the Fraud-BNC. PagSeguro is the well-known online payment service of Brazil. This online service was used to create a dataset through which this proposed technique was further generated. To handle the cost-sensitive classification, the proposed approach was tested along with the two strategies. Comparisons were made amongst the results achieved by seven different algorithms and the proposed algorithm. The presented technique had performed superior, and the company's economic efficiency was improved to around 72% as per the current state.

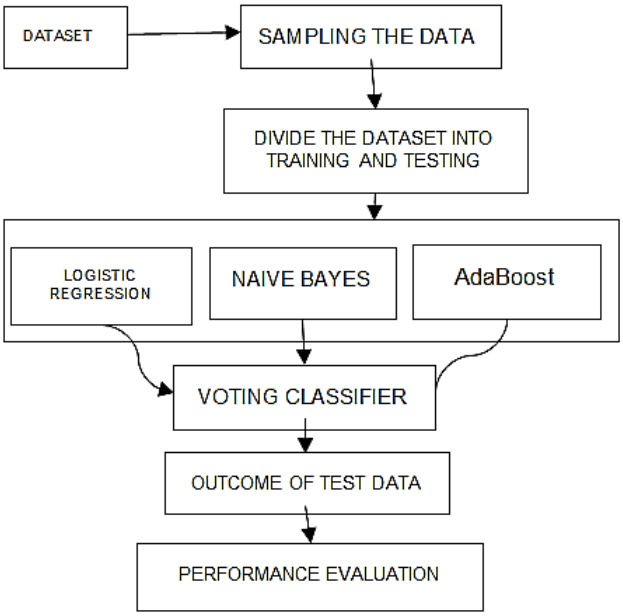
Akila S. et al. [21] proposed Risk Induced Bayesian Inference Bagging (RIBIB) model in which a bag creation technique was utilized to detect frauds. The base learner and cost-sensitive weighted voting integrated approach were used in this technique. Simulations were performed by implementing the proposed method on the bank data of Brazil. It was seen that the cost was minimized to 1.04–1.5

times when the proposed technique was applied. Without using the domain-specific parameter fine-tuning, the model proved highly robust when implemented on UCSD-FICO data.

FabrizioCarcillo et al. [22] proposed a novel technique by integrating the big data tools with machine learning techniques for handling specific complex scenarios. This technique was named Scalable Real-time Fraud Finder (SCARFF). It was initially challenging to maintain the enormous streaming data by the fraud detection techniques. Thus, improvements were suggested so that the excessive data could be handled efficiently. It is seen that on a significant stream of transactions, the scalability, efficiency, and exactness of the presented technique have improved more than the outcomes achieved by previously existing approaches.

IV. METHODOLOGY

In the process flow (Fig.1), we first import the dataset. In this paper, the problem of class imbalance is addressed by using sampling techniques. In oversampling, we have used the SMOTE method. We used three classifiers- logistic regression, Naive Bayes, and AdaBoost, to classify the data. Then apply a voting classifier.Then, to analyze each of the models' performance, four types of performance metrics: accuracy, precision, f1 score, and recall, are used.[9]



(FIGURE 1)

V. PERFORMANCE EVALUATION

A.DATASET:

The dataset is available in source form Kaggle. The payments of credit cards done through European cardholders in September 2013 are composed in this dataset. The transactions made in 2 days and further include 284,807 transactions have been described in this dataset. The dataset is unbalanced and skewed in the positive class. The input variables are available in only numerical form as these values have resulted from the PCA. Therefore, thirty input attributes have been carried out in it. The details and background information regarding the features are not defined as there are some personal issues. The seconds elapsed amid every transaction, and the first transaction in the dataset is included in the time attribute. The amount attribute is the amount of the payment. The feature class is a destination class employed to perform the binary classification and provides the value 1 in the positive case situation and 0 for the non-fraud case.

B. DATA PRE-PREPROCESSING

The model accuracy depends on the amount of data on which it is trained. The more data, the better will be the performance of the model. In this first step, the data is cleaned and preprocessed as follow:

Cleaning: Fixing missing data or removal of duplicate data from a dataset is called cleaning. The dataset may contain records that may be duplicated, incomplete, or may have null values. Such documents need to be removed by cleaning.[25]

C. RESAMPLING TECHNIQUE

As the number of frauds in the dataset is less than an overall transaction, class distribution is unbalanced in credit card transactions. the sampling method is used to solve the issue. [25].The over-sampling is done on a too unbalanced dataset for obtaining two sets of distribution to perform the analysis. The stepwise expansion and deduction of an information point are inserted among existing information focuses until the over-fitting limit is reached.

D.METRICS

There are four basic metrics to compute the experiments based on TPR, TNR, FPR, and FNR rates metrics.

True Positive(TP): The actual positive rate represents the fraudulent transactions' portion correctly classified as fraudulent transactions.

True positive=Tp/TP+FN (1)

TrueNegative(TN): The actual negative rate represents the regular transactions' portion correctly classified as routine transactions.

True negative=TN/TN+FP (2)

False Positive (FP): The false-positive rate indicates the bit of the non-fake exchanges wrongly delegated as fraudulent transactions.

False positive=FP/FP+TN (3)

False Negative (FN): The false-negative rate demonstrates the part of the non-deceitful exchanges wrongly being named normal exchanges.

False negative=FN/FN+TP (4)

E. CLASSIFICATION

1 Logistic Regression Classifier: Logistic regression is a supervised classification algorithm.In this the objective variable(or yield), y, can take just discrete qualities for a given arrangement of features(or inputs), X. The calculated relapse model outlined the association between indicators that might be persistent, twofold, and absolute. Strategic relapse turns into a grouping procedure where just a call edge is brought into the picture. The edge worth setting is a fundamental feature of strategic relapse and relies upon the arrangement drawback itself. It predicts the opportunity that a given information passage has a place with the class numbered as "1"

2 Naïve Bayes Classifier: Naive Bayes (NB) technique classifiers depend on Bayesian hypothesis that chooses the choice dependent on contingent likelihood [24].

This algorithm performs decision-making according to the maximal probability. Bayesian probability makes use of given values for estimating indefinite probabilities. This algorithm enables past knowledge and logic to be implemented to unclear descriptions. This algorithm assumes the conditional independence of features within the data. This classification model follows the idea of conditional probabilities of the two classes called fraudulent and non-fraudulent.

Here, n corresponds to the maximal number of attributes"" signifies the probability of feature value in the class. Refers to the likelihood that generates the feature value of a known type.) is the probability of class incidence. Also,) depicts the likelihood of the incidence of feature value.

The result is C1 when

The result is C2 when

Ci denotes the target class for classification. Moreover, C1 and C2 represent non-fraudulent and fraudulent cases, respectively [15]

3.AdaBoost: Adaptive Boosting or AdaBoost is utilized related to various calculations to improve execution. The outputs square measure combined by employing a weighted add that represents the combined output of the boosted classifier, which represents the combined output of the boosted classifier, i.e.,

$$Ft(x) = ft(x) \quad (5)$$

Where each ft is a classifier (weak learner) that profits the anticipated class concerning input x. Each feeble student gives a yield forecast, h(xi), for each preparation test. In each cycle t, the frail student is picked and is designated a coefficient, αt, so the preparation blunder whole, Et, of the subsequent t-stage helped classifier is limited,

$$Et = \sum [FKO0(x'') + \alpha Kh(x'')] \quad (6)$$

In whichFt–1(x) is a boosted classifier that is constructed in the preceding phase, E(F) represents the error function, and ft(x) = αth(x) is a weak learner who is considered for the final classifier. The vulnerable learners are squeezed concerning misclassified data samples by AdaBoost. However, it has susceptibility against noise and outliers.

AdaBoost has the potential for enhancing the individual outcomes from diverse algorithm till the classifier performs randomly [14]

4.Majority voting: Majority voting is frequently used in data classification, again utilized in information grouping, which includes a joined model with at any rate two calculations. Every calculation makes its forecast for each test. The last yield is for the one that gets most of the votes, as follows.[15]

Algorithm steps for finding Results

Step1: Import the dataset.

Step2: Data preprocessing.

Step3: Do oversample.

Step4: Give 70% data for training and 30% for testing.

Step5: Assign train dataset into models.

Step6: Apply the algorithm.

Step7: Predict the test dataset for each algorithm.

Step8: Perform various metrics.

VI. RESULTS

There are 2,84,807 observations in our test dataset, out of which 17% of transactions are fraudulent. In this study, four classifiers: logistic regression, naive Bayes, AdaBoost, and voting classifier, are refined. The performance evaluation of machine learning models is based on F1 score, precision, recall (sensitivity), and accuracy. Moreover, from the confusion matrix the value of True Positive (tp) ,True Negative(TN), False Positive(FP), False Negative(fn) are concluded. the whole dataset is divided into a 70:30 ratio. 70% of the dataset is used for training, and the other 30% used for testing. The results show accuracy for logistic regression, Naive Bayes, Adaboost, voting classifiers, 94.51%, 91.41%, 95.67%, and 94.69%.

Table 1 represents the result of logistic regression, which give 94.5% of accuracy,

```
Total number of observations: 284807
Percentage of fradulent transactions in data.: 0.17274856386288034
Accuracy on the Logistic regression model is: 94.51259885593452
[[91344  7948]
 [ 2349 86807]]
              precision    recall  f1-score   support

           0       0.97      0.92      0.95     99292
           1       0.92      0.97      0.94     88356

    accuracy                           0.95    187648
   macro avg       0.95      0.95      0.95    187648
weighted avg       0.95      0.95      0.95    187648
```

Performance evaluation of logistic regression machine learning algorithm

Table 2 represents the result of Naive Bayes, which give 91.41% of accuracy,

```
Total number of observations: 284807
Percentage of fradulent transactions in data.: 0.1727485630620034
Accuracy on the naive_bayes is: 91.4144522800415
[[82974 12448]
 [ 2198 72969]]
              precision    recall  f1-score   support

           0       0.97      0.87      0.92     95422
           1       0.85      0.97      0.91     75167

    accuracy                           0.91    170589
   macro avg       0.91      0.92      0.91    170589
weighted avg       0.92      0.91      0.91    170589
```

Performance evaluation of Naive Bayes machine learning algorithm

Table 3 represents the result of Adaboost, which give 95.67% of accuracy,

```
Total number of observations: 284807
Percentage of fradulent transactions in data.: 0.1727485630620034
accuracy on the adaboost is: 95.67674351804631
[[82657  4860]
 [ 2515 80557]]
              precision    recall  f1-score   support

           0       0.97      0.94      0.96     87517
           1       0.94      0.97      0.96     83072

    accuracy                           0.96    170589
   macro avg       0.96      0.96      0.96    170589
weighted avg       0.96      0.96      0.96    170589
```

Performance evaluation of Adaboost machine learning algorithm

Table 4 represents the result of the Voting classifier, which give 94.69% of accuracy,

```
Total number of observations: 284807
Percentage of fradulent transactions in data.: 0.1727485630620034
accuracy on the testing set: 94.69719610490263
[[83693  7567]
 [ 1479 77850]]
              precision    recall  f1-score   support

           0       0.98      0.92      0.95     91260
           1       0.91      0.98      0.95     79329

    accuracy                           0.95    170589
   macro avg       0.95      0.95      0.95    170589
weighted avg       0.95      0.95      0.95    170589
```

Performance evaluation of voting classifier

VII. CONCLUSION

The models designed for credit card fraud detection perform well on the little datasets, however the exactness gets decreased when the dataset size increments.The models intended for credit card fraud detection perform well in terms of some parameters but do not perform well in terms of all. The credit card fraud detection model needs large quantities of historical information to train models. While handling such a large amount of data, the model's execution time is increased, affecting performance. In this study, the voting classifier is applied for the prediction analysis. This increases the prediction analysis complexity and increases execution time; the efficient prediction analysis technique must establish a relationship between attribute and target set. So far, the proposed plans are not so efficient to drive relationships between target sets and attributes of the dataset. In the future, a hybrid classification method will be designed to detect credit card scams.

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Optimization of Wind Turbine

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Abstract— Wind turbines are power tools to tap nonconventional wind energy. Onshore wind turbine needs plenty of land area for power generation. Thus it was a natural step to take Offshore Wind Turbine (OWT). The wind resources are even more abundant and of better quality at sea as compared to onshore. The major components of the offshore turbine are turbine blades, Rotor- Nacelle Assembly (RNA), tower transition piece and the foundation. By accounting for almost 25% of the capital cost of an OWT (offshore wind turbine), optimization of support structures provides an efficient way to reduce the currently high cost of offshore wind energy. In this paper, a structural optimization model for OWT support structures has been developed based on FEA (Finite Element Analysis).

Keywords— FEA, Wind Turbine, Optimization

I. INTRODUCTION

Wind turbines are power devices to tap nonconventional wind energy. offshore wind turbine needs a lot of land region for power age. Consequently it was a characteristic advance to take Offshore Wind Turbine (OWT). The breeze assets are significantly more plentiful and of better quality adrift when compared with inland. The significant segments of the offshore turbine will be turbine sharp edges, Rotor-Nacelle Assembly (RNA), tower transition piece and the establishment. It can give 2 or 3 edges to turbine, however generally 3 sharp edges are given. The plan and development of establishments for seaward turbines are testing a result of the cruel natural conditions. Various sorts of help structures for OWTs exist, (a) gravity-based foundation, (b) monopile foundation, (c) caisson foundation, (d) multi-pile foundation, (e) multi-caisson foundation, (f) jacket foundation.

The selection of support structure relies upon numerous measures, for example, water profundity, seabed conditions and monetary requirements. Mono heaps are presently the most well-known establishment idea. This examination centres around monopiles, as they actually address by far most of as of now introduced or as of now in plan OWT support structures.The underlying enhancement model of a breeze turbine tower by and large comprises of two parts, a breeze turbine primary model, which investigations the primary presentation of the pinnacle, for example, tower mass and deformations; and an optimization algorithm, which manages plan factors and looks for ideal arrangements.

