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DIGITALISATION IN TRANSFORMATION: BRIDGING ACADEMIA & INDUSTRY

Proceedings of the International Academic Conference 2021

Digitalisation in Transformation: Bridging Academia & Industry

October 26-28, 2021

Nurul Nisa Omar, Ng Sok Choo, Nanthini Jayaram, Abdul Abdul Rahim Rachman, Hafiz Hassan *Editors*



Proceedings of the International Academic Conference 2021

Digitalisation in Transformation: Bridging Academia & Industry

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PREFACE

We are pleased to present the proceedings of International Academic Conference (IAC 2021) Digitalisation in Transformation: Bridging Academia & Industry.

The momentum behind digital technology that's driving change in industries globally is unstoppable. When compared with previous industrial revolutions, the Fourth Industrial Revolution is evolving at an exponential rather than a linear pace. Technology has continuously evolved to make our lives much easier, with most of our modern needs and demands conveniently served. To be competitive and stay relevant, organisations must move with the times. Their long-standing success may well be defined by their ability to adapt, and how well they apply the use of technology in their business strategies.

This proceedings is a compilation of research papers that was presented at the IAC 2021. These research papers I believe will have a great contribution not only to the academic but also to the industry practitioners.

I would like to say thank you to all authors who contributed their papers to this proceedings and to the conference committee who has work very hard to ensure the success of IAC 2021.

Dr. Nurul Nisa Omar Chairperson IAC 2021 International University of Malaya-Wales Kuala Lumpur, Malaysia

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Understanding the Heart and Soul of an Organization Through Corporate Branding

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Abstract—Corporate branding is a marketing strategy employed by companies which adds value not only as a shared understanding of the brand among its employees, a device for competitive advantage but also as an intelligible asset of goodwill that drives value and enhances market wealth. In spite of this, there is little research work done on corporate branding of government-linked companies in Malaysia. What are the visual elements that are used and how do they communicate the company's philosophy and values. Hence, this study examined the philosophy and visual image of Malaysia's fully integrated oil and gas company, Petronas, Visual analysis and formal analysis were applied to examine the brand logo elements consisting of color, tagline, language, concept, typeface and shape. Observation was also performed on previous and existing Petronas from the year 1974 to 2016 in terms of corporate branding in logo design, taglines, and other corporate identity elements. The findings show that great emphasis is not only given on the corporate branding design but also to the Malaysian government as a reflection of wealth, success and political image. It is hope that the study will shed light on corporate branding issues in Malaysia, especially in the aspect of visual communication and design.

Keyword- branding design, corporate social responsibilities, restructuring, economy, corporate rebranding

I. INTRODUCTION

The philosophy of corporate branding aid to shape today's visible world as corporations begins to adapting technology to consumers and employees. Branding is the main conveyance for communicating multiplex plan in an understandable way. Corporations with unforgettable brand image not only provide philosophy things ought to be told, but they need to comprehend an organization's heart and soul [6]. Like any other product or sector, branding is a current critical integrant in the aviation business. Air Asia is perhaps one of the most successful airlines in the area [7]. It's unavoidable, even so, that as competition rise, carriers of lowcost will need to broaden their marketing strategies beyond fees in low rates. As amongst most essential aims of brand and product management are to build strong brands, since it will result better in short and long-term returns for corporations [6][9]. Since the mid-twentieth century, attempts to understand how corporate rebranding design affects the organization's stakeholders have arisen visual

viewpoints that frequently impact the features of rebranding, and corporate identity effectiveness [8]. The authors of this researchers examined at Petronas current corporate branding style [9].

II. BACKGROUND OF STUDY

A. Corporate Branding

Corporate branding includes the marketing part on how organizations plan and strategize their company through a corporate theory or theme. The branding can be portrayed in corporate identity and also the corporate image. Identity is through the visual elements to communicate a company's philosophy and value through the company logo whereas image is the way people perceive an organization [4]. Branding plays an important role to create a sustainable identity which is widely recognized by the public [2]. AmeriCorps is an example of a company which provides a guideline to use the logo to ensure the branding and image of the company has been recognized by the nation [5].

B. Importance of Corporate Branding

A company's success depends on the mission, value and goals as conveyed through the branding of the company. Branding can help a company to promote loyalty and consumer's opinion of a brand. On top of that, company existing and awareness can also be built through a brand. In a case study in Indonesia, the government uses the communication branding strategies to branding the City of Joglosemar through the social media and promotion strategies [3] as it is one of the efforts to increase the number of visitors to the city.

C. Brand Recognition

Brand recognition and the brand awareness of a company are two different items. While awareness refers to the people or consumer experience of the products, recognition refers to identifying the brand from the company's visual elements [1]. Consistent and effective brand marketing is indeed important to ensure the people are aware of the brand [3]. Brand recognition helps the public or consumer to differentiate the company with other competitors in the market [2]. Through the brand identity created for different destinations can make the visitor differentiate the differences [3]. A case study by AmeriCorps in the branding guidance stated how the

recognition helps the nation to recognize and instill the feeling of comfort, trust and empowerment [5][7].

III. PROBLEM STATEMENT

According to Brunel University scholars, with the rapid speed of globalisation, a healthy competition between nations has arisen in attracting visitors from all over the world. Many prior studies in corporate branding have focused on the nation's impressions of Petronas, particularly in relation to tourism which revealed the Petronas Twin Tower has been recognised as an iconic skyscraper that is synonymous with Malaysia [10].

Journal of Academic Research in Economics' research focuses solely on a recovery program in Petronas' peripheries and in country in Africa [11]. Another prominent research study on the effect of leadership and leaders' behavioural characteristics on Petronas Berhad workers focuses on the forms of leadership in the workplace to maintain employees' staging [12].

Currently, no particular research on corporate branding has been published for Petronas. Other research has found only general branding has an impact on company and the economy and Petronas has been mentioned but from several angles. This study is in line with the need to analyse the evolution and efforts in understanding the heart and soul of an organization through corporate branding.

IV. WHY CORPORATE BRANDING IS IMPORTANT?

A. Case Study 1:AirAsia Berhad

Airasia.com has launched its new rebranding logo design as Asean's enhance application on the internet, complete AirAsia's metamorphosis from a digital airline to a full lifestyle center for everyone. The airasia.com provides a simpler, and more comfortable user experience with primary pillars: fintech, e-commerce, and travel. According to Tony Fernandes, the Air Asia Group's Chief Executive Officer (CEO), airasia.com allows users to dine, stay, shop, and fly all in one application. The company has not mismanaged the crisis; in fact, they have been fine-tuning the platform and unifying the user experience. Across their wide variety of services, the rebranding effort is all about connecting people [13].



Figure 1. Corporate Rebranding - AirAsia Berhad

B. Case Study 2: GCH Retail Sdn. Bhd. - Giant Hypermarket

Dairy Farm GCH Retail (M) Sdn Bhd, founded in Hong Kong, has invested around RM25 million to revamp its Giant hypermarkets in Malaysia, adding thousands of new products [14][15]. Dairy Farm Group's Southeast Asia Food Marketing Director, Lee Hik Yun, highlighted the firm went through with its digital content production plan. He said that simply altering the colour scheme, the company emblem would be associated with freshness. Giant discarded its orange and green colour scheme in favour of a more straightforward design [14][15].



Fig. 2. Corporate Rebranding - Giant Hypermarket

V. METHODOLOGY

This study conducts qualitative method which synthetize the visual and formal analysis of Petronas branding design. Which include the brand logo elements consisting of color, tagline, language, concept, typeface and shape and other corporate identity elements.

Structured interviews been conducted with the former executive (respondent A) of Petronas. Face to face interview was conducted, and the audio recording was transcribed and analysed using the Saturate app, an open source application. This tool allows researchers to extract and code essential elements (keywords), particularly in the areas of logo design origin and corporate aim. The outcome from the interviews session will clarify on corporate branding issues in Malaysia, especially in the aspect of visual communication and design.

VI. VISUAL AND FORMAL ANALYSIS

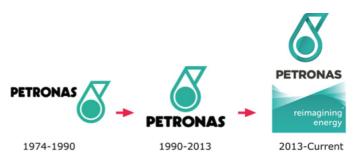


Fig. 3: Corporate Rebranding - Evolution of Petronas Logo

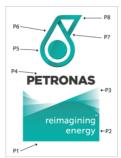


Fig. 4: Tagline and Logo

Code	Visual Observation
P1	Corporate color:
	- Black
	- Emerald Green
P2	Tagline: Reimagining energy Language: English
P3	Concept:
	Respondent A
	- Potray sea, land and oil and gas resources
	- 1974, green and oil drop represent solid stability
	- Mission and vision came to alive
	- Warmth and ergonomic design provide a sense of humanity to
	the experience.
	- Visual Identity System is inspired by the concept of being
	'always in motion for new perspectives'
P4	Typography:
	The letters in Museo Sans are made up of block geometric
	fundamental forms, giving the impression of being visually
	extremely substantial, sturdy, and dependable. It is big and
- D.5	broad in size, conveying a message of confidence and bravery.
P5	Shape: Oil drop
P6	3Dimensional: The Result Is Futuristic And Dynamic
P7	Gradient color
	To Demonstrate The Progression Of A Branding Mark From A
	Single Colour Flat To A Gradient
P8	Triangle
	Strong Sesire to Achieve a Higher Goal

TABLE I. VISUAL AND FORMAL OBSERVATION

Open Code	Properties (Respondent A)
Strategy for	- Understanding and Psychology of Human
Branding	Being
	- Articulate and brainstorm
	- Business strategy
	 Fundamental of Business
	- Recognition
Rebranding	- Digest and Translate the History and
Design	Resources
	 Comparison in Brand Value.
	 Comparison with current Branding Issues.
	- Enhancing
	- Problem Occurs
Corporate	- Meaningless without Philosophy
Philosophy	- History, DNA
	- Purpose of Business
	 Emotion and Expression
Corporate Identity	- Concept and Design
Formal Qualities	- Communication
	 Powerful Mind of Translate and Visualize
	- Precise and Detail
Head for	- Guidance
Teamwork	 Hire experience agency or the expertise
	- Employee Management
Corporate Social	- Return back to the Community
Responsibility	- Youth Current View
(CSR)	- Learn Every Culture Closely

TABLE II. INTERVIEW INTERPRETATION (RESPONDENT A)

VII. FINDINGS AND DISCUSSIONS

A. Corporate Branding Design

According to interview respondent A, the initial brand logo was created by advertising firm Johan Design Association in the year 1974. The brand logo was kept until 1990, when it was updated again by the same advertising firm till 2013. Petronas subsequently underwent a second change in 2013, with a new motto, Reimagining Energy, and improved branding. Three (3) distinct years of logo design have been used to transform the rebranding design. The typeface has changed three (3) times, as has the location of the oil drop symbol.

The font is on the left and the symbol is on the right in the initial logo design. When comparing the first and second brand logos, the circular green inner shape is larger. The most recent version of the brand logo features noticeable modifications to the typography and gradient on the symbol. The tagline is a component of the logo, and beneath the symbol and typography is a gradient flowing motion form. The author observed an evident unchanging feature in all three (3) logos: the hue emerald green and black, which has now become the company's official corporate colour [16][17].

B. Understanding of Corporate Philosophy in Corporate Branding

Frequent keywords were grouped into numerous categories and themes after the coding and organising process was completed, with pertinent sentences gathered around them. Respondent A, Dato' Mohammed Azhar B. Osman Khairuddin, was interviewed. He has served as the Legal Officer (1979), Vice President of Legal and Corporate Affairs Division (1997), Secretary (2000), and Group CEO and Group President of Suria Strategic Energy Berhad. Branding, branding strategy, rebranding, rebranding design, philosophy, corporate philosophy, corporate identity, image formal characteristics, leaders for corporate affairs, teamwork, corporate social responsibility (CSR), awareness, and consumer feedback are among the coding categories.

As a result of the interview, a rising firm must have a branding plan. Design has a lot of value and requires a lot of thinking; branding is all about the heart and knowledge of human psychology. The most important thing is to go back in history and figure out why the firm was founded in the first place. If there is no concept behind the logo, it makes no sense; yet, in order for it to thrive, the firm should set up a corporation with responsibility and legal aspects to develop the business.

All Corporate Social Responsibility (CSR) program must adhere to the emotion and expression-based idea and philosophy. Respondent A stated that a company's ideology is its DNA (Deoxyribonucleic Acid, the basic and distinguishing traits or attributes of someone or something, especially when considered as immutable) and that the key principle is to give back to society.

After the first brand logo in 1974, the Petronas brand logo underwent modest revisions in 1990. The goal of the upgrade is to improve your position in the oil and gas sector so that it can be seen in your market. There was a political issue with the green circular shape logo, which caused some

controversy, so the management decided to make a modification that would assist the firm look at its best in cooperating with any partner networking, including the government network.

VIII. CONCLUSION AND RECOMMENDATIONS

In this study, corporate rebranding design is an essential marketing and visual communication strategy. Typically, businesses hire a professional creative agency to improve their financial skills and propel their firm to new heights.

Understanding the heart and soul of an organization through corporate branding which adds not just as a tool for competitive advantage, but also as an intangible asset of goodwill that generates value and increases market wealth, value is defined as a common understanding of the brand in the corporations.

The main concept in corporate branding design was that corporate philosophy is the DNA of any organization's development. Design has a lot of value and requires a lot of thinking; branding is all about the heart and knowledge of human psychology. All *Corporate Social Responsibility* (CSR) program must adhere to the emotion and expression-based idea and philosophy. The consequences of both philosophical and practical elements of this study point to greater awareness. Future study could focus on consumer perception towards Petronas branding design, or on other related areas such as demography, brand recognition and brand communication for other established oil and gas companies.

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A Systematic Review on Business Resilience and Digitalisation Strategies during Covid-19 Pandemic Among 14 Countries

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Abstract— The fast spread of Covid-19 during the nonexistence of vaccines have forced the government to take fast action and decisions for the people to survive in the pandemic outbreak. This includes lockdown rules being implemented in many countries in order to curb the widespread of the virus. However, it has affected a lot of businesses especially the micro and small businesses. These small businesses faced huge challenges that have negative impact on their income. The managers were forced to be more creative and bolder to overcome the economic downturn. Business resilience is the ability of a company to adapt to disruptions in maintaining continuous business operations to safeguards the resources. There are some theoretical models that can clarify their immediate responses to the economic disruptions. The companies grabbed whatever opportunities that were available to adapt to the changes that took place in the environmental, economic and social by leveraging the technology, government initiatives, business model creation and others. The purpose of this paper is to find out how the micro and small businesses survived during the pandemic Covid-19. The study was conducted by reviewing articles that were selected from Scopus, on the strategies adopted by many small companies. There are four themes and 10 sub-themes that compromise the strategy adopted by the small and micro business in order to sustain in their business operation during this pandemic. Nevertheless, there are also problems and limitations faced by the micro and small businesses in implementing the strategies. Recommendations were provided to help the businesses to increase their business performance.

Keywords— Systematic Review, Micro and Small Business, Sustaining Business, Covid-19 Pandemic, Countries

I. INTRODUCTION

Small business is a type of business that has up to 500 employees with an average revenue of six million dollars or less. This differs within the types of sectors, for instance manufacturing, retails, services and others. On the hand, micro businesses are businesses with employees of 10 people at maximum. These businesses are said to be important as reported by [1], since it offers almost 10 percent of jobs in the private sectors. Murray also stated that micro businesses represent 75 percent of the total private sector employers in America.

In 2019, a new global disease was found known as the Coronavirus disease 2019 or Covid-19 for short. This disease is spreading through physical touch and can be transmitted through droplets of sneezes or coughs from infected persons

[2]. In the midst of the pandemic Covid-19, most countries implemented the lockdown rule in order to prevent the wide spreading of coronavirus. The lockdown rule imposed by the governments had given negative impacts to the small businesses as they have to close down their business for more than two months. As such they have liquidity constraints that led to financial distress. It is crucial for companies to recover immediately from the economic destruction and adopt sustainable strategies to avoid further damages to their business. The study was conducted to observe the strategies that small companies adopted to cope with the challenges during the pandemic Covid-19, which is a world-wide issue.

The world was not prepared for the outbreak of Covid19. Many businesses especially the micro and small businesses were unable to sustain during the pandemic. The impact of this virus was damaging that caused many companies to go bankrupt. Business cannot operate during the lockdown resulting in nil income. However, they still need to pay for their fixed costs like rentals, loan repayments and salaries. As a result, these companies incurred losses. During this pandemic the production industry for example was facing a decline in demand for their products causing a disruption to their supply chain management. On the hand, the shift in consumers' demand became an opportunity for producers of face masks, sanitizers and others [3]. To continue operating all businesses must observe the standard operating practice (SOP) in the new normal. As a preventive health measure, business premises must provide on-site lodging for employees, sanitizers and hand-washing equipment for customers. These are added operating costs that may further adversely affect their bottom line.

The challenges that the businesses faced can be an opportunity for them in terms of being creative and innovative. Because small businesses possess the lack of specialization, it urges the small businesses to innovate and adapt to the environmental changes by using the technology in order for them to recover the losses they have faced [4]. For instance, in China they adopted the use of mobile payment as the consumer interest has shifted to online payment as the process of transaction could prevent the spread of the viruses [5].

The need of systematic literature review

The systematic review's main goal is to help in making better judgments by allowing more informed and less biased decisions to be made. The requirement for systematic reviews derives from the fact that the relevant litterateurs for most empirical issues are vast. Without a systematic review, judgments are directly dependent on a small segment of articles that may or may not be present in the entire research, and there is a risk that authors will consciously or unconsciously "cherry-pick," that is, choose articles that positively influence their points of view. Systematic reviews take on the large task of discovering, analyzing, and synthesizing the literature while eliminating bias, and they provide the findings in a style that decision-makers can understand. Systematic reviews are increasingly being utilized to make clinical choices, establish clinical guidelines, and create research goals, which is not a surprise

The systematic review provides a solution to the question based on the whole literature and indicates how confidently we should accept the result; alternatively, it concludes that the subject is still open and that more research is required. To begin writing a systematic review, one must first do a search to find all relevant publications. This is referred to as an "exhaustive search". The word is deceptive, because a search that is supposed to be exhaustive may not be so. Articles are only deemed relevant if and only if they match predetermined and stated inclusion criteria. The search should be repeatable, and the written assessment should include enough information to allow for this. The whole literature that covers the research issue should be found as a consequence of this search.

After the exhaustive search, the conclusion is extracted (the answer to the research question) and other data from each selected article is gathered. The degree to which the answer/conclusion is believed will be examined; occasionally, and as indicated when producing a systematic review that will shape therapeutic guidelines, the answer or conclusion is rated to reflect this degree of belief. Some studies may give us strong reasons to believe that the pandemic gives a negative impact to the small and medium size enterprises (SMEs) in a little way, while other studies may give us weak reasons to believe that the pandemic gives negative impact to the SMEs in a major way. However, systematic review on the selected relevant articles can help to determine the impact on SMEs, taking into account the extent to which we should accept each article's answers or conclusions [7].

The review of articles was guided by the main objectives, to find out how small and micro business survived during the Covid-19 pandemic. Then followed with the research questions, firstly what are the impacts of pandemic Covid-19 towards the small and micro businesses? This paper aims to identify the impacts of Covid-19 towards the performance of small and micro businesses in the industry. Secondly, what are the challenges faced by the small and micro businesses in the crisis period of pandemic Covid-19? This paper also aims to identify the challenges faced by the small and micro businesses in the midst of Covid-19 outbreak. Lastly, what are the strategies and methods used by the small and micro businesses in order to combat the pandemic? The main

objective of this paper is to study the strategies and methods implemented by the small and micro businesses in facing the challenges of the pandemic.

II. METHODOLOGY

This section will discuss more about the methodology that will be used in preparing this article review. The method used is PRISMA. PRISMA has become a high standard for reporting and publication, Articles are selected from Scopus: a source of resource, systematic literature review, and also analytic strategy.

A. PRISMA

PRISMA is the short name for Preferred Reporting Items for Systematic Reviews and Meta Analyses. PRISMA is a systematic process that authors need to go through for them to find the good material in systematic reviews and meta-analyses. In PRISMA, the authors need to find the element of transparency, consistency and have a high standard of result with strong evidence. PRISMA is involved with some procedures which include identification, screening, eligibility and inclusion.

B. Database

The resources are chosen from Scopus database, which provide a lot of articles from various fields including business. Currently, Scopus is among the highest and most popular indexing databases that is referred for each area of the world. Scopus is known as a high-quality source of databases as it also provides the segment of journals that can be patented by the authors. For this article review, the article selected will only focus on how the small and micro business are coping with Covid 19. Keywords such as small business, micro business, business sustainability will be used to search the relevant article.

C. Systematic literature review

Systematic literature review consists of three stages which are identification, screening and also eligibility. Each stage plays an important role and gives high satisfaction for the reviewers as at the end of the stages, the reviewers will find a very relevant article with the area of studies.

l) Identification

Identification is the first stage of the literature review. It is a process where the reviewers will search articles by keywords, titles or authors. The reviewers need to use the formula that is needed by the Scopus to generate the search. Word AND and OR should be used carefully during the process. There are a large number of articles available in the database. During identification stage the number of articles can be minimised by limiting the range according to publication years, the type of publisher, the study field and others. The reviewers can control the finding articles that they want. For this article review, the author had focused the area of study to be "small business" AND "micro business" "adapt" AND "change" AND "Covid" AND "sustainability". As the topic is focusing on Covid-19, which is very new to the world, therefore the number of articles in the database is small. The articles were published in 2020-2021 only, at the early Covid-19 pandemic.

2) Screening

The second stage is screening the articles that involve an inclusion exercise. It is the process where the reviewer will prepare a checklist to determine which articles meet the requirement of the study. Once the checklist is met, the article will be included as part of the article to be reviewed. The reviewer will not go through the whole article since it will be time consuming. Instead, the reviewer will first read the abstract of the articles and if they meet the requirement of the study, the reviewer will proceed to review the full articles. For this screening process, the focus theme will be government policy, technology-based knowledge, business models and adaptability. Articles that are not related to the study, more general, or more specific on a gender will be eliminated during the screening process.

3) Eligibility

The third phase is the eligibility stage, where the last 18 articles are screened again to make sure that the selected articles really meet the requirement of the study. This may involve an exclusion where abstract will be read again to confirm that the articles are related to the study before the full articles are reviewed again.

Table 1 below shows the inclusion and exclusion process to confirm that the article is discussing the theme and subtheme that was chosen earlier.

Table 2 below shows the keywords and searching information strategy.

TABLE I. THE INCLUSION AND EXCLUSION CRITERIA

Criterion	Eligibility Exclusion	
Literature type	Indexed Journal (research articles)	Non indexed journals, Systematic literature review journals, chapter in book, conference proceeding
Language	English	Non-English
Timeline	Between 2020-2021	< 2020

TABLE II. THE KEYWORDS AND SEARCHING INFORMATION STRATEGY

Database	Keyword
Scopus	"covid-19" AND "SMEs" OR "micro_and_small_business" AND "Strategy" OR "business resilience" OR "Covid-19" AND "SMEs" AND "strategy" OR "Covid-19" AND "SMEs" OR "micro_and_small business" AND "strategy"

D. Flow Diagram

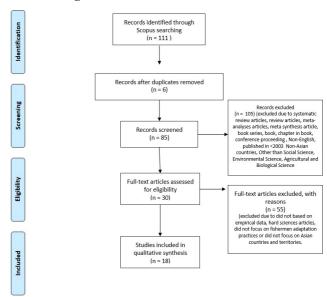


Fig 1. Flow diagram of the study (Adapted from Moher et. al., 2019)

III. RESULTS

A. Background of the selected articles

The reviews managed to obtain 18 selected articles that are based on thematic analysis. Four themes were developed namely government initiatives, technology-based knowledge, business models and adaptability. The themes were further analyzed into 10 sub-themes. Out of 18 selected articles, two studies were conducted in Australia, two studies were conducted in United States, two studies in China, another two studies were conducted in Lithuania, and the remaining studies were conducted in Mexico, Croatia, Brazil, Spain, Zimbabwe, Indonesia, Poland, Pakistan, Uganda and Vietnam (Fig. 2). Out of 18 selected articles, seven articles were published in 2020 and the remaining of 11 articles were published in 2021 (Fig. 3).

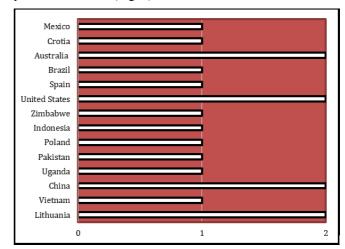


Fig. 2. Countries where studies were conducted

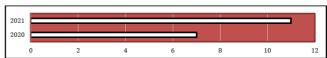


Fig. 3. Year of publication

TABLE III. THE THEMES AND SUB-THEMES

Studies	(Government 1	vernment Initiatives Technology-based Knowledge Business Model A		Adapt	Adaptability				
	Financial	Training	Communications	Mobile	Digital	TPB	ВМС	SWOT	Distance	Innovative
	support	program		Application	Technologies			Analysis	Working	
G. 1v.				& Payment						
Strakšienė et al (2021)									/	
Bressan et						/				
al. (2021)						,				
Thukral										/
(2021)										
Aristeidis	/		/							
Gkoumas										
(2021)										
Kimuli et al.					/					
(2021)										
Rashid &										/
Ratten										
(2021)		,								
Juergensen	/	/								
et al. (2020)				/						
Cao (2021) Mitręga &				/	/					
Choi (2021)					,					
Raharjo		/								
(2021)										
Caballero-							/			/
Morales										
(2021)										
Manyati &				/			/			/
Mutsau										
(2020)										
Eggers	/									
(2020)										
Mont et al. (2021)										
Corredera-	/									
Catalán et	,									
al. (2021)										
Akpan et al.										/
(2020)										
Klein &								/		
Todesco										
(2021)										
Gregurec et						/				
						1	1			

B. Main findings

In these sections, the discussion would revolve around the main four themes, which are government initiatives, technology-based knowledge, business models and adaptability and along with 10 sub-themes, which are financial support, training program, communication, mobile payment, digital technologies, theory of planned behaviour (TPB), Business Model Canvas (BMC), SWOT analysis, distance working and innovative (Table 3).

1) Government Initiatives

The government plays an important role in creating policies that could help small businesses in mitigating the challenges they are facing. Small businesses needed the financial support from external sources like the government in order for them to sustain their business in the respective industry as well as to prevent liquidity crisis. In addition, the government help in disseminating information pertaining to the current situation of the pandemic. This will alert and enable the businesses, especially the small businesses to develop plans to recover their losses as well reset business models so as to protect their resources which includes the employees. Based on the literature review we have conducted, there are three types of government initiatives: financial support, training programs and communication.