Primary models utilized for OWT support designs can be generally arranged into two gatherings, for example 1D (one-dimensional) shaft models and 3D (three-dimensional) FEA (limited component investigation) models. A monopole model discretises the help structure into a progression of versatile Euler or Timoshenko beam elements. Because of its computational proficiency and satisfactory exactness to display worldwide primary elements conduct, the bar model has been generally utilized in business codes to demonstrate OWT support structures. Albeit productive, the pillar model neglects to address precisely primary reactions, for example, stress fixation impacts, when a more nearby scale is required. To catch underlying reactions precisely, it is important to build the OWT support structures utilizing 3D FEA. Contrasted with the 1D bar model, the 3D FEA model is equipped for catching underlying reactions precisely and analyzing itemized pressure circulations across the design. Because of its high devotion, the 3D FEA model has been broadly utilized for demonstrating wind turbine structures . Hence, the 3D FEA is picked in this investigation to demonstrate the OWT support structures The meta-heuristic calculation is characterized as an iterative age cycle and issue free calculation that utilizes keen technique, in view of stochastic choices, to investigate effectively the pursuit space to discover close ideal worldwide arrangements. A large portion of the pursuit methodologies are developmental calculations dependent on regular interaction. The Genetic Algorithm (GA), advocated by, is the most mainstream of meta-heuristic calculations. It will in general imitate the normal choice cycle dependent on the Darwinian hypothesis of advancement, in which a populace will in general advance through determination and age of fitter people. Since it doesn't need an express numerical definition of the issue and the estimation of the slope of target work, this technique has been broadly utilized in complex issues and has end up being extremely productive and powerful for cross breed environmentally friendly power framework, wind turbine design in wind ranches, wind turbine composite cutting edges and OWT-related investigations. Along these lines, the GA is picked in this examination to look for ideal arrangements. This paper endeavors to build up an inventive coordinated primary enhancement model of OWT support structures by consolidating FEA and GA. A parametric FEA model of OWT support structures is created and approved and afterward combined with GA, in view of an incorporated methodology.

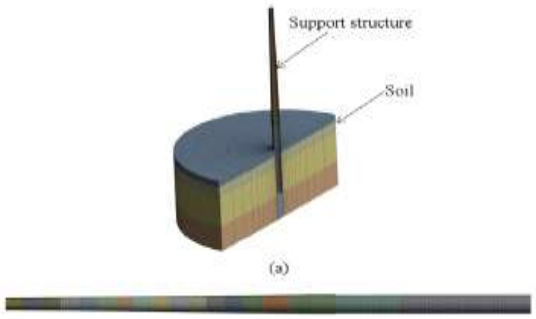

Figure 1: Cut view of the assembly model

II. OBJECTIVE

Integrated structural optimization of offshore wind turbine structures based on finite element analysis and genetic algorithm.

SCOPE

Studies have been performed for design optimization of OWT structures. However, these studies consider an independent optimization of the different components (such as tower, transition piece and mono pile) of OWT structures. Here we are considering an integrated approach, in which different components are optimize simultaneously, to get better optimization results.

III. MESH CONVERGENCE STUDY

Details of the structure are;

- Material of turbine tower and mono pile is steel.
- Turbine tower with height 80 m and cross section diameter of 6 m.
- Diameter of pile is 6m and embedded length of pile 20m
- Soil properties are poison ratio of 0.279 and density of 18 KN/m^3.

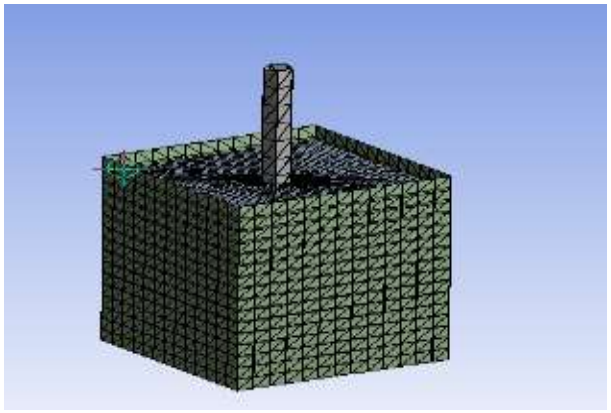

Figure 3.3.1 : Geometry and meshing (mesh convergence study)

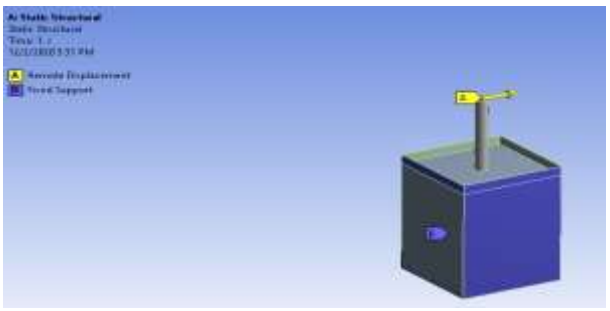

Figure 3.3.2 : Structure with a remote displacement of 10mm(mesh convergence study)

Number of elements – 14677

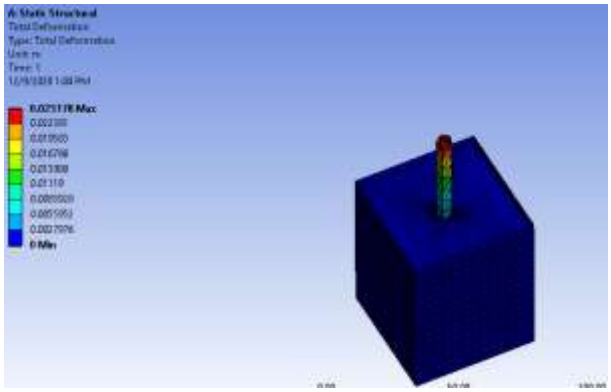

Figure 3.3.3 : Total deformation (Number of elements – 14677)

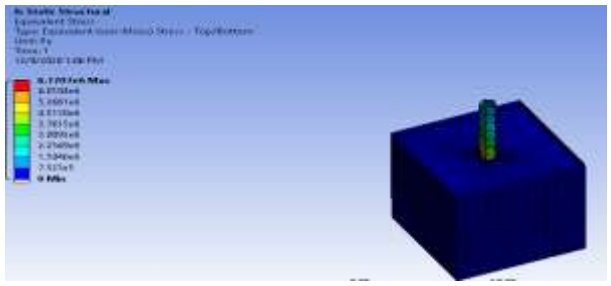

Figure 3.3.4 : Equivalent Stress(Number of elements – 14677)

Number of elements –7504

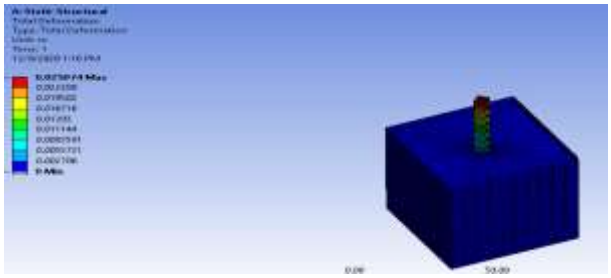

Figure 3.3.5 : Total deformation(Number of elements – 7504)

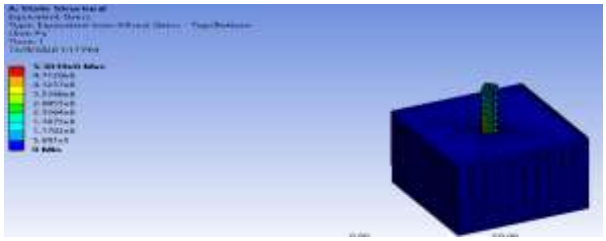

Figure 3.3.6 : Equivalent Stress(Number of elements – 7504)

Number of elements –5616

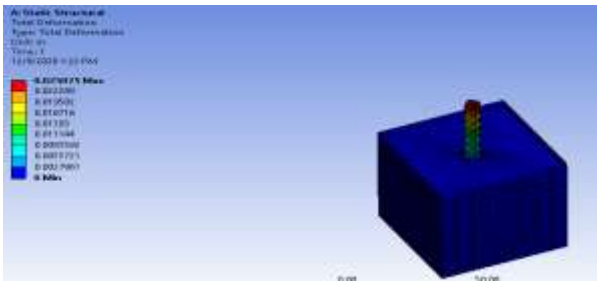

Figure 3.3.7 : Total deformation(Number of elements – 5616)

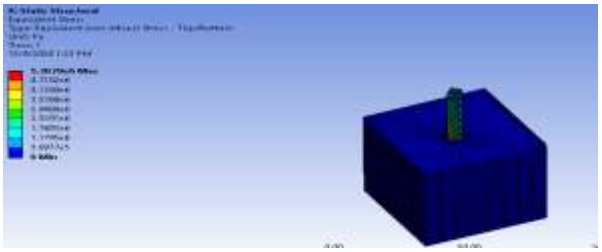

Figure 3.3.8 : Equivalent Stress(Number of elements – 5616)

Number of elements –3464

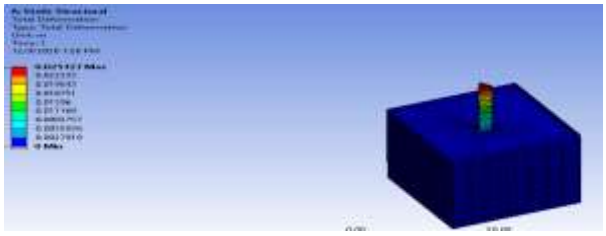

Figure 3.3.9 : Total deformation(Number of elements – 3464)

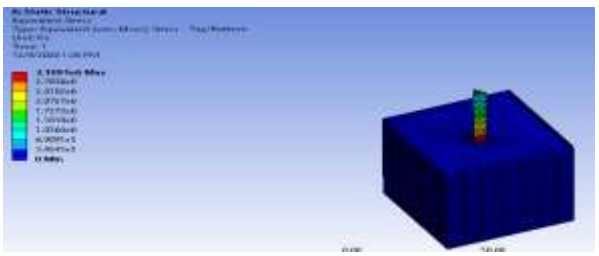

Figure 3.3.10 : Equivalent Stress(Number of elements – 3464)

Table 3.3.1 : Mesh convergence study

Elements	Nodes	Total Deformation (m)	Equivalent Stress (Mpa)
14677	56138	0.025178	$6.77x10^6$
7504	28326	0.025074	$5.30 x10^6$
5616	21657	0.025075	$5.31 x10^6$
3464	13309	0.025127	$3.11 x10^6$

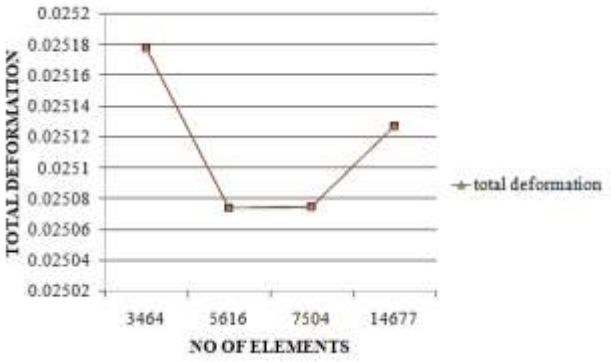

Figure 3.3.11 : Mesh convergence based on Total deformation

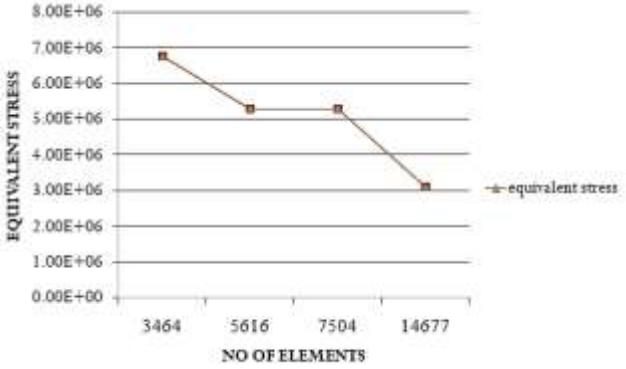

Figure 3.3.12 : Mesh convergence based on Equivalent Stress

From the two graphs we can see that the variation curve between 7504 and 5616 is linear. So we can consider the optimum number of elements as 7504.

LOAD CALCULATION

1) INERTIA LOAD

- Rotor Nacelle assembly mass = 350000Kg
- Moment of Inertia of Rotor Nacelle assembly = $4372352x10^7$ Kg/m^3

2) HYDROSTATIC LOAD

$$F_h = \rho_w g h$$

$g = 9.81 m/s^2$
h = water depth = 20m
$\rho_w = 1025 Kg/m^3$

- $F_h = \rho_w g h = 1025x9.81x20 = 201105Kg$

3) WIND LOADS ON THE TOWER

- $\tilde{V}(z) = \tilde{V}_r (z/z_r)^{\alpha}$
- $F_{TOWER} = (1/2) \rho_a C_{DT} D(z) \tilde{V}^2(z)$

4) WAVE LOADS

For finite depth

- $P=g(H/2)(\cos(k(x-ct))(\cosh k(y+d))/(\cosh kd)$

For deep water

- $P=g(H/2)(\cos(k(x-ct))\exp(ky)$

IV. SIMULATIONS AND EXPERIMENTAL RESULTS

- Turbine tower with height 87.6 m and cross section diameter of 6 m.
- The soil contains 3 layers ;

  1) Dense sand = 22m
  2) Medium sand = 9m
  3) Loose sand = 5m

- Depth of water = 20m

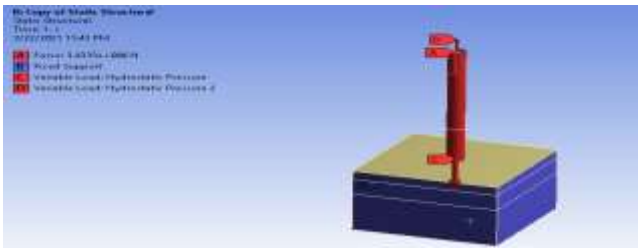

Fig.4.1.1 loading conditions

Fig.4.1.2. Total Deformation

Fig.4.1.3.Equivalent Stress

Table 4.1.1: Optimization results

Wave Velocity (M/S)	Wind Velocity (M/S)	Height (M)	Total Deformation (M)	Stress(Pa)
26.668	6.9	77.6	0.027677	2.25E+06
		87.6	0.041458	2.87E+06
		97.6	0.043362	2.65E+06
		107.6	0.049056	2.69E+06
	10	77.6	0.028313	2.29E+06
		87.6	0.041218	2.86E+06
		97.6	0.044562	2.72E+06
		107.6	0.048564	2.67E+06
	50	77.6	0.02843	2.30E+06
		87.6	0.040658	2.82E+06
		97.6	0.043013	2.63E+06
		107.6	0.049067	2.69E+06

Wave Velocity (M/S)	Wind Velocity (M/S)	Height (M)	Total Deformation (M)	Stress(Pa)
50	6.9	77.6	0.10826	9.03E+06
		87.6	0.15445	1.09E+07
		97.6	0.16271	1.01E+07
		107.6	0.18642	1.01E+07
	10	77.6	0.10654	8.91E+06
		87.6	0.15578	1.10E+07
		97.6	0.16582	1.03E+07
		107.6	0.18368	1.02E+07
	50	77.6	0.10738	8.97E+06
		87.6	0.15281	1.08E+07
		97.6	0.16542	1.03E+07
		107.6	0.18428	1.03E+07

Wave Velocity (M/S)	Wind Velocity (M/S)	Height (M)	Total Deformation (M)	Stress(Pa)
211.1	6.9	77.6	1.9797	1.67E+08
		87.6	2.83	2.01E+08
		97.6	3.0376	1.90E+08
		107.6	3.416	1.91E+08
	10	77.6	1.9927	1.68E+08

		87.6	2.8606	2.03E+08
		97.6	2.961	1.86E+08
		107.6	3.3589	1.88E+08
	50	77.6	1.9709	1.66E+08
		87.6	2.805	2.00E+08
		97.6	1.9496	1.39E+08
		107.6	3.4795	1.94E+08

V. CONCLUSION

With the increase in the height , wind velocity, and wave velocity the total deformation and the stresses will increases.

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Evaluation of Dual-Switch High Boost DC-DC Converter Based on SC for PV Applications

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Abstract— The classical DC-DC boost converter has the drawbacks of low voltage gain followed by discontinuous output current. Also the main switch and diodes voltage stress is high as output voltage. Therefore, dual switch high boost converter based on switched capacitor technique is presented. The topology provides a high voltage gain using a small duty cycle, thereby reducing the voltage stress and loss on semiconductor devices. Power switches are controlled by PWM which leads to simplicity and cost reduction. Moreover, a 20 W pv panel is integrated to verify the viability of the topology.

Keywords— Dual switch switched capacitor(DSSC) converter, high-voltage gain

I. INTRODUCTION

Renewable energy resources are going to be an increasingly important a part of power generation within the new millennium. Besides assisting in the reduction of the emission of greenhouse gases, they add the much- needed flexibility to the energy resource mix by decreasing the dependence on fossil fuels. However, they having low and variable output voltages. A dc-dc converter with a high voltage gain is thus required for the interface between low-voltage source and high-voltage dc bus of the inverter. The classical boost converter is most common topologies used to improve the output voltage[1], but it is difficult to realize a high voltage gain because of the presence of stray elements and large duty cycle is required.As well , the power semiconductors are subjected to a high voltage stress. Aiming to provide higher voltage gain , many topologies for the dc-dc converters are presented. In [2],a high frequency transformer is used for galvanically isolating the input and output, which makes circuit more complex. A high voltage gain can be obtained by providing a coupled inductor to topology [3,4,5], they can reduce voltage or current stress on power semiconductor devices with higher efficiency , but presence of coupled inductor cause more difficult to design and leakage inductance making a negative impact.

The non-coupled inductor based converters are presented in [6, 7] can also to be used to increase the voltage gain with higher power density and less no of magnetic devices, but the voltage stress across power semiconductors is high as output voltage. In SC based converters, the input voltage is used to supply energy and the switched-capacitors are connected in series and provide energy to the load. Thus, the source voltage can be multiplied [8]. In [9], a transformerless buck–boost converter is introduced. The converter voltage gain is three times as high as the conventional buck–boost converter. The Z-source dc-dc boost converter with cascading SC was introduced in[10].This topology can improve the voltage gain with help of the voltage multiplier is dependent on SC. However, the disadvantage of the converter are evident,like the different ground points between the source side and the load side and discontinuous input current.

In[11],a tansformerless KY buck–boost converter is presented. An SC- based high voltage gain active network converter(ANC) is presented in [12], However which required a larger duty cycle . A new isolated high boost dc-dc converter with low voltage stress on the switches and diodes is presented in[13]. The circuit topology can improve the voltage gain by using ladder type voltage multiplier, but they need large no of components which leads to larger size and cost.In [14],a buck–boost converter without transformer is introduced. There are three main switches in this converter. In such a topology, the voltage stress of the switch is identical with the output voltage.High conduction and switching losses occur. Voltage multiplier cells[15],cascaded[16] are also used to provide a high boost to transformer less structures. In [17],high boost interleaved converter shall be presented. The interleaved boost converter and the voltage-double unit are provided to acheive higher voltage gain but higher voltage stress appears on the diodes and switches. Switched-inductor techniques also can be utilized to get a high voltage gain as presented in [18],but large numbers of inductors are required for this topology. Therefore, the size and price of those converters are going to be increased.

The paper is arranged in this way. In section II, the circuit and operating principles of the converter are addressed. The components design is presented in section III. Finally, the simulation results are given in section IV. conclusion given in section V.

II. ANALYSIS OF DSSC CONVERTER TOPOLOGY

A. Structure of the Converter

The dual switch (DSSC) converter based on SC is shown in Fig 1 . It comprises of one inductor (L),two power switches(S1,S2),three capacitors(C0-Cy),four diodes(D0-D3) and a R load. Fig 4 shows the waveforms of the DSSC converter.

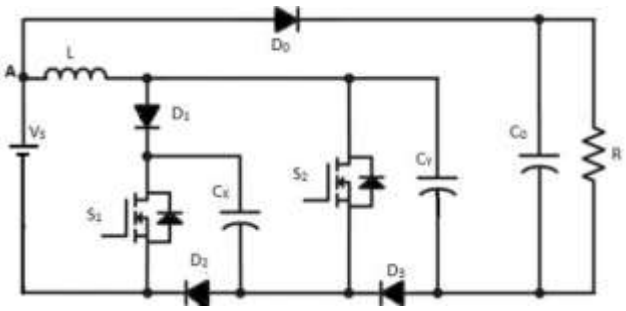

Fig. 1. DSSC converter

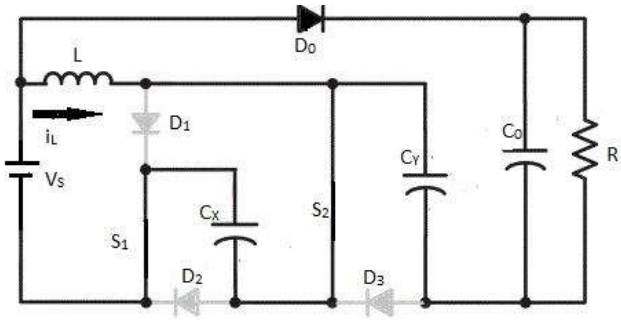

Fig. 2. state 1

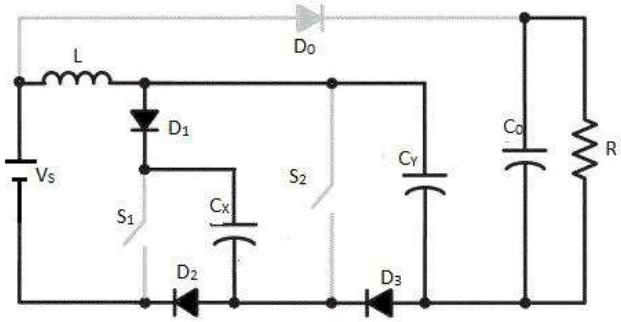

Fig. 3. state 2

B. Modes of Operation

Gate pulses for the two power switches (S_1, S_2) are similar– S_1 and S_2 are turned ON and OFF simultaneously.

Based on that DSSC has two switching states , which are shown in Fig 2 and Fig 3 .

1. Switching state I – As shown in Fig 2 , S_1 and S_2 are turned ON. The inductor L is connected across the sup-ply.Current through the inductor increases and energy stored in it. The capacitors C_x and C_y are discharged. The diode D_0 is forward biased and the diodes D_1, D_2, and D_3 are reversed biased.

2. Switching state II - As shown in Fig 3 , S_1 and S_2 are turned OFF. The polarity of the inductor voltage quickly reverses. The capacitors C_x and C_y are charged. The diode D_0 is reverse-biased,meanwhile the diodes D_1, D_2, and D_3 are forward-biased.

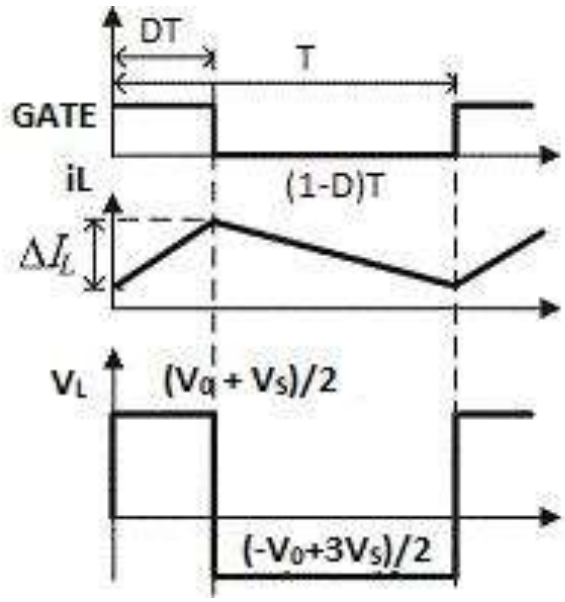

Fig. 4. key operating waveforms of the converter

C. Voltage gain

Total period of the power switches is T, DT is the ON-state period, and (1 – D) T is the OFF-state period, where D is the duty ratio of the switches.

By applying KVL in Fig.2 and Fig.3 the following equations can be derived:

$$L\frac{di_L}{dt} = V_S + V_{Cx} \quad (1)$$

$$V_0 = V_S + V_{Cx} + V_{Cy} \quad (2)$$

$$L\frac{di_L}{dt} = V_S - V_{Cx} \quad (3)$$

$$V_{Cx} = V_{Cy} \quad (4)$$

Volt–second balance law for inductor L:

$$(V_S + V_{Cx})DT + (V_S - V_{Cx})(1-D)T = 0 \quad (5)$$

According to volt-balance principle (1) (2) to (3) (4) yield the following equation:

$$V_{Cx} = V_{Cy} = \frac{V_S}{1-2D} \quad (6)$$

From equ (6) and (1) (2) output-voltage gain of the presented

DSSC converter is as follows:

$$G = \frac{V_o}{V_S} = \frac{3-2D}{1-2D} \quad (7)$$

Where G is the conversion ratio ,i.e, the voltage gain. Equation (7) shows that presenting topology can attain a high voltage gain.

III. COMPONENT PARAMETER

A. Design of inductor

The inductor ripple current in state 1 is as follows:

$$\Delta I_L = \frac{V_S + V_{Cx}}{L} DT \quad (8)$$

The average inductor current is obtained by applying KCL at node A shown in Fig.1.

$$\tilde{I_L} = \tilde{I_{in}} - \tilde{I_o} = \frac{V_o^2}{V_S R} - \frac{V_O}{R} \quad (9)$$

taken from (4), (5), and (7), DSSC converter inductance is as follows:

$$L = \frac{D(1-D)(3-2D)TV_S^2}{I_r\%(1-2D)P_o} \quad (10)$$

B. Design of capacitors

The current through the capacitor C_x in state 1 of the DSSC converter same as peak current of the switch S_1 , at the same time current through the capacitor C_y corresponding to peak current of the diode D_0 which are shown in Fig.2.

The capacitor–voltage ripple is limited by the vr% the capacitances for C_x and C_y is as follows:

$$C_x = \frac{(1-2D)TP_o}{v_r\%(3-2D)^2V_S^2} \quad (11)$$

$$C_y = \frac{(1-2D)^2TP_o}{v_r\%(3-2D)^2V_S^2} \quad (12)$$

The current through the output capacitor C_0 in state 2 same as output current as given in Fig.3. In order to reduce the ripple on the output voltage using the vr%, the C_0 capacitance is as follows:

$$C_o = \frac{(1-D)(1-2D)^2TP_o}{v_r\%(3-2D)^2V_S^2} \quad (13)$$

TABLE I: SIMULATION COMPONENTS

Input voltage	V_S	12 V
Inductor	L	0.3mH
Capacitors	C_xC_y	22 F
Capacitor	C_0	150 F
Switching frequency	^tSW	50kHz
Output power	P_0	20W
Duty ratio	D	0.16

IV. SIMULATION RESULTS AND INTERPRETATION

To substantiate the viability and effectiveness of the DSSC converter, simulation was developed by using matlab software. The simulation parameters for the presented converter are shown in Table I. The output voltage is stepped up to 43 V. As shown in Fig 9, the input current is continuous and the inductor current is 1.09 A.The output voltage is the sum of voltage of the capacitors C_x and C_y and the input voltage.The voltage of the capacitor is boosted to 15.5V respectively as shown in Fig 10. Voltage of output diode D_0 is boosted upto 31.8 V and voltage of diodes D_1,D_2 is 16 V as shown in Fig 11.