Financial support. Policymakers in Europe were quick to realize that supporting small business or Small-Medium Enterprises (SME) was of vital importance to tackle the economic crisis caused by the global epidemic. Recognizing that the small businesses are particularly vulnerable during such a major economic shock, the initial policy focus at the start of the pandemic was to address the issues that small businesses face during the survival phase [3]. The European government reacts by giving financial support which is through direct financial subsidies and grants, deferral tax, and postponement of payment to ensure that the liquidity rate among small businesses can be reduced. Not only that, bank loans are also given to expand their lending to help them recover their business that has faced downturn due to the pandemic. This can be called the mixed policy and regardless of the type of business, the mixed policy is done to ensure their survival during the early stages of the crisis remains the same. Similarly discussed by [8], Taiwanese Government has provided a Coronavirus Relief Plan in giving financial aid to the small businesses. It was found that the Tainese restaurants' owners preferred the tax breaks given by the government as it helps the owners to recover their financial system more as compared to the financial supports given. This is due to the process.

Training program. In terms of employment rate, the government reacts through the support schemes, sick leaves, training and development, and reduction of working hours. This allows the SMEs to operate and generate profits without having to fully close their business during the crisis and simultaneously reduce the unemployment rate in the industry. The support that came from the European government offers innovation and networking opportunities towards the SMEs as they need to improve their product quality in meeting the demands of the consumers. The training and development opened the opportunity for the SMEs to differentiate their product and allow them to enter new international markets while strengthening the local networks. All SMEs will benefit from the support schemes from the government as they are able to innovate in order for them to compete in the industry as the current situation demands them to be able to use the technology [3].

Similarly, [9] reported that due to the pandemic of Covid-19, exporting activities in Indonesia including wood had a decrease by 30 percent. This has affected the handicraft sector as they play a key significance as a foreign exchange source to the country. Hence, Indonesia New Exporter (INE) was developed to help entrepreneurs and Micro, Small and Medium Enterprises (MSME) in Indonesia gain new knowledge and skills through training programs and learning processes in production and exporting products. INE focuses on the new entrepreneurs that are willing to learn about the process and procedure in running a business and production through coaching and development programs. INE has produced a number of entrepreneurs in the handicraft sectors, as it has become a competitive sector in producing a good quality product. Not only that, INE aids in the improvement of the community's welfare and economy, as well as the growth of the state's foreign exchange reserves [9].

Communication. Effective communication resulted in great opportunities for people to achieve more than they could. In the phase of a country facing a pandemic, communication is the most important tool for the government to disseminate information to everyone in the country. This is to ensure that everyone is well-informed and well-prepared to follow the guidelines planned by the government. As reported by [8], news coverage is the most reliable source of information especially in this outbreak. The Taiwanese government's communication strategy comprised the daily broadcast of accurate, up-todate, and accurate information about Covid-19. The communication strategy can increase the trust of the public towards the government. The Taiwanese Government holds onto speed and simplicity in giving information to ensure that everyone gets the same information and knowledge fast and simply to be understood.

2) Technology-based knowledge

The lockdown rule imposed by many countries during the pandemic Covid-19 has urged consumers into online shopping and the usage of social media in daily life has increased. Due to a large decline in the physical use of cash, credit cards, and debit cards during the Covid-19 pandemic, there is a growing share of mobile payments uptake. This demanded small businesses to have the technology-based knowledge in order for them to cater for the demands of the consumers during the pandemic outbreak. Companies with the knowledge in technology have a competitive edge over the others that still rely heavily on the old style of running businesses.

Mobile application and mobile payment. Reference [10] reported that the widespread usage of mobile devices, particularly during the Covid-19 epidemic, changed the nature of labor in terms of skill supply and demand. Online platforms are also making opportunities for innovation and value creation more accessible at lower costs. In addition, it was discovered that the adoption of mobile applications aided SMEs in implementing cost-effective operations. According to recent research conducted in China and South Africa, SME owners quickly accepted mobile applications because they were inexpensive, dependable, and simple to use. SME owners

saw mobile apps and live streaming on social media platforms as useful ways to reach out to customers, and as a result, they were able to get through the Covid-19 issue [10]. Furthermore, [5] found that contactless payment or mobile payment can be said to provide a more hygienic and safer way of transactions compared to the traditional payments. The pandemic has made people to look for other alternatives to avoid holding cash and prevent the spreading of covid virus. This urges small businesses to adopt technology-based knowledge in using digital transactions and online payments throughout their business process [5].

Digital technologies. As a result of the Covid-19 business owners are considering the use of digital technologies as a potential approach for sustaining their businesses. Businesses that use these technologies are more likely to gather crucial information such as client complaints, user experience, and client requirements. Given that consumer complaints can be recorded in real time, this means that using digital technologies will enable businesses to provide better services. Digital technologies have been shown to reduce expenses, increase the speed with which firms advertise, and improve communication with customers, suppliers, and other stakeholders. It is also worth noting that micro and small enterprises primarily use social media platforms and are prepared to learn about other technologies if given the opportunity [11].

3) Business Models

Business models is a profitability approach or framework used by companies or businesses on their business process. It outlines the goods or services that the company aims to produce, as well as the targeted audience. It also involves any expenditures required during the business process that has been forecast earlier. Business models are crucial for both new and current enterprises because they help start-ups and expanding companies in obtaining funds or financial resources, recruit talent, and motivate managers and workers [12]. During the pandemic outbreak some small and micro businesses can adopt new business models or enhance their current models used in the business in order to strengthen their business structure and processes.

Theory of planned behaviour (TPB). The TPB's utility has been demonstrated through an assessment of crisis-related circumstances in various environments, where the desire to engage in mitigation reactions has been highlighted. Based on [13] firstly, the attitude toward behaviour is illustrated through the pro-activeness in searching ways to mitigate effects of the crisis, in a way that the actions taken to run their business during the crisis, includes diversification initiatives, engaging with clients and end consumers, and unleashing their enthusiasm, which encourages them to confront the evident predicaments. Next, the subjective norms or perceived social pressures that influenced one's action includes lifestyle and paying back loans. It is the supportreliance or subjective norms that portrays the company's dual or correlation coefficients with the relevant referents like the family or friends. It highlights that the social pressures match others' actions or deeds. Lastly, the

perceived behavioral control became clear that it has substantial ties to entrepreneurial self-efficacy and controllability. It was said to mitigate the effects of the unprecedented crisis, it is proposed that intentions be put into action [13].

Business Model Canva (BMC). Business Model Canva is a framework that helps the company to manage their business. There are nine elements in the business canva that can be focused: relationships with customers, customer segments and channels, key partners, activities, and resources, value proposition of product and service and costs and revenue streams. BMC helps companies in creating impact for their changes. If they are incorporated within the innovation process with care, newly created and improved business models can serve a mediation role between those factors and the improved performance of organizations [4].

SWOT Analysis. A SWOT analysis is created to assist an accurate, fact-based, data-driven view at the strengths and weaknesses of an organization, plans, or within its industry. The organization wants to keep the analysis precise by preventing preconceived beliefs or gravy areas and as an alternative they focus on real-life contexts. Using data that companies have either internal or external data, SWOT analysis can help businesses toward strategies that will most likely be successful, and away from before that are likely to be less successful. Independent SWOT analysis, investors, or competitors can also guide them on whether a company, product line, or industry might be strong or weak and why. For business, financing issues are a big threat for them. In every idea of innovation, it will turn to question whether they have enough financing support or not. Therefore, from the SWOT analysis, they will see what are their strengths and opportunities that can be grabbed in order to make sure that innovation can be implemented [15].

4) Adaptability

The global pandemic Covid-19 not only affects the lives of people around the world, it also has changed the business landscape. Entrepreneurs and small businesses need to adapt themselves with the changing environment. To quickly adjust to shifting market conditions, small enterprises are reworking their business strategies. New client needs must be addressed, as well as dynamic capabilities that can aid small enterprises in surviving and growing throughout this health crisis [16]. Many small businesses fail quickly owing to pre-existing issues such as a lack of investment and financial resources as well as lack of expertise, required skills and formal planning [17]. These cause small businesses to face difficulties during the pandemic outbreak. In order to ensure their existence in the market, small businesses need to adapt to the changes, which can be done by adapting the distance working and being innovative.

Distance working. The dramatic increase in the number of distance employees in many companies and organizations became a significant test with the advent of the Covid-19 epidemic and lockdown. According to distance work research, during the epidemic in Lithuania, about 40% of people worked remotely on average, similar to Europe. The shift to remote work entails significant

social and cultural transformations that fundamentally alter not only the concept of work organization, but also the concept of work itself. Openness and the ability to work from various locations and at various times are fundamental characteristics of distant work. The main reason for people working remotely is because of the mandatory restrictions of economic activities as imposed by the governments. The study also found that the distance working provides that their work is much more organized. However, the distance work has revealed the insufficient competencies of workers in IT equipment and software development that would impact their productivity [18].

Innovative. There are many ways for small businesses to be innovative with their business plan, it can be in the way of product innovation, process innovation, or management system innovation. The most vital factor in improving a business success is the innovation of products. However, while selecting and implementing the essential management and technical strategies and tools, questions about "when," "where," and "how" to undertake innovation are critical. This is because huge costs are incurred and risks are involved in the process of innovation and the present Covid-19 event has influenced both factors, having a significant impact on SMEs' performance [17]. In Zimbabwe, [10] reported that the manufacturing sectors are required to improve in certain area in order for them to be able in meeting the demands of green technology industries. They need to improve in terms of the resource mobilization; green innovation in design and product development; energy and material substitution; implement the apprenticeship schemes in improving competency of semi-skilled labor; and modify and control the process of using new and cleaner technologies.

IV. DISCUSSION

As derived from the four themes and 10 sub-themes, in this part, we will further discuss the impact of the pandemic Covid-19 towards the micro and small businesses, the challenges faced by them as well as the strategies adopted to combat the pandemic outbreak that are aligned with the research question. The pandemic has affected the world socially and economically. Mortality rate has increase and businesses collapsed. Micro and small businesses experienced a bigger decline in business activity compared to the bigger companies. Before the pandemic most of the small and micro businesses were already experiencing financial crisis. They were making small profits that barely covers their operating costs. The pandemic has brought them to a deeper stage of financial distress where operations were halted resulting in no revenue but increasing costs. Government had taken a drastic move to lock down all business activities. Even after lockdown were lifted the small and micro businesses were unable to continue operation because they were unable to adhere with the SOP imposed by the government in curbing the wide spreading of the virus. Owners were not able to spend more on creating a more conducive working areas for their employees.

Despite having to face various impacts of the pandemic, the small businesses also have to face several challenges in order for them to recover their business in the industry. When the government imposed the lockdown rule, it was found that there are changes in consumers' buying behavior from the traditional one to online shopping and digital transactions [19]. The pandemic outbreak has forced people to be more aware of hygienic procedures while doing transaction business to ensure that they will not carry the viruses back home [5]. Online shopping has a lot of benefits in terms of time, product offering and safety. Consumers would save a lot of time while browsing through the applications in search of the products they wanted and they have various options for the same products with different prices. Not only that, online shopping avoid the consumers from going to crowded places especially in the pandemic outbreak period, where the spread of viruses are unseen. Avoiding crowded places is very crucial at this period as there are chances that someone is spreading the virus without him knowing. Small businesses need to adapt with the social changes and overcome the challenges in using digital technologies in their business in order for them to increase their business performance. The other challenges faced by small businesses is financial constraint. To follow social changes are costly, especially when the business needs to change the overall business system.

The government initiatives have helped many small businesses to recover their financial constraint especially in terms of tax relief, where it eases the load they have faced [8]. Not only that, leveraging the training programs provided by the government will help entrepreneurs and small businesses to enhance their ability and increase their knowledge in certain skills. For instance in Indonesia, they focus on the handicraft sector as it becomes one of the significant sectors in the country [9]. Other countries are focusing on the use of technologies and digital tools to ensure that small businesses are able to keep up with the social changes and demands from consumers. Apart from that, small businesses are forced to adapt with the environmental and economic changes as the impact from the pandemic outbreak. Businesses all around the world are slowly adapting to the distance working, where everyone is working from home or any place other than their offices to ensure that their business can continue to operate during the pandemic outbreak [18]. This is due to the movement control order imposed by the government to ensure that the country is able to curb the widespread of the coronavirus diseases that restricted the movement of people and gathering at public places.

Not only that, this has forced small businesses to innovate. Some products demands are low as the essentials products are getting more attention during the pandemic outbreak, for instance facemask and hand sanitizers. Therefore, some businesses have shifted their focus from selling their old products to selling the essential products to ensure that they are able to tackle the demands in the market. Besides that, businesses also need to be creative to innovate their business plan to ensure that they are following the economic changes as well as the social changes. Many have adopted various strategies including

using digital tools and technologies. The emergence of technology has increased and demanded the small business to acquire the technology-based knowledge in operating their businesses. Not only could digital tools reduce expenses, it is also time saving while doing business with the consumers. Business owners are able to communicate with the customer anytime and anywhere by using the digital tools. They are also able to sell their products through online shopping platforms, whereby the customer can make online payment transactions smoothly. Online selling can also be done through various mobile applications and social media, for instance Whatsapp, Telegram, Instagram, Tiktok, Twitter, Shopee, Lazada and many more. Small businesses can leverage the free toolsto promote their products to targeted customers.

Various strategies can be adopted by small businesses to ensure that they can recover their business operations, not only to save their sales and income but also to open opportunities for other people to be employed during the pandemic outbreak. Other than adaptation to the changes, using digital tools and technologies in business processes, small and micro businesses can change or create a business model that can help them restructure the operation and management process. For instance, by using the SWOT Analysis, businesses can tackle their strengths and weaknesses within the company and be able to acknowledge their opportunities during the pandemic period and the threats they are facing. This allows the business to plan out the proper strategies for them to ensure that they can stay relevant in the industry. Besides that, businesses need to also discover the behaviour that surrounds its business processes which indirectly affects its performance. Not only the environmental and financial but also the social aspect. It is only effective if the plan is executed strategically.

V. RECOMMENDATION

There are few recommendations that can be made, in terms of technology, the internet and network connections. suggested national [5] that the communication authority should collaborate with private network providers to promptly establish trustworthy ways to ensure the internet access in a good quality and a good coverage of the network. For instance, China should also invest in ICT infrastructure in order to allow the development of a mobile payment system. All small businesses should teach their employees to gain a better understanding of mobile payment systems. Furthermore, small businesses should apply for credit to help with the mobile payment adoption cost and to modernize their technological equipment based on company needs [5]. Moreover, in terms of policies, [3] provides that policymakers will have to take a more proactive approach, coordinating new industry activities to link domestic capacity to global value chain trends. The Covid-19 situation can act as a catalyst for digitization and sustainability transitions, as well as rekindle interest in technologies of emerging health like biotechnology and genetics. In the light of the ongoing structural restructuring of globalization marked by China's growing influence, policymakers should establish new incentives

for European enterprises to take advantage of these opportunities (Petricevic and Teece 2019) [3]. This necessitates the development of a new generation of demand-driven innovation policies, such as targeted public procurement for innovation and investment in environmentally friendly initiatives in renewable energy, transportation infrastructure, and information technology [3]

VI. LIMITATION

There are few limitations, especially since Covid-19 is still ongoing and most of the research was conducted at the early stage of the pandemic. Covid-19 has just been discovered to have a novel variation, which is causing the disease to spread faster. The impact of this on business, particularly small businesses, has yet to be seen and explored. Not only that, there are some countries that were hit with the second and third wave of the pandemic. Several of business models and strategies have been adopted by the government as well as by the small businesses to face the risk of the pandemic. However, the strategies and models adopted may not cater to the whole situation of the new wave of the pandemic. Furthermore, based on the study made by [5], the small medium businesses faced problems in adopting mobile payment. This is because mobile payments demand more technological innovation than traditional payment methods, and the majority of developing nations are technologically insufficient. As a result, despite the benefits of mobile payment, many small businesses experience difficulties in implementing the system. It was also reported that, because fraud cases in China increased, it created trust issues among consumers in using the mobile payment transactions. There were also arguments that consumers' propensity to accept and use technologies is determined by perceived usefulness and simplicity of use. The usefulness of mobile payments over the traditional methods shows positive results and could be accepted if SMEs opt to adopt the system [5].

VII. CONCLUSION

Covid-19 is a pandemic that impacted the whole world that forced lock downs in many countries and have led to too many deaths. People are forced to live in a new norm and no one can predict when it will end. Efforts by the governments in responding immediately to situation are not quite successful in sustaining operation if businesses still adopt the old ways. Government at the initial stage of the pandemic have helped by providing financial aids. It eased some of the financial problems faced by the business but not for long. Businesses must be creative and willing to make changes in order to recover their losses and try new business and approaches to sustain. The various strategies adopted by some businesses in enhancing the technologies, either digital technology, mobiles payment, and innovation have however brought them to another level. This is in line with the era of digitalization that requires businesses to focus on technology to improve their performances. New

business models must be developed with the inclusion of new products in order to remain relevant in the business.

Small and micro businesses are encouraged to build their own strategy while receiving help from the government. For example, in Malaysia, after more than one year of this pandemic, we can see there is an increase in the number of small and micro businesses in the industry. People are choosing to open small businesses as their source of income after being terminated by the previous company. Besides that, the opening of new business opens up employment opportunities for other people who faced the same fate of being terminated due to the pandemic outbreak. It shows that the small businesses are increasing in the industry. The pandemic outbreak has impacted many businesses and caused them to face liquidity crisis, however it also brings opportunities for new businesses to enter the market with strategic plans being implemented. In conclusion, all research questions were answered in this paper.

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Adopting the Agile Approach for Front End Loading in the Oil and Gas Industry

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Abstract — The front-end loading (FEL) project management process is a method that is trusted and ingrained into most Exploration and Production of oil and gas companies worldwide. The entire FEL is modeled after the Waterfall model which is sequential in nature. The waterfall model can be construed to be too slow in adapting to changes resulting in a significant number of oil and gas projects having a high tendency of cost overruns, schedule delays and not meeting stakeholder objectives. On the hand, the agile model employed by IT, software and technology companies offer a refreshing view to achieving the desired result in projects. However, these two industries have substantial differences between them, for example in project value and regulation. This explains the reluctance by major oil and gas companies to implement agile as part of their project management approach. Nevertheless, as the environmental and organizational factors in project management in all sectors are changing at a very fast speed, seeking alternative and workable approach is vital. The paper seeks to evaluate the concept of adapting the agile methodology for FEL in oil and gas field development projects. The paper identifies areas for integrating agile such as in FEL selection criteria and draw evidences from a handful of oil and gas projects that have employed this method successfully. The paper further suggests to seek a balance between the two contrasting methods. Overall, the results from a case study in the oil and gas industry indicates that by adapting agile approach into the current FEL practice, it's more likely that the right project would be sanctioned, therefore, increasing the chances of project success.

Keywords: Front-end loading, oil and gas industry, waterfall model, agile model, project management

I. INTRODUCTION

Pre-project planning, feasibility studies, conceptualization, early project plans – these are a few examples of the labels or titles that different

organizations and industries have used over the years to refer to the phase of works leading up to project sanction and Final Investment Decision (FID). In 1987, in reference to these many labels, the DuPont company coined the term 'Front End Loading' (FEL) [1]. FEL is essentially a structured method, in the mould of the stage-gated process of the Waterfall model to ultimately help determine the basis, assumptions, objectives and requirements prior to project sanction. Today, FEL is a project management process that is widely accepted and used globally, probably none more so than by Exploration and Production (E & P) companies in the oil and gas (O & G) industry.

Oil and gas industry projects are known to be huge, complex, and challenging to manage. These projects are characterized by their complexity, extreme size and fast-tracked execution strategy with multi-disciplinary engineering teams. The nature of the projects leads to the importance of having systematic project management in its execution especially in the decision-making process. Saputelli and Black [2] highlighted that the FEL methodology measures and increases the probability of project success at any stage of the life of the oil field.

This paper reviews areas of existing literature that highlights the issues in present day FEL in the oil and gas industry, and seeks to understand the details of the Agile method and its current application and penetration in said industry. The paper puts forth concepts for adapting Agile into specific areas of FEL whilst identifying potential gaps and limitations that may arise through the experiences drawn from an actual project in Malaysia.

II. LITERATURE REVIEW

A. Project Management Methodologies

Waterfall Model

The oldest of the software development life cycle models, the Waterfall model, is a sequential development model in which the output for one stage becomes the input for the next stage, resembling a waterfall flowing downwards through the phases [3].

At each stage, the requirements and development must be completed in its entirety before the process can proceed to the next stage. Although first originating in the software industry, the Waterfall method has been a mainstay in capital intensive industries such as construction, infrastructure and oil and gas. In said industries, with every change in requirement having huge cost implications, it is only natural for stakeholders to ensure that much or all of the project information is available before moving on to the next stage. The Waterfall model is so ingrained into the O & G industry that major O & G project contracts are denoted by the key stages of the project. Take the commonly heard term EPCIC as an example. This refers to the order of the project stages, beginning with Engineering (E), before moving on to Procurement (P), Construction (C), Installation (I) and finally concluding with Commissioning (C), each stage only proceeding once the previous stage has been satisfactorily completed.

Agile Model

The Agile approach to projects on the other hand, successfully employed in the technology and software fields, have been established specifically to address rapid changes and evolving customer requirements, all with the goal to develop a Minimum Viable Product (MVP) to roll out to the market. Agile, by definition, is to be nimble and able to move quickly and easily. Likewise, in project management, the Agile model represents the ability of a project to alter course or pivot in tandem with the changes. Agile in project management is characterized by iterative cycles called 'sprints', that execute agreed packages of prioritized scope over a short timeframe [4]. These quick sprints facilitate the development of a minimum viable product (MVP) that can be pushed to market and more importantly, which is continuously improved on in subsequent sprints. Agile practitioners live and die by the Agile Manifesto that was born from a group of 17 Agile pioneers. It reads:

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

By reading through the manifesto, it's obvious that the conventional waterfall approach values the items on the right more than those on the left and hence would seem to be ideologically contrasting to the Agile approach. Be that as it may, this paper would explore key components from Agile that can be adapted and integrated into Waterfall and FEL, which in turn would enable the alignment of O & G projects objectives with the change in requirements prior to project sanction.

B. Project Life Cycle - Front-End Loading

Backtracking to the start of the project life cycle, the Front-end Loading (FEL) process refers to the process preceding the sanctioning of a project. FEL is a 3-step planning process by which a company develops a detailed definition of the scope of a capital project meeting business objectives [5][6].

To lead the FEL works, a company would usually appoint a Project Sponsor (PS) and a Project Manager (PM). The PM would then be ably supported by a team that comprises of personnel from various departments working in a matrix organizational structure. More often than not, other than the PM, personnel are expected to split their workload between department responsibilities and project responsibilities.

The three Waterfall-like steps or stages in a FEL process go by various terms in different companies but can basically be narrowed down to – Appraise (FEL 1), Select (FEL 2) and Define (FEL 3).

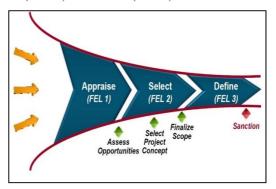


Figure 1: Front-end Loading Stage Gate Method

The visual above by Naderi [7] provides an accurate depiction of the funnel-styled stage gate method FEL employs. The arrows indicate the multitude of opportunities or concepts that are available at the start of the process in FEL 1 when each is assessed against the business case and market opportunities. As the process progresses along each stage, guidelines assist to provide a benchmark of the expected level of detail and maturity the data and information are to be at to be presented to the approving authority, commonly referred to as the Decision Review Board (DRB) at each stage gate. At each stage gate, one of three decisions is reached:

- Approval to proceed to the next stage
- Recycle or rework of the current stage. This is typically asked for by the approving stakeholders if the data provided isn't

- sufficiently detailed and further refinement is required.
- Project is shelved or cancelled. There could be plenty of reasons for this but more often than not, the project would have been deemed to be uneconomical or not technically feasible at that point in time.

Of the 3 stage gates, FEL 2 is probably the most crucial stage of the entire FEL process. Typically, at FEL 2 stage gate, based on the presented data, the evaluating team would select a single development concept to advance to the definition stage (FEL 3). The implications of a wrongly selected concept are farreaching. As proven from previous projects, a project may meet all intended outputs but still be a strategic failure if the choice of concept turns out to be the wrong one – the wrong solution to the problem at hand [8].

FEL 3, referred to also in the O & G industry as the Front End Engineering and Design (FEED) phase, is a key component of FEL and plays an essential role in the overall success of large projects [9]. It is basically the building blocks of the initial design and engineering of the selected concept that will be, upon project sanction, detailed further and subsequently be constructed and installed.

The FEL process in E & P companies can at times take up to a period of a couple of years depending on the size and nature of the project such as Shell'smultibillion-dollar Prelude Floating Liquefied Natural Gas (FLNG). In recent years, with the ever changing business-environment, fluctuation in commodity prices and increased importance in needing to meet shareholder expectations, the waterfall method can seem to be too slow in adapting to the changes and getting to market [10], directly contributing to the endorsement and approval of the 'wrong' projects, subsequently leading to failure in terms of cost overruns, schedule delays and not meeting stakeholder objectives. Judging from the literature available, it is plainly obvious that to advance the FEL process in oil and gas as a whole, one would first have to start with improvements to the concept selection method in FEL 2 and in so doing, drastically increase the likelihood of the 'right' project being sanctioned.

C. Analytical Hierarchy Process (AHP)

Developed by Thomas Saaty in the 1970s, the Analytical Hierarchy Process or AHP for short, is a multi-criteria decision making tool based on math that is advantageous for groups. The process works through pairwise comparisons by pitting one intangible criteria against another, with each individual in the group assigning a numerical ranking to each criteria until eventually, all intangible criteria's are ranked by priority or importance in relative terms. The selected criteria's, usually at the behest of the project team, can range from the traditional project objectives like capital

expenditure and project schedule to O & G specific criteria's such as unit development cost (UDC) and production gains (in barrels of oil equivalent) and even to broader criteria's such as greenhouse gas (GHG) emissions and technological risks. McLachlan et al. [4] states that the AHP technique can be used to facilitate reaching agreement on a project's value drivers and when applied to FEL, increases the probability of success in generation of economic return and mitigation of major capital risks [11]. With its proven use cases in FEL, the AHP tool features prominently as a vital reference point in the hybrid Agile-FEL methodology proposed in the next section. In so doing, the paper will briefly discuss a perceived limitation of the AHP measurement by making the intangible criteria's, tangible.

III. METHODOLOGY

This paper details the process of decision making at the FEL stages (FEL 1, 2 & 3) from the experience of the O & G industry. It outlines the application of conventional methodologies and highlights the applicability of using a FEL-Agile hybrid methodology. A case study of the implementation of said methodology in an O & G project further emphasizes this.

IV. FINDINGS AND DISCUSSION

This section explains the various FEL stages and the focus of the methodology in each of the stages.

A. FEL's 1 & 3

Although others such as Ciccarelli et al. [10] have reasoned that different aspects of Agile and its manifesto can be integrated into each of the three FEL stages, this papers view, as briefly touched upon in the prior section is that the focus of Agile adoption should be limited to FEL 2. Before diving into the proposed hybrid Agile-FEL methodology, it's worth examining why FEL's 1 and 3 are better suited for the O & G industry in the manner and form they are presently in.