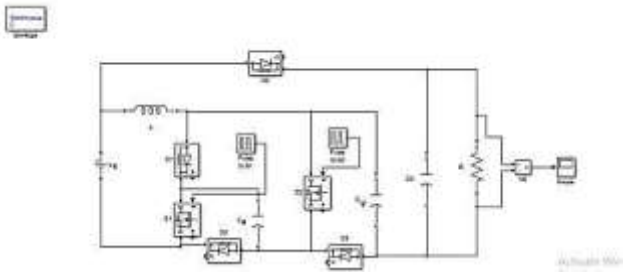

Fig. 5. Open loop configuration

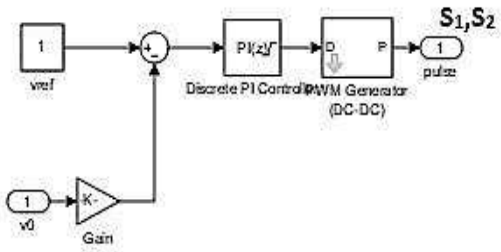

Fig. 6. PI-Voltage control of the DSSC Converter.

The closed loop configuration has been simulated in Simulink software,using a simple proportional-integral-feed-back output voltage control as shown in fig 6. For designing PI controller Ziegler – Nichols method is used. For this work, K_P = 0.7 and K_i=100 is used,as shown in Fig 7 and getting output voltage as 48 V. , as shown in Fig 12.

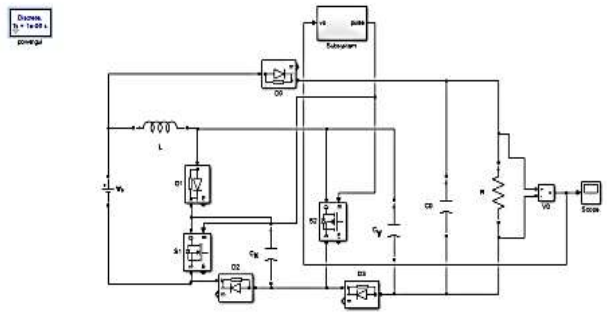

Fig. 7. closed loop Configuration

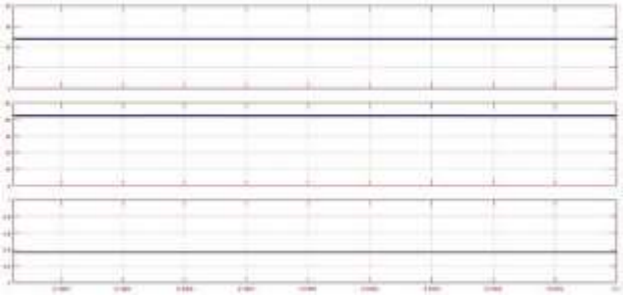

Fig. 8. Simulation results of DSSC converter. From top to bottom: (a)input voltage, (b) output voltage and output current.

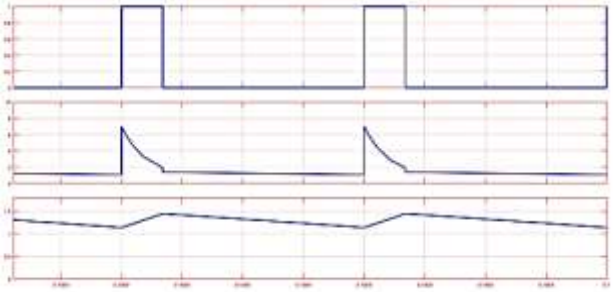

Fig. 9. From top to bottom: (a)Gate signal, (b) input current and inductor current.

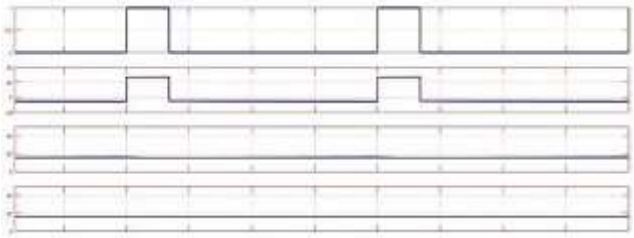

Fig. 10. From top to bottom: (a)Gate signal, (b) Inductor voltage and capacitor voltage Cx and Cy

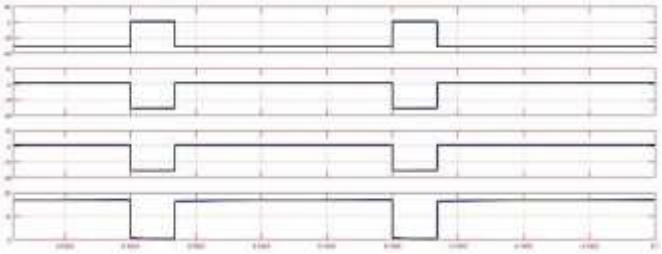

Fig. 11. From top to bottom: Diode voltage(D0-D3) and Drain to source voltage of switch.

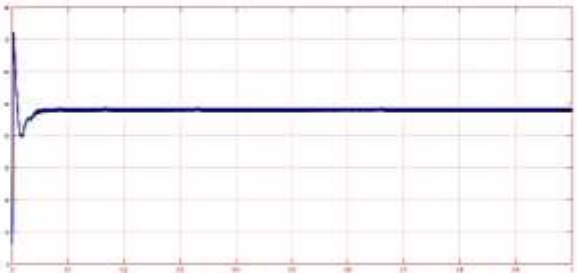

Fig. 12. Output voltage waveform under PI controller

The Simulation diagram and waveforms of PV integrated system given in fig 13 and fig 15 respectively. The integrated configuration has been simulated using 20 W PV panel. For this work modelling of perturb and observe algorithm is done as shown in fig 14 and getting output voltage as 48V.

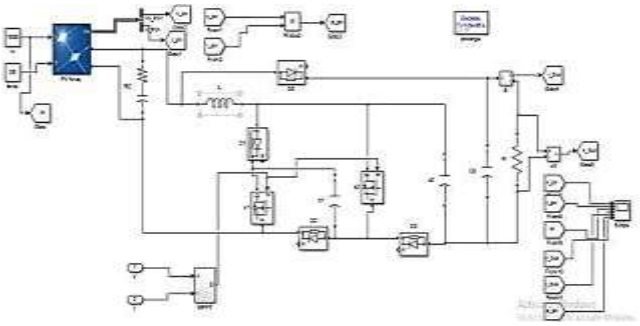

Fig. 13. Simulation configuration of pv system

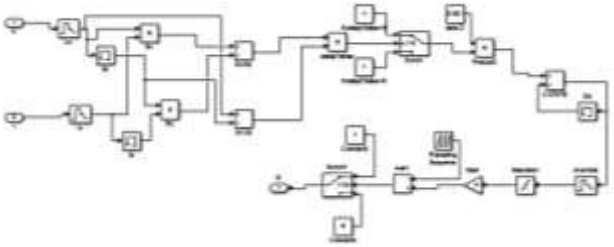

Fig. 14. Simulation of P and O modelling

Fig. 15. Waveforms of integrated configuration. From top to bottom: (a) voltage from pv (b) current from pv (c) irradiation (d) output voltage of DSSC (e) output current (f) power of pv

V. CONCLUSION

In this paper,a DSSC dc-dc converter was presented. The presented converter can attain high-voltage gain using a small duty cycle,reduces the conduction loss and voltage stress on the power semiconductor devices.The DSSC converter has simple structure;hence the converter control is also simple. In addition, a 20 W PV panel is integrated and results are given to verify the presented converter.

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Production of Fatty Acid Methyl Esther from Wastewater Grown Algae

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Abstract— Biodiesel is an alternative source of fuel which is non-toxic and biodegradable than the conventional fossil based fuel. Moreover high cost of production has been one of the major factors affecting the commercialization of it production. In this research, biodiesel was produce by the cultivation *Chlorella sorokinian*a in palm oil mill effluent. The lipid content of the algae was obtained using solvent extraction method. Gas-chromatography mass spectrometer was used for the identification of Fatty Acid Methyl Esther (FAME). The physical properties of biodiesel were characterized according to the standard methods. Based on the results of biodiesel analysis, the components of FAME confirmed in microalgae biomass are mostly saturated fatty acid and they include; Tridecyclic acid (C13:0), Myristic acid (C14:0), Pentadecylic acid (C15:0), Palmitic acid (C16:0) and Stearic acid (C18:0). POME supplemented with urea gave the best biomass and lipid production. Urea concentration of about 1.5 g/L was reported to be the optimal concentration for maximum biomass and lipid production. These indicated that the biomass of *C. sorokiniana* after wastewater treatment has the potential to be used for bioenergy production.

I. INTRODUCTION

Biodiesel is an alternative source of fuel, which is non-toxic and biodegradable in nature (Jayakumar *et al*., 2017). It is prepared by transesterification process of triglyceride oil with monohydric alcohols. The feedstocks used for biodiesel production are canola oil, sunflower, rape oil, maize oil, canola oil, jatropha and soy bean which are classified as first generation feedstock (Ajanovic, 2011). The disadvantage of the first generation feedstocks is that they pose a serious danger to food availability and supply because of their potential usage as human sources of food (Azad *et al.*, 2014). Sustainable production of biodiesel from non-food based feedstock (Microalgae) will provide an alternative solution to the current biofuel and global warming crisis. Microalgae is one of the non-food based plants that are at the forefront of renewable energy and provide a perpetual solution to environmental and climate problems. Apart from eradicating food scarcity and competition with other terrestrial crops, algae biomass can be processed into a value-added product such as bio-fertilizer, bio-protein, and non-toxic biodiesel without emitting carbon dioxide (CO_2) into the atmosphere (Rawat, *et al.*, 2011).

Compared with fossil fuel, the rate of commercialization of biodiesel (algal-based fuel) is very low due to the high cost of production in biomass harvesting, lipid extraction and the choice of cultivating media to produce biodiesel. The concept of increasing viability of this technology has received greater attention among researchers. One such viable option of reducing the high cost of algae-based biofuel is by substituting synthetic medium with natural media such as wastewater (Figure 1). Cultivation of microalgae in wastewater directly eliminates the need for growth medium. Wastewater, be it agricultural, industrial or municipal has been known to be composed of suitable nutrients mainly nitrogen and phosphorus.

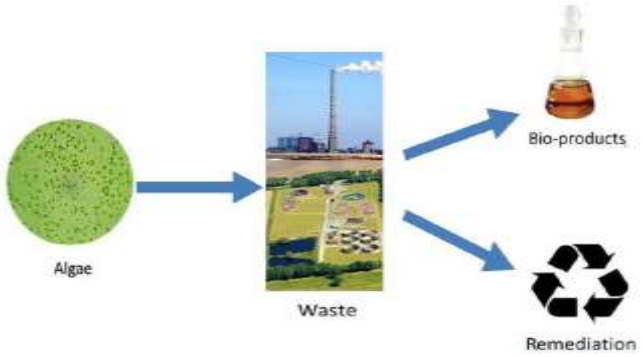

Fig. 1: Win-win strategy of wastewater treatment and biodiesel production

In terms of nutrient strength, industrial wastewater contains higher nutrients than agricultural followed by the least, which is municipal wastewater. The nitrogen and phosphorus content of wastewater is a necessary source of food for algae growth (Chinnasamy *et al*., 2010). In that case, when microalgae are cultivated in wastewater, it will perform the dual role of nutrients removal and production of biomass for energy generation. This implies that

biodiesel production from wastewater-grown algae could be a viable option for the alleviation of global energy demand.

In the one of our published research article, the various experiment regarding kinetic coefficients data had shown that *C. sorokiniana* have a high yield of nutrients removal, which is an indication of high biomass production (Saidu *et al*., 2017). In this paper, the potential of converting the biomass of POME grown algae for bioenergy production was examined. To the best of my knowledge, there was no report on biodiesel production of *C. sorokiniana* in POME.

Biodiesel production from wastewater-grown algae could be a viable option for the alleviation of global energy demand. This paper provides the potential of producing biodiesel (FAME) by growing microalgae in POME.

II. METHODOLOGY

All the chemicals used for this experiment were of analytical grade, were used as received without any further purification, and were obtained from Sigma-Aldrich and Fisher Scientific unless stated otherwise. All solutions were prepared with deionized water.

Fresh sample of POME was procured from facultative anaerobic pond (FAP) from local palm oil mill industry (Kilang Sawit Bukit Besar, Johor Bahru Malaysia) in a clean plastic bag in order to avoid loss of moisture due to evaporation during transportation. The area lies between coordinates 1.772670 and 103.702432. The area lies between coordinates 1.772670 and 103.702432

Microalgae and Culture Condition

A pure strain of *C. sorokiniana* was obtained from algae culture collection center at University of Texas, Austin Texas USA and was maintained on Proteose media prepared in the laboratory at a temperature 29^{o}C. The Proteose medium contains the basic nutrients element necessary for the growth of microalgae which are nitrogen, phosphorus, and ammonium. The selection of *C. sorokiniana* for this experiment was mainly due to its high adaptation to a wide range of substrates. The cultivation condition was maintained under constant aeration. Two fluorescent lamps made up 3000 lux were utilized to provide a continuous illumination at 12 h photoperiod interval (Day: Night). The culture pH and temperature were kept at 7 and 29^{o}C respectively. In order to avoid false reading, the experiments were undertaken in triplicate and the average readings were used for the analysis. The batch culture consists of 1-liter flask placed perpendicular to the fluorescent lamp. Each flask was equipped with connecting tubes that convey carbon dioxide from the aerator to the flask. In all the batches used for the experiment, 0.2µm syringe filters were fixed to the tubes connecting the aerator and the flask. This step is necessary in order to filter out potential microbes that might have their way into the culture via the connecting tubes. Axenic techniques were ensured at all time.

Biomass Harvesting, Cell lysis and Lipid Extraction

Biomass of sterilized POME grown algae was harvested at exponential phase of growth by gravitational settling followed by centrifugation method. 50 mL of algal culture was taken and allowed to settle under gravitational effect, then centrifuged at 4000 rpm for 15 minutes. The supernatant was discarded and the pellet was dried under the sun on drying bed at temperatures of (25-30^{o}C) according to the method described by Guldhe *et al*., (2014). 0.2 g of algal biomass was weighed and placed in 50 mL centrifuge tube. 4 mL of hexane was added to the biomass as according to the method of (Pooja, *et al*., 2014) but with modification of using sonication rather than reflux for cell rupturing. The justification of using hexane other than other solvent is due to it less toxicity and ability to extract efficient non-polar lipid. The mixture was then sonicated for 12 min at 20 MHz using sonicator system (model; Q500). Following the sonication, the mixture was centrifuged at 4000 rpm for 10 min at 4^{o}C to separate the biomass from the solution. The supernatant was pooled with 2 mL of distilled water to form two layers of upper hexane with lipid and lower water. The solvent was removed from the oil by evaporating the mixture in an incubator at 60^{o}C for 24 h. The amount of lipid was measured gravimetrically using analytical balance (Model; ATX224 Shimadzu Corporation). The lipid content was calculated according to the formula in Equation 5.1.

$$L = W_2/W_1 \qquad \textit{eq. 5.1}$$

L is the lipid content (%), W_2 is the weight of the extracted lipid (mg/L). W_1 is the weight of the biomass (mg/L)

Transesterification Reaction

Fatty Acid Methyl Ester (FAME) was obtained by acid transesterification reaction according to the method of (Ichihara and Fukubayashi, 2010). One mL of lipid was mixed with chloroform-methanol (2:1) and was evaporated. 2 mL of 5% acetyl chloride in 1 mL hexane was added and the mixture was kept at 80^{o}C in a water bath (Cole-Parmer, USA) for 2 h. After the reaction has reached completion, two phases appeared consisting of methanol with acid at the upper phase and hexane-chloroform with lipid at lower phase. The hexane phase was evaporated and the dried FAME was collected in a clean GC vial. To analyze the sample using GC-MS, the sample was dissolved in hexane, vortex and allowed to rest and filter using 0.2-µm nylon syringe and was subjected to GC-MS analysis.

FAME Analysis and Quantification

FAME was analyzed using gas chromatography mass spectrometer (Shimadzu GC-MS QP2010 Ultra) equipped with flame ionization detector and BPX-70 capillary column. The column oven temperature was kept at 150^{o}C for 2 min, and then raised at 215^{o}C at a rate of 6^{o}C m^{-1}, and then 235^{o}C for 5 min. The injector temperature was set at 240^{o}C and helium gas was used as a carrier gas. FAME was identified in NIST Mass Spectral Database. The quantity of individual FAME was obtained by comparing the peak area with that of external standard. The quantity of FAME was

obtained using the equation 15 as adopted from (Dwivedi and Sharma, 2016; EN, 2003);

$$Q = \frac{A_a}{A_d} \times 100 \qquad eq.\ 5.2$$

Where 'Q' is the FAME quantity (mg/L), 'A_a' is the area of sample and 'A_d' is the area of the standard

Increase in the algae biomass was determined using cell dry weight.

The lipid content was calculated according to the formula in Equation 1

$$L = W_2/W_1 \qquad eq.\ 1$$

L is the lipid content (%), W_2 is the weight of the extracted lipid (mg/L). W_1 is the weight of the biomass (mg/L).

The quantity of FAME was obtained using the equation 2 as adopted from (Dwivedi and Sharma, 2016; EN, 2003);

$$Q = \frac{A_a}{A_d} \times 100 \qquad eq\ .2$$

Where 'Q' is the FAME quantity (mg/L), 'A_a' is the area of sample and 'A_d' is the area of the standard

III. RESULTS AND DISCUSSION

Determination of Fatty Acid Content and Composition

Since *C. sorokiniana* grow well in 80% POME producing important biomass, the potential of extracting lipid from its biomass and converting it to biofuel was examined in this section. The extracting solvent used for the lipid extraction was hexane because it is less toxic in nature. The mixture of the algal biomass, hexane, and water before and after centrifugation resulted in the formation of two layers of upper hexane with lipid and lower water. The hexane is then evaporated to leave behind lipid (Figure 1). Literature has reported that the colour of biodiesel can vary from dark brown to a very light yellow (Knothe, 2009). In another study involving microalgae growth in wastewater, it was reported that the colour of the biodiesel produced is light yellow (Lannan, 2011). In our sample, the produced lipid was found to be pale brown probably, suggesting the presence of phenolic compounds. The major phenolic compounds found in raw POME are gallic acid, protoctechnic acid, p-hydroxybenzoic acid, caffeic acid, syringic acid, vanillic acid, p-coumaric acid and phenol (Ciulu *et al*., 2016). These percentage compositions of the individual fatty acid obtained from this study were compared with other studies (Figure 2).

The components of FAME confirmed are mostly saturated free fatty acid and they include;

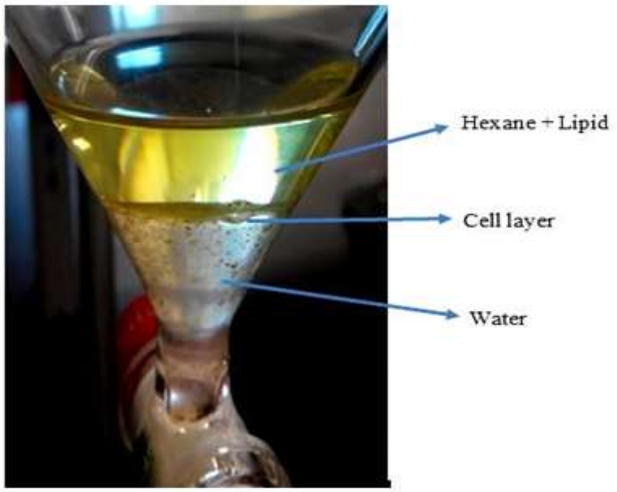

FIGURE 1: Separation of solvent, lipid and water in a separating funnel after extraction

Tridecyclic acid (C13:0), Myristic acid (14:0), Pentadecylic acid (C15:0), Palmitic acid (C16:0), Stearic acid (C18:0). Lipid content of POME grown algae was computed using the relationship described in Eq. 5.2. A total of 52.1% saturated fatty acid composition was determined in this study. Palmitic acid (C16:0) was the most abundant fatty acid in the algae body with a percentage composition of 32.3%, followed by 9% of Trydecyclic acid (C13:0), 4% of Pentadecylic acid (C15:0) and 2.4% of Myristic acid (C14:0).

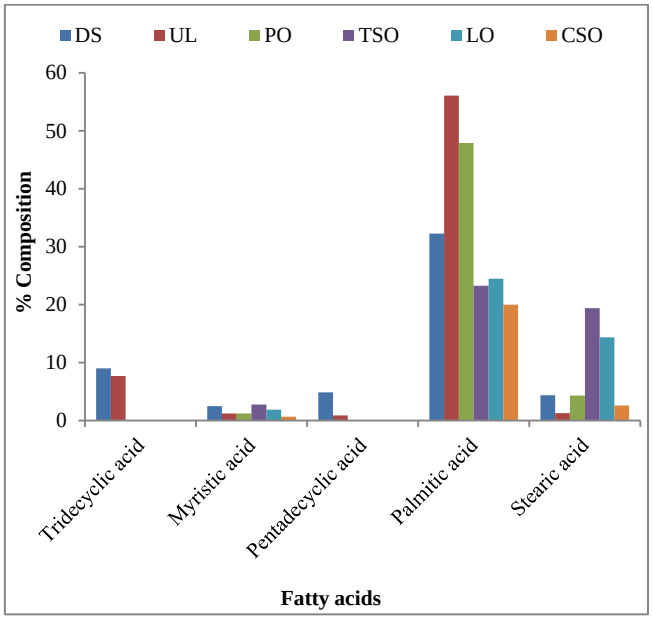

FIGURE 2: Comparison of fatty acid composition of POME grown algae with the different feedstock. DS- this study, UL- *Ulva Linza* biomass (El Maghraby and Fakhry, 2015), PO- palm oil (Gragg, 1994), TSO- tallow seed oil (Bamgboye and Hansen, 2008), LO- lard oil (Van Gerpen *et al*., 2004), CSO-cotton seed oil (Bamgboye and Hansen, 2008).

The percentage composition of C13:0 (9%) obtained from this study was comparatively similar with 8% produced using biomass obtained from *Ulva Linza*. About 2.4% of C14:0 was produced from this study which is lower than 2.8% obtained using TSO feedstock but higher than 1.23%, 1.22%, 1.89%, and 0.7% produce from *Ulva Linza* biomass, PO, LO and CSO biodiesel feedstocks. The result of this study produced higher compositions of C15:0 of 4% which is higher than 0.9% reported using biomass of *Ulva Linza* as a biodiesel feedstock. In case of C16:0, the percentage composition of 32.3% reported from this study was found to be lower than 47.9% obtained from POME as biodiesel feedstock but higher that 23.3%, 24.49%, and 20.1% reported using TSO, LO and CSO as a biodiesel feedstock. The percentage composition of C18:0 (4.4%) from this study was relatively less than 19.4%, 14.39% obtained using TME and LME feedstock but higher than 4.23% and 2.6% obtained using POME and CME biodiesel feedstock. Based on this comparison, it was observed that C15:0 and C13:0 were only detected in the biomass of algae from this study and that of UL biomass but absence in PO, TSO, LO and CSO feedstocks. This is an indication that oil from microalgae biomass contains various types and composition of fatty acid than other types of feedstocks used for biodiesel production (Singh *et al*., 2016). The variations in the compositions of fatty acid were due to differences in feedstock used for lipid extraction.

This has agreed with the literature that the fatty acid content of biodiesel was strongly influence by the sources of feedstock used for the production (Singh *et al*., 2016). It is however noted that low amount of fatty acid content in microalgae biomass has been considered as the major challenge for use in biodiesel production (Chisty, 2007)

Therefore this challenges can be reduced to the bearest minimum if the cultivation of microalgae can be done using large quantity of raw materials so as to obtained uniform high lipid content for enhanced biodiesel production.

A report by Cai *et al*., (2013) showed that, the Precursor's fatty acids are synthesized *de novo* in the chloroplast, using carbon fixed during photosynthesis; the exact free fatty acids are exported from the chloroplast and then converted to TAGs in the endoplasmic reticulum (ER), where they formed a pool of oil bodies in the cytosol (Appendix K). Acetyl-CoA carboxylase (ACCase) is the key enzyme catalyzing the ATP-dependent formation of malonyl-CoA from acetyl-CoA and bicarbonate. Once the lipid is been formed, the process of its extraction varies based on the methods and solvent involved in the extraction. In this research, lipid was extracted using hexane due to it cheap and non-hazardous properties. The rupturing of algal cell wall gives solvent ability to penetrate and interact with lipid to form solvent lipid complex (SLP). The SLP diffused across algal cytoplasm to the surrounding environment where solvent removal and lipid purification processes take place (Halim, *et al.*, 2011).

The production of FAME obtained from this study was confirmed by the results of the GC-MS analysis. The chromatogram containing the peaks of individual FAME was shown in Figure 3-7. The identified FAME from this study are reported to have characteristics of high carbon number and a single bond. These features define them as a good quality biodiesel (Knothe, 2009). Therefore, the use of wastewater-grown algae for biodiesel production remains an attractive field of research. Hence, biodiesel production from wastewater-grown algae is new technologies that can go a long way in providing an alternative source of bioenergy with reduce production cost. The importance of this technology is its attempts to imrpove the economy of biodiesel production.

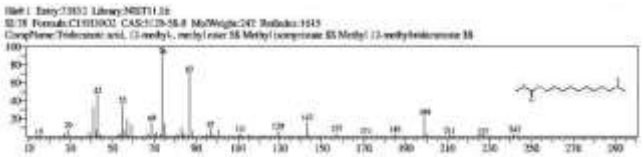

Figure 3: GC-MS result for identification of Tridecyclic acid methyl ester (C13:0)

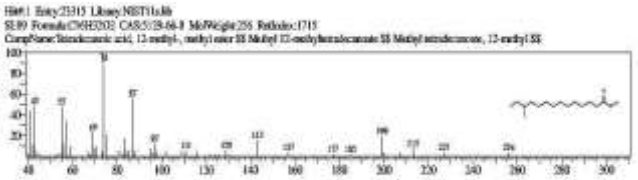

Figure 4: GC-MS result for identification Myristic acid methyl ester (C14:0)

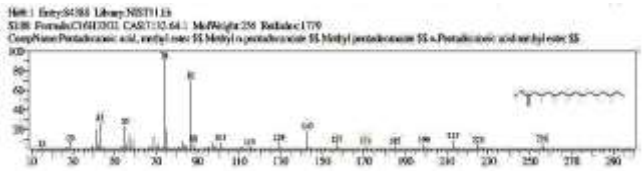

Figure 5: GC-MS results for identification of Pentadecyclic methyl ester (C15:0)

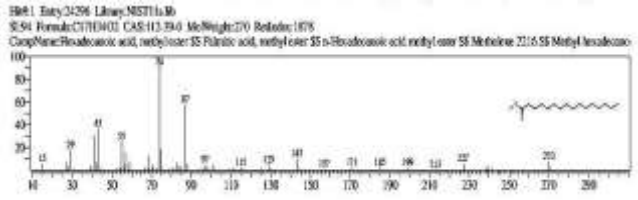

Figure 6: GC-MS result for identification of Palmitic acid methyl ester (C16:0)

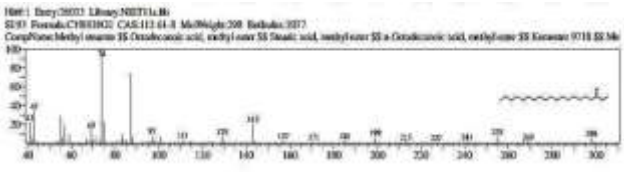

Figure 7: GC-MS result for identification of Stearic acid methyl ester (C18:0)

IV. CONCLUSION

Based on the results of biodiesel analysis, the components of FAME confirmed in microalgae biomass are mostly saturated fatty acid and they include; Tridecyclic acid (C13:0), Myristic acid (C14:0), Pentadecylic acid (C15:0), Palmitic acid (C16:0) and Stearic acid (C18:0). These indicated that the biomass of *C. sorokiniana* after wastewater treatment has the potential to be used for bioenergy production.