At FEL 1 or the Appraise phase, a high level screening of activities and opportunities are performed to assess the economic viability of each and if they fit within the company's strategic objectives, portfolio and business case. As the duration of this stage is already reasonably condensed when considered against the work required, it would be futile to further segregate this phase into multiple sprints. Furthermore, parameters for selection of opportunities at this stage need not be specific to a project but instead are typically drawn from the company's historical data and benchmarking. From a financial standpoint, as the works that are necessary for FEL 1 are usually carried out by the in-house team or a third party that is familiar to the company, the amount saved would not warrant the additional time and effort invested to incorporate Agile into the FEL 1 structure. Looking at it from

another perspective, in a way, FEL 1 is already set up to produce a Minimum Viable Product, or in this case, Minimum Viable Projects (MVP), which shall be progressed on to the next phase, that is FEL 2.

Once the optimum concept is selected at FEL 2, FEL 3 is almost entirely spent executing the FEED of the preferred concept. At the FEED stage, as is the norm in any form of O & G engineering, individual teams, conventionally grouped by their disciplines such as mechanical and electrical, work in parallel within the defined design boundaries and datasets to produce their respective deliverables. Cross-discipline engagement and sharing is on an as-needed basis and at regular review checkpoints. One may argue that it appears the Agile methodology already shares some key characteristics with FEL 3 such as parallel teams, and that there might be further efficiencies to be gained by wholly incorporating Agile. With that being said, this paper is of the opinion that the task of integrating Agile into FEL 3 would require not only an in-depth research into the FEED processes, but also into the deep-rooted engineering practices and structure in the O & G industry. A transformation such as this would have sweeping implications as entire engineering companies and departments in multi-national corporations are organized with current engineering practices in mind.

B. Utilizing AHP to define FEL 2

That leaves FEL 2 as the prime candidate for a major upheaval by embracing the adoption of Agile. The present issue faced at FEL is the rigidity and inflexibility of the system to cater for changes in requirements. After all, the oil and gas industry is probably the most capital-intensive industry in the world; with underlying uncertainties commonly large enough to torpedo economic viability, therefore most would rightly argue that a clear plan, and adherence to it, is essential for success [4]. As true as that may be, failure to recognize that changes to project requirements, albeit undesirable, are necessary, will certainly lead to the 'wrong' concept being selected.

To overcome this obvious shortcoming, the paper proposes introducing a set of key criteria's up front, prior to beginning any work on FEL 2. The question then becomes how best to decide on criteria's and how to prioritize each criteria from another. Here, instead of proposing a new or revolutionary method, we fall back on Mr. Thomas Saaty's established and proven decision-making tool, Analytical Hierarchy Process (AHP), due to its familiarity and widespread use within the industry. Despite its extensive usage, an alleged limitation of the AHP tool is that the criteria's assessed are intangible and hence, as each individual in the group performs a comparative ranking of the criteria's, their perspective and understanding of what each criteria represents may be vastly different, leading to a flawed overall outcome in the priority ranking.

A proposed method to add a measure of tangibility to the tool is by expanding on the description of the criteria's assessed in order to ensure it is specific to the company's overall strategic objective. Take the Capital Expenditure (CAPEX) and Schedule of a project as an example. Although a project's CAPEX is recognized as being a vital component in any project, it would be tough to determine if the CAPEX of a project is more or less important when compared to the Project Schedule. However, if both criteria are further enhanced to read as follows:

- 'Maximum Capital Expenditure of US\$ 100 million' instead of CAPEX, and
- 'Project Schedule of 24 months from FID to First Gas' or 'First Gas by January 2024' instead of just Schedule,

it would certainly allow for a much better comparative judgement of the value and importance each criteria offers the project and company.

Utilizing the Amended AHP, or AHP+ for short, the Project Sponsor, Project Manager and at most, two (2) other project team members, are to list and clearly define a maximum of 10 value drivers, preferably those that are derived from or aligns with the organization's overall strategy and financial objectives. In addition to the two criteria mentioned above, below is a list of a number of micro and macro criteria's that are regularly assessed in the O & Gindustry:

- Project Net Present Value (NPV)
- Operating Expenditure (OPEX)
- Unit Production Cost (UPC)
- Price per barrel of oil
- Greenhouse Gas (GHG) Emission
- Technological Complexity (usually for newly introduced technology)
- Environmental Risk
- Sustainability

Once the complete list has been developed, and prior to commencing FEL 2, the determining criteria's shall be ranked using the AHP+ technique by those individuals in the following two groups:

- i. Primary stakeholders, which customarily refers to the senior management team.
- ii. The approving authority or DRB responsible for authorizing a project to move from one FEL stage to another

It is of paramount importance that the AHP+ assessment is undertaken individually to avoid therisk of groupthink. The results are then shared and challenged by members of the group with the aim being to question and appreciate the perspective of others [12].

Needless to say, with the criteria's ranked according to priority, it provides the project team with

a clear guide on how to best go about focusing their efforts in maturing the opportunities that were developed in FEL 1. With that said, one must not forget that this is still front-end design and thus not all the data will be made available or possibly even uncovered at this juncture. Taking this into account, its best to introduce acceptable tolerances for each criteria for the project team to work with. For example, with respect to achieving the US\$ 100 million CAPEX budget, an opportunity should be acceptable if its CAPEX figure lies between an accuracy of +25% to -15% of US\$ 100 million. This compares with the industry proven AACE International's Cost classification guidelines.

C. Integrating Agile into FEL 2

With the guiding principle in place, Agile methodology is introduced into the FEL 2 workflow by tapping into the three key philosophies of the manifesto.

The first being 'Individuals and interactions over processes and tools'. For this, the paper proposes dividing the project team into multiple, lean squads. Basically, the squads shall comprise of small, multidiscipline professionals working on separate MVPs within the confines of the criteria's provided. Like the 'sprints' in Agile, the squads will execute the work packages over a pre-determined timeframe, preferably not more than two months, although this would be reliant on the overall schedule of FEL 2.

Next, with a view towards better 'customer collaboration over contract negotiation', the paper agrees wholly with McLachlan et al. [13] on having frequent interaction and reviews with the Decision Review Board (DRB) at the end of every 'sprint'. This is a step-change from the usual method of presenting the findings only once the project team 'arrives' at the Stage Gate at the end of FEL 2. The major benefit of this would be that the DRB would be more involved in the engineering and hence be able to flag any concerns well ahead of time.

Finally, a cornerstone of the Agile manifesto is its ability to 'respond to change over following a plan'. In order to determine if there are changes in project requirements or needs whilst FEL 2 is being executed, the AHP+ technique shall be repeated at least twice at scheduled intervals with the same stakeholders. The scheduling of when best to perform the AHP+ assessment shall be decided upfront depending on the FEL 2 execution timeline. The objective of repeating the AHP+ assessment is to ensure the validity of the criteria's and the respective rankings. If the priority of value drivers has indeed been reorganized, the squads go back to the drawing board to re-engineer the MVPs. This process is repeated until there's little or no change in the priority ranking of the criteria's. At that point, the DRB has the option of:

- requesting the project team to enhance and refine the quality of the data by increasing the accuracy and reducing the tolerances for each criteria, or
- b. agreeing to advance the concepts to the Stage Gate sitting, upon which a single concept would be endorsed to move on to FEL 3

It is the opinion of this paper that after integrating these three tenets of Agile to develop a FEL 2 – Agile hybrid methodology, the obvious and glaring inefficiencies of FEL will be ironed out. With that said, one should be mindful that the methodology is only effective if the stakeholders responsible for executing the FEL, have the courage and discipline to resist the temptation and pressure from investors and management to expedite and push the project through without the due process.

D. Case Study

With the building blocks of the hybrid methodology firmly in place, an upstream O & G Multi-national Corporation (MNC) operating in Malaysia had experimented with this proposed new methodology in a recent project.

The project, which was to recover an estimated 22 million stock barrels of oil (MMstb) from four (4) new wells located approximately 7 kilometers away from an existing satellite platform, began its front-end development works in 2018. In true Agile spirit, the team 'sprinted' to refine a total of six (6) minimum viable opportunities identified in FEL 1. At the completion of the sprint, the team engaged with stakeholders and the DRB in a workshop setting to share the results of the work done thus far and to assess it against the designated criteria's. Two were chosen from the six to be matured further before the next session

At the next engagement session, it was found that the two opportunities did not offer an acceptable technical and economical solution when gauged against the updated criteria's, specifically:

- Breakeven Price of below US\$ 32/ bbl
- Discounted Profitability Index (DPI) of 0.6
- First Oil date of November 2020

By being forced to go back to the drawing board to improve on the other opportunities, the team discovered a new concept that met all the project requirements and needs. Once again, the process was repeated and the new concept along with two other concepts (not the previous two that were vetoed) were shared with the stakeholders and DRB at the ensuing engagement session. All three were endorsed to proceed to the Stage Gate sitting for the selection on which project will advance to FEL 3. Finally, after a year – a four-month delay from the initial FEL 2

schedule - the new concept, which was by utilizing the Extended Reach Drilling (ERD) capability from the existing satellite platform, was endorsed to proceed to FEED

Fast forward to the present time, even with the Covid pandemic besetting O&G projects globally and oil prices briefly hovering at US\$ 20 per barrel, the project has been completed successfully, proving that it certainly was the 'right' project.

Although on the face of it the FEL 2-Agile hybrid methodology may seem sluggish, in actuality, if the AHP+ tool illustrates that the evaluated criteria's don't differ much from previous evaluations, the selected project would be progressed to FEL 3 at a much quicker rate as the 'customer', in this case the DRB, has been engaged throughout and is unlikely to raise any major findings at the Stage Gate sitting.

On the other hand, if outcomes differ drastically each time the AHP+ technique is carried out, this suggests that the stakeholders are not in sync and possess different viewpoints of the project's aims. Instead of driving the project forward, it would be advantageous to take a step back to assess what the overall goal and objective of the project is and how it fits into the larger company direction.

Moreover, and perhaps most crucially, by repeating the AHP+ evaluation, it provides for senior management buy-in and ownership throughout every step of the concept select process within FEL 2 and offers assurance that the 'right' project is selected. One that is aligned with company's strategic objective and the ever-changing market conditions.

V. CONCLUSION

In performing a review of the FEL process within the O & G industry, particularly on areas that are challenging and can be further improved on by applying the Agile methodology, this paper has laid the foundations for the adoption of Agile to close the observed gaps and limitations. Based on literature, FEL 2, otherwise known as the concept select stage, was identified as the flawed component of the conventional FEL. Simply put, the 'wrong' decision at FEL 2 primarily leads to failure of the entire project. To address this, key aspects of the Agile methodology was integrated into FEL 2 along with a refined AHP tool, referred to as AHP+. Furthermore, by isolating FEL 2, a complete overhaul to the FEL process was not necessary, which should allow for a swifter acceptance within the industry.

As demonstrated by the case study of a project in Malaysia utilizing the hybrid methodology, the methodology was effective in selecting the 'right' project, one that succeeded in meeting all of the organizations' and project goals. This provides a strong basis for a more widespread roll-out of the hybrid

methodology in the O & G industry to enable it to be accurately appraised and evaluated.

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Insight to Abandoned Construction Projects in Nigeria

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Abstract— The Nigerian construction industry has become a place of dumping junk of abandoned projects worth billions. There are lot of potential in the construction industry, it is surprising that the country is experiencing such an immensity of abandonment. This study addresses the issue of abandoned construction projects and the challenges they pose to both clients, contractors, and the economy at large and explores potential solutions on how to overcome the abandonment of construction projects in the infrastructure sector of Nigeria. The sampling framework consisted of all the 106 in-house construction professionals in FCDA and 31 registered contractors with FOCI who received the online questionnaire. The research employs a statistical tool for the evaluation and analysis of the data on the causative factors as well as the effect of abandonment. The research findings established political interference, corruption, poor supervision, poor planning, and misplacement as major factors that are responsible for the abandonment. The study revealed that delay in property values, loss of economic benefits of the project, the Centre for illegal activities, the environment and physical danger to residents, and reduction in economic activities were major effects of abandonment. The research advocates adherence to the project management knowledge guidelines to reduce project abandonment. The study also recommends that more project managers are needed, and project managers should collaborate with the Standard Organization of Nigeria (SON) and Nigeria Society of Engineers (NSE) to ensure good project management performance and control. The study highlighted the need to establish the construction policies to fill the missing link that stipulates standard forms construction processes.

Keywords—Project management, Infrastructure sector, causes of abandonment, effects, remedies

I. INTRODUCTION

Construction has an important part in developing any country around the world. Roads, power, housing, railways, water supply, sewage, and industrial areas are all part of infrastructure projects [1]. Project Abandonment occurs when a project is held without any work carried out for a period of time [2]. In Nigeria, projects are held with no indication of when the work resumes, or even if they will resume at all. Short-term abandonment lasts between one and two years, while long-term abandonment lasts between three and five years [3]. According to a 2020 report, over 12,000 infrastructure development projects have been abandoned, costing more than \$12 trillion in comparison to 2013. Those

projects include houses, churches, schools, highways, bridges, dams, tunnels, airports, and seaports [4]. In Abuja there are roughly 437 abandoned buildings in Abuja. Even though construction activity in the capital city, the FCT is increasing, insufficient research has been done to identify and address the problem of abandonment [5]. Based on these previous studies on abandonment, further investigations are required in the field of project abandonment, indicating that project management practices have been understudied in the Nigerian context [6]. The contractual procurement strategy, was defined as a basis for the client's action in determining the process to be followed from project inception to handover, is critical to the industry's efficiency [3]. It is discovered that project management in the Nigerian construction industry is still in its infancy [7]. The service is available, but only in conjunction with other consulting services. The fact that project management is learned by experience and is not represented by existing professional bodies, although many consultants are members of the Association of Project Management (APM) and the Project Management Institute (PMI), does not help matters [8]. The objective of the study was drawn to study the causes and effect and most especially explore the key informant's perception on a potential solution to overcome construction project abandonment issues in the Nigerian Infrastructure Sector and with the focus of introducing the project management system to minimize the abandonment issues.

II. REVIEW OF RELATEDLITERATURE

A. Challenges in the Nigerian Construction Projects

Construction projects in Nigeria and across the world are filled up with difficulties and unseen cases can result in project deadlines going missing, frequently based on poor quality and cost overruns, resulting in failure of the project and abandonment [9]. According to [2], it was argued that although Nigeria has the largest economy in comparison to South Africa, it has consistently underperformed in terms of providing the best life possible for its people in terms of improved living standards, economic development, fairness, and other factors [6]. Ignoring poverty indices has compelled Nigeria's government to improve infrastructural facilities as a means of propelling advocacy for rapid development in terms of stimulating economic growth and development, but Nigeria's government's performance in this regard has been dismal [8]. Nigeria's population has shown to have grown to approximately 2.5 percent every year until it reaches 400 million people in 2050. As shown in Table I, the country's current infrastructure is anticipated to be overburdened soon. Nigeria invested \$3 trillion to solve its infrastructure lacking in certain areas, according to a World Bank report [10]. The Government of Nigeria has addressed the infrastructure issues by increasing investment, which is a 30-year infrastructure master plan with a 2043 time limit, with the

goal of bringing Nigeria's infrastructure stock up to the World Bank's target threshold of 70% of GDP [7].

TABLE I. NIGERIA INFRASTRUCTURE SECTOR (USD MILLION)

	2017	2018	2019	2020
Total Market Size	878,282	962,522	962,522	680,000
Local production	217,754.06	238,640	265,225	2,562,017
Total exports	75,960.72	83,246.35	90,500	87,423
Total Imports	660,528	723,882	800,000	772,800
Imports from U.S.	162,049.54	177,592.39	195,000	188,700
Exchange rate:	367	362	360	379.5

[7]

B. Causes and Effect of Project Abandonment in Nigeria

In Nigerian building project execution, it is a well-known fact that the majority of building projects in Nigeria are done without any adequate preparation and schedule of building project plans, and without any feedback from project management by a qualified project manager [11]. If there is a case where projects are planned, the planners rarely have a proper way of scheduling technique logically to process the activities planned in the building project, providing comprehensive execution of the project [12]. However, the importance of careful preparation, scheduling, and monitoring of construction project activities cannot be overstated, particularly if project abandonment, project failure, building project collapse, project cost, and time overruns are to be prevented [13]. In the majority of cases, new governments reject previous government policies or initiatives in order to embrace self-conceptualized ventures. Despite the fact that this condition was aggravated by regular military intervention in Nigerian politics (1983-1996), highlighted both the current and previous democratic regimes [14]. A specific inadequate allocations of funds to the development projects, and puts an imperative effect on the causes of project abandonment [15]. Finance is a major sustaining factor for accomplishing a project and where such is insufficient or inappropriately allocated; the projects suffer abandonment scenarios [16]. Therefore, proper allocation is important for the required funds to be made for any development projects to avoid the projects crippling into abandonment situations in the economy. At the same time, the project development timing should be properly conceptualized, planned, and implemented accordingly [17].

C. Project Management Practice System in Nigeria

A project is defined by the Project Management Institute as a "temporary endeavour" taken to produce a specific product, service, or outcome". In the Nigerian construction industry, resources could consist of a house, installation services, or another infrastructure project [18]. As a result, experts are frequently assembled to achieve this goal. This expert team must have the necessary expertise, experience, resources, and techniques to complete the project. Project management is the process of putting certain factors, abilities, experience, resources, and strategies to use in order

to achieve the desired result [19]. It was discovered that project management was in infancy in the construction industry of Nigeria. The services are available, but it must be combined with other consulting services. management acquires different experiences through learning and is not always represented by existing professional bodies, members part of the Association of Project Management (APM) and the Project Management Institute (PMI), exacerbates this problem [20]. As a result of an ineffective project manager, project management factors such as communication and coordination issues, an ineffective project plan and schedule, project control issues, and poor on-site safety management arise [21]. It can be concluded that improved services in the form of greater efficiency and timeliness would certainly yield a positive impact. Project management activities in the construction industry should be carried out in every project and should be within an organization or part of the construction industry

III. RESEARCH METHOD

This methodology adopted for this research involved a combination of literature review, questionnaire survey, and interviews on information. The literature review formed the basis for the causes and the effects of project abandonment in Nigeria. The first phase of questionnaire preparation was discussions with the key informant directly affected by the problem of abandonment, which resulted in some additional effects not listed in the literature. The additional information collected was from the formulation of the questionnaire in the administration as the second phase. A quantitative research approach via questionnaire survey to 106 in-house construction professionals in the Federal Development Authority (FCDA) and 31 registered contractors with Nigeria's Federation of Construction Industry (FOCI) was adopted in this study. To increase response rates, the questions were simple and straightforward, and the language used was appropriate for the survey population. The collected data was presented in tabular form, with opportunities to identify factors responsible for construction project abandonment in Nigeria. For the questionnaire survey, a 5-point Likert scale was used to obtain opinions from the respondents and for further data analysis. These ordinal scales measures levels of not important/extremely important were used in this study: 1 = Not important, 2 = NotFairly important, 3 = Important, 4 = Very important, and 5 = Very importantExtremely important. The statistical tool for analysis used to test the hypothesis in this research work was the Statistical Package for the Social Sciences (SPSS software). The study further employed the Relative Importance Index method

$$RII = \frac{\Sigma w}{A \times N} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5 \times N}$$
[18]

Where W denotes the weighting assigned by the respondent to each variable, A denotes the highest weight, and N denotes the total number of respondents. The RII value ranges from 0 to 1, with 0 being the most extreme. It demonstrates that the more important the sustainable criteria are, the higher the RII value is, and vice versa. The transformation matrix was used to compare RII with the

corresponding importance level [22]. The derived importance levels from RII, are as follows, as shown in Table II.

TABLE II. RELATIVE IMPORTANCE INDEX

Level of Importance	RII
High (H)	0.8 <rii<1.0< td=""></rii<1.0<>
High-Medium (H-M)	0.6 <rii<0.8< td=""></rii<0.8<>
Medium (M	0.4 <rii<0.6< td=""></rii<0.6<>
Medium-Low (M-L)	0.2 <rii<0.4< td=""></rii<0.4<>
Low (L)	0.0 <rii<0.2< td=""></rii<0.2<>

[22]

IV. DISCUSSIONS AND FINDINGS

A. Respondents background

Based on the data gathered from the distribution of questionnaires, the findings show that (96.8%) of the respondents were male and (3.2%) were female. For this reason, there is an impact of gender issues in the construction industry and can be useful to policymaking regarding female employment in Nigeria [23]. This is because the Nigerian government has not harnessed the potential of women to participate in building construction work. Therefore, few or fewer women are in the construction industry. According to the respondents' backgrounds, the majority of respondents work in civil engineering in various capacities such as site engineer, consultant, developer, and contractor. It is critical to have a respondent who understands the topic and works in the same field because, in order to have reliable data, the respondent's background should be in the same field. It was then divided into two sectors: the government sector and the private sector. It was analysed that almost more than half of the respondents are from the private sector (77.4%) while the other half of the respondents are from the public sector (22.6%). In Nigeria, the present state of the public construction industry falls short of meeting domestic and international quality standards and the performance demand expected from the sector [3]. Therefore, must contracts be awarded to private sector to increase the rate of project delivery but still there is a long way to go in contributing to the solution to the problem of project abandonment [6].

B. Causes of Project Abandonment in Nigeria Infrastructure Sector

The findings of the results confirmed 16 factors are the causes of why most projects were abandoned in Nigeria. The 5 top major factors were ranked high, and 11 factors were ranked between a high to medium level of importance. These factors include: Political interference (R.I.I 0.8774); Corruption (R.I.I 0.8516); Poor supervision (R.I.I 0.8387); Poor planning (R.I.I 0.8193); Misplacement of priorities (R.I.I 0.8193). Poor tendering (0.7870); Use of Substandard Materials (R.I.I 0.7870); Use of substandard materials (R.I.I 0.7870); Unqualified contracting (R.I.I 0.7870); Neglect of Bill quantities (R.I.I 0.7677); Lack of funding (R.I.I 0.7613); Lack of effective communication (R.I.I 0.7548); Security

challenges (R.I.I 0.7419); Slow decision making (R.I.I 0.7419); Unspecified scope of work (R.I.I 0.7096); Land issues (R.I.I 0.6774); Change in design (R.I.I 0.6645) respectively. Political interference remains a major cause from 2016 to 2020 [31]. For example: In Niger State, the former governor, Dr. Muazu Babangida Aliyu, oversaw a mega shopping complex project in the heart of Minna, the state capital, but when his tenure ended in 2015, his successor, who took over from him in May 2015, did not interfere with the project, which has since failed and been abandoned [24].

TABLE III. CAUSES OF PROJECT ABANDONMENT IN NIGERIA INFRASTRUCTURE SECTOR

S/No		RII	Rank	Level of
	Causes			Importance
1	Political interference	0.8774	1	Н
2	Corruption	0.8516	2	H
3	Poor Supervision	0.8387	3	Н
4	Poor Planning	0.8193	4	H
5	Misplacement of Priorities	0.8193	4	H
6	Poor Tendering	0.7870	6	H-M
7	Use of Substandard	0.7870	6	H-M
	Materials			
8	Unqualified Contracting	0.7741	8	H-M
9	Neglect of Bill Quantities	0.7677	9	H-M
10	Lack of Funding	0.7613	10	H-M
11	Lack of Effective	0.7548	11	H-M
	Communication			
12	Security Challenges	0.7419	12	H-M
13	Slow Decision Making	0.7354	13	H-M
14	Unspecified Scope of Work	0.7096	14	H-M
15	Land Issues	0.6774	15	H-M
16	Change in Design	0.6645	16	H-M

C. Effect of Project Abandonment on Project Performance

The effects of Construction Project Abandonment on project performance were assessed and established, and the (12) effects were confirmed to be significant. These effects on real properties, however, are suggested to be negative, and they are Delay of property values (R.I.I 0.7548 and ranked 1st); Loss of economic benefits of the project (R.I.I 0.7483 and ranked 2nd); Centre for Illegal activities (R.I.I 0.7548 and ranked 2nd); Environmental and physical danger to residents (R.I.I 0.7419 and ranked 4th); Reduction in economic activities (R.I.I 0.7419 and ranked 4th); Waste and under-utilization of resources (R.I.I 0.7354 and ranked 6th); Promotion of criminal activity (R.I.I 0.7226 and ranked 7th); Negative aesthetic to the Neighbourhood (R.I.I 0.7225 and ranked 7th); Garbage (R.I.I 0.6903 and ranked 9th); Breeding ground for dangerous animals and insects (R.I.I 0.6838 and ranked 10th); Negative impact on government tax revenue (R.I.I 0.6580 and ranked 11th); Public/Fire safety hazard (R.I.I 0.6193 and ranked 12th). The total value of a real property is the sum of its market value, value in use, going concern value, investment value, liquidation value, assessed value, and insurance value [25]. The delay of property value is ranked (R.I.I 0.7548 and ranked 1st) because when projects are abandoned for a long time, the consequence is that it brings a reduction in the value of property, thereby affecting the performance of the project, which leads to the loss of the economic benefits of the

project as affirmed [26]. There is no doubt that project abandonment has a significant impact on the construction industry and project performance, which ultimately contributes to a country's economic growth and benefits. The causes and effects are not dissimilar, and various countries dealing with the issue of abandoned projects face similar challenges. All these effects, however, have been identified as project abandonment effects. However, it is possible that it was conceptualized in the scope of this research [27].

TABLE IV. EFFECTS OF PROJECT ABANDONMENT ON PROJECT PERFORMANCE

S/NO		RII	Rank	Level of
	Effects			importance
1	Delay of Property values	0.7548	1	H-M
2	Loss of Economic benefits of the	0.7483	2	H-M
	project			
3	Centre for Illegal activities	0.7483	2	H-M
4	Environment and physical danger	0.7419	4	H-M
	to residents			
5	Reduction in economic activities	0.7419	4	H-M
6	Waste and under-utilization of	0.7354	6	H-M
	resources			
7	Promotion of criminal activity	0.7226	7	H-M
8	Negative aesthetic to the	0.7225	7	H-M
	Neighbourhood			
9	Garbage	0.6903	9	H-M
10	Breeding ground for dangerous	0.6838	10	H-M
	animals and insects			
11	Negative impact on government	0.6580	11	H-M
	tax revenue			
12	Public /Fire safety hazard	0.6193	12	H-M

D. Key informant's perception on Project Abandonment

Based on the perception from key informants on project abandonment (9) solutions were confirmed significant and these solutions will provide a better positive effect on project abandonment in Nigeria infrastructure and these are Good project management system (R.I.I 0.9419 and ranked 1st); Good and adequate supervision (R.I.I 0.9225 and ranked 2nd); Good planning (R.I.I 0.9225 and ranked 2nd); Strict adherence to design and specification (R.I.I 0.9161 and ranked 4th); Accuracy of project cost and time (R.I.I 0.7419 and ranked 4th); Government intervention (R.I.I 0.8967 and ranked 6th); Learn from previous projects experience (R.I.I 0.8709 and ranked 7th): Training of staffs to efficient skills (R.I.I 0.8580 and ranked 8th); Revocation of contracts (R.I.I 0.800 and ranked 9th). Multitudes of labourers work directly and indirectly in Nigeria's numerous construction sector, the majority of whom are untrained, unskilled, and unqualified workers rather than professionals [24]. With these issues, there is a need for additional cohesion, training, and supervision for these workers on the job site in order to complete tasks perfectly and ensure good project delivery. It is therefore recommended that more efforts be made to resurrect project abandonment, particularly now, because more project managers are required to take turns assigning good and adequate supervision [25]. Based on the findings of this study as shown in Table III, it was possible to confirm (9) potential solutions that were significant in overcoming

construction project abandonment in Nigeria. This study further analysed the potential solutions based on ranking using the RII method as recommended [18]. Nine potential solutions were identified as major, with a high level of importance: good project management system, good and adequate supervision, good planning, strict adherence to design and specification, accuracy of project cost and time, government intervention. Learn from previous project experience, staff training in efficient skills, and contract revocation. This section of study was not only successful in exploring potential solutions for how to overcome the abandonment of construction projects in Nigeria's infrastructure sector. This research also filled a research gap in introducing and improving project management performance and practices in Nigeria. The provision of a "project management system that has been understudied and ignored for many years in the Nigeria construction industry" was ranked as the highest ranked potential solution in this study. As a result, before a project can begin, it must be strictly understood, and all perceptions must be classified [26]. The remaining significant solutions for project abandonments are strict adherence to design and specification, the accuracy of project cost and time, government intervention, learning from previous project experience, training of staff in efficient skills, and revocation of contracts. Studies carried out agree with these significant possible solutions [28,29,30].

TABLE V. KEY INFORMANT'S PERCEPTION

S/NO	Solutions	RII	Rank	Level of importance
1	Good project management	0.9419	1	Н
	system			
2	Good and Adequate	0.9225	2	Н
	Supervision			
3	Good Planning	0.9225	2	Н
4	Strict adherence to design and	0.9161	4	Н
	specification			
5	Accuracy of project cost and	0.9161	4	Н
	time			
6	Government Intervention	0.8967	6	Н
7	Learn from previous projects	0.8709	7	Н
	experience			
8	Training of staffs to efficient	0.8580	8	Н
	skills			
9	Revocation of contracts	0.8000	9	Н

V. CONCLUSION

The study provided an insight into project abandonment in Nigeria in general and in Abuja, Nigeria's capital city in particular. The study established the causes, effects, and possible solutions to the problem. The study identified that many construction projects have a positive impact on the economy with the societal nation development litters cutting corners and the country's open sources. The study found that the causes of project abandonment in the Nigerian construction infrastructure sector were identified as political interference, corruption, poor supervision, poor

planning, and misplacement as the major contributing factors. However, the effects of project abandonment on the project performance were classified as delay in property values, loss of economic benefits, illegal activities, the environment, and physical danger to residents, and decrease in economic activities. The study concludes that since it is evident that the major causes of project abandonment relate to poor planning and supervision, the concept of practicing project management mechanism is introduced as it provides the project manager an opportunity to be involved in the project which gives him or her to understand the project complexity involved in the management process. Overall, the research was carried explored successfully and the results from the research were presented to people in stakeholding and policymaking of the construction industry to understand the impact of the project abandonment.

VI. RECOMMENDATION

The following recommendations are advocated based on the conclusions drawn and analyzed from the factors in the project management practice and performance.

I. It is recommended that a project manager has to make sure the integration of any project based on the 5 PMI process groups (Initiating, planning, monitoring, and controlling, executing, and closing, and 10 knowledge areas) should be practiced throughout the project life. Therefore, more project managers are needed, and project managers must take part in the Standard organization of Nigeria (SON) society and the Nigeria Society of Engineers (NSE), which must ensure good project management performance and control.

II. It is recommended that using a political undertone rather than an economic advantage in the selection of projects should be discouraged. Political interference and corruption at the level of government and other stakeholders in the construction infrastructure sector should be curbed through due process, Economic and Financial Crime Control (EFCC), Budget Monitoring and Price Intelligence Unit (BMPIU), and other crime control agencies should ensure no neglecting the projects of previous government governance by new governance.

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Investigation of Various Project Management Methodologies and Standards for the Helicopter Maintenance Project

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Abstract - There are several methods, standards, tools and softwares for Project Managements. It was developed based on specific interest and industry such as the software industries developing the agile project manifesto and developing several techniques such as Agile Scrum. This paper aims to review the methodology, standards and techniques for the application in helicopter maintenance projects. The methodology of the study was Comparative research, it compared the project management methodologies, standards and techniques or tools. The results show that the international standard body, ISO (International Standard Organizations) has covered most of the standards and streamlined the standards for general application across the industry. In conclusion, Helicopter maintenance is one of the aerospace industry is better suited to apply the ISO 21502:2020 Project, programme and portfolio management — Guidance on project management

Keywords—Project Management, International Standardization Organization, Helicopter, Maintenance

I. INTRODUCTION

Project management is defined as a process in managing a group of activities and tasks with the objectives to complete those activities and tasks within the required time frame, in accordance with agreed scope, within the budgeted cost and delivery with the required quality standards [1]. Project Management methods have shown to be successful in managing projects across the industries [2]. In the aircraft industry the civil aviation authority of the states has acknowledged the production planning in the aircraft maintenance as one element of ensuring the aircraft issafe in service after maintenance. The civil aviation authorities have mandated the production planning process in the regulation as the prerequisite for the companies to be approved to carry out maintenance for an aircraft. The Civil Aviation Authority of Malaysia (CAAM) also follows a similar approach by ensuring the aircraft maintenance, repair and overhaul (MRO) companies establish the process of production planning as the prerequisite to be approved to maintain an aircraft [3]. However, project planning is just one of the stepin project management cycles [4]. The question is whether this approach improves aircraft safety. Aircraft accidents still occurred and one of the root causes of the accidents related to errors in maintenance and missing maintenance tasks. This paper explores the Project Management methodologies and possible implementation as a complete project management cycle rather than applying a selective phase of the project management cycle in aircraft maintenance projects. The focus of the study was the helicopter maintenance project because the maintenance of helicopters has a higher rate of accidents compared to fixed wing aircraft [5].

II. HELICOPTER MAINTENANCE

The helicopter is only airworthy if it is maintained in accordance with the helicopter maintenance program [6]. Bell Model 206L4 Long Ranger-IV was used in this study. The maintenance program referred to in this study was based on the helicopter maintenance manual document number BHT-206L4. This Maintenance Manual (MM) states the scheduled inspections of the helicopter for 100 hours, 300 hours, 1200 hours, 12 months, 24 months. For components, the inspections are scheduled for 600 hours or 12 months of component operation, 1200 hour of components operations, 1200 hours or 24 months of components operation, 1500 hours of components operation, 3000 hours of components operation, and 12 months of components operation [7]. The inspection must be completed as it reaches the required hours and months. If the inspections have lapsed the helicopter Certificate of Airworthiness will no longer be valid [8]The helicopter components must also be maintained in accordance with the required hours, months and years. Some of the tasks are routine such as the daily and weekly inspection, which to be carried out but most on a fixed hours period. However, months or year inspection requires the helicopter to be in a hangar and the tasks must be appropriately planned. The planning must consider the availability of hangar space, competent maintenance personnel, availability of materials and planning for vendors or subcontractors to repair the unsuspected damage. For this study, the 100 hours of inspections tasks has been reviewed [8]. The 100 hours inspection tasks listed are purely technical with little requirements for preparation tasks. The preparation task is only to ensure the logbook entries are current and to ensure the inspection program is updated [8]. There are no requirements or even recommendations in the manufacturer manuals to approach the maintenance as a project or even prepare the maintenance planning. The Maintenance Repair and Overhauls (MRO) company internal procedures may have the planning procedures since it has been mandated by the authority to establish such procedures before the MRO being issued with approval. Since there are no specific requirements and techniques to handle the maintenance projects, the internal companies procedures may vary between the Maintenance Repair and Overhauls (MRO) companies.

III. ANALYSIS OF PROJECTMANAGEMENT METHODOLOGIES AND STANDARDS

Project management methodology approach always begins with the project initiation, planning, execution, control and closure [9][10]. The concept of project

management cycle approach is generic throughout the project management standards and methodologies. However, the recognized and industry accepted standard project management methodology comes from several sources. In this study the author reviews the project management methodology and standards sources, determines the objectives of the methodologies and standards, and reviews the implementation to the projects, especially helicopter maintenance. Hopefully, there are methods or standards suitable for maintenance projects.



Figure 1: The research methods

A. Source of Project Management methodologies and standards

The two most common sources of the project management methodologies are the Project Management Institute (PMI) and International Project Management Association (IPMA) book of knowledge [9][10]. PMI is the world leading organization providing the Project Management Professional certification platform (Project Management Institute, n.d.). The PMI has members around the world and is based in the USA. The PMI published the Project Management Book of Knowledge (PMBOK), which is now at the latest 7th Edition. The IPMA is a federation of about 70 Member Associations (MAs), which develop project management competences and published IPMA standards - Individual Competence Baseline (ICB4). These organizations develop the competencies of project management professionals and the project management professional requires them to learn, practice and acquire the appropriate experience before they are considered as competent. During the process they need to learn and understand the project management methodologies. However, they do not publish standards, the ISO has taken the initiative to standardize the Project Management from various aspects of the methodologies and published ten standards related to project management. These standards cover the project, programme and portfolio management. The project, programme and portfolio are complete business processes, where the organizations are required to manage its business. The portfolios are the company's group of products, services, and business units that conform to its strategic goals, where there are several programmes within the portfolios, and there are several projects within the programmes. Based on author experience, for helicopter maintenance companies, their portfolios are providing maintenance services, ground handling and selling spares for helicopters. In one of the portfolios, there are aircraft maintenance programs, and within the programs there are several maintenance projects for each aircraft model.

In the study to determine the sources of the project management methodologies, the results show thatthe project management professional bodies provide the methodologies best practices for the project management professionals. These professional bodies do not publish standards. The ISO being the international standardization body publishes various standards related to project management. These standards also have taken the consideration published by the professional bodies, especially the PMI and IPMA.

B. Objectives of the standards and methodologies

In this study, the focus is on the ISO Standards because it is universal for the states and companies, whereas the PMI and IPMA methodologies may be focused on the members of the institutions. The ISO published 10 standards related to project management. However, each of the standards have different objectives. The first standard is the ISO 21500:2021 "Project, programme and portfolio management — Context and concepts" and this is the latest published standard in 2021 [11]. This standard specifies the organizational context and underlying concepts for undertaking project, programme and portfolio management. The standard defines a project as a temporary activity to achieve one or more defined objectives, programme as a group of projects and a portfolio as a collection of programmes. In an organization, for business sustainability these three elements must be considered. These standards are broken into several independent standards to address project, programme and portfolio. ISO 21502:2020 for Project, programme and portfolio management — Guidance on project management, this is second edition [12]. The first edition was published in 2012 and has been used by many companies. ISO 21503:2017 is for Project, programme and portfolio management — Guidance on programme management and BS ISO 21504:2015 is for Project, programme and portfolio management — Guidance on portfolio management. [13][14].

The ISO 21505:2017 is published for governing the projects programmes and portfolios for assessment, assurance or verification of the governance function for projects, programmes or portfolios [15]. This standard is considered managing the three standards ISO21502, ISO21503, and ISO21504. The ISO 21505:2017 is also intended for the governing bodies and executive and senior management regarding the governance of projects, programmes and portfolios. Project, programme and portfolio management — Vocabulary and terms are defined in the published ISO/TR 21506:2018 [16].

ISO 21508:2018 "Earned value management in project and programme management", which introduces the concept of project Earned Value which allows the project manager to measure the amount of work actually performed on a project [17].

The Work Breakdown Structure (WBS) is a very important aspect in project and program management, the ISO 21511:2018 "Work breakdown structure" is published to provide guidance for work breakdown structures for organizations undertaking project or programme management [18].

The standard for Quality Management of the whole project is published in the ISO 10006:2017 Quality management — Guidelines for quality management in projects [19].

Based on the review of the project management standards objectives, the 10 standards cover all aspects of project, programme and portfolio management of a business.

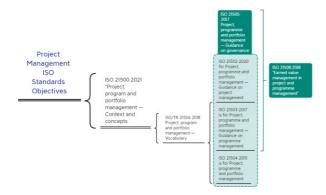


Figure 2: Summary of the interrelation for 10 ISO Project Management related Standards

C. Implementation of the standards

From several standards, which have been analysed on their objectives, project management methodology of the IPMA and PMI have clearly explained the project lifecycle and process. The PMBOK has the details of how to manage projects, which focus on the professional competencies. However, it does not publish standards generic for the industry, which require flexibility. However, the ISO approach is more of a framework for easy adaptation to the industry and the process. Specific for project management three standard are directly related; ISO 21502:2020 for Project, programme and portfolio management — Guidance on project management and the ISO 21511:2018 "Work breakdown structure" provides guidance for work breakdown structures for organizations undertaking project or programme management and ISO 21508:2018 "Earned management in project and programme management". The 21502:2020 for Project, programme and portfolio management — Guidance on project management explains the phases of the project in several contexts; project lifecycle, integrated project management practices and management practices for a project.

The ISO 21502:2020 for *Project, programme and portfolio management* — *Guidance on project management* provides the detailed framework for a project, which can be adopted and adapted for helicopter maintenance projects, which currently only focuses on planning. According to the ISO 21502:2020 for Project, programme and portfolio management — Guidance on project management.

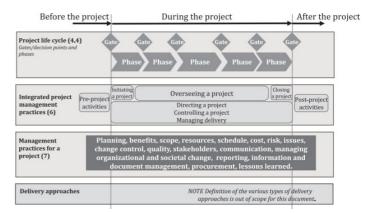


Figure 3: The Project Management Lifecycle (12)

IV. DISCUSSION

Based on author experience, the helicopter maintenance tasks fits into the project phases in accordance with the ISO ISO21502:2020, which shall encompass of;

- Pre-project activities survey for the MRO with appropriate scope of approval, acquire the quotation, negotiation on the pricing, draft contractual agreement between the aircraft owner or operators with the MRO company,
- 2. Initiating a project establish the approved maintenance program, tow the helicopter to the hangar, jack and trestle the helicopter, briefing the maintenance personnel.
- 3. Overseeing the project
 - Directing the a project project manager establish the work plan and prepare the work cards according to the tasks in the WBS, which are established from the MM maintenance tasks
 - Controlling a project ensuring delivery of each tasks
 - c. Managing delivery ensuring completed of all tasks, aircraft inspection and flight test
- 4. Closing a project review of the paperwork
- 5. Post project activities receiving any complaints and handling warranty claims.

The above list of activities are structured due to the standards published by the ISO, whoever applies the ISO will have a standardized approach in helicopter maintenance.

V. CONCLUSION

The Helicopter maintenance especially for based maintenance fits into the definition of project and the project management concept in ISO 21502:2020 for *Project*, programme and portfolio management — Guidance on project management is applicable, Further work is required to simulate the ISO 21502:2020 for *Project*, programme and portfolio management — Guidance on project management for actual

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The Relationship between Emotional Intelligence and Sales Performance with a Mediating Role of Effective Communication

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Abstract— In our current multifaceted and communicative, communication effectiveness, environment. emotional intelligence and sales performance remain a main topic of concern among businesses worldwide. Emotional intelligence is essential to successful communication, and the two are intertwined as past research shown that emotional intelligence can act an important tool to increase communication effectiveness which then assists in sales performance such as helping sales representatives to deal and adapt to challenging customers. The current concept paper is to explore the understanding of the impact of emotional intelligence on sales performance and how it is mediated by effective communication. The dimension of emotional intelligence in this study includes both the ability model which views emotional intelligence as a set cognitive abilities and trait model which views emotional intelligence as made up of personality characteristics which can be measured through self-perception of the participants. The effective communication dimensions include four skills, (i) non-verbal communication, (ii) attentive listening, and (iii) ability to understand and to control one's own emotions. The sales performance dimension consists of three factors, and they are: (1): Self-efficacy, (2) Competitiveness and (3) Effort. Within the theme of transformation, connecting the intellectual concept and work practice will help to provide recommendation for any necessary up-skilling effort. Therefore, this study is significance not only to the theoretical aspect but also the practical aspect of communication, sales and marketing

Keywords— Emotional Intelligence, Sales Performance, Effective Communication

INTRODUCTION

This study is to explore the concept of emotional intelligence on sales performance and how it is mediated by effective communication. For businesses to be successful in sales in existing uncertain times, a salesperson needs not only an economical advantage but also a communicative advantage (Sojka & Deeter-Schmelz, 2002). According to Cohen and Stalk (2007), effective communication is an important and required tool when it comes to preserving solid relationships at the workplace as well as accomplishing higher work performances like sales. Additionally, it increases work efficiency and ensures that employees and employers can connect with each other better by conveying information to

one another successfully and proficiently (Bryant,2005). On the other hand, organizations that are weak in communication can cause a deficiency in productive operations and a decrease in confidence among work peers(Myers,2002). Often, businesses that do not practice effective communication as part of their work culture tend to not achieve high work productivity and performances as compared to business that do practice effective communication. Especially in the sales fields which need continuous and rapid high growth. (Cohen, Stolk, & Niezen, 2007; Pearce, 2008; Wetter mark, Godman, Andersson, Gustafsson, Haycox, & Bertele, 2008; Young & Dixon, 2008).

Another main view that has been regularly debated about in literature, especially sales literature is emotional intelligence which could fundamentally support in predicting and detecting successful sales performance (Van Roony, Viswesvaran, & Pluta, 2005). Past literature has shown that emotional intelligence can act an important tool to increase communication effectiveness which then assists in sales performance such as helping sales representatives to deal and adapt to challenging customers. (Walker et al., 1977; Weitz, Sujan, & Sujan, 1986).

Emotional intelligence can be enhanced with continuous practice and acquiring. (Goleman, 1998). Weinberger (2002) suggests that if there is an increase in significant correlations that exist between emotional intelligence and sales performance, research in the future can analyse the predictive power of this skill and whether it can be successfully cultivated and trained with others. According to McKee (2002), the past decade emotional intelligence is a known concept within leadership literature, but it has been overlooked within the sales area of literature and research. (Goleman, 2000; Goleman, Boyatzis, & McKee 2002).

The current research will examine the impact of emotional intelligence on sales performance and how the impact of emotional intelligence on sales performance will be mediated by effective communication. The purpose of this research is to understand whether emotional intelligence plays a role in passing the threshold of accomplishment in sales results and to understand how the degree of emotional intelligence differs between an average salesman and a successful one.

This will contribute to the theoretical understanding of the subject matter. This research will be guided by the following research questions:

- 1. What constitutes emotional intelligence in effective communication?
- 2. How does emotional intelligence relate to sales performance?
- 3. How does effective communication relate as a mediator towards emotional intelligence and sales performance?

LITERATURE REVIEW

This literature review covers topics which pertain to emotional intelligence, effective communication and sales performance.

Emotional Intelligence

The necessity for emotional intelligence ability is increasing, particularly in the corporate environment. Peter and Shauen (2002) stated that emotional intelligence taps into every facet of our daily lives starting from decision making, managing our feelings, managing daily stresses and resolving conflict to how we function and lead at work. Emotional intelligence can be described as the capacity to be aware of, control and express one's emotions and to handle interpersonal relationships judiciously and empathetically (Walter and Hayes, 2003). More specifically, Mayer and Salovey (1997) states that emotional intelligence can be described into four branches which are: (i) perception of emotions which involves how well people can identify emotions and emotional content, (ii) managing own emotions, involves using feeling to promote thinking such as analytical processing, (iii) managing others emotion, is described as understanding and identifying the meaning of different emotions and (iv) utilizing emotions involves the capacity to actively control emotions.

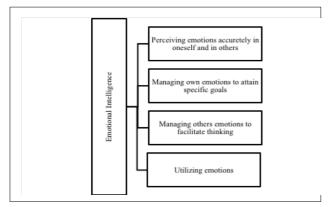


Figure 1: Ability Model of Emotional Intelligence

On the other hand, Petrides, Frederickson, & Furnham (2004) states that emotional intelligence refers to a constellation of behavioural dispositions and self-perceptions concerning one's ability to recognize, process, and utilize emotion-laden information. It is a constellation of emotion-related self-perceptions located at the lower levels of personality

hierarchies (Petrides, 2009), which related to typical performance and it is mostly assessed by using self-report method (Warwick & Nettelbeck, 2004).

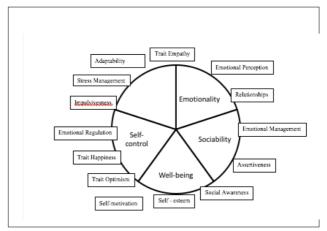


Figure 2. Trait Model of Emotional Intelligence

Literature in relation to organizations state that emotional intelligence abilities and experiences are required to be practiced within an organization in order to maintain a high and constructive working environment (Ono, Sachau, Deal, Englert, & Taylor, 2011).

Current research in the sales area reveal a significant correlation between individuals who score higher in emotional intelligence and performance. Individuals who scored higher in emotional intelligence tend to handle high stress situations better as compared to individuals who score lower in emotional intelligence (Naseer, et al., 2011).

Johnson (2002) states that emotional intelligence is important for career development which also helps to differentiate the best employee performance from the mediocre performance.

It can be extremely beneficial to companies and businesses to help recognize sales representatives that have higher emotional intelligence because they can function well in multifaceted circumstances and achieve better goals. Nearly all employees and managers tend to occupy their time at work into negative and positive emotions, especially towards task orientated circumstances. If working individuals score higher in emotionally intelligence, they will be able recognize and identify emotions easier and comprehend other people's emotions such as clients or consumers. These individuals have learnt these emotions to generate better outcomes (e.g. profit) for their organizations (Naseer, et al., 2011).

Effective Communication

One of the most essential and imperative tools towards work performances, especially relating to sales is effective communication. According the Sanchez & Guo (2005), effective communication is a method of conveying information to ensure that the message being conveyed is understood clearly by others. Effective communication is awareness, education, empowerment and appreciation. According to Salako (2016), effective communication is a critical weapon for progress in any organisation. It is the means by which an organisation achieves its objectives. The

advantages of effective communication are profitable company, rich partnerships and the opportunity to convey emotions, feelings and suggestions effectively and comprehensively.

Effective communication is at the basis of any effective action. Every organization improves or declines on the strength of the communication skills. These skills include (i) non-verbal communication, (ii) attentive listening, and (iii) ability to understand and to control one's own emotions (Males and Winter, 2004). Nonverbal communication is defined as messages without words or silent messages (Manning & Reece, 1989). This skill requires the efficient usage of body language to convey the purpose or message you seek. It involves facial gestures, rotation of body parts such as hands and legs, eye contact, stance and tone of voice (Peter, 2002). For example, when communicating with a client, a cross handed posture means that the individual is protective and unable to consider the views of others.

Attentive listening is a skill that involves not just knowing what the other individual does, but also understanding the context and the messages concerned (James and Oher, 2002). It contributes to deeper and more efficient understanding between organisations and consistency in the exchange of knowledge. It often negates all sort of harmful feelings in order to build a positive and balanced atmosphere for communication (Hiller and Zeme, 2004). For example, paying attention to what the client is saying helps to grasp the material and the message. Understanding and regulating emotions aids individuals to interact non-verbally (Razfer, 2001). It contributes to an agreement of individuals as to how some are viewed and how others are interpreted. Good communication becomes unsuccessful if the entities are overly emotional or out of contact with other feelings (Krishnan & Wong, 2004). Thus, it aims to reduce gaps and misunderstandings. For example, if a client struggles with a decision to buy an item, knowing his emotional condition may help to persuade him differently. All these skills contribute to greater productivity, increases desire to do well, increases loyalty to the organization, increases improved relationship and understanding with client & service staff and individuals inside and outside the organisation. These skills need to be developed in order to produce a successful outcome.

Sales Performance

Sales performance is the measurement of effectiveness in selling activities, the ability to achieve sales goals (Walter, 2002). One of the most appropriate way to obtain the information needed to measure and evaluate a salespeople's performance is through Krishnan, Netemeyer, and Boles (2002) sales performance model. The model consists of three factors, and they are: (1): Self-efficacy, (2) Competitiveness and (3) Effort. Self-efficacy is defined as the confidence the individual has on him/herself and on his/ her skills to perform given sales tasks (Sujan, Weitz, and Kumar, 1994). Effort is defined as the time and energy invested in sales activities (Kohli, Shervani, and Challagalla, 1998). Competitiveness is defined as the need of interpersonal competition, the wish to win and to be better than the others (Wachner, Plouffe, and Grégoire, 2009). Sales output has been conceptualised in systems and numerous research reviews, arising from a broad

variety of endogenous, moderating and mediating factors (e.g., Anderson and Oliver 1987; Babakus et al. 1996; Churchill et al. 1985; Verbeke, Dietz, and Verwaal 2011). Given major improvements in sales efficiency, our capacity to forecast based on detailed, documented studies in the sales and marketing fields was less than optimal, including sales range, buyer-seller engagement, work design, incentivization programmes, sales management and monitoring, etc.

RESEARCH CONCEPT & DISCUSSION

One of the main purposes of this research study is to establish the relationship between effective communication, emotional intelligence and sales success for sales professionals in the average and successful ranges working in multiple different industries in Kuala Lumpur. Understanding how emotional intelligence may influence the gap between performance ranges for sales professionals may provide insight into how to improve both individual and organizational performance in the sales community.

According to Bateman and Snell (2011), identifying what factors influence gaps in performance is the first step in correcting such gap. To this end, data will be collected from a general sales population in Malaysia to establish emotional intelligence (EI) as an important factor between successful and average sales achievement.

Since analysis can clarify a slight variation in sales efficiency, our perception of sales and the potential for different theoretical models are sufficient opportunities to do this

Emotional Intelligence and Effective Communication

Emotional intelligence together with effective communication helps create strong leadership skills which facilitates better interactions with staff, superiors and clients. The ability to perceive and regulate one's own feelings, as well as to understand other people's emotions, makes it possible to change how we interact and communicate with others. When there is no emotional maturity, one can't begin to grasp how to interact and communicate successfully with others. Emotional intelligence is about establishing connections and creating relationships to accomplish results, employing diplomacy and tact to fix disputes and settle disagreements.

Effective communication with others creates a difference in producing outcomes. It is essential to ensure that interactions are brief, transparent and take into consideration the interests of the other side. Efficient, constructive, well thought-out oral and written contact helps you to handle disagreements, communicate desires, affect others and enhance listening which are all part of emotional intelligence.

Research states that emotional intelligence can benefit effective communication, especially with messages (Goleman, 1998b; Mayer et al., 2004; Weisinger, 1998). For example, with the appointment setting situation stated above, individuals who have high emotional intelligence tend to identify the tone of the client and recognize the distress in the tone and ensure to follow up with the set appointment.

There are three main theorists of emotional intelligence, and they are Goleman, Mayer and Bar On. Goleman (2001) states

that there is a relationship between the social cognizance of emotional intelligence and effective communication. For example, an empathetic individual is able recognize emotional tides and grasp nonverbal signals such as tone and facial expressions. According to Bar-On (2002), for an individual to be emotionally and socially intelligent, one must be able to recognise and communicate oneself efficiently, to understand and connect well to others and to cope well with everyday needs, difficulties and pressures. Lastly, Mayer et al (2004) states that the highly emotionally intelligent person will interpret emotions more centrally, use them in reasoning, grasp their senses and handle the emotions more freely and pleasantly, than others tend. As has been seen, the three theories centre on the value of comprehension and the interaction with others which is strongly related to the case of communication, where tolerance and good usage of experience and abilities are important when engaging with others. For that cause, an underlying element may be common, which would contribute emotional intelligence to the quality of communication.