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A Survey on Securing Wireless Network Routing Protocols using Group Key Management

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Abstract— Wireless networks have been increasing dramatically in the world of Telecommunications Networks. Wireless networks provide the core features of knowledge connectivity without recognition of spatial and topological qualities of a user. Over the last three years, cellular network has expanded exponentially because of growing pace of the Internet and the exponential development of mobile devices as an instrument of connectivity and data sharing. Mobile ad hoc networks (MANETS) and wireless sensor networks (WSN) like WiMAX face larger protection threats than their equivalents. Nodes serve as both routers and end points. This renders the Internet protocol (IP) more susceptible to security threats. The biggest difficulty when accessing routing details is to judge whether it is from a trustworthy node or not. As for now, the approach is cryptographic signed notes. It is presumed that nodes can be trusted since they hold the true secret key the powerful and stable key management system is quite important. Keys are often used to encrypt data in the program. The emphasis of network layer specific knowledge is on network layer management. Key control systems are successful for the upper layer programs, but cannot be applied for the lower level protocols. Keys are required in order to bootstrap a network protection. This paper studies the state of the art and analyses their applicability for key management for ad hoc networks and sensor networks. The work places strong focus on their applicability to rescue and disaster situations.

Keywords— MANET, WSN, Security, Group key, wireless security

I. INTRODUCTION

As wireless technology does not need wires, cell networks can be comprised of machines that communicate with each other wirelessly. Mobile devices have characteristics that are different from traditional devices. The topology of a network will alter over time due to the mobility of network nodes, which induces regular swapping of network connections. Often called a "community', each member in a group has a copy of a message and each page has one copy, each member has a copy of the whole page, and if anything is modified in one copy, all members of the group would be aware of it. Any message that is relevant to the group is replicated to all members. Wireless networking may be a very sensitive form of contact that is inadvertently eavesdropped upon like an unauthorized eavesdrops. In order for a clique to share private details and share encrypted communications, a shared secret key is needed—a community key that is used to encrypt and protect information sent by the clique members. "It is rather important for community participants to discuss plans beforehand for updating the key for sharing group memberships and to give group members keys to enter the groups accordingly" [3]. The unified main delivery strategy involves an agreement among the group members with the parties of a trustworthy third party. It offers modular group encryption and authentication for broad groups utilizing symmetrical encryption AES and classified logical key tree. However, this practice is not convenient and must be done continuously. This telecommunication regulation is not appropriate for cell networks with peer-to-peer communication. In order to ensure safe community key sharing among a group of nodes, such as a group of mobile devices, a secure link should be established among all nodes in the group. It takes a lot of coordination and will rely on another main relay systems [9][10]. The Diffie-Hellman key conversation is a procedure to create a shared key which is then dependent on a public formula, but not a TTP formula. Using a shared key, two parties may securely exchange messages between them via an unreliable link. To overcome the inconvenience of regularly community DH assessments, group-wide main agreement protocols have been established [11–16]. In the protocol, often called a contributory key arrangement, all community participants lead to the generation of a shared key. Before they can be used by community participants to key and upgrade their group keys dynamically, group key management is a slow and error-prone method. An approach to reduce the computing expense that employing a tree framework to handle key management. In tree dependent key-based protocols, the tree needs to be stored and list the key of the element, the tree needs to send an organized message and distribution of the element across all branches.

Wireless networks [17] [18] are growing in the field of telecommunications networks. Wireless networks actually function as foundation for fast transfer of information and results. Over the past three years, wireless networks have grown rapidly because of the speed of the handheld devices that are used for Internet and data sharing. The most common mode of network is broadband network nowadays. Base-stations are bridges to the internet linking nodes. Furthermore, cellular phones connect to their base stations in a way. The transition of cell phones was allowed since the air-time was moved from one base station to another base station. This is something that also requires the

structured job of administration. This condition would be more restrictive due to shortage of telecommunications facilities. Here is a list of disadvantages in traditional buildings. This topic was answered with the advent of MANET [19] [20]. There is a network of individual nodes that collectively act as a router to establish connections between the nodes. Any node that participates in the broadband network are accountable for its proper functioning. Nodes swap packet series to determine the direction of contact. Each node in MANET is able to switch in any manner it likes. Cellular networks would obviously be advanced regardless of this. Any node in the framework may be either a participant or non-member of the network. The goals of MANET are to provide the administration and real-time data sharing without being worried with the shift of spatial design of MANET. There are several difficulties in the implementation of MANET [21] [22]. The analysis of MANET needs specific expertise and care.

This paper covers the technological specifics of Wi-Fi based sensor networks, its past, previous implementations and some innovation issues that concerns the growth of the sector. It recommends modern low-overhead routing systems to cope with the vulnerability issues of Internet users. In this study, we will firstly explore the use of distributed beamforming and especially hybrid routing approach to discover the best antenna clusters of the traffic in a Wireless Sensor Network (WSN) [23] [24]. For work in this field, the impetus is the presence of a disconnect between the canonical topology assumed for the conventional WSN and the more "ad hoc" physical layer structures employed to engineer real-world deployments. For eg, even though routers are generally thought to be homogeneous, most topologies in actual operations have been focused on routing strategies such as dedicated wiring. It is worth checking how clusters of homogeneous nodes will interact and shape a heterogeneous network, in the sense of a multihop network. Many protections for WSNs [25] [26] [27] are currently accessible as external modules from the rest of the protocol stack. Some recognize that relying on physical layer to offer facilities will be prohibitive. Cryptography has been used to preserve secrecy and credibility of message transmission and verification of peers in order to guarantee that established devices can participate. The limited energy reserves that any node have cuts the degree to which cryptography (especially public-key cryptography) can be relied upon to protect WSN systems. It is not possible to guarantee security in cryptographic schemes [28] [29] [30] as it is susceptible against attacks through changed internal topologies. After its discovery, the wormhole assault is always probable. This motivates the investigation of security approaches that integrate more tightly with the critical data distribution mechanism of the network. Focusing away from a network [31] [32] [33] area in which there are risks is a feasible way to prevent assaults. This policy helps the army to enhance its overall defense without degrading its capability.

This essay (like several others listed all over the web) has focused on the fundamental aspects of management. The key control consists of the method of handling cryptographic keys. The means of security includes the generation, development, distribution, protection and sharing of sensitive protected data and the use of an information system for protecting against unauthorized use of such protected data. Cryptographic systems [34] [35] [36] are used both in routing and in data flows to protect the information that is transferred. To ensure privacy, it is essential to provide server key management. Key management is considered to be one of the essential resources ensuring the secrecy, honesty and accuracy of records. Strong protection needs are the core of delivering network security. However, existing routing schemes ignore the critical role of confidence creation, key control, and key revocation.

II. MANET

This form of network makes use of wireless networks used by several users at the same time. A node may be any electronic device with the potential to connect directly with other devices. For example, a smartphone, a PDA, a mobile phone, a PDA, or any other mobile device. In the course of development, the topology of a computer network varies with time as nodes can shift, or any new nodes join the network. Either way, some nodes may even be removed from the network. The network is built, controlled, and coordinated solely by the nodes themselves, in a decentralized manner, without the help of a centralized third-party or fixed infrastructure. As a consequence of this collaboration, the relations of the nodes within themselves is what is founded upon in this network. A node does not only utilize the network for communication with other nodes, but also helps the network's features by executing routing operations effectively.

Fig-1: Mobile ad-hoc network

If a node wishes to connect with another node which is not inside its contact range, a relayed message would be passed on and passed on before it gets to the position of the other node. Multi-Access Networks (MANETs) are different from conventional networks in that they can quickly be set up and broken. They are not tethered to the numerous

computers in the traditional network. Figure 1 shows what feels like the creation of a MANET [37].

2.1 Keys used in MANET

a. Symmetric keys maintenance in Manet.

Both the sender and the receiver use the same collection of encryption keys to handle the protected data themselves. This key is used to encrypt some data and then it's often used for the decryption of data. If five participants are going to have a discussion in various places, so the number of keys in each area is equivalent to half of the numeral of keys**.** The public key is made publicly accessible, not used for encryption, and is meant mainly for authentication (logging in). The traffic encryption key is required to be used to decode the data and is sent to the only recipient. Each key communication they create has to be passed along to both the public and private key.

PIKE

To prevent from security attacks in the wireless network PKIE [38] [39] [40] (Peer intermediaries for key establishment) is used, nodes with sensors are used as trusted intermediates in the network. Data obtained over a period of time was used to validate the key used for safe key exchange. PIPOKE is a chain of nodes using a special hermetic (secret) key. There is a constant random wait until the key will be released. In the PIKE 2-D method, a key can be hidden in order of n total nodes, which can be protracted into any one of the dimensions of the image. Anyone who may reach me could have received unauthorized details regarding the PIKE Credit Union. It helps our website to withstand targeted threats since it is placed up on several different pages. PGP helps ensure the two private keys are extracted so that they are not just random odds.

DKPS

It is essentially a main selection system Distributed key pre distribution scheme (DKS) In this method, by segregationgoods, data by random A key may be taken by any node since the common set. This exclusion property is proved by doing the family linkage study. An algorithm of probabilistic is used for a distributed algorithm. Each node has a hidden key that is exchanged with another node. It cannot be found by a particular node in the ring. The laws are not rigid. The method doesn't provide protection, but it is simple to test because in DKS process eavesdropping may occur. The step in question is critical for successful functionality of mobile nodes. This resource would remove excessive storage in DKPS. Team main agreement [7] is inefficient according to this method.

Key infection

This definition involves an equal involvement from any mobile person.And because TEEs on its own does not allow the trusted domain to interact beyond itself; the symmetric key used in its protocol is broadcasted to TEE instances and cannot be removed. This latest design provides all the security of the security services which are weak but contributes enormously to the infection scheme having low prices, low operating costs, and low encryption cost. This software has the downside of having late mobile node entry. Transactions do not need to go through middlemen which lowers cost and increases transaction pace [8].

b. MANAGEMENT OFASYMMETRIC KEY IN MANET

Asymmetric key encryption requires two keys to encrypt and decrypt details. The sender of the signal has a particular private key, and a similar public key. At the stage where the document was encrypted, a digital signature was also created through the method of signing it with the recipient's public key. The receiver, gets a letter, from which he opens one important part of the message, after two important sections are known by the sender and him. Thus, the key remains safe. Proper monitoring of main improves enforcement standard and decreases possibility of data loss. Now we will address the relevant asymmetric main management schemes.

Mobile certificate authority (MOCA)

It is essential to recognize a trustworthy certificate authority for the different key management process such as key creation, key delivery, key revocation and key updates. In this typical, someone who is physically stronger or better is used as indicator of MOCA. Each node has an equal probability of being selected for the next hop in the network. By enabling the use of various certificate authorities, the MOCA method offers the method of redistributing certificates to each OCA case.

Self-organized key management (SOKM)

Deferring local certificate revocation for a particular pair of local certificate servers by updating the second one (the one not copied/copied over to the first). When communicating details in a credential graph, the nodes are supplied with a file that contains knowledge regarding the best exposed credential. Per Mobile Node produces a Public Key Credential that is forwarded to all other Mobile Nodes. Utilizing a public key certificate as the authorization tool is used. Certificate of permission. The route algorithm uses a web of trust that makes it unsuitable for ad-hoc networks. It offers the company a multitude of possibilities for modifications of the networks.

SEKM

In Secure and efficient key management (SKEM) server party, there is a configuration of a mesh. This is a group of all servers with partial private key used for communicating with the group. This structure of the autonomous hidden shareholders and the thorough protocols for contact is all supported by this effective and stable scheme. Server costs a lot.

Private remote key control scheme

The recommended scheme that is in [11] contains of setup, registration, testing, and key exchange. As part of checking identity of a customer, a key generation center, which is a trustworthy organization, must be used which will eventually produce the cryptographic key. One of the daunting aspects regarding the encryption process the company's protection strategy is that the master key is automatically chosen for the encryption's computation. The public-private key pairs are generated using the RSA framework be it private or public. This strategy, while established, is good to escape the problems of brute force strike, replay attack, and guy in the middle attack. End-to-end encryption guarantees safe connectivity for all devices. By understanding the suitor's public key, the suitor will not be allowed to send a response using his or her private key.

c. MANAGEMENT OF GROUP KEY IN MANET

The SEED scheme implies that a user begins with a randomly created id, gets a registration code, and gets a credential. The document must be checked by the identity of the client, and the generation of the private keys must take place in a secure location. When it comes to producing this function, the public key is computed by comparing the established key against a shuffled variant of the same key. Using the private/public key algorithms, helps a user to submit and receive files. This model lets one escape physical force, repetition, and the guy in the middle assaults. Encryption is also present in this platform. The generation and delivery of key used by the user is not required by any organisation. MANET's are just as critical for a group organizer as they are for an activator.

The group key has gained attention as a common key among individuals. The aim is to create a dispute key from which only a community of users may interpret messages or broadcast code. Managed by a key management scheme which only enables those who are genuine group members to obtain the key. Community key protocol can be categorised into three forms- centralised, dispersed and decentralised. This month's posts also addressed various community main management systems.

PGSK

Anonymity is granted to people signing the letter by using a group signature scheme like [10]. Patients also get correspondence from and about their doctor. Such messages may contain a signature of a party's workers in hopes of hiding their healthcare provider's name. This scheme has a certain form of "verifying function" that enables anyone to delete the anonymity of the verifying function's performance. Getting a selective disabling of members is endorsed in some systems in that the signature power of removed members would not experience substantial damage. A key server retains a private key to create a public key signature throughout the network for each node while preserving full secrecy. In this method, you can say the behavior of the correct connection between persons.