Emotional Intelligence and Sales Performance

Emotional intelligence is a skill that uses emotions, reactions and feelings to think and reason more intelligently (Walter,2003). Literature states that emotional intelligence has a strong significant relationship with sales performance, which will eventually lead to sales growth (Ono, Sachau, Deal, Englert, & Taylor, 2011). According to Nadler (2011), emotional intelligence helps with corporate dealings and communication, and this can benefit the sales performance.

According to Peter and Will (2002), being able to understand the correlation between sales and emotional intelligence can be beneficial towards differentiating successful and average performance in sales. This concept can serve as a significant indicator of the impact emotional intelligence has on sales. Sales representatives and sales supervisors can specify that sales output is influenced by a variety of distinct variables related to both individual and market circumstances.

According to Johnston and Marshall (2009), organizations need different kinds of sales representatives with different personal characteristics and skills to fit into different selling situations. Many sales representatives that struggle in their sales activities, irrespective of the circumstances and are unable to defend their position, are more likely to be fired from the sales team. But individuals who have mediocre results and are able to support their status, and those that have a legacy of achievement that supports their position, the factors that influence their performance are less apparent.

Situations that affect the continuity of mediocre and good performance are more linked to individual skill than to external factors of impact. Johnston and Marshall (2011) suggested that the performance of two people with the same credentials, preparation and background experience can differ due to the individual characteristics and skills that influence their sales performance.

Comprehending the role, if any of emotional intelligence in a scenario where success differences occur in complicated

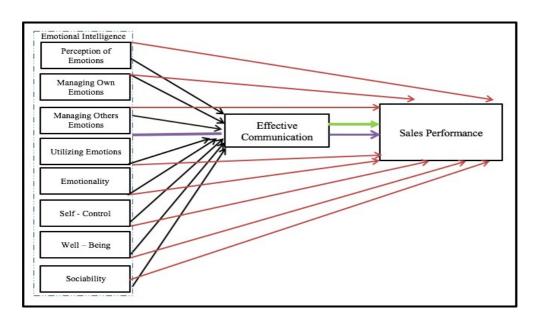


Figure 3: Research Framework

Emotional intelligence can contribute towards the sales process, especially relating to consumer relations. By understanding consumer relationships through emotional communication, an organization can restructure their previous sales strategy in order to produce better sales and business outcomes (Ghatde, 2003).

business environments becomes a valuable instrument towards business growth. The working conditions, where efficiency and progress are anticipated, are perfect for integrating emotional intelligence processes, according to Fiedeldey VanDijk and Freedman (2007).

In summary, there is a communication perspective of emotional intelligence on the relationship and interaction elements of the mechanism. The opinion is that emotional maturity is the product of the communicative phase. It follows that to enhance the productivity of sales representatives requires a major focus on communication efficacy, as that is the view; it is through communication effectiveness that emotional intelligence exists.

To achieve the research objective of this study, the independent variable being emotional intelligence will be explored using Mayor and Salovey (2002) ability model and Petrides, Frederickson, & Furnham, 2004) trait model. The ability model consist of four categories which are (i) perception of emotion, (ii) managing own emotions, (iii) managing others emotions and (iv) utilizing emotions and the trait model consists of four dimensions which are (i) wellbeing, (ii) self-control, (iii) emotionality and (iv) sociability. The mediating variable for the current study is effective communication which will consist of three key communications skills, non-verbal communication, attentive listening, and understanding and controlling emotions (James & Roman, 2000). The dependent variable for this study will be sales performance which is described using Krishnan, Netemeyer, and Boles (2002) model. This model consists of three elements which are self-efficacy, competitive and effort.

Emotional intelligence is assumed to have an impact on effective communication among sales representatives which then has an impact on sales performance. The current study will hypothesize based on Baron and Kenny (1986) mediation analysis.

CONCLUSION

In conclusion, the significance of this research is to help the salespeople improve their emotional intelligence ensure that there is an increase in successful sales productivity Furthermore, the findings are intended to establish sales preparation and recruiting systems that contribute to increased sales success at the organisational level. This knowledge would be valuable not just for more study in the industry, but also for human resource workers and sales managers in service sector organisations. It will further help to improve training and development systems for staff and supervisors and may shift the way managers and organisations see recruitment or training and development processes.

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Digitalisation in International Relations: Redefining the Phenomenon in a Globalised World

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Abstract-Digital transformation is the use of digital technologies to enable an organization to improve or evolve into something new. E-business, E-commerce, artificial intelligence, industrial revolution 4.0/5.0, robotics, digital literacy, information literacy are some of the examples that are being introduced in the era of digital transformation. These terms are used extensively - to reflect the current global economy that has changed rapidly due to globalization and the exponential growth of technology. Few scholars international relations have argued that the digitalisation and globalization of the economy has eroded national sovereignty, reshaped conceptions of materiality and space, and facilitated new circulations of culture, capital, commodities, and people. Digital transformation has also digitalized international relations, diplomacy, and foreign policy. Due to the ongoing lockdown across the globe as a result of the current COVID 19 health crisis, digital transformation has digitalized the regular international relation instruments used by diplomats, states or politicians in the world politics. Tech-savvy terms such as data diplomacy or big data diplomacy and international global governance are the newly transformed instruments in the international relations realm. The objective of this paper is to analyse to what extent the digital transformation phenomenon has modified the traditional views on international relations. This paper explains briefly, first, the conceptual understanding of digital transformation from the realm of international relations. Secondly, the main features of digitalisation in international relations are examined and discussed. The third part of the paper provides an analysis through a case study on how the digital transformation phenomenon has modified the traditional views. Finally, the paper concludes by arguing that digitalization, of world politics or global politics and in public diplomacy, in general, is a process rather than a tool being used in global governance.

Keywords— digital transformation, international relations, global governance, diplomacy

I. INTRODUCTION

Modern developments in information communications technology (ICT) have added new magnitudes to the way nations interact. More so, thanks to globalization – the connection, interaction and cooperation between nations has made the world map look smaller. ICT and digital transformation are shaping all aspects of statecraft. Even though the Covid 19 pandemic has hit the entire world and had put many businesses between nations at a standstill, digitalisation in international relations has made it

possible for nations to carry on some or most of the governing possible. Entering the digital age has allowed governments to connect with one another like never before to solve international issues. From the international relations perspective, there are 4 different phenomena to view how ICT has made an impact on the day-to- day business landscape. First is the digital diplomacy or the instruments used by diplomats. Second is the data diplomacy or big data analysis that also used by diplomats in the world politics. The third phenomena is about the international global governance and internet and finally the digital voting or internet voting that is being used in numerous countries. Even though the use of ICT has brought much ease to various dimensions in international relations, at the same time, ICT has also opened the door to an ongoing risk of cyber warfare and cyber espionage. The objective of this paper is to analyse to what extent the digital transformation phenomenon has modified the traditional views on international relations.

II. DIGITALISATION ININTERNATIONAL RELATIONS

Everybody talks about digitalisation of international relations now. In fact, the term globalization and digitalisation have been the most commercialized word used in international stage by businessmen, scholars, and politicians in the last few years. Even though these terms complement each other, they are not quite the same. The term 'digitalisation' is defined as the "integration of digital technology into everyday life" (Hart, 2010), whereas the term globalization is defined as "the increasing integration of input, factor and final product markets coupled with the increasing salience of multinational enterprises crossnational value-chain networks". While globalization and digitalisation complement each other, they are not mutually dependent. Thomas L. Friedman is an example of a scholar who argued

that one of the impacts of globalization is the enhancement of digital technologies in every spectrum of international relations. According to him, the Information and Communication Technology (ICT) has stimulated the global economy, businesses, and movement of people. Friedman further explained that the world today is very much reflected by a global system of interconnection and technology.

The development of ICT has also served as a powerful catalyst in the distribution of power in the international system. With the advent of the internet, social networks and digital technology, people got new channels of interaction to voice their opinion. In the last decade, most of the people around the world have witnessed phenomena such as online social movements around the globe. People use digital technology to mobilize and protest against their government and fight for their freedom and rights. After the protest in Iran (2009), and Arab Springs (since 2011), and in different parts of the world, - ICT has accelerated the mobilization and dissemination of opinion on world politics. China is a prime example of a state whose foreignintelligence capabilities have been dramatically transformed over the past 20 years through the use of cyber espionage for both commercial and statecraft purposes. Many states in Africa, Asia and Latin America are using greatly enhanced technology to monitor or suppress dissent among their own populations more effectively, while criminal groups use similar capabilities to hamper the efforts of law enforcement. Meanwhile, North Korea has utilised its substantial cyber capabilities both to attack adversaries and to raise revenue through cyber criminality, a case in point being the theft of US\$81 million from the central bank of Bangladesh in 2016. Therefore, it is evident that advances in ICT and the digitization of information have made more pervasive intelligence collection possible, and by a wider range of actors.

Digitalisation in International Relations (IR) can be viewed from three important facets. First, digital technology enables more and indifferent actors to get involved in political and diplomatic processes. Digital technology increases the number of voices and interest involved in international policy making. It democratizes the diplomacy in a way that we see multiplication and

diversification of actors and simultaneous growth of collaboration and polarization between them. The digital technology has not made this change, but it has reinforced the capacity of non-state actors to participate in debate and outcome. Collaboration between these new actors creates new dynamics. However, the same capacity can lead to polarization as well. Secondly, digitalization in IR has accelerated the dissemination of information. It has multiplied the amount of publicly available information by an expansive amount. However, the questions as to whether it is manageable, trustworthy, or secure are on the list of international relations. Third, digitalization is a term new term that still is undergoing a process of binary state. So, as a term, it centers on the normative and temporal influences of digital technologies. Closest to the current situation or essence that is happening today are communication society (Wiener 1950), information society (Bell 1973), global village (McLuhan 1964), and network society (Castells 1991). The authors of these concepts agreed that the significant of information and knowledge will be the cornerstone of the future society.

III. MAIN FEATURES OFDIGITALISATION OF INTERNATIONAL RELATIONS

There are four main features of digitalization of international relations namely digital diplomacy, global internet governance, big data and data diplomacy, and digital electoral technologies.

A. Digital Diplomacy

Digital diplomacy is the use of social platform by state actors to achieve their foreign policy goals and manage their reputation. Digitalisation of diplomacy has become a popular medium for top officials and policy makers to reach out and connect to their intended group of people or citizens in general in real time and space. It is more engaging, easy, and low or no cost is needed at all.

The traditional way of diplomacy of negotiating behind closed doors is still being practiced but with the adoption of digital diplomacy, these processes of negotiating and communicating with the people for support of foreign policy are done simultaneously. Traditional diplomacy stands on three platforms: time, space, and tact. All three platforms are being afflicted and constructed by the digital transformation. When policy makers compete to be the first on social media during negotiations, time gets pressured. Private space is being eroded instantaneously when leader tweets and leaks information from inside the negotiation room. Tact involves the skill and expertise of a policy maker or a leader in expressing difficult issues to the masses. Now with social media, being tact is limited to only 140 characters provided by the smartphones. Long and complicated language of diplomacy does not fit in the social media as it risks losing audiences in doing so.

The revolution of digital diplomacy has also opened foreign policy to the whole world and made it possible for everyone to follow international events. International community is now becoming more aware and informed of any conflicts happening far away from their country. It shapes their perspectives of international relations without the constrain of space and time.

B. Big Data and Data Diplomacy

Big data refers to great and diverse quantity of information collected through shared comments on social networks and websites, government and non-governmental agency records, personal information gathered through personal electronics and applications, online questionnaires, product purchases and electronic check-ins (Manor, 2016). Data diplomacy uses the information provided by big data in negotiations especially in Track II diplomacy which allows for a broader range of stakeholders related to Track I.

Traditional diplomacy ensues between nation-states but the accessibility of big data across the globe challenges this traditional practice of diplomacy. Data and access to data as a domain for diplomacy allows diplomats and policy makers to see shifts in conventional geopolitical, organisational, and thematic boundaries (Boyd, 2019). The practice of traditional international affairs revolves around diplomats representing the state and the citizens. But with data diplomacy, drivers of change also include stakeholders in industry, academia, as well as the public in general. Diplomacy in this

modern time is a data-driven diplomacy. One example is how Track I diplomacy deals with the human rights violations. The human right violation data produced by the non-profit Human Rights Data Analysis Group - for example; is used to support diplomatic efforts like the "name and shame" campaigns in both formal and informal diplomacy.

C. Global Internet Governance

The internet is the international network that has changed our lives by easing online communication between people all over the world, new business models, exchange of information, free flow, and storage of data. Meanwhile, internet governance refers to the development and application by governments, private sector, and civil society, in their respective roles, of shared principles, norms, rules, decision- making procedures, and programs that shape the evolution and use of the internet (Kurbalija, 2014). So how is the internet governed? In general, the internet has no unified governance thus no unified rules and policies exist. However, when discussing about internet governance, there are several stakeholders:

Governments

Government and national legislation authorities determine the national policies for access and use of the internet on national level. Governments who practiced this aspect include USA, European Union as a whole, Brazil, China, and Russia.

• Internet Service Providers (ISPs)

ISPs are the key online intermediaries who provide access to the internet for users. ISPs services are regulated by the national legislation of each country which may lead to unequal treatment of internet services in different countries.

• Telecommunication Companies

They facilitate internet traffic and run the internet infrastructure. Their primary interest in internet governance is to ensure a business- friendly global environment for the development of a telecommunication e- infrastructure.

• Internet Content Companies

They can either be small startup or a very big well-known tech company. Their core business models can be affected by changes in internet governance and issues such as IP, privacy, cyber security, and net neutrality.

• Civil Society

Civil society actively supports the multi- stakeholder approach to internet governance. The impact of civil society issues related to privacy and data protection impacts internet governance.

D. Digital Electoral Technologies

The use of technologies has been extended into a more personal sphere of a defined territory, namely the election. The terms like electronic voting and internet voting are becoming popular especially now when every country in the world is in lockdown due to the spread of Covid-19.

According to Garnett and James (2020), the era of online election is indicated by five fundamental characteristics. First, online elections are characterized by the existence of ontological digital data such as voters personality data and campaign information which is managed by the electoral management bodies. Second, online elections provide new information flow of data of electoral registers. Third is the increased commodification of electoral data used by institutions or multinational corporations in creating new centralized database to generate profit. Fourth, because of the speed of communication and data exchanges, lots of aspects of the electoral processes can occur at a higher speed. Lastly cyber elections are indicated by an increase in the range of actors involved in electoral governance who want to plan on new policies and strategies to achieve their goals.

However, there are concerns about database hacking, media manipulation, and foreign technological interference. One example was when the US Senate Intelligence Committee discover evidence of Russian interference and media manipulation in the 2016 presidential election (Garnett & James, 2020).

IV. THE ASIA PACIFIC ECONOMIC COOPERATION AS ACASE STUDY

The Asia Pacific Economic Cooperation (APEC) forum has made a considerable benefaction to the spread of globalization with its adoption of the Bogor goals. Achievement of "free and open trade and investment in the Asia Pacific" by 2010 or 2020 supposedly inflates the gains from economic liberalization for all economies in the region. However, this Bogor goals were not achieved at the final leg of 202 and was replaced by Putrajaya Vision 2040.

APEC has proliferated into becoming a vigorous engine of economic growth and one of the weightiest regional forums in the Asia-Pacific. Its 21 member economies are home to an estimated 2.9 billion people accounting for 38% of the global population. This region generated a nominal GDP of USD 53 million in 2019, accounting for 61% of the global nominal GDP. Its region also accounted for approximately 47% of global trade goods and services in 2019.

As a result of APEC's work, growth has wheeled in the region, with real GDP increasing from USD 19 trillion in 1989 to USD 46.9 trillion in 2018. Bringing the region closer together, reducing trade barriers, and smoothing out differences in regulations have boosted trade which, in turn, has led to this dramatic increase in prosperity. Average tariffs fell from 17 percent in 1989 to 5.3 per cent in 2018. During that same time, the APEC region's total trade increased over seven times—outpacing the rest of the world with two-thirds of this trade occurring between members economies.

APEC apparatuses a wide variety of programs and projects to help amalgamate the region's economies and stimulate trade while getting to grips with sustainability and social equity. APEC works to help all residents of the Asia-Pacific engage in the economic upswing. For example, APEC projects dispense digital skills training for rural communities and assist indigenous women export their products abroad.

A. APEC and the Terms Digital Economy, Internet Economy and Digital Trade

In 2017, APEC Leaders vouchsafed to work together to appreciate the potential of the

internet and digital economy and embraced the adoption of the *APEC Internet and Digital Economy Roadmap* (AIDER).

The roadmap is a framework that affords guidance on actions and key areas to expediate policy and technological exchanges among member economies. It also promote innovative, inclusive, and sustainable growth, as well as to bridge the digital divide in the APEC region.

It disburses eleven key focus areas of work: Development of digital infrastructure; Promotion of Interoperability; Achievement of universal broadband access; Development of holistic government policy frameworks for the Internet and Digital Economy; Promoting coherence and cooperation of regulatory approaches affecting the Internet and Digital Economy; Promoting innovation and adoption of enabling technologies and services; Enhancing trust and security in the use of ICTs; Facilitating the free flow of information and data for the development of the Internet and Digital Economy, while respecting applicable domestic laws and regulations; Improvement of baseline Internet and Digital Economy measurements; Enhancing inclusiveness of Internet and Digital Economy; and Facilitation of E-commerce and Advancing Cooperation on Digital Trade.

In 2018, the conception of the Digital Economy Steering Group (DESG) was agreed upon at the Concluding Senior Officials Meeting (CSOM) in Port Moresby. The DESG intends to ease the development of the internet and digital economy, including e-commerce and digital trade. The digital economy propounds many opportunities for APEC member economies, including opportunities in electronic commerce and digital trade. The internet and the digital economy enable greater economic integration, more innovation, as well as robust, sustainable, and inclusive economic growth for the Asia- Pacific region.

APEC economies have seen the benefits that accrue through network interconnectivity and open participation, while recognizing the investment required for digital infrastructure buildout and the need for a conducive policy and regulatory environment to facilitate the sustainable and inclusive growth of the Internet and Digital Economy. APEC economies are increasingly influenced by the expanding Internet

and Digital Economy, where all sectors of economic and social development are empowered by the underlying digital infrastructure.

The digital economy is sometimes characterized narrowly as online platforms and activities that owe their existence to such platforms. However, in a broader definition, all activities that utilize digitized data constitutes part of the digital economy. Depending on the definition of "digital economy," current estimates of the size of the digital economy range from

4.5 percent to 15.5 percent of global GDP. Over the next decade, it is estimated approximately 70 percent of new value created in the economy will be based on digitally enabled platforms.

However, before every member economy adopted the term digital economy, they were using the terms internet economy, e-commerce and digital trade to describe their electronic transactions for commercial purposes.

In 2014, China coined the term *internet economy* to describe electronic transactions for commercial purposes for the members of APEC to adopt. This is because China is the world's largest eCommerce market with over 50% of global eCommerce transactions coming from China. Moving into 2021, China's eCommerce market is predicted to be larger than those of the U.S., UK, Japan, Germany, and France combined.

However, this term was not welcomed by the US as the US is using the term *digital trade*. This is because *digital trade* is seen as a broader concept, capturing not just the sale of consumer products on the Internet and the supply of online services, but also data flows that enable global value chains, services that enable smart manufacturing, and myriad other platforms and applications.

And when the APEC Internet and Digital Economy Roadmap (AIDER) was formulated and passed as an APEC document, there were further disputes and debates on the roadmap's number 11th key focus area of work which was the *Facilitation of E-commerce and Advancing Cooperation on Digital Trade*.

With the establishment of the Digital Economy Steering Group (DESG), every APEC member consensually agreed to adopt the term *digital economy* in describing the economic activity that results from billions of everyday online connections among people, businesses,

devices, data, and processes. It can be said that the term *digital economy* is a stable term that every 21 members of APEC has consensually agreed to adopt to describe their electronic transactions for commercial purposes – goods and services.

B. APEC and the Terms Internet Security and Cybersecurity

Computers and information networks are available throughout the globe and have made it possible for individuals in every APEC Economy to access the Internet and participate in e- commerce, online financial transactions, e- government, and other electronic endeavours. This expansion and its potential effect on individual economies have made it important for economies to coordinate their cybercrime and infrastructure protection efforts more rapidly and efficiently.

Effectively tackling cybercrime and protecting information infrastructures depends upon economies having in place systems for evaluating threats and vulnerabilities and issuing required warnings and patches. By identifying and sharing information on a threat before it causes widespread harm, networks in every economy can be better protected. In 2012, APEC released the APEC Guidelines for Creating Voluntary Cyber Security ISP Codes of Practice. This report provides a set of guidelines for ISP cybersecurity. The key objective of these guidelines is to provide information for economies to assist them to develop effective ISP cyber security codes of practice.

Many APEC member economies already have such capabilities, including institutions operated the private sector, the public sector, or a combination of the two. For example, many economies have Computer Emergency Response Teams (CERTs); others have industry information sharing coalitions that allow corporations within a certain sector (telecommunications, energy, banking) to share threat information; and still others have government agencies that assist in assessing the threats. There also exist efforts to address kinds of threats such as the release of viruses and other malicious code.

However, the term digital security was not accepted by Russia and China as the term was seen to be unstable. Plus, Malaysia and other APEC member economies were using terms such as cybersecurity and security in the use of ICTs. The US was the one and only member economy which supported the use of digital security to be adopted by member states. In 2019, China and Russia vetoed the decision and the paper on *Digital Security* by Thailand did not pass as an APEC document. The paper was only accepted at the APEC Telecommunications Working Group Level (APEC TEL). Hence, the term cybersecurity is voluntarily accepted by APEC member economies.

V. CONCLUSION

Digitalisation provides both opportunities and challenges in international relations. APEC countries have recognised the investment necessary for digital infrastructure. An implementation of a conducive policy and regulatory environment is pertinent to enable the viable and comprehensive growth of the internet and digital economy, while effectively tackling cybercrime and protecting information infrastructures. Despite their differences, APEC countries are striving to strengthen their relations for better future. Digitalisation in IR is definitely the way forward in international relations. With the new norm, digitalisation promises hyper level performance achievement as a measure of advancement. It however imposes a need for every nation to comply to a digitalization agenda. Therefore, care has to be taken in turning the outside-in approach to streamline into a workable solution.

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Disruption Conditions and Resilience Practices: Retrospective Narratives from an International Development Project

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Abstract—The unprecedented Covid-19 pandemic that hit the world in 2020 was a startling example of how work routines have been disrupted and forced most industries to go digital, including how we manage and implement projects. Based on this backdrop, we explored the disruptions or unexpected conditions faced by project practitioners in an international development project in the Maldives. Furthermore, we identified how project practitioners shape their practices to be resilient in such conditions of adversities including disruptions and shocks.

Keywords—disruption conditions, resilience practices, international development, projects, narratives

I. INTRODUCTION

International Development projects financed by Multilateral Development Banks (MDBs) such as the World Bank and Asian Development Bank facilitate developing countries in implementing projects aimed at developing infrastructure and capacity building. On a strategic level, the objective of such initiatives is to reduce poverty by achieving sustainable and equitable growth or improving the livelihoods of people from the countries in the Global South [1]. Moreover, international development projects have also been vital in providing emergency assistance. They include, supporting efforts of developing countries to re-build and recover from natural disasters and pandemics.

The unprecedented Covid-19 pandemic that hit the world in 2020 was a startling example of how work routines have been disrupted and forced most industries to go digital, including how we manage and implement projects. Building resilience to overcome adversities has been a topic of research in project studies for a long time. However, the importance of resilience has become more important in "building back better" from the current Covid-19 pandemic. As such this paper presents the preliminary findings of a larger PhD research by the first author that portrays the disruptions conditions and resilient practices of an international development project implemented in the Maldives.

Maldives is a small island developing state situated in the Indian Ocean surrounded by sea. It was projected that the Maldives has a population of 568,362 according to estimates of 2021. Even though the Maldives is a middle income country, it is vulnerable nation susceptible to climate change, rising sea levels and adverse shocks to the economy. Hence, the Maldives continue to receive aid from MDBs to implement international development projects.

The onus of project implementation in such international development projects is on the government. Hence, the successful implementation of the projects are heavily dependent on the administrative capabilities of the implementing agencies of government. The situation is more complex and difficult in developing countries where there are limited resources, low level institutional maturity in implementing projects. Furthermore, small island nations are more vulnerable to economic shocks, environmental hazards such as sea level rise, tsunamis, and tidal waves, which signifies the dire need to build resilient practices in both general project implementation and rebuilding efforts to overcome such adversities.

Despite the context of project implementation, project donors require a strict compliance to their guidelines such as the procurement guidelines of the donor, to be followed by the implementing agencies of the government. As a result, project teams implementing projects are burdened with a complex set of hindrances to successfully implement projects.

Based on this backdrop, the research questions we intend to explore are: What are the disruptions or unexpected conditions faced by project practitioners in international development projects in the Maldives? And how do project practitioners shape their practices to be resilient in such conditions of adversities including disruptions and shocks?

II. THEORATICAL LENS

We applied the Social Constructivist Theory of the prominent Russian psychologist Lev Vygotsky [2] to explore how knowledge is co-constructed by examining the resilience practices of project practitioners. Vygotsky's epistemological philosophy of relativism follows closely with Kuhn's notion of paradigm.

III. METHODOLOGY

A retrospective narrative qualitative approach was used to capture the experiences of a project practitioner of an international development project implemented in the Maldives. Our philosophy is rooted is social construction where we believe in capturing the subjective reality of the phenomenon. A rich thick description of disruption conditions and resilience practices in implementing projects was obtained from the interview. Project scholars have called on researchers to produce research in narrative analysis to capture lived experiences of project managers so that lessons learned can be more meaningful [3].

We contend that the findings contribute to both theory and practice of project management. In terms of theory, the research is expected to augment the traditional literature of uncertainty and risk management in projects [4]. Furthermore, our contribution is to incorporate resilience practices from a psychological lens. Reporting stories of individuals are vital to understand system failures because the epicenter of disruptions stem from individuals, community, or team level disruptions [4].

As for project practices, we envisage the research findings will shed light on how contemporary issues are dealt with in an unusual and unique context such as the Maldives. It is hoped that other similar island nations implementing similar projects may benefit as such research are rarely reported in the project studies literature [5].

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International HR Digital Transformation Post Covid-19: Future Research Agenda

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Abstract— Digital transformation is a hot topic across businesses around the globe for the past few years. The introduction of e-business, e-commerce, artificial intelligence, industrial revolution 4.0/5.0, robotics etc. have changed the business landscape and eco-system for future growth and business sustainability. Digital human resource transformation is about human resource leaders taking up dual challenges of transforming operations on one hand and transforming the workforce and the way work is done on the other. The Covid-19 pandemic has added pressure amongst business leaders to expedite the digital transformation not only to survive in the current international business environment, but more on preparing the workforce for post Covid-19 human resource strategies. Given this background, many international business organizations have started to invest in human resource digital transformation while observing strategies pursued by their competitors in digitalizing human resource processes. However, the unanswered question when one dives deeper into the phenomenon of human resource digital transformation is what constitutes it, why is it necessary and how do organizations go about it especially for post- Covid-19 human resource strategies. This conceptual paper attempts to answer these questions while providing future research agenda for leaders to be more prepared for post Covid-19 pandemic in achieving competitive advantages.

Keywords—international business organizations, HR digital transformation, Covid-19.

I. INTRODUCTION — EVOLUTION OF HR: WHERE IT'S BEEN AND WHERE IT'S GOING?

Human resource (HR) has evolved greatly for the past few decades from compliance-type function to its current state as a key driver of human capital development [12]. It is known as 'waves' of transformation based on both, push and pull factors mainly by employees and the workplace ecosystem.

The idea of a connection between worker wellbeing and their productivity emerged in early 19th century and leaders learnt that when employees have opportunities to learn and are well rewarded, they will add value to the organization. This notion is supported by many HR motivation theories including Herzberg's Two-Factor Theory and Deci and Ryan's Self-Determination Theory [7, 11]. It is clear that employees' needs and wants should be given importance by employers. In addition, both internal and external environmental factors also influence this relationship.

New and emerging technology, also known as digital transformation, has shifted the focus from administrative tasks towards employee engagement and strengthening

culture in order to get the best out of employees. In addition, globalization and competitive business environment necessitates talent initiatives to be based on and integrated into the business strategy giving more HR leaders a seat at the C-Suite table [1, 2, 5, 8]

Roles for HR in digital transformation are [4, 9, 10]:

- Hiring digital talent that has digital capabilities such as design thinking, agility and a data-oriented mindset.
- Creating an innovative and agile culture. Such a culture is required to pursue opportunities that arise due to changes in technology.
- Digital transformation is a long-term, strategic project requiring collaboration. HR needs to support it with the right communication initiatives and ensure organizational alignment.

Coronavirus disease (Covid-19) pandemic has accelerated the need for immediate HR digital transformation for businesses to survive the pandemic, let alone growing the business and sustaining it. HR leaders are investing resources in digitalizing their HR practices as part of their efforts to improve both the effectiveness and efficiency of HR functions [3, 11].

Given the above, this conceptual paper strives to investigate what, why and how organizations can go about digitalizing their HR activities during and especially for post-Covid-19 era. Later, a proposal for future research agenda catered towards leaders to be more prepared post Covid-19 pandemic in achieving competitive advantage is provided.

II. HR DIGITAL TRANSFORMATION

As new digital tools and technologies are constantly flowing into the market, HR is rapidly evolving. HR digital transformation is about the transformation in the way in which HR functions are carried out with the use of technology to augment HR department's capabilities [6]. HR digital transformation primarily aims to automate HR processes in order to save time and cost, and to collect and analyze data from those processes to make more data-driven decisions [13]. The year 2020 and 2021 saw a mass transformation as

many businesses discovered digital solutions to help operations run remotely due to Covid-19 pandemic [3, 11].

Covid-19 pandemic has become an eye opener for many businesses especially Small Medium Enterprises (SME) and Government Link Companies (GLC) as there have been calls for remote workforce management in times of pandemic. It has brought forth the need for every business to adopt digital HR processes and best practices such as staffing, training and development of employees, performance management, rewards management and staff engagement, motivation and retention where organizations require the right HR tools for making a leap in the digital era.

HR digital transformation is far greater than merely adopting technology in HR functions. It is the need to look beyond core software system to view how HR leaders can utilize technology to improve both returns on investment and fulfilling employees' expectations [9, 10]. Fig. 1 depicts the core benefits of adopting and deploying HR digital transformation.

There is a strong correlation between employee engagement and digital transformation where it will eventually become a culture within organizations. Digitalizing HR will change everything on what the HR team does especially in terms of functions related to employees such as career structures, knowledge, employees' expectations, and the skills needed to perform specific job functions. More importantly, it is embedded in the daily work of employees i.e., a way of life.

Many employees believe that they have better career prospects when they work for a digitally enabled company. Through the integration of culture, engagement and technology that employees use, a digital workforce breaks down communication barriers and transforms employees' efficiency, innovation and creativity. In other words, a whole new digital experience drives the transformation by putting new technology into daily work. It also re-emphasizes the believe that HR will always put 'people first' where technology will complement and improve talent competencies and capabilities.

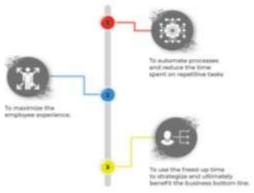


Fig. 1. Benefits of HR digital transformation

Source: https://www.toolbox.com/hr/hr-innovation/articles/what-is-hr-digital-transformation-definition-strategies-and-challenges/

Organizations that have transformed into digital HR functions have found measured success and are more likely to report strong financial performance, invest in diversity at all levels and have mature strategies for succession. The upcoming digital transformation wave will only drive greater productivity and that very trend is way too significant for HR leaders to keep a closed eye. Therefore, HR leaders must assume a strategic role in embracing digital revolution, lead HR transformations and engage employees to reap benefits.

The role of HR teams in digital transformation is twofold:

- 1. It is responsible for its own transformation by use of automation and digital, data-led processes.
- HR is now summoned to lead organizations towards digital transformation and support its continual digital evolution while collaborating with IT sector within their respective organizations. This involves empowering employees with a digital mindset to improve workforce processes and boost productivity.

HR leaders globally have either created their own HR digital transformation tools or have collaborated with IT vendors and consultants to develop and execute their HR functions with digital transformation such as:

For recruitment processes:

- Applicant Tracking Systems (ATS)- software screens candidate resume and eliminate unqualified candidates
- b. Artificial intelligence (AI) powered job post writers
 tools such as TapRecruit, Gender decoder for job ads and Textio that HR team can use to write job postings
- c. On boarding software tools such as Enboarder and Talmundo are capable of personalizing on boarding journeys for new hires
- d. Recruiter chatbots to assist in candidate screening and engage with candidates and enhance experience

For improved productivity:

- a. HR Analytics HR team uses workforce analytics to better assess workforce performance. It uses employee and enterprise data to gain insights about employee and HR performance.
- b. HR chatbots deploys a chatbot that answers frequently-asked-questions (FAQs) which can enhance employee engagement and performance.
- c. Talent Management System an integrated software that contains performance management, learning and development, compensation management and succession planning components.
- d. Performance management to assist HR teams in collecting feedback and building performance management systems that reward results.
- e. Learning management helps organizations keep track of candidate development, identify skills of

- employees and experiment with new learning approaches.
- Compensation management keep track of all aspects of compensation including stock options, retirement benefits etc.
- g. Attrition prediction able to predict which employees will leave in the near future using machine learning for HR team to take proactive actions.

source: https://research.aimultiple.com/digital-transformation-in-hr

Some of the benefits of adopting HR digital transformation include:

- a. Time/Leave management- tracking pertinent information and managing leave requests, monitor remaining leaves and automate the time-consuming process of time or leave management.
- b. Managing Information- simplifies the process of accessing all employees' essential information, in addition to simplifying decision-making, as all data are instantly accessible and up to date. Just as employees like to be able to choose how and when they manage their profession, using data and analytics can add value to the business, areas like preselection, learning and development, and employee engagement can be measured by digital HR. Predictive analytics tools, placed at the disposal of HR functions, can also help in improving HR processes and ensuring employee satisfaction.
- c. Future proof recruitment- smooth mobile experiences, data-driven pre-selection processes and personalized AI-based onboarding programs.
- d. Improve employee experience for millennials- the line between their professional and personal lives has blurred. They may check their social media account during office hours, but they will also equally check their work emails during the weekend. As such, they expect to be treated as customers, and they want their employer to provide them with a similar user experience when it comes to the digital work environment.
- e. Shifting focus on core activities- can automate any time-consuming manual processes, allowing employees to focus on more productive and important work.
- f. Employee Development- can help in training and learning and development activities. It can facilitate employee development from training courses to performance appraisal.

Source

https://www.hrdconnect.com/2020/01/17/what-are-the-benefits-of-digital-hr

III. COVID-19 PANDEMIC AND HR DIGITAL TRANSFORMATION

As mentioned, Covid-19 pandemic has forced organizations globally to find quick solutions especially in managing employees who are working from home, their work life balance, performance management, engagement etc. The proactive HR leaders have decided to embrace HR digital transformation to complement their traditional HR practices by investing resources to procure the right hardware and software while progressively receiving their workforce to embrace change towards digital transformation in face of the new norm. They are becoming a game changer of HR practices to grow and sustain their business.

We also have a group of HR leaders who have taken the approach of 'wait and see' believing that the pandemic will sooner or later clear and businesses can resume usual operations. This is the case for most Small Medium Enterprises (SMEs) and Government linked Companies (GLCs) in most developing countries. Their reason for not considering HR digital transformation as follows:

- a. Reactive business mindset most of the leaders are afraid of doing something new in order to not disrupt current businesses. They are afraid to bring in foreign element such as technology in HR in fear of it affecting current performance.
- b. No past experience to learn from Covid-19 is believed to be a major disruption in human history in terms of its magnitude and duration taken to eliminate the pandemic. Given this, many HR leaders are skeptical about HR digital transformation.
- c. The follow suit mentality this is the typical mentality of most leaders who are not ready to assume risk of championing HR digital transformation. They rather wait for others to do it first then they will consider joining the bandwagon.
- d. Budget limitations HR digital transformation does not only require human readiness but also huge capital commitments in procuring hardware and setting up systems. Budget constraint can limit the aggressiveness of organization to adopt and adapt HR digital transformation.
- e. Lack of HR leadership- decision to go for HR digital transformation must be a top-down approach. Leaders must believe in the advantages that the transformation agenda can bring forth to the organization to embark on a digital transformation journey.
- f. Resistance to change any new initiatives such as HR digital transformation will receive

resistance to change from both directions i.e., top-down and bottom-up. Change leaders must have the right step by step strategies to unfreeze, implement change and re-freeze implementation of HR digital transformation in order to reap the benefits of it.

g. Ignorance is bliss attitude – this is where the management team comes up with excuses. They prefer to maintain their status-quo by prolonging HR digital transformation agenda.

Given the above challenges that might hinder planning and implementation of HR digital transformation, what is the future of these organizations?

- a. Many of them are already out of business or downsizing massively – we have seen many organizations internationally being out of business since the beginning of Covid-19 outbreak in 2020. Organizations that are employee intensive like hospitality industry, aviation industry, tourism sector and manufacturing have seen massive downsizing of their workforce and many have eventually closed down.
- b. Will become loser in the near future those organizations who still believe in traditional HR practices as sufficient would eventually become losers in attracting as well as retaining top talent. This is limiting their opportunity to compete globally and losing their competitive advantage.

Therefore, organizations do not have any choice but to embrace HR digital transformation for both reasons, survival and business sustainability. HR leaders should be able to convince their board members to allocate sufficient resources for the purpose of adopting HR digital transformation. This is what business leaders term 'game changing organization'.

Some of the potential strategic action plans that HR leaders can consider are:

- a. Outsourcing HR digital transformation if necessary, HR leaders can partner with third party providers to start the HR digital transformation journey. This is possible for their operational HR functions such as recruitment, onboarding activities and administrative tasks.
- Partnering with other organizations for knowhow and to share resources – HR leaders can also leverage on business partnership models with other similar organizations to share capital investment and risks towards HR digital transformation. Meanwhile, HR leaders can

- learn from each other. This partnership can strengthen their business alliances.
- c. Recruitment of talent who can champion and lead HR digital transformation- HR leaders can hire the right pool of talents to champion their HR digital transformation agenda. This decision might require bigger amount of capital investment, but in the long term, the benefits will outweigh the costs.

IV. SUGGESTIONS FOR FUTURE RESEARCH

HR digital transformation is still at its infant stage especially with the Covid-19 pandemic which has pushed the panic button among HR leaders internationally to look at this agenda. Most of the available data are based on consultancy reports, therefore limited academic research in this area in the context of what it is, why is it important and best-practices on how to go about carrying it out. This has created a good opportunity for academic researchers to explore HR digital transformation globally and share best practices for others to learn. In addition, there are limited contributions on development of relevant theories and models for employees and HR digital transformation in times of a pandemic.

The core idea of this paper is to introduce strategic integration of HR digital transformation with organizational corporate strategies to achieve better business performance. As digitalization of HR accelerates, the need for corresponding research effort increases and this paper provides a conceptual basis for such research and is intended to support next steps of research on technology-based human resource management (HRM).

V. CONCLUSION

It can be concluded that HRM is about human touch and it will gain more benefits with aid of HR digital transformation. It is set to alter the workplace by engaging employees and their leaders on a daily basis, providing them with job performance goals, learning, recognition, feedback and a social and emotional connection. This digital transformation is critical; therefore, HR leaders should embrace it, impacting deeply on the culture and employee engagement within the workplace.

Organizations that have adopted HR digital transformation are game changers within the HR landscape in attracting, managing, engaging, developing and retaining their talent pool. This investment will in turn provide them greater return on investments and competitive advantage especially in HR-related matters.

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Digital Readiness for the Implementation of BIM in a Project Life Cycle: the Case of Nigerian Construction SMEs

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Abstract—In a quest to diversify economies throughout Africa and other developing countries, efforts to adopt Digital Economy are gaining momentum. Currently, the Nigerian Government is on a Digital Economy transformation drive to create more competitiveness for the huge micro sector (SMEs) and other sectors of the economy, however, there is need to understand the level of readiness of each sector and across all level (citizens, firms, government agencies) of the economy in order to formulate the right policies for each sector. Several measures are utilized to quantify and rank different countries' digital readiness. These measurements have, however, given a source of comparative analysis between various digital economies but are far from ideal. The majority are diverse and hard to compare, for example, given that they accept "one size fits every one" and they neglect unique policies and strategies, environmental, cultural and contextual elements in different countries. The other objections of these indicators include, as contrasted to underdeveloped countries, that they are 'firstgeneration metrics' for the developed world. So, the core challenge of the research was that there were no adequate evaluation methodologies to comprehend and measure citizens, firms, government organizations' level of digital readiness. The objective of this study was to develop a model for assessing the DR level of owner/manager in Nigerian construction SMEs for the implementation of BIM in a project life cycle. To test and validate the model, a quantitative technique approach was employed. Empirical evidence with business and academic practitioners/experts in acquired Nigeria was questionnaires. Government documents contained other sources of data (policies and strategies). The data were analyzed by combining an adapted theory method with an interpretation. An academic review of the document was done to derive dimensions of digital economy implementation strategies. Through further analysis these were synthesized into the focus points of the assessment model. Further dimensions and concepts were derived from literature to form the conceptual framework. Testing and Validation of the model via data collection and analysis were done. The final model, a novel contribution to the existing body of knowledge, will serve as a tool to collect base line data and assess the readiness level of citizens, companies, government agencies across different sectors of the economy. The model can also serve as a guide for policy makers, other countries and for further studies.

Keywords— Digital Economy, Digital readiness, BIM

I. Introduction (Heading 1)

The idea of Digital Economy (DE) is developing across the globe. (DE) addresses a significant move on the whole parts of monetary life, as the world goes to another information based and data innovation economy. It has a high possibility for world economy, affecting various areas like energy, banking, development, retail, distributing, transportation, instruction, wellbeing, and media [15, 46]. The World Economic Forum figures that by 2022, more than 60% of worldwide GDP will be digitized and that digital channels will be utilized to create almost 70% of new incentive throughout the following decade. Clearly, every country stands to benefit by it, considering the wide scope of digital technologies. The (DE) is able to advance in development and provide benefits as well as advance comprehensive creation. This trend can be seen in the widespread adoption of digital technology by consumers, businesses, and governments, though at varying rates across regions and countries. The use of digital technology increases the sustainability of capital and labor while also empowering support in global value chains [26]. By lowering exchange rates, tending to data deviations, and taking advantage of economies of scale and organizational impacts, the (DE) contributes to exceptional consideration (World Bank, 2016). Through these methods, the (DE) has expanded the openness to recently minimized gatherings of an entire scope of business sectors and administrations [46]. Digital technologies have become a fundamental pillar of contemporary global poverty reduction procedures (SDG 2020) in emerging economies, as well as a game-changing means for African economies to achieve the much-desired growth. Countries in Africa (Kenya, South Africa, and Nigeria) are starting to see that using digital innovations and ICT capabilities is basic to their economic growth particularly among Small and Medium Sized Enterprises (SMEs) [12, 25, 30].

As a precursor for (DE) implementation across all sectors of the economy of any country, there is need to have a tool to collect and assess data regarding the digital readiness level of citizens companies and government agencies. In this study, a novel model was developed to assess the digital readiness level of owner/managers of SMEs in the Nigerian Construction industry. The development of the assessment model incorporates the objectives and implementation plan

along Eight Pillars in the newly launched policy document (National (DE) Policy and Strategy, NDEPS 2020-2030) by the Nigerian government in order to diversify the economy from being oil-based dependent to a more global trend (DE) also known as the Knowledge based economy.

II. LITERATURE REVIEW

As estimated by [15], Nigeria is the populated nation in Africa (over 200 million). According to a [16], Africa's has the largest economy, with a (GDP) Gross Domestic Product of 397 billion dollars. Nigeria is also the world's sixth primary source of oil and the world's tenth largest oil saver. The Nigerian government is making an effort to extend the oilbased economy to a (DE) because of the reduction of global oil costs and the need for oil-dependent nations to widen their economy. ICT accounted for 13.85 percent of GDP in the second quarter of 2019, compared to 8.82 percent.

A. Digital Economy

The (DE) consists of a variety of GPT technologies and a number of economic and social activities performed by internet users and related technology. It includes digital technology based (broadband lines, routers), access equipment (computers, cell phones), the apps that run it (Google, Salesforce) and the functionality that it provides (IoT, data analytics, cloud computing). The (DE) has permeated multiple aspects of modern life, including retail, transportation, education and agriculture, and benefits consumers, businesses, and governments [15]. Digital economy definitions have developed throughout the years, reflecting ongoing technological advances. When [35] coined the term, the emphasis lay on networking of humans through technology, which expanded to include the emerging phenomena of e- business and ecommerce in the early 2000s. More recently, the digital economy has been understood as a worldwide network of economic and social activities, enabled by digital technologies for a more comprehensive understanding of the concept of digitalisation [4, 8, 45, 56].

B. Digital Economy in Nigeria

At 200 million people, Nigeria accounts for about half of the population of the West Africa. According to the Nigeria Systematic Country Diagnostic published by the World Bank in June 2019; Nigeria has a nominal Gross Domestic Product (GDP) of \$450 billion, making us the largest economy in Africa. Nigeria also has an incredibly young population with approximately half of the citizens aged 30 years and below. About 3 million young Nigerians attain the working age every year; and the economy is currently highly reliant on the oil and gas sector which accounts for 90% of exports, as well as 50% of consolidated government revenue.

As a result of this trend, the government of President Muhammadu Buhari, GCFR, is making concerted efforts to diversify the economy. Furthermore, on the 12th of June 2019, Mr. President outlined his administration's plan to lay the foundation for lifting 100 million Nigerians out of poverty within a decade. Both the diversification and poverty reduction programmes of the Federal Government can be greatly aided through the adoption of digital technologies. As such, embracing the (DE) has become an imperative for national development.

Table 1 below shows the variables of the developed model and their connection to the National digital economy policy and strategy documents (NDEPS 2020-2030).

Table 1

NDEPS 2020-2030 Eight Pillars			
Dimension/Measure in the Model	NDEPS Pillars	Strategy	
Law/Regulation/Policy	Pillar 1: Development al Regulation.	Regulation of Policy	
Digital Literacy and Skills Digital Capability	Pillar 2: Digital Literacy and Skills.	Providing Digital Skills for the Citizens	
Digital Infrastructure	Pillar 3: Solid Infrastructure.	Providing Digital Infrastructure	
Digital Platforms Construction 4.0 (BIM)	Pillar 4: Service Infrastructure.	Provision of Digital Platforms	
Digital Trust Digital Culture	Pillar 5: Soft Infrastructure.	Providing Trust, Security and Culture	
Digital Ecosystem Digital Innovation	Pillar 6: Digital Services Development and Promotion.	Provision of Digital Ecosystem	
Digital Innovation- SDGs	Pillar 7: Digital Society and Emerging Technologies.	Fostering Digital startups	
Digital Innovation	Pillar 8: Indigenous Content Development and Adoption.	Local content development	

C. Digital Readiness

This assessment, when appropriately executed as part of the overall evaluation process, is the first step in turning positive intentions into expected behaviors that have a genuine impact on people's lives. Assessments of e- readiness are aimed to assist development activities by giving standards for comparison and measuring progress. To suit today's technological realities, this ancient procedure has been modernized by examining the current situation in order to prepare and argue for specific improvements. In literature, the term "digital readiness" has a variety of meanings, for instance [3, 35, 67] used the term digital readiness to measure adult skills in using digital technology in the United States. As described by [24,44,50], "digital readiness" refers to teachers' abilities, knowledge, and confidence in adopting digital

learning in Ghana's elementary schools. According to [32, 44] research on Sri Lankan institutions' readiness for egovernment implementation, the phrase "e-government readiness" was used. [12, 45, 56] utilized digital status in their investigation of the digital preparation of writers in Malaysia in utilizing digital innovations. There is a commonality between the different terminologies used in the existing digital readiness concepts and models - whether it's employees, residents, or consumers. It appears that all of the concepts and incorporate individuallevel measurement components to determine digital readiness. It is therefore vital or important to develop a digital readiness measurement model for individuals [12, 23, 43, 65]. This is also conducted by [45] when he developed technology readiness and [43] when they developed e- business readiness of employees.

D. Digital readiness Models

It is important to note that the aims, strategies and results of the e-readiness evaluations are extremely different [43]. Organizational capabilities, access, and opportunities given by e- government projects are evaluated as part of the E-Readiness Assessments process. Because of this, ICTs-related data may now be gathered, shared and managed in a variety of ways [32]. According to [54, 67], e- readiness has this diversity in order to offer different uses in different manners. A number of researchers have classified e-readiness based on its economic or social implications [10, 19, 26, 54]. Social inclusion, individual property rights, and population density are only a few examples of how e-society might benefit from the use of ICTs.

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E. Digital Capability

According to [47] digital capabilities are "a collection of processes for planning by exploiting digital assets to produce differential value. It is through the development and maintenance of these capabilities that firms gain and maintain competitive advantages over their rivals. As the Capability Maturity Model (CMM) suggests, maturity models are typically used to measure these skills. With regard to digital readiness, the capability to use digital technology in conjunction with digital skills is required to achieve digital readiness. According to the theory of dynamic capability, digital capability could be viewed as an organization's ability to produce new goods and processes, as well as adjust to changing market situations [51, 60]. According to this study, digital capability is defined as "the ability of the owner/manager to use digital technologies and resources in the construction process". [51] A successful digital transformation requires organizations to create a variety of capabilities in many different areas. These capabilities may vary based on the industry and specific demands of a business.

F. Digital Innovation

The intricacy, dynamism, and vulnerability of the innovation progression and reception period are all seen as important characteristics. Since it frequently handles several intertwined variables that sway, or are influenced by, various elements, the innovation cycle is complicated [7, 19, 37]. When the level of complexity is high, it can be difficult to understand the characteristics of the entire system, as the structure and relationships of the cooperating elements can easily be overlooked or misinterpreted [39, 40]. Since these communicating variables change and advance over time, the innovation cycle is complex. Thus, an innovation's viability can be jeopardized or unintended consequences can occur in a short period of time due to changing environments [62]. There are four forms of innovation uncertainty according to the TCOS framework: a) technological feasibility (i.e., existence or not, and possibility to develop the required technology); b) commercial viability (existence or not, and possibility to create a market for the innovation); c) organizational appropriability (i.e., the potential to appropriate the benefits of the innovation and how difficult it is for competitors to imitate the innovation); and d) societal acceptability (i.e., the potential to have the innovation accepted by society given its societal side- effects, including environmental, social, cultural, and political implications). A new phenomena, innovation for sustainable development (SD) faces the same challenges that other types of innovations have in terms of creation and execution [35,56].

G. BIM Implementation

The current state of BIM implementation in Nigeria's construction industry According to [20] there is a low level of mindfulness and advanced skill in BIM in Nigeria. This can be linked to a lack of BIM preparation and a lack of openness to BIM concepts [20]. In Nigeria, companies involved in construction projects, both small and large, are dominating the implementation of BIM [20, 46]. Nonetheless, small businesses occasionally use BIM in their operations. The construction sector in Nigeria is largely fragmented, which means that various development experts usually generate and oversee project data separately. According to [38, 55], if BIM used for presentation, clash detection, and visualization, its many inherent capabilities can go untapped [32]. Similarly, the Nigerian construction industry's limited use of BIM reflects a lack of BIM expertise. Change of behaviour from conventional procurement methods is important, according to [18, 53] but change of behavior to effectively incorporate BIM is also difficult because it necessitates a total transfer of work processes. While BIM implementation is increasing in most developed countries, the level of BIM implementation in most developing countries, such as Nigeria, is at best stagnant [29, 51].

III. RESEARCH METHODOLOGY

The research design, which includes justifications for following the quantitative research method, the sampling methodology, and the data collection procedure, is explained in the first section of this chapter. Then, the response rate is discussed, followed by the procedures involved in the pilot study, explaining how variables are operationalized and measured. Finally, in this review, the chapter proceeded to instruments and techniques used in analyzing the data. The researcher will distribute the questionnaire to 1077

owner/manager of SMEs in construction industry in Nigeria. First, researcher need to obtain ethical from International university of Malaya- wales to guarantee that the research is mainly ethical and attentive. Second, to carry out an investigation, the researcher needs to receive ethical consent from 1077 owners/managers in Nigeria. Third, to explain the study goals and the questionnaire to be answered, the researcher must provide the responders with a summary of the written agreement. Moreover, the investigator also will be with the respondents to avoid any possibilities of unanswered or skip questions. After the respondents have answered the questionnaire, the questionnaire will be collected.

All statistical systems will be directed utilizing Structural Equation Modeling and furthermore utilizing IBM Statistical Package for Social Science (IBM SPSS). The utilization of this strategy in contemplating social sciences is expanding because of the great capacity to evaluate the hypothetical model [39, 40].

To test the external model dependent on 1) the external loadings, 2) composite dependability, 3) average difference removed (AVE) and 4) discriminant legitimacy, a corroborative composite investigation is first performed (Hair et al., 2014). Second, in view of size and significance, the external loadings are assessed. Composite sturdiness is tried straightaway. Composite strength is exhibited by external loadings more prominent than .708. An investigation of the AVE chooses, at that point, if the external model has focalized legitimacy. For all things estimating a form, an AVE more prominent than .50 infers joined legitimacy for all things estimating a development [53, 60]. Focalized legitimacy demonstrates that things inside a build that ought to be comparative are truth be told comparative.

A. Law, Regulations and Policy

Law, Regulations and Policy questionnaire develop by [24] Was been adopted and adapted and will be used in this study. The total questions in these questionnaires are 5 items.