SEGK

In this engineering model, a pair of multicast trees are built. The boss maintains track of the team members efforts. The party leader has to hold to his/her role and make the required and appropriate decisions. We provide a central decision management system for a Manet network. A stable double multicast tree formation is an effective way to reduce the fault tolerances, particularly when the networks are big. A group organizer can desire to begin the process of unifying the community by sending an enter. The direct proportional relation between numeric processing capacity and the no. of devices on a network. Group key is recently modified quite frequently for maintaining backward and forward protection. A network may be entered and left in this form of network.

d. FUSION KEY ORGANIZATIONIN MANET

Hybrid keys are rendered by mixing two or more than two keys. Now I will analyse some of the hybrid main control systems

Key management using Zone

There are zones defined in this wireless model where each node will run. Wireless networks are structured because they broadcast messages that are transmitted from one node to a node that is a fixed number of nodes and then broadcast. A node within a distance of the control zone is using symmetric key encryption. To ensure inter-zone inter-dependency, a device made up of asymmetric keys is kept unsteadied without clustering. This model sorts zones using the Zone Routing suggested in [12].

Key management using Clusters

These are the ways we can use to protect our scheme, by using hierarchical clustering, off-line key authority, partial distributed key management on the database systems, and mobile agent on the mobile devices. Without the use of cluster head that looks at the public key of the members, the problem of key content control is lessened. Mobile backups include private keys of the trust formed signer of the mobile agent. A new key is produced by assigning the old public key to newly developed numbers secret then distributed among private key holders. The timestamps in the AVI may be used for main renewing period. The computer prevents utilizing more power and network access to complete the data transmission phase Hierarchical Clustering inside this model supports the repetitive model filling. [13].

III. LITERATURE SURVEY

In this scenario, the LUCC nodes are arranged as CH, centre nodes and periphery nodes. All core nodes have the duty to build and allocate Community Key. (GK). The mistrust evidence used for electing CH is removed from the party. The core members produce theoretical information and shared grounding utilizing two round agreement procedure (TRP). Not only the core members but even all members do any rekeying to minimize job load.

In research [5], they present stable key approach in hierarchical community, rekeying Key chain is used in key chain. A roving protocol for safe group communication built by host and home groups enables the host group to submit and intercept incoming messages without new keys. But as there are expanded quantity of community and scale of the organizational system, the conversation overhead rises and so does the importance-by-product difficulty. The protocol ideal for a fixed group is the same and nodes will switch to separate router.

Through authors' methodology which combines direct and indirect values of confidence, they could compute trust value of each node. The node with more confidence value is chosen as CH node. Also, the recently named supreme CH will serve as auxiliary CH in the upcoming event. The malicious nodes left the group by the presumption of being untrustworthy. The key agreement included here is GDH2, the GNOH, and the GDH (Group Diffie Hellman).

In order to restrict copy/paste in the lab, researchers introduced an intra-group population key generation for intra-group communication. The writers, with a modern type of encryption, suggested that key generation dramatically decreases overhead for group controllers and participant access control. The node that is inserted last becomes the most important one since it is the one that is used for future contact. The community keys are identical to the controller and participants without the use of cryptography. Via their results, they found that re-keying was substantially decreased while participation in membership was increased. The growth in incomes was only feasible by way of polynomials.

In [4], the wireless MANETs are usually said to be more weakly formed than wired MANets. Nodes serve both the role of routers and touch points. The web-layer becomes susceptible to protection breaches if you aren't cautious. One of the tests given during the screening is to judge whether or not the routing memo emerged from a reputable source. It then pulled together the unencrypted messages. From the maximum assumption, it is assumed that the node is trusted with the valid hidden key.

In [5], the authors found... In this post, they suggest extending the sensitive encrypted tag by utilizing these latest encryptions for wireless ad-hoc networks, which has not yet been discovered before. At present in the literature, there are fairly much two primary areas of cryptography, namely key cryptography and ID-based cryptography. These two come with their own disabilities though. If you were using an area dependent key encryption system, a certificate authority (CA) would be used to verify the certificates are signed for the private and public keys as well as the other users keys (the key escrow problem).

In [6], the authors presented a ground-breaking paper that of Id-based and hierarchical cluster main association schemes on large-scale MANET. The secret steganography strategies for the grand accumulator scheme is by being all these hidden shadows from group core nodes. After node was wandering from one sub-group to another, they could check for non-practicing node to cut the price of such two centre sub-groups.

[7] notes that in. Mobile ad-hoc web is a smooth integration of nodes, who may be sender, receiver or relay and may be oblivious until they are placed alongside any other supplementary in a clustered network. Communication needs to be carried out in a safeguard manner and as changes are done on topology, latency, web size, services and much more. Aspects of belief group among the mobile nodes will operate together with the assistance of verification key exchange.

In [8], writers' spotlight. Main connection is a most significant topic in MANET. Signcryption, a modern cryptographic approach that incorporates the purposes of digital signature and encryption for authentication and secrecy is an efficient way to cope with key-association problems in MANET. They suggest an ID-based transitive key association method that is both effective in terms of computational expense and retain no record of the unencrypted messages.

[9] implies. There is a core association practice that utilizes a proxy CA engine to furnish quality key compartmentation assistance. In their scheme, a single cluster must have certain server nodes that use threshold verification method to comprehend trust certificate. A higher-level CA cluster can allocate proxy signature key shares to a lower level CA cluster across the new algorithm they designing. It is reliable, low-cost, and scalable because it can be deployed in broad MANETs.

In [10], the writers have assumed that security is one of the most critical facets of mobile Ad hoc networks (MANETs). To remove aggressive nodes, we must ensure that all nodes in an M2M network are friendly. They claim that peer-to-peer Byzantine fault tolerant broadcast algorithms can be used for MAC management in MANETs. In their counselled scheme, the key is connected to many other keys held and placed in pieces in a random manner according to a polynomial. Any single node in the counselled system is installed alongside an assign ski of the CA confidential key SK, the node's area key pki, and the CA area key PK beforehand entering the network. Although this could not be feasible, the chief confidential key might be retrieved from the threshold for each piece proven from Lagrange Interpolation. Because of this, the counselled approach improves the security of MESH Networks.

Cryptographic methods are being introduced in MANETs to guarantee the reliability and protection of the network. Cryptography is classified between symmetric and asymmetric schemes based on the way the key is applied. In symmetric scheme, the hidden keys are exchanged until the two parties interact and join the network. Details of any encrypted communication shared in a community are revealed if an intruder tries to penetrate the link. The

symmetric networks are ill-suited for MANETs. Public Key Infrastructure is a key management system of conventional asymmetric encryption (PKI). The efficacy of certificate-based PKI is partly contingent on the security and credibility of the certificate authority (CA). Nodes have a comparatively small chance of being exploited in a MANET due to the infrastructure constraints on wireless networks and the limited internal relation immunity. Once CA gets hacked, the whole device is jeopardized. Another issue with PKI systems is the large overhead in their set up (PKCs). There is no need for certificate authorities (CAs) and public key infrastructure (PKI) for identity-based cryptography (IBC). Recently, IBC has drawn further attentions from academics and identity-based systems have been placed forward. The benefits of identity-based key management include reduction of the data, computational and connectivity expenses, rendering it more desirable for restricted capacity or space constrained networks.

IV. WIRELESS SENSOR NETWORKS

Based on sensor and actuator, wireless sensor network also evolved from the idea that miniature sensors may be used to analyze environmental situations or resources. These sensors wirelessly relay information to a home base station. To accomplish the transmission line, a sensor is connected to the base station wirelessly. Wireless sensor networks have quickly become a heated topic in the academic world and have become the subject of a host of articles and a large number of annual conferences. The Wi-Fi is also considered a "wireless ubiquitous" network because it is often hard-wired into the system.

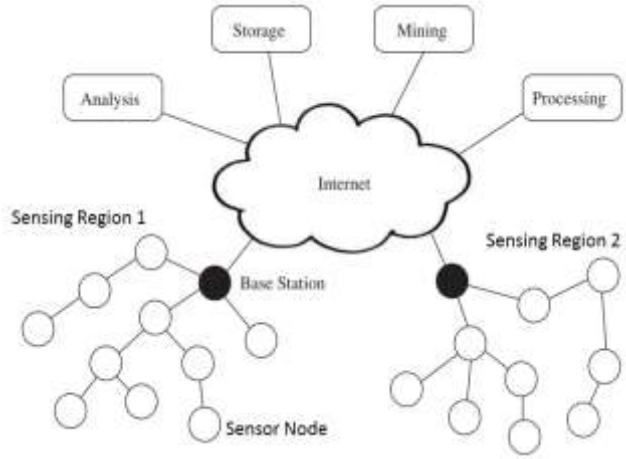

Fig-2: Wireless sensor network

4.1 Key management in WSN

To offer group key, unified group key management may be split into group key distribution (centralized) and group key negotiation , which uses a decentralized group key management . (Key management is a tool used in communication to guarantee a standard password for security purposes) (distributed model).

a. Centralized Model

It uses Community Key Delivery Schemes including Group Key Management Protocol (GKMP) [26]. This strategy is too burdensome and won't scale to a wider network. In Logical Key Hierarchy, individual and auxiliary keys are grouped in a hierarchy and each clause member is allocated to a root. The universal key is used for all participants of a party. In this system, the number of OWL messages would be limited (log N). It enhances protection standard by utilizing the local encryption. In such multi-hop WSNs, rekeying messages created from the logical key tree can be forwarded via one or more intermediate nodes. The Topological Key Hierarchy (TKH) allows it possible to lower the cost of contact by minimising demand for keys.

It is very troublesome in WSN architecture to implement this kind of methods. Firstly, rekeying the messages must be done over both wired and wireless link. The consumer must certify and agree a common secret key with each sensor node on the grid. All community key delivery algorithms can help end-to-end safe communication.

b. Distributed Model

In this scenario, each person is granted fair attention. For community secrets to be exchanged safely, group participants must participate in Diffie-Hellman (DH) key exchange or provide a secret sharing strategy. Group members will throw their DH seeds blindly through unreliable networks and the last member can give the collected DH seeds to all other members so that all members can compute the group key. Secret exchange principle has significance since it may improve the robustness of safe key generation framework. That implies that an intruder that catch more than M members will not be able to recover the group key. This end creates repeated encounters which can incur high computing expense. In addition, the distribution of hidden seeds must be secured by utilizing a mutual key between peers.

Group primary methods cannot be employed for the WSN owing to the cost escalation in computing and connectivity. The causes of infeasibility of groups main delivery structures are still exist.

Hierarchical community key control is a system in which several subgroups are introduced. In addition, the token rekeying may be performed inside the cluster. Hierarchical group-based models are most suitable in IoT environments. We split the control of community key into two simple components.

c. Self-Healing Theory

To possess the power to self-heal, the community manager can use a t-degree shielded polynomial whose value is equivalent to zero.

d. TKH Group Rekeying Policy

In the TKH, the nodes in the same subtree (ST) share the same tree key. (TK). ST is an acacia with the sub-branches with main branches situated below each sub-branch. All sibling nodes in a tree share the same sibling key. (SK). An individual key (IK) is exchanged across any node. The community key helps to encrypt all traffic inside a group. The value of TKH is to restrict the tree depth "4" regardless of the network size. This reduces the amount of memory needed to encrypt the most sensitive keys.

V. LITERATURE SURVEY ON WSN

Atan. et al. [38] have proved a successful certificateless authentication system for VANETs. Their partnership consists of three stages to ensure the protection of its participants. In the first step, automobiles can register with a trustworthy entity. The second step of vehicle authenticating is the offline registration phase. The third factor is the key shared between each community generated with Chinese Remainder Theorem (CRT). provided a modern approach for protecting connectivity in complex WSNs. In their suggested system, the developers made use of four types of keys. The public/private key pair is created by the node itself using the certificateless authentication scheme. Each node requires its own key for private communication. The Pairwise Key will protect contact between each node in the cluster. Both nodes transmit all messages to each other using the cluster key. The downside to this system is that it includes a hidden key for each node of the cluster to transfer and in that way induces overhead. Moreover, the cluster head will broadcast a new mutual secret key and then hash the details. The assault will contribute to significant harm to the network.

Gupta and Biswas also describe a category of variables. This is achieved by each node to create the participant key for the group. The main benefit of this approach is that it offers a widely trusted community key without the requirement of a third party. This is unacceptable because there are a lot of contacts. Also, because each node computes own values, the computational requirements expand. This scheme should not address the node right to enter or exit a WSN and its effect on the re-sending of the community key for the remaining nodes inside the WSN. Tan and Chung suggested a scheme to create a common community key to maintain high protection in NG. The trustworthy node is responsible for providing the community key, which would be the mutual hidden key. The authors addressed the entering or leaving protocols and state that whether one enters or exits, the community key must be regenerated. Their creative scheme would fit great on higher powered computers, but it could not work well on low-powered models. Their systems did not cover backward confidentiality, since the last relaying node already had the mutual hidden key. Cheah et al. suggested the self-healing primary distribution. In LUCC protocol, each node receives a polynomial group as a multiplicative group of finite field of order 2 and each special integer as node identity. All new nodes entering the community are brought the same parameters, but excluding the previous session keys. this protocol aims to reduce the main management overhead effectively. Based on this method, it is more effective to group nodes in one joining session to provide one network overhead and thereby save resources. Furthermore, Al-Shammari and Eljeit suggest an effective procedure for WSNs. The protocol attempts to spread a hidden key among a community of nodes. Symmetric Cryptography is easier and therefore they preloaded public key knowledge to all nodes before network deployment. Each node secures a community secret key using this group key. The initial μTESLA is that it raises power demand so much. Therefore, they substituted set cycles for data flows. The authors suggested that their approach effectively enhanced the performance of main usage and reduced the expense of network connectivity overhead and the computing costs. However, they did not recognize the element of secretiveness that come with entering or quitting nodes.