- i. The e-administration activities and systems by government are satisfactory.
- ii. Government is adequately putting resources into preparing.
- iii. Public workers are knowledgeable with ICT and e-business.
- iv. You are generally happy with government activities and assumptions to support ICT (data and correspondence advances) infrastructure.
- v. In this study, Cronbach alpha coefficient for 5 items was measured .83 and the range was accepted from .75 to .93. For papers with more than six authors:

B. Technology

In technology questionnaire, there will have three dimensions which is Digital Infrastructure (ICT) [19, 37] Digital Platforms [44] and Digital Ecosystem [29]. There were 15 total questions. The questionnaire has been adapted and adopted. For Cronbach alpha coefficient was measure .85 and the range accepted at .75 to .95.

Digital Infrastructure (ICT):

- 1) Improved great and quality correspondence of ICT In Digital Capacity, there is only one dimension which is administrations across staff
- 2) Upgraded quicker coordination through gathering working and information sharing
- 3) Prevented unapproved access, robbery or actual harm to our IT frameworks
- 4) It has caused nature of my work to turn out to be a lot Implementation of BIM in Construction 4.0:
- 5) It has enhance productivity and saves times on ICT use.

Digital Platforms:

- 1) I am concerned about how to use digital platforms creatively
- 2) I like using digital platforms
- 3) I use digital platforms to reinforce concepts that government already introduced
- 4) Our organization is intentionally enhancing and increasing collaboration with business partners
- 5) I feel confident matching digital platforms to the learning goals

Digital Ecosystem:

- 1) Digital platforms have allowed me to enhance my professional profile outside my organization
- 2) The nature of work in a digital environment drive collaboration in our organization
- 3) Digital platforms have allowed me to enhance my professional profile inside my organization
- 4) The availability of new tools and techniques drive collaboration in our organization.

C. People

For people questionnaire, there were three dimensions which is Digital Literacy and Skills [59], Digital Culture [20] and Digital Trust [37]. There were 15 total questions. The questionnaire has been adapted and adopted. For Cronbach alpha coefficient was measure .85 and the range accepted at .75 to .95.

Digital Literacy and Skills:

- 1) How have technology changes affected business
- 2) Are skills can give benefit towards your business
- 3) Are you confident in the use of technology in the construction industry
- 4) Is it easy to find information online?
- 5) Effective and efficient access to information study.

Digital Culture:

- 1) I understand the value and want to learn more about digital.
- 2) I believe digital to be integral to the organization's mission
- 3) I believe digital is key to organization success.

- 4) I believe digital shall be incorporated into most thinking offices to adjust its human resources for innovative
- 5) I expect my job to change considerable over the next 3-5 changes.

Digital Trust:

- 1) You are happy with the public authority defenses and administrative approaches in regard to online exchanges and business.
- 2) You are troubled utilizing more up to date advancements as they make spying/sneaking around simpler by corporate and government offices
- 3) You believe that a form of physical validation is essential for any type of online transaction to avoid flaws
- 4) Replacing individuals with tech-devices requires a moderate methodology as innovation can distinct any time
- 5) Are you confident with government defenses and regulatory policies.

D. Measure for Digital Capability

Implementation of BIM in Construction 4.0. The total questions were 5 questions that been asked by researcher. This questionnaire has been adopted and adapted and been develop by [16]. For Cronbach alpha coefficient was measure .80 and the range accepted at .76 to .92.

Implementation of BIM in Construction 4.0:

- 1) Arrangement of preliminary programming
- 2) Preparing of development staff
- 3) Presentation of BIM in construction industry
- 4) Arrangements for regulation on the use of BIM
- 5) Preparing customer on the significance of BIM

E. Digital Innovation

In Digital Innovation, there were only one dimensions of questionnaire which is Sustainable Innovation for SDG. This questionnaire has been adopted and adapted and been develop by [54]. The total questions were 5 items. For Cronbach alpha coefficient was measure .87 and the range accepted at .72 to .97.

SDG:

- 1) Government guideline identified with reasonable development, improves the company's monetary exhibition,
- 2) Absence of Managers with inspirational mentality towards supportability is one of the primary deterrents to expand productivity in the organization.
- 3) Reputation as an innovator in supportability assists with improving the organization's monetary profile
- 4) The Company reacts decidedly to government feasible improvement enactment, regardless of whether it influences productivity inside the firm
- 5) The firm perceives Managers with inspirational disposition towards supportability, as a significant resource for improve monetary execution instead of government guideline or partners' view.

IV. RESULTS

A. Profile of the Respondents

Respondent's demographic profile in the example will be portrayed in this subchapter. This fragment centers on portraying the respondent's demographic profile in the example. Four questions were asked in the demographic profile segment, which is: gender, age, experience and education (as shown in table 2 below).

Table 2

Items		Frequency	
Gender	Male	506	47.0
	Female	571	53.0
Age	18-25	129	12.0
	26-30	161	14.9
	31-35	455	42.2
	36-40	200	18.6
	41-50	132	12.3
Experience	1 years	281	26.1
	2 years	216	20.1
	3 years	578	53.7
	4 years	2	2
Education	Secondary school	850	65.6
	Diploma	88	15.6
	Degree	89	14.0
	Master	30	2.9
	PhD	20	1.9

As shown in Table 2, the respondent's majority in the study is 53.0% (N=571) females, and the rest is 47.0% (N=506) describing the male respondent. Besides that, earlier studies have indicated similar ratio regarding respondent's gender. Follow by age group of respondents, 42.2% of the respondents was in the 31-35 years old range. Some followed them in the 36-40 years old with 18.6% (N=200) of the sample. The smallest age group is 18-25 years old with 12.0% (N=129). For the next demographic was experience, the highest was around 3 years which is 53.7% (N=578) and 1 years 26.1% (N=281). The least experience was around 4 years which is 2% (N=2). From the result above, the questions regarding respondents' occupation also are included in the questionnaire. The higher number of percentages was from secondary school which the result revealed 65.6% (N=850) and the least number was from people with PhD 1.9% (N=20).

B. COMMON METHOD VARIANCE

Common method variance (CMV) might be significant when self-report polls are utilized to gather information

simultaneously from similar members. CMV is a variance that is inferable from the estimation method instead of to develop the measures address. To analyze CMV, Harman's single factor test in SPSS has been used in this study. Based on this Harman' test, if the percentage exceeds 50%, it could lead to bias towards the data. Table 3 shows that the per cent of difference is 32% which could not affect the data.

Besides, convergent validity refers to the degree to which specific particular variances converge or share construct indicators [6]. [66] proposed the factors that determine convergent validity, which include factor loading, average extracted variance (AVE), and composite reliability (CR). The amount of composite reliability and average variance extracted should be 0.5 or higher, [8] reported. The results show the results in AVE, Law/ Regulations/Policy (0.493), Digital Culture (0.396) and Digital Innovation (0.380) has lower number 0.5. Moreover, Digital Innovation (0.445) has lower number of 0.5. (See table 3)

Table 3

Construct	AVE	Composite Reliability	Cronb ach	Indica tors	Loadin s
		ľ	Alpha		
Law,	0.493	0.829	0.748	LRP 2	0.764
Regulations /Policy				LRP 3	0.701
				LRP 4	0.624
				LRP 5	0.662
Digital	0.508	0.826	0.736	ICT 1	0.423
(ICT) Infrastruct				ICT 2	0.464
ure				ICT 3	0.816
				ICT 4	0.853
				ICT 5	0.866
Digital	0.659	0.906	0.870	DP 1	0.782
Platfor ms				DP 2	0.768
				DP 3	0.819
				DP 4	0.830
				DP 5	0.857
Digital	0.729	0.931	0.907	DE 1	0.789
Ecosyst em				DE 2	0.842

				DE 3	0.864
				DE 4	0.893
				DE 5	0.879
Digital	0.510	0.837	0.766	DLS 1	0.753
Literacy and Skills				DLS 2	0.550
Skiiis				DLS 3	0.723
				DLS 4	0.808
				DLS 5	0.712
Digital	0.396	0.752	0.681	DC 1	0.818
Сипиге				DC 2	0.641
				DC 3	0.444
				DC 4	0.377
				DC 5	0.749
Digital	0.582	0.874	0.819	DT 1	0.683
Irusi				DT 2	0.825
				DT 3	0.800
				DT 4	0.802
				DT 5	0.694
Digital	0.554	0.859	0.795	BIM 1	0.552
Саравину				BIM 2	0.696
				BIM 3	0.804
				BIM 4	0.797
				BIM 5	0.835
Digital	0.380	0.445	0.374	SDG 1	0.918
Innovation				SDG 2	0.914
				SDG 3	0.250
				SDG 4	-0.132
				SDG 5	-0.373

Furthermore, the current study employed a quantitative approach to examine the influence of factors on the intention to SMEs in the construction industry. Thus, the outcomes of the present study provide several theoretical and practical implications which are discussed in the following sections. One of the major theoretical implications of the current study is that it is mainly based on Digital Readiness, which owners and managers should relate to their businesses. As a result, it encompasses the whole Digital Readiness. In this way, the current study will fill in the theoretical gaps by examining how Digital Readiness is used. The present study provides practical implications for all SMEs that lead to high digital readiness in the usage of BIM among SMEs. This study serves as a guide for the management of construction SMEs to focus on specific factors if they want improvement. Following that, the study's empirical findings highlight the critical factors that aid in increasing digital readiness intentions among construction SMEs owners and managers. The aim of this study was to develop a model for assessing the DR level of owner/manager in Nigerian construction SMEs for the implementation of BIM in a project life cycle. The implementation of BIM in Nigerian using digital readiness as an alternative for conventional interventions that helps the owners/managers get quality work from the digital resources, digital capability and digital innovation. However, this digital readiness should be given attention in the future for other researchers and can make this study as a reference. So that, it can provide better understanding and identify critical factors that are crucial from the efficiency in digital readiness among owners and managers.

VI. CONCLUSION

The findings of the present study can help owner and managers of SMEs in the construction industry in Nigeria and academic researchers in the field of technology management. The researcher proposes using digital readiness for design information delivery for the construction industry. The research found statistically significant performance benefits on digital readiness. Furthermore, the current study employed a quantitative approach to examine the influence of factors on the intention to SMEs in the construction industry. One of the major theoretical implications of the current study is that it is mainly based on Digital Readiness, which owners and managers should relate to their businesses. As a result, it encompasses the whole Digital Readiness. In this way, the current study will fill in the theoretical gaps by examining how Digital Readiness is used. The present study provides practical implications for all SMEs that lead to high digital readiness in the usage of BIM among SMEs. This study serves as a guide for the management of construction SMEs to focus on specific factors if they want improvement. Following that, the study's empirical findings highlight the critical factors that aid in increasing digital readiness intentions among construction SMEs owners and managers

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Luckin Coffee: A Simple Case Review

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Abstract—The purpose of this paper is to provide a simple case review on China Luckin Coffee, whereby financial irregularities were discovered only eight months after IPO. The primary aim of this review is towards preventing and detecting financial fraud is to uphold high moral standards, sound governance, and an effective internal/external control system.

Unfortunately, Luckin's financial fraud revealed that the company's Chairman, CEO, and COO were all directly involved in fabricating financial revenue and are therefore accountable for the fraudulent act. It reflected a lack of morality, poor corporate governance, and regulatory inadequacy. The fabrication of sales revenue began both before and after the initial public offering. This type of financial statement fraud referred to as "cooking the books," is a common way for a business to increase profits and manipulate financial data. Enron, WorldCom, and Wirecard all engaged in similar accounting fraud.

Models of Kohlberg and Fraud Triangle were among the models used to address the issues in the case. A solid anti-fraud system may significantly reduce the likelihood of fraud occurring. Another critical point to mention is the successful formula for IT and technology-based business models such as Alibaba Taobao, Netease, Tencent, Baidu, Pinduoduo, Ctrip, Meituan, and even Luckin.

A further consideration is concluded in the paper in terms of developing the culture of honesty and ethical behavior that should be instilled and reinforced at all levels of the organization.

Keywords—Financial Fraud, Corporate Governance, Organisational Culture, Morale and Honesty

I. INTRODUCTION

CEO Jenny Oian founded Luckin Coffee in October 2017. Her primary objective was to grow Luckin Coffee into China's largest homegrown coffee chain store operator. China has always been and continues to be a Chinese teaconsuming country. At the time, coffee was not widely consumed. Jenny Qian observed that the average annual consumption of coffee in China is six cups, compared to about 300 cups in the west. She recognized an upward trend in coffee consumption and decided to pursue this new venture. Luckin Coffee opened its first location in Beijing in January 2018 and has since expanded to 2370 locations throughout China following its Nasdaq IPO on May 18, 2019. In the IPO news press release, Jenny Qian stated that Luckin intends to open 2500 additional locations to eclipsing Starbucks as China's largest coffee chain store. This is the quickest time a newly established Chinese company has ever achieved Nasdaq listing status. According to recent research

on their respective company websites, Starbucks and Costa Coffee are the market leaders in China, with 4123 and 400 locations, respectively. Starbucks is the country's largest coffee chain store.

Luckin Coffee has pursued a cost-cutting strategy to compete and expand its market share. Loyal customers received promotional discounts of up to 50%. Additionally, promotional activities such as the "buy one get one free" and "free coffee for member referrals" campaigns. Kevin Johnson, the China CEO of Starbucks, stated in a CNBC interview that gaining market share through aggressive discounting is not sustainable. The retail price of a typical cup of coffee at Luckin coffee is between 30% and 50% less than at Starbucks.

Luckin considers itself a technology firm rather than a food and beverage company. It is similar to UBER in that it provides substantial subsidies to draw new users to the network. This is a quick approach for quickly achieving "scalability." In contrast to Starbucks, which places a premium on comfortable seating and a welcoming atmosphere, Luckin places a premium on self-pickup and fast delivery (within 30 minutes upon order placement). This is why the bulk of Luckin places are kiosks or quick-service restaurants.

Luckin's primary competitive weapon against Starbucks and Costa Coffee is its technology-driven retail Mobile App model. Starbucks launched its mobile application and partnered with Alibaba's online food delivery service platform Ele.me to counter Luckin's aggressive technology-driven model [31].

II. WHAT HAPPENED?

Muddy water, a short-selling firm, received an 89-page report on allegations that Luckin fabricated financial revenue on January 30, 2020. The report's author employed 92 full-time employees and 1418 part-time employees to track the daily traffic and revenue of 981 stores throughout China. The report contained substantial evidence that the company fabricated financial revenue totaling up to 40% of its reported revenue. Additionally, the report asserted that the number of "items sold per store per day was inflated by at least 69 percent in the third quarter of 2019 and by 88 percent in the fourth quarter of 2019," based on 11,000 hours of recorded video. Additionally, the report stated that nearly 26,000 customer receipts demonstrated that "Luckin artificially inflated its net selling price per item by at least RMB 1.23 or 12.3 percent to sustain the business model."

Two months later, in an unexpected turn of events, Luckin Coffee informed the US Securities and Exchange Commission (SEC) that its 2019 second and third-quarter results, as well as fourth-quarter guidance, cannot be relied upon because its chief operating officer, Jian Liu, and several of his subordinates fabricated approximately USD 310 million in transactions over the last three quarters.

Additionally, an internal audit of the Luckin board discovered that companies associated with Chairman Lu purchased large quantities of coffee coupons that were never delivered.

On April 2, Luckin's share price plummeted by up to 80% and closed at \$4.39 per share before trading was suspended on April 7. Luckin established a special committee to investigate Jian Liu and its subordinates for "misbehavior, including the fabrication of certain transactions" totaling RMB2.2 billion (about USD310 million).



Source: NASDAQ

The board of directors fired CEO Jenny Qian, COO Jian Liu, and then Chairman Lu, following an internal investigation into sales fraud.

From August 2019 to April 2020, the Chinese Government Authority discovered that Luckin inflated its sales, costs, and profits with the assistance of multiple third-party partners. According to the Chinese Authorities, Luckin violated competition laws and misled the public. As a result, the Authority fined Luckin and its affiliated companies USD 9 million for causing unfair competition through sales fraud.

III. CALENDAR OF KEY EVENTS

The following is a calendar of Luckin Coffee's significant events:

- In October 2017: Luckin Coffee was founded in Xiamen.
- January 2018: Trial run in Beijing and Shanghai.
- July 11th, 2018: Completed a USD 200 million round A financing with a USD 1 billion valuation.
- On October 18, 2018: Opened 1300 locations, surpassing Costa Coffee to become China's second-largest coffee chain.
- December 2018: Completed a USD 200 million round B financing, valuing the company at USD 2.2 billion.
- April 2019: Completed a USD 150 million B plus a round of financing.

- May 18, 2019: The company raised USD 561 million in its initial public offering after pricing shares at USD 17.
- Dec 31, 2019: Luckin self-operated stores surpassed 4507, with an aggregated customer base of over 40 million.
- January 8, 2020: Luckin coffee express and Luckin pop MINI intelligent vending machines enter the unmanned retail market.
- 31 January 2020: Muddy water, a short-selling firm, received an 89-page report detailing Luckin's financial fraud inflating outlet sales revenue.
- April 2, 2020: Luckin reported to NASDAQ that it generated 2.2 billion RMB (USD 310 million) in "revenue fabrication" from the second to the fourth quarter of 2019.
- April 7, 2020: Luckin ceased trading on the NASDAQ.
- May 12, 2020: As part of an internal investigation into sales fraud, Luckin Coffee fired its CEO and COO.
- July 6, 2020: Charles Zhengyao Lu, the founder and chairman of Luckin Coffee, was ousted.
- Sept 23, 2020: The State Administration for Market Regulation of China fined Luckin and its affiliates a total of USD 9 million for financial fraud and unfair competition.

The <u>six stages</u> of moral development identified by Kohlberg are as follows:

1. Key players and stakeholders

- a. Chairman Charles Lu
- b. CEO Jenny Qian Zhiya
- c. COO Jian Liu
- d. Shareholders
- e. Employees
- f. Suppliers
- g. Auditors
- h. Government authority
- i. Consumers
- j. competitors

2. Luckin's financial fraud revealed that the company's CEO, COO, and chairman were all directly involved in fabricating financial revenue and are therefore accountable for the fraudulent act. It reflected a lack of morality, poor corporate governance, and regulatory inadequacy. The fabrication of sales revenue began both before and after the initial public offering. This type of financial statement fraud referred to as "cooking the books," is a common way for a business to increase profits and manipulate financial data. Enron, WorldCom, and Wirecard all engaged in similar accounting fraud.

The top executives prioritized their self-interest and lack morality to benefit from the IPO's highest stock price listing. Kohlberg's theory of stages of development can be used to analyze an individual's morale in the Luckin scandal.

3. Kohlberg's model is composed of three stages, each with two levels.

- Stage 1 Preconventional Morality exhibited a strong sense of self-interest behavior on the part of the top executives. In determining what is right and wrong, the emphasis is on avoiding punishment and maximizing self-interest.
- Stage 2 Conventional Morality, the COO and CEO are motivated by their social behavior and adherence to Luckin's social norms.
- Stage 3 Post-conventional morality, the COO, CEO, and Chairman collaborate to defraud and maximize the IPO value for their benefit and maximum return on stock value.

Top executives should uphold their moral and ethical principles regardless of their position or power within the organization.

- 4. According to stakeholder theory, a business should create value for all of its stakeholders, not just shareholders. There will be pressure on one stakeholder group in a stakeholder theory context to commit financial statement fraud to present fraudulent financial statements to another stakeholder group. Top management was unconcerned about its employees, consumers, suppliers, and authority in this case. Its primary objective was to go public and become the largest coffee chain in China, even though it would incur significant financial losses due to its rapid expansion. Investors, shareholders, and competitors all played an important role in pressuring Luckin's top management to commit financial fraud by fabricating sales revenue and profit.
- **5. As a whistleblower**, short-seller Muddy Waters exposed Luckin's lack of governance on both an internal and external level. Internal audits failed to reconcile financial revenue, which may explain why top executives could quickly fabricate income. To prevent individuals or businesses from committing fraud, a financial reconciliation system must be in place. The internal audit committee's inability to detect and report financial fraud to the company's board of directors demonstrates an evident lack of compliance procedures. The CEO, COO, and CFO are accountable for the financial statement's accuracy. The Board of Directors failed to fulfill its responsibilities and was incapable of putting an end to this accounting fraud or ensuring an ethical corporate culture.

Corporate governance models are typically composed of four pillars: the board of directors, management, internal audit, and external audit. External auditors, investors, and regulators all play a role in detecting financial statement

fraud. Financial fraud would be reduced significantly if both internal and external controls were implemented.

Corporate governance is comprised of several mechanisms, including a board of directors and audit committees. The board of directors is a critical corporate governance mechanism, representing shareholders and creating value for them. The audit committee's role is to ensure that the financial statements have been prepared and verified reliably [8].

Luckin's organizational structure and operating procedures do not prevent fraud from occurring. According to Salleh and Ahmad [27], compliance is not synonymous with governance, nor does compliance simply "doing the right thing."

Additionally, they proposed that rather than focusing on structure and process, a governance structure governs the humans in an organization.

6. The Fraud Triangle Theory (FTT) of Cressey [6] and the Fraud Diamond Theory (FDT) of Wolfe and Hermanson [32] are the two most frequently cited theories explaining the causes of fraud.

As defined by WIKIPEDIA, fraud is the deliberate deception of another person to obtain an unfair or unlawful advantage. There are numerous types of fraud, with financial statement fraud being the most prevalent [1].

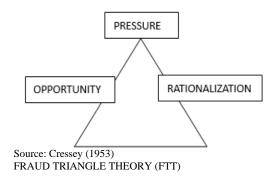
According to FTT, fraud requires the presence of three elements: pressure, opportunity, and rationalization. According to Lister [13], pressure is a significant factor in committing fraud.

Financial pressure is the most common factor that leads to fraudulent activity, according to Albrecht et al. [1]. In this instance, Luckin's top executives faced enormous pressure to meet the company's sales revenue target and the expectations of investors and shareholders. Additionally, there were incentives if they generated financial revenue that resulted in a higher stock value.

Internal control deficiencies provide top executives with an opportunity to commit financial fraud. Opportunity is the only Triangle Fraud control component that exists independently of management control and financial fraud. According to Kelly and Hartley [12], if opportunities exist, people will take advantage of them.

The third component of this FTT is rationalization. The term "rationalization" refers to the process of justifying and excusing fraudulent behavior. According to Hooper and Pornelli [9], the fraudster's unique mindset enables them to rationalize and justify their fraudulent behavior. The top executive explains that it is acceptable to commit such financial fraud and believes that the authorities will not detect it. According to the FTT, top executives must believe that unethical behavior is morally acceptable before engaging in it.

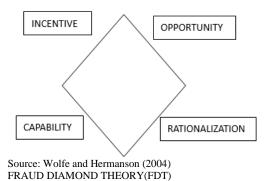
Fraud Triangle Theory



The Fraud Diamond Theory (FDT) is a supplement to the Fraud Triangle Theory (FTT).

Capability is added to the three components of the FTT that deal with fraud (Pressure, Opportunity, and Rationalization). Not everyone is capable of committing fraud if they cannot perform. According to FDT, top executives must possess the necessary skills and capabilities to commit financial fraud. They identify an opportunity and bring it to fruition. Wolfe and Hermanson [32] define capability as "the combination of stress, position, intelligence, and ego." Luckin's top executives took advantage of their positions because they knew the company's internal weaknesses. They had large egos and a great deal of confidence in their abilities to commit financial fraud without being detected.

Fraud Diamond Theory



IV. CONCLUSION

The case study of Luckin Coffee is typical of financial fraud cases involving top management and key decision-makers such as Wolfcom and Enron. Financial fraud is frequently committed by overstating financial revenue and profit. To meet investors' expectations and contractual obligations, top management fabricates financial data to avoid market repercussions and lowering the stock price. Based on Cressey's [5] Fraud Triangle Theory, the fundamental factors of fraud are identified. It encompasses external pressures/incentives/motives, opportunities to

exploit an organization's weakness, and the justification necessary to convince oneself that such action is acceptable. Wolfe and Hermanson's [32] Fraud Diamond theory extended FTT by including capability as a fourth element. Capability is defined as the capacity to act and perform. External audits are critical in preventing such financial fraud by checking and balancing the financial statements.

The primary aim in preventing and detecting financial fraud is to uphold high moral standards, sound governance, and an effective internal/external control system. A solid anti-fraud system may significantly reduce the likelihood of fraud occurring. A culture of honesty and ethical behavior should be instilled at all levels of the organization.

Another critical point to mention is the success formula for IT/technology-based business models such as Alibaba Taobao, Netease, Tencent, Baidu, Pinduoduo, Ctrip, Meituan, and Luckin. These China-based technology companies share the following characteristics: NASDAQ's initial public offering (USA) and a large market (China). The world's largest and second-largest economies are demonstrating to the world that such a collaboration model works well in today's dynamic business environment. America possesses the financial muscle and significant funds necessary to finance any new technology start-up if the market is large enough. Given the high PE of the NASDAQ IPO, this collaboration model provides the highest return on investment.

As for future work, it is recommended that some issues be examined. Firstly, in terms of IPO Readiness, is Luckin prepared to go public less than two years after its formation? Management and key executives are focused on financial objectives rather than operational efficiencies. Secondly, ownership percentage, whereby Chairman Lu and CEO Jenny Qian own a combined 50% of the company. Is this the primary motivation for financial fraud: to maximize stock value and return? Thirdly, Chairman Lu is actively involved in daily operations rather than leading the company strategically. Why is this so?

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Is Workplace Spirituality (WS) Model Effective in the Organizational Citizenship Behaviour (OCB) Leading to Job Satisfaction (JS)?

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Abstract

Over the recent decade, there had been a resurgence of interest calling for additional research in order to enhance the understanding of the adoption of workplace spirituality (WS) and its impact on business. The market segment of interest is in the small and medium sized enterprises (SMEs) due to an increasing importance of SMEs around the world especially in developing countries, being the motivation for this research. This segment is largely and adversely affected by the recent COVID-19 pandemic crisis, whereas in 2021, it was reported now to have the potential to develop bio- psychological instability in the workplace and is responsible for much of the increase in mental disorders or mental distress leading to exhaustion that still occurs even after a year of the pandemic beginning [1]. In addition, this resurgence is now on the uptake as research on spirituality showed a reduction of the psychological suffering of workers, not only in moments of pandemic, but in the daily work routines of the workplace [1]. The motivation behind this stems from the rapidly growing number of working professionals, academic communities, and businesses applying workplace spirituality alignment of staff values with organization values for its benefits. This research explores the uptake and the secular application of WS in SMEs; identifies the roles of WS in Organizational Citizenship Behaviour (OCB); determines factors that affect the extent of use of WS and lastly examines the relationship between the use of WS and Job Satisfaction (JS) performance of SMEs during the entire period of these challenging pandemic times.

Keywords— Workplace Spirituality, Spirituality, Organizational Citizenship Behaviour, Job Satisfaction, Small Medium sized enterprises, SMEs, Corona-virus, Covid-19, pandemic, Crisis Intervention

Enneagram Model's Personality Profiling in Managing and Motivating Workplace's Supervisory and Team Conflict?