VI. CONCLUSION

This paper explores various forms of MANET key control systems. Three groups of the key management in symmetric encryption are defined as PIKE, DKPS and INF. PIKE offers scaling with strong security. To promote clarity and correctness, DKPS is a more powerful algorithm than community key agreement and pair wise key agreement. INF templates do not involve comprehensive teamwork. We also addressed the various forms of main management systems as well. The identity-based key management helps avoid protection vulnerabilities and is applied in systems without PKI. Group key scheme PGSK is more efficient and stable than Group Key Scheme SEFK. In terms of hybrid key management, region dependent key management and cluster based key management are addressed. We would focus on protection networks in future and thus have secure contact.

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Fault Detection in Cloud Computing

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Abstract— Cloud computing has brought about a transformation in the delivery model of information technology from a product to a service. It has enabled the availability of various software, platforms and infrastructural resources as scalable services on demand over the internet. However, the performance of cloud computing services is hampered due to their inherent vulnerability to failures owing to the scale at which they operate. It is possible to utilize cloud computing services to their maximum potential only if the performance related issues of reliability, availability, and throughput are handled effectively by cloud service providers. Our method detects anomalies by discovering the abrupt change of correlation coefficients with a EWMA control chart, and then locates suspicious metrics using a feature selection method combining ReliefF and SVM-RFE. We validate our method by injecting typical faults in TPC-W an industry-standard benchmark, and the experimental results demonstrate that it can effectively detect typical faults.

I. INTRODUCTION

Cloud computing is a new technology in distributed computing. Usage of Cloud computing is increasing quickly day by day. Cloud computing offers various resources in the form of services to the end users on demand basis. It enables businesses and users to use applications without installing them on physical machines and allows access to required resources over the Internet.The openness, flexibility, and complex architecture of cloud computing have led to many different types of fault from infrastructure systems, platforms to applications on them. These affect users and cause enormous economic losses. For example, in August 2013 Amazon stopped working in 45 minutes due to a fault which caused losses of up to $5.000.000. According to Tellme Networks, fault detection takes 75% of the system recovery time and prevents 65% of faults from occurring [1].According to some researchers, it is likely that in the future, the tool service-level agreement (SLA) Google applications are expected to manage all causes of faults [2].Additionally, fault detecting and diagnosing face following challenge:

• Cloud computing transparency makes it difficult to analyzeapps status as this much depends on the interaction amongthe system components together with other apps.

• Cloud computing‘s large scale with thousands of nodes make difficulty in collecting figures of the system from net-work, hard ware, operating system, virtual machines, infrastructure and apps.

• In practice, collecting abnormal and faults is a problem andit is really costly to make system operate in fault conditions.FOCSVM needs no abnormal data, it is easier to train and to apply to detect abnormal compared to the traditional SVM. However, OCSVM is extremely sensitive to outliers in the training data [3].We propose the fault detection approach, named EWMA-FOCSVM, which monitors abrupt fluctuation of the decisive boundary value of FOCSVM based on EWMA chart.

II. STATE-OF-THE-ART

A.Types of Faults in Cloud Computing

•Crash faults: where system stops responding completely and performs no operation further (hard disk failure).

• Byzantine faults: when system keeps on working even after the fault but results in incorrect manner.

• Data faults are faults due to data collection during the operation of system. The data may be jammed, incomplete, and even some damaged data may be unreadable. For example, the online customer information.

• Calculate faults occur in the network due to network partition, packet loss, packet failure, destination fault, linkfault,etc; faults occur in hardware such as CPU faults,faults in memory, etc…

B. Fault Detection and Diagnosis in Cloud Computing

Fault detection problem is one of the biggest challenges ofa real system. It is an important task to ensure reliability andto reduce losses which happen by fault in the system.Fault detection problem is one of the biggest challenges ofa real system. It is an important task to ensure reliability andto reduce losses which happen by fault in the system.

•Intrusion strategy: The variables and status of the systemare observed, collected, and measured periodically. Afterthat, the process of analyzing and evaluating the variablesand the state of the system are applied to quantify information. Intrusions are identified by measuring a bias betweenthe measured values of system with those measured in thenormal process.

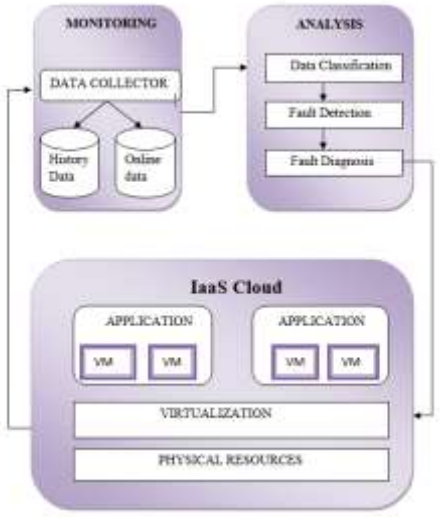
• Heartbeat strategy: A message is sent periodically froma monitored node to the bug detector to notify that it isstill alive. If Heartbeat’ messages do not arrive before thetime was up, the fault detector suspected that there is anoccurred fault at this node.

Pinging strategy: A message is sent continuously from a fault detector to a monitored node. The fault detector will get the answer ACK (Acknowledgment). If a sustained message fails, a probe (a series of messages separated bya period of time) can be used to verify if a node is actually faulty. Detecting broken nodes with partially centralized monitoring supports to large-scale system. However,inability to detect malicious attacks if the nodes are stillfunctioning properly, detecting incidents depending on thereliability of the detection node and network conditions,potentially buffer overflow due to transmission the message.

System's signatures are collectedby system operators or commercial monitoring tools like HPOpenView, IBM Tioli, etc., so that alerts will automatically generate whenever metric values exceed the predefined thresholds.Web applications provide concurrent services to a large number of users through Internet connections. [11] proposed an online fault detection approach that depends on SVM-Grid to predict emerging issues in cloud. The accuracy of traditional SVM model is enhanced by using grid method for model's input parameters to accomplish fine-tuned prediction. In addition, FT algorithm which updates samples database to minimize time costs is developed. To evaluate the proposed method, algorithm is bench-marked with Back Propagation, traditional SVM, and Learningvector quantization (LVQ).

In [12] proposed the online abnormal detection method based on self-adaptive cloud monitoring.To address the issues which administrators manually define suitable monitoring rules, the self-adaptive monitoring approach isbuilt with two phases.By adjusting automatically in the monitoring period, the accuracy of abnormal detection is improved.This approach has low overhead.

III. FAULT DETECTION AND DIAGNOSIS APPROACH



The simulation example showsthat the sturdy 1-class SVM is superior tothe final 1-class SVM, particularly once thecoaching information set is corrupted byoutliers, and therefore the fault detectiontheme supported sturdy 1-class SVM presents satisfactory.

A. System Architecture

Web applications are hosted on cloud computing which usually possess multi-tier architecture such as Servlet, JavaServer Pages and Enterprise JavaBeans based on Java Framework or .Net Framework of Microsoft. A typical multi-tier architectureUsually consists of a view tier, business logic tier and data base tier. There are specific servers for each layer which is a virtualmachine (VM) for applications in cloud computing infrastructure services.

A.1 Monitoring Component

Monitoring component collects data from physical resourcesand virtualization. Metrics of system performance such as resource usage of servers, workloads, and performance metricsin the application are gathered by interfaces provided by operation system or third-party software like Hyperic SIGAR, Ganglia, or Promethus etc. The collected data will be first processedby standardizing, outliers adjusting and deleting those repeated. Next, the gathered data is both stored in historical and onlineones. Finally, online data will be transformed into Fault analysiscomponent while the historical one will be labeled as normal orfaults to be used for fault diagnosis.

2. Fault Analysis Component

There are three main phases in fault analysis component including abnormal detection, fault detection and fault diagnosis.

• Abnormal detection is a process to identify objects withbias compared to common ones. These objects carry significant differences or are created by a different mechanismcompared to the normal ones. It is essential to find out aproper method of deviation measurement serving for abnormal detection purpose.

• Fault detect is a component to monitor the characteristicsystem state and then identify abnormal data related tofaults by comparing the multidimensional monitoring datacollected. Sudden changes in the metrics are detected using EWMA control charts that do not require specializedknowledge.

• Fault diagnosis is a component which applies feature selection method through analyzing variance of multiple parameters. And then, auto-scaling technologies (e.g., scale-up, scale-down, migration) is used to reduce the impactof faults through adjusting allocation resources in the IaaScloud.

B) Abnormal Detection Based on Fuzzy One-Class Support Vector Machine

In this section, the fuzzy one-class support vector machine abnormal detection model is proposed based on the general one class support vector machine.In one-class SVM, the slack variables ξ = [ξ1, ξ2, · · ·, ξN] are used to locate some data points outside the decisive boundary. The number of points located outside the decisive boundary can becontrolled by the penalty factors of 1/N υ.Consequently, the classification accuracy of one-class SVM is badly affected by a part of normal data points outside the decisive boundary. The adaptive penalty factors based on fuzzy membership function describes the distances of relationship between a data point and the center of the training dataset.To solve Fuzzy one-class support vector machine problem, the SMO algorithm is applied to select two α parameters, αa and αb and to optimize the objective value [32].The output of abnormal detection phase is used to identify faults in the fault detection phase.

B.1) One-class Support Vector Machine

The proposed a method for forming a decesive boundary which has the maximum margin between the origin and the normal data set. Considering the dataset of X = [x1, x2, · · ·, xN] ∈<NXM, which accommodates normal data, an optimization model of the boundary is considered as follows:

$k(x, y)=\varphi(x).\varphi(y)$

The commonly used kernel functions follow as:

Linear Kernal: $\mathrm{k(x,y)} = \mathrm{x^T y}$

Polynomial Kernal: $\mathrm{k(x,y)} = (\mathrm{x^T} - \mathrm{c})^{\mathrm{d}}$

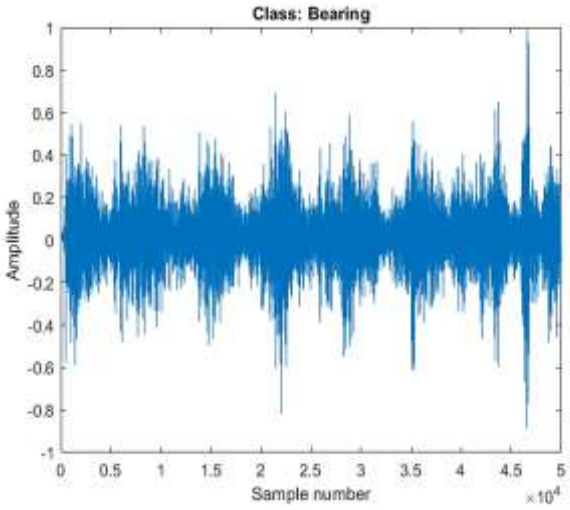
RBF Kernal: $\mathrm{k(x,y)} = \exp\left(-\frac{\|\mathrm{x}-\mathrm{y}\|^2}{2\sigma^2}\right)$

C. Fault Detection with EWMA Chart:

In this section, the fault detection model, named EWMA-FOCSVM, is modeled by using the output of the abnormal detection model and EWMA chart. The decision value of f(x) in by equation. Will be stable in a normal situation. Otherwise, it will fluctuate much when faults are triggered. In dynamic cloud environment, the fluctuation of decision values need to be figured out if they are stable or not. To do this, these values are monitored, and then an alarm is set when the current values are inconsistent with the past ones. For example, Web applications run normally in most cases, but they become abnormal when there is a huge of sudden users' requests at the same time or the systems are attacked by "hackers". Thus, a control chart is needed to track and calculate the stability of the decision values.

IV. EVALUATIONS

To evaluate methods of detecting and identifying faults, TPC-W1- open source e-commerce application on service of cloud computing- was implemented. TPC-W is a benchmark for E-commerce web, including three main components: (i) Web Application System Under Test (STU); (ii) workload generator and send to STU; and (iii) performance monitoring component for SUT. TPC-W allows simulation of three different types of web interactions: shopping (WIPS), web browsing (WIPSb) and web-based ordering (WIPSo). TPC-W uses the concept of an Emulated Browsers (EB) group to make requests to the SUT. EB simulates users interacting with SUT using a browser by sending and receiving HTML content through HTTP.



Online Processing Phase

The online computation for fault detection when a new sample arrives,$x \in R^{1_{xM}}$ consist of

1) The score vector t is obtained by normalizing the new sample with the mean and variance of X

$$t = xp_{pc} \in R_1 x^l$$

2) Calculate the boundary decision function

$$F(t) = -\sum_{i=1}^{n_x} \alpha_i \, k(t_i, t) + \rho$$

Where t_i are the support vectors with xii = 0, ns is the numberof support vectors.

3) Using EWMA-FOCSVM model to detect a fault to F (t)

4) Using RFE-RF model to ranking suspicious metrics after detecting fault.

5) Updating training dataset after detecting fault.

USECASE DIAGRAM:

V. CONCLUSION

In this paper, a fault detection and diagnosis approach is proposed for multi-tier web application in infrastructure cloud computing. This problem is addressed through three-step approach, where we first proposed the Fuzzy one-class support vector machine model to detect abnormal data based on the decisive boundary. Then, the exponentially weighted moving averagechart which monitors the decisive boundary value of FOCSVM model is applied to detect faults for multi-tier web application.Finally; the Random Forest ranking feature algorithm is applied to determine if suspicious metrics are the root of faults.. In fault detection problem, the accuracy of EWMA-FOCSVM is higher than one in Threshold-FOCSVM. In order to compare Random Forest algorithm and Bagged Decision Trees in term of ranking features,Recursive Feature Elimination method with each iteration using Random Forest or Bagged Decision Trees is applied. Also, the exploration ability of Random Forest algorithm in unbalanced training data is higher Bagged Decision Trees. However, more study should be done on byzantine fault for further research.

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