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Abstract

Various studies on various behavioral patterns and personality types had played a critical role in personal development and ego building in the field of psychotherapy. However, there is a lack of existing studies that measure the effects of the application of personality profiling deep inner work that is useful in the managing and motivating people in supervisory team conflict in Malaysia. The motivation behind this stems from the rapidly growing number of working professionals, academic communities, and businesses having applied the Enneagram personality system model for workplace use in the world. The objective of this paper is to assess the usefulness of the Enneagram model deep work that has significant impact in managing and motivating people in supervisory or team conflict in the many small and medium business enterprises in contribution to significant key measures e.g. employee satisfaction, morale, productivity etc. Also as the current use of Enneagram model rapidly expanding as a tool for working with personal development in a diverse array of contexts in the areas of businesses, governmental agencies, education, and the human services fields worldwide [1]; this research would be significant as adding on to the repository of knowledge for researchers.

Keywords—behavioral patterns, personality types, Enneagram, managing, motivating, supervisory, team conflict, problem solving, coaching, personal development, Malaysia

Worldwide System Integration:SSM And XBRL Perspective

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Abstract— Global collaboration during the internet era is facing some challenges through language and cultural gaps nationalities. Miscommunication between can intentionally or unintentionally due to human mistakes or motivation. A concept of Extensible Business Reporting Language (XBRL) was studied to emulate the capabilities of conveying messages with the right context and the right format to be specifically understood by the message recipient. This was carried out via a metadata dictionary or called taxonomy. Although XBRL is specifically meant for financial reporting purposes, the concept of standardization of context that traverses through language barriers can be a research opportunity in addressing the needs of other disciplines, which can later be the basis of an international unified collaborative system serving all needs of humankind.

Keywords— Metadata, Taxonomy, Autonomous System, Global Collaboration

I. Introduction

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The Global close integration among nations and races as described in the recent era is not coincidentally evolved by itself. It has been foreseen and felt decades before the advancement of computer technology. McLuhan narrated in his book The Making of Typographic Man way back in 1962 [1], [2] about transnational collaboration in economics and culture. McLuhan used the term "Global Village" to describe how media and communication have created a virtual perception of congested and crowded space as an outcome of massive correspondence of the human races all over the world. It described precisely with what we termed now as World Wide Web.

Throughout civilization history, humanity learned that collaboration and socialization is key to progress. We stay safe and comfortable with physical and psychological wellbeing with others' support [3]. These interdependencies to others indicate how naturally we need collaboration among us. With the help of technology, these needs are served by the internet and social media. From a bigger perspective, cross national collaboration spawn tremendous opportunity economically. Notwithstanding the benefit of international cooperation, threats of frauds and malicious intent by certain quarters assert pressures to international regulators to ensure rules of law is uphold and adhered to.

All these requirements to manage the collaboration has triggered a demand for a democratic virtual open platform that

enables a heterogeneous communication system. This open global platform is closed to reality with web technology support, which allows autonomous systems to inter-work with each other. As a start, XML (eXtensible Markup language) technology is the foundation of web technology to enable all web-based systems to share standard information and react accordingly to computer instructions. This technology was then evolved to Financial Management with the advent of XBRL technology introduced by Charles Hoffman[4], XBRL has become a trend to the business community and regulators alike.[5] It facilitates financial transparency as well as avoiding misunderstanding among stakeholders.[6] Scholars have been researching and articulating the impact of XBRL in facilitating real-time transparency as opposed to delayed data integrity as accelerated through the online system.[7] All the arguments and benefits lead us to understand how the message and the context of the message can be standardized for all parties involved in the information sharing.[8],[9]. Particularly in Malaysia, Suruhanjaya Syarikat Malaysia (SSM) as the custodian of business financial information, plays an important role in promoting XBRL as a medium to report financial and good standing of business entities. This article learns from SSM experience in leveraging XBRL standards to expand the concept, allowing the same capability to be extended to other disciplines by identifying the critical requirements and characteristics to make it adaptable in different fields.

II. BACKGROUND

Financial good standing or financial performance is a status indicating the capability of a company is facing the pressure of handling operation costs and other liabilities. This performance is the main interest of stakeholders, such as financial institutions, shareholders, investors and etcetera.[10] As described in the renowned Agency Theory by Barry Mitnick and Ross Stephen in 1973 [11], a company's executives naturally carry the pressure to prove to the stakeholders their financial worthiness, and this led to a phenomenon called Information Asymmetries [12]. The theory is depicted in Fig 1: Agency Theory. Adopted from [13] below. Stakeholders may not be able to have complete transparency of financial indicators at the right time to make a crucial decision, either due to systemic issues or contextual disparity. Hubbel further explains that this motivation has led to major scandals such as the infamous Enron Scandal in 2001. The lesson learned by this imbroglio has triggered Accountant

Associations and Regulators to tighten the method of reporting business performance.

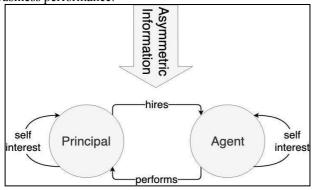


Fig 1: Agency Theory. Adopted from Notland et al[13].

With the predicament, Extensible Business Reporting Language (XBRL) was established to allow the context of reporting to be transmitted to information recipients together with the essential information. This context is represented in the form of meta-data or precisely termed as taxonomy. XBRL consists of 2 parts, namely instance, which carries the basic information, while the taxonomy holds the information about the Instance [14] The taxonomy provides standards of how business reports should be comprehended and analyzed based on the report creator's actual intent. However, the taxonomy allows an extension to the widely accepted standard. This extension provides flexibility to the context, desegregation needs and purpose of the instance as the information being conveyed to multiple stakeholders and organizations [8].

III. HISTORICAL OF XBRL

Charles Hoffman, an accountant, in December 2003 established the first working schema of XBRL with the advocacy of the American Institute of Certified Public Accountants (AICPA).[15], [16] This reporting standard was developed from the same Extensible Markup Language (XML) concept, the fundamental technology of web system development. Since then, XBRL has become an international standard for online business reporting, especially for financial statements and annual reports. Hoffman's counterpart, Raynier van Egmond who was also responsible for co-authoring several parts of XBRL specification, recently had adopted the concept into Healthcare Industry by establishing Medical Protocol Markup Language (MPML).

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While researchers worldwide heavily study XBRL, the adoption was reassessed by critics for its data integrity issues and the user-friendliness of the application [18]– [20]. These re-evaluations, however, provide opportunities to improve on the method of securing and maintaining the overall information reliability. These study gaps have also provided opportunities for studies related to improving the control and integrity of the XBRL information.

IV. FOURTH INDUSTRIAL REVOLUTION (IR4.0)

While the internet has created unprecedented international collaboration spectacle, the industrial world reacted intensively to the opportunities brought along by the newfound global assimilation creating a borderless market, an opportunity and threat disguised in the form of disruptive technology. This is in line with the Theory of Economic

Development by [21] that says, "Innovation creates profits and drives economic development" [22]. This disruptive world had recently known by Fourth Industrial Revolution or IR 4.0, a term first introduced by the German Government or specifically mooted by Schwab (one of the founders of the World Economic Forum), at the Hannover Fair in 2011 [23]. In the wake of this disruption, scholars and industrial players alike try to identify the technology components contributing to the whole phenomenon. As described by Rüßmann [24] and supported by Erboz [25] the Main pillars of IR 4.0 consist of;

- i) Big data Analytics
- ii) Autonomous Robots
- iii) Simulation
- iv) Horizontal & Vertical Integration
- v) Internet of Things (IoT)
- vi) Cloud Computing
- vii) Additive Manufacturing
- viii) Augmented Reality
- ix) Cyber Security

This paper describes the 'Horizontal and Vertical System Integration' as the main component which has propelled into the creation of a new Unified Grand System which carries the same characteristics of disruptive nature from all aspects.

V. EMERGENCE OF INTEGRATION The history of integration started with the needs of human interaction which, is a nature that goes back to as long as history can remember. However, the subject was initially studied way back before the 1850s [26]. The study of integration gained its momentum with the advent of Computers and became more exhilarated in the 1960s through the creation of the Internet by DARPA [27]. Internet as the fundamental of modern communication platform gives a giant leap to sharing of information and globalization, which McLuhan (1962) termed as "Global Village" [28]. It provides accessibility to all corners of the world, allowing collaboration and integration beyond human imagination. Computer systems are now built with capabilities to serve users from the other side of the world with the precision to know and understand the specific behaviour or preferences of the users. Information currently has no limit of language nor context. Independent system has now evolved into automated data serving sub-component of other systems through integration. The output of a system is now automatically transmitted to becoming an input of another system without human intervention. This automation served data integrity and confidentiality purpose well, where no human error or unauthorized sleuthing involved.

In analyzing what it takes for an integration to complete; we should compare characteristics of technology and standards used in a common success integration system, particularly in the Internet system. For that, we categorically identify XBRL as the case study in associating three different layers of communication as an internet application, namely IP datagram, Web technology and XBRL. These three different levels of communication standards are depicted in the diagram below.

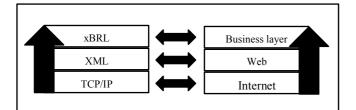


Fig 2- Integration Application layers

Based on the layers depicted above, three similarities were identified, which are;

i) The standard for common communication protocol ii) Metadata definition iii) Extensible / Optional parameters

Table 1- Compariso	n of similarities o	f integration layers
Tuble 1- Companiso	n of similamines o	i iiilegi alion layers

		Standard	Metadata	Extensible/Option	
1	XBRL	xBRL	XBRL	Extensible	
		International	Taxonomy	Taxonomy	
2	XML	W3C XML	XML	XSD (XML	
		Fifth Edition	Metadata	Schema	
			Schema	Definition)	
3	TCP/IP	RFC0001-	Packet	IPv4 (Option)	
		9083	Header	IPv6 (Extension	
				Header)	

Based on Table 1 above, we can point out that, to have a good integration, three types of principles represented by three different schemas should be defined to address the classic Communication Theory as defined by Gabor [29], where sender and receiver should be able to have a common context of information to be processed in cognitive cognizance. The principles should covers;

- i) Common Understanding Standards
- ii) Adaptive to dynamic needs Extensible/Options
- iii) Validation and governance Metadata

Recent literature and scholars have been debating on additional components that will address cultural and value diversities. As described by Rajhans et al [30] and Pimentel [31], data heterogeneity is an added criterion for a good integration process. Based on these prior studies, it would be wise to take into consideration to include iv) Heterogeneity; as another principle to improve the modern universal system integration criteria.

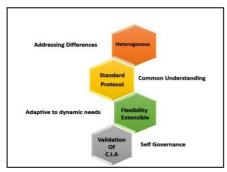


Fig 3: Criteria for Universal Integration

VI. WORLD INTEGRATED SYSTEM

The proposed model for Universal System Integration defined above should is an opportunity for further deliberation and research as the gap in studies on the applicability of the model is still wide. Nevertheless, this model can be adopted in the XBRL context where business reporting is currently shared across nationalities and countries traverse through languages and cultural differences, and yet the industrial practitioner can agree on context and method to have a unified understanding for business reports. This study is proposing to extend the concept to be adopted to other areas where disciplines of knowledge supersede the limitation of languages. As also being advocated by Van Egmond, the co-founder of XBRL, in the field of the medical and Healthcare Industry [17]. The same concept should also be adopted to areas such as compliance and enforcement, research, agriculture, tourism, religion, utilities, and the list would be endless. As all the knowledge disciplines starting to build their own taxonomies, interindustrial standards will then be required to be harmonized and coordinated, avoiding conflicting contexts, especially for a sistering discipline such as agriculture and farming, Bovine and Ruminant livestock etcetera.

The study by Hung [32] also states that not only communication standards should be defined, but knowledge integration plays an equally important role in ensuring information and knowledge transmitted can be amicably understood, thus avoiding communication disparity or Information Asymmetry.

Building this integration of communication and knowledge integration leads to the World Grand System, which runs on autonomous purpose but delivers multiple purposes for the benefit of the people where information democratization and personal privacy can be balanced and justified.

VII. MALAYSIAN EXPERIENCE: XBRL

Grand unified system through integration vision as envisaged in this study is nearer than we realized. In Malaysia, the XBRL concept was adopted as early as 2018 by SSM [33]–[35]. As the business benefit from the implementation is reaped and realized, the pressure for vertical and horizontal integration will take the front seat. By having knowledge integration standards defined and adopted, initiatives like a single portal for government services direct integration with commercial systems will lead to another new norm where human-counter transactions will merely be historical events as Covid-19 proves recently that online transaction and virtual intellectual collaboration can still enable economic activities and putting foods on the table.

Another lesson learned from the Malaysian experience on XBRL is the adoption drive and technology trust [35], [36] discussed in their research, few issues such as data integrity, ease of usage and trust in technology need to be inculcated to the targeted population of stakeholders. However, [37] are optimists on the new generation of millennials that have higher eloquence in the online norms as they have high perceived benefits of the online transaction as compared to others.

VIII. CONCLUSION

Beside expanding from SSM experience on leveraging business reporting standard to promote wider usage of XBRL [9] to other purposes, this paper also provides an insight into integration history and evolved to become one of the IR4.0 pillars that gives an imperative impact on human life and livelihood. Further study should be able to extend the detailed requirement of all principles outlined for a good integration system, including to advance further understanding of the impact of knowledge integration on another discipline apart from business reporting language. Future studies may also be able to see the impact of other pillars of IR4.0 that influence the integration activities such as artificial intelligence and big data analytics in which are the product of data integration between knowledge domains. It is hoped that the aspiration to see an International Grand System work towards the benefit of men will ensure the sustainability of future generations.

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Academia Vs Industry: Truth Beyond Digitalization

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Abstract—The drive for this discourse is to scrutinize the importance of collaboration between academic and industry in order to strengthen the curriculum towards producing better graduates who will be more ready to serve their employers or even work towards becoming an entrepreneur and one day be an employer themselves.

The Malaysian Education Blueprint 2015-2025 (Higher Education) ("MEB") has highlighted the requirement of partnership amongst academia and the industry to the next level by empowering the industry to play a significant role in design and delivery curriculum via collaboration representations. It is the intention of this paper to create a better understanding and awareness towards the importance of collaboration between the academia and industry. For students of the higher educational institutions, there seems to be a mismatch of skills and competency that are required by the industry. As such, this might affect employability. Hence, establishing good working relationship between the academia and industry through academic engagement via curriculum, lectures and industrial training is then imperative. Technology, innovation and digital leadership further demand the need of the academia to prepare the learning outcome in these related areas, however this cannot be accomplished from just one side. Both the academia and the industry need to play a team-work role in order to produce an entrepreneurial four-flat achiever by the students. Digitalization is seen today to provide support in narrowing the gap. The rise of the COVID19 pandemic has catapulted the addressing of working from home (WFH) or learning from home (LFH), more so in this lockdown with strict SOPs. Fortunately, the access to digitalization is available to the majority of the population though some may have some limitations.

It is expected that for the tool of digitalization to be applied effectively, there should be better infrastructure, applications and controls in place so that the objective of the learning outcomes agreed mutually by both the academia and industry will be materialized. Coupled with digitalization will be qualities of good governance, synchronization of operational excellence towards bridging the gap between academia and industry as mooted by the MEB.

Keywords—academia-industry gap, synchronization, operational excellence, governance, reality, academia-industry collaboration, industrial training, job placement

II. INTRODUCTION

Universities were credited as the ivory towers all this time as universities were more anxious in its academic quests however not that anxious with regards to industry out there [6]. However, the awakening of social and egalitarian theme has resulted the university to steadily withdraw from its initial approach and to exhibit a tougher obligation to the wellbeing

of the community. Literatures suggests that to enable a nation to triumph in this knowledge-based economy, the industry should identify how to obtain, utilize and influence knowledge successfully [13]. Benjamin Franklin once said "An investment in knowledge pays the best interest." No matter what happens, the one thing that cannot be taken from is the contents of the mind. The more a person gains knowledge, the better prepared the person would be to confront the volatile, uncertain, challenging and ambiguous life thrown in the path.

Higher education refers to undergraduate studies and beyond. School leavers enrol into higher educational institution (HEI) to increase their knowledge and prepare to join the industry as workforce. The type of programmes includes Diploma and Degree levels, there are post graduate levels too which some students continue doing to complete their studies and only thereafter they join the workforce. Many progresses on intermittently by completing the degree/diploma and thereafter work for few years, and continue with their Masters, Doctoral or Professional Certification programmes.

It should be noted that universities or the academia produce trainable graduates. Certain programmes are fully academic and the fresh graduate enters the industry as a pure white freshie ready to be trained and moulded by the industry based on their academic achievement and co-curriculum involvement, to certain extent. It can also be seen that vocational and skill-based programmes are more tilted on hands-on resulting to easier moulding by their potential employer in comparison to the fully classroom-based, academic only type of programmes. Moving on, there has been inclusion of practical or internship component into the academic programme. This confirms that the industry prefers a more plug and play workforce instead of trainable graduate and ready to be moulded. The variables affecting the breadth and depth of the internship varies from HEI to another HEI, involvement of key stakeholders including both privateowned and public HEI, ministries and other government agencies apart from the students showing support in the industrial training component, especially prior to diploma/degree graduation.

Whilst the issues will be looked into later in this paper, the whole process of closing the gap appears to be improvising to some extent on the current academia-industry relationship with an additional challenge arising from the global pandemic era. The onset of the COVID-19 pandemic resulted to a high demand for notebook and computers for both working and

learning purposes. While demand began ramping up in FY2020, subsequently resulting in a shortage of the computer equipment in Q3 and Q4, even until today. Regardless, it is then pertinent for tasks to be continued by the work force as a means of communication and work progress. This is also the case in the HEI whereby lectures, consultation and assessment are still being conducted however it is on an online approach in order to provide for education continuously, even in pandemic and lockdown. As such the training of digitalization and online support or platforms are utilized in both at the academia and also the industry.

Therefore, the objective of this paper is to examine the importance of collaboration between academia and industry in order to strengthen the curriculum towards producing better graduates who will be more ready to serve their employers or even work towards becoming an entrepreneur and one day be an employer themselves.

III. LITERATURE REVIEW

In support of the MEB, it will produce main alterations in HEIs' system operation, especially, it will focus on outputs and all stakeholders have shared responsibility. This is good towards bridging the aforementioned gap. Page 15 of the MEB emphasizes that students and academia resources to gain entrepreneurial skills and follow their own creativities via study leave, business secondments, business incubators, and green lane policies that backs student-owned businesses. In achieving this collaboration amongst academia-industry is the way forward. At page 18, the MEB advocates industry to take charge of curriculum design and delivery via new collaboration frameworks and elevating the excellence of its delivery via enlarged apprenticeship, practical exercise, actual replications, and dedicated employer training activities. The MEB therefore benefits from intimate amalgamation with industry both domestic and global community-partnerships. In return, all stakeholders: HEI, industry and government will drive their transformational leadership in making this happen via three waves to build (2015), improvise (2016-2020) and strengthen (2021-2025) the education blueprint deliverables and commitments [2].

Literatures as summarized by Ng Kim-Soon, exposed that partnership in knowledge transfer and strategies and collaboration characteristics are the famous concerns being researched about. In addition to that, industry relevance, academic firmness and industrial training [12] are the other concerns. Methods of hypothesizing includes coalition perspectives, undercurrents of partnership perspective, which focuses on governance between organizational collaboration and the learning and knowledge transfer in between organizational partnership [12]. The criticality of shaping intimate partnership is indeed an energetic academic study range and it is appealing much devotions. Partnership between HEI and industry would be able to harvest collaboration. It commences with university offering professional education which results in creating knowledgeable resources that is head-hunted by the industry, and it does industry-based study which will harvest more tailor-made courses. Alternatively, the industry will be able to offer funding to enhance and advance curriculum by endorsing the courses. In total, this collaboration framework

will harvest joint profits for not only both the HEI and industry, but the other key stakeholders, e.g., the ministry of higher education.

With regards the collaboration aspect, MEB calls for more rigorous and regular industry and societal relationship, teamwork, and corporations. A collaborative approach between academia and industry leaders would synchronize the revised curriculum with industry requirements. As a result, a new breed of graduates will bloom with increased employability quotient, unlike in the past years.

Recent literature proposed that HEIs are anxious on how to improve the progress of competences for graduate employability advocating robust intelligence of novelty and partnership models employed in HEI [9]. However, application of maintainable strategies on this theme by HEI will enlighten the remaining way forward. Relevance of evolving governmental and institutional policies is critical. Development of competences is proposed to be an integrative stakeholder's approach which is related to Sustainable Development Goals (SDG) 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth). HEI to embrace these matter in their plan in order to cultivate and validate the significance of bridging the gap between the HEI and industry.

IV. THE CONNECTION

HEI generally has three key activities i.e., teaching, knowledge-cum-experience transition, and research. The first two activities are the basic pillars of HEI, the prestige and to what they are renowned e.g., the Harvard and the Oxford universities. This does not in any way implicate that these two-grand master HEIs in anyway lacks the closeness with the industries.

The knowledge-cum-experience transition which the HEI and the industry links up with each other, or vice-versa is the subject matter at hand which is being deliberated for the benefit of the stakeholders involved. The product of the HEI are the students whereby the industry competes amongst them to offer employment for the student who is more well-rounded plus emphasis on attitude not necessarily four-flat gold medalists purely with academic distinction only. Bookworms at time may not produce A results when comes to realpractical-business environment. Steve Jobs graduating high school with a 2.65 GPA, Bill Gates dropping out of college and the late Karpal Singh secured a third-class law degree – at any time these names are excellent, exemplary and outstanding figures whom we want to work with or be associated with despite they have not secured four-flat grades. This is to caution that we should not take it as a rule of thumb that we can be weak academically and upon just passing with below average grades become employed easily in esteemed organization, and amongst others (Korn Ferry, Job Street and Turin Watson):

a. Results by Job Outlook 2019 survey in Bethlehem, United States, indicated that 73% of potential employers who have filtered employment candidates by GPA stated that candidates require minimum of B average prior to their CV being evaluated; and b. 91.91% of the respondents via survey conducted by recruitment agency, Talentbank which has office in Malaysia, with employers on graduates graduating in 2021 and 2022, ticked good attitude over academic excellence whilst the remaining 8.09% tilted on academic excellence.

When a student graduates, he or she must be capable of synchronizing with the industry which he or she has accepted to contribute for the growth of their career in the organization, be it civil or private. In performing their job description, no organization wants a fully book worm performer - the newly joined staff should be able to execute the work in sync with the organization's requirement. The organizational culture, the environment, the people and the expectation are not classroom based - files may be thrown at your face, harsh unpleasant words may be hurled upon you, ability to interact with seniors and cross borders to deliver the superior's requirement is vital, execution to factor into not only academic knowledge but marketing, cost saving and revenue generation factors in mind, apart from innovation. All these readiness at the new phase of a fresh working individual varies – the lesser the issue and faster the synchronization with the industry to perform and produce the deliverables, the faster he or she climbs up the corporate ladder. Having said that, human greed, favoritism and other subjective factors also influence the success in a particular organization despite having good governance and integrity culture.

To narrow this gap in bridging the connection between academia and industry, industrial training is one way apart from other regular academic-industry interactions (talks, seminars, conferences, self-exposure, and personal efforts in engaging with industry players during semester breaks). There are few aspects with this regard when narrowing the gap between the academia – the student-the industry: -

- Genuine involvement: dedicated participation is full from all the three parties;
- 2. Mixed involvement: the level of input and output towards readiness is not up to the par so long all three parties are satisfied and ticked the checklist of the training assessment record log;
- 3. Not bothered involvement: if audited definitely a non-conformance: the academia leaves it to the student to get their industrial training done, the student's dedication and attendance is not proper (and may be pre-agreed), and the industry supervisor is not concerned or takes it as a yearly nuisance just to satisfy the authority and the corporate world.
- Zero involvement: industry totally not keen to contribute to the academia as they see it as a pure waste of time, money and resources and the return of investment is zero.

Whilst the above scenario is set, the possible root cause as to why this gap came about firstly could be due to several factors including difference in mind set and targets. The industry needs to survive with variety of regulatory compliance, governance apart from enduring a black balance sheet whereas it's the recognition that the academia is

wanting. This translates to the wanting of taking risk, the industry will take low risk; cost leadership and every single activity is money (regardless of whatever tax exemption or look good investment they do). The academia aims for new solution with high innovation, heading more prestigious.

It might be often thought that the academia may lack the appreciation of industrial challenges. The industry and the HEI are like land and sea, it takes two to tango where the need to synchronization is expected to be effective and efficient, with operational excellence at leading and managing the industrial training for bridging with industry requirements.

V. COLD TOWEL, OTHERWISE GAP ALMOST CLOSED

The CEO @ Faculty Programme by the Ministry of Higher Education (MOHE), Malaysia is expected to narrow the gap between the academia and the industry. It partners top domestic and global CEOs and industry captains into Malaysia's HEIs to part their leanings and experiences with future employees / entrepreneurs and the academia fraternity. By narrowing the private-public gap and solidification of industry-academia links, the Ministry hoped to augment what the academia can offer which results in knowledge transfer efforts with the industry. Commenced in 2015 with 24 CEOs participation and in 2016 with 60 CEOs having volunteered the programme [11].

The programme is MOHE's way of restructuring education. In the domestic academia world, the presence of industry players has always been there, however the method is more organized and focused. Superior synchronization amongst academia and industry will pave way to an improved structure of HEI in the future.

It is expected that the CEOs @ Faculty would have brought benefits, however no reports were available as to the level of contribution realized by the academia. In addition, it is apparent that several universities make the attempt to invite industry players over to their universities as an Industry Advisory Panel and Adjunct Professors as a platform to bring industry experience to the classrooms.

VI. EMPLOYABILITY POST GRADUATION

Ashenafi Abate Woya employed a Kaplan–Meier estimate to distinguish the duration of not being employed from two or additional groups of 2012 and 2016 graduates of Bahir Dar University, Ethiopia. Response from 303 graduates indicated that 17.7% were jobless and the remaining 82.3% had jobs wherein of the employed graduates, 65.8% held a permanent work and the remaining 16.5% of graduates secured a temporary work [1].

The 2020 Graduate Tracer Study conducted by the MoHE recorded the graduate employability rate at 84.4% in 2020, reduced slightly from 86.2% in 2019, though above forecast of 75%. Quickly, pandemic will be used as the reason – though it is one of the factors, the 1.8% decline is not that significant. MoHE's interference in enhancing the

employability of graduates that can be labelled as operative includes:

- a. partnership of MoHE-Malaysian Technology Development Corporation (MTDC) Graduate Employability Industry 4.0 programme.
- b. entrepreneurship development programmes with the Perbadanan Usahawan Nasional Bhd that offers entrepreneurship training to graduates and the Ministry of Entrepreneur Development and Cooperatives (Medac) for the MoHE-MEDAC Siswapreneur programme.
- c. employment matching programmes with the Social Security Organization (Socso) and
- d. graduate employability programmes in corporation with the ministry's tactical associates.
- e. apprenticeships programme IPTA-domestic industry players for a duration of three months training on Career Enhancement Workshops, Industry Speed Interview, Industry Attachment and Job Placement.

VII. TRUTH BEYOND DIGITALIZATION

Now, whilst all these connections of narrowing the connection between academia and the industry is already happening (and did not to certain extend), will digitalization assist to bridge the gap?

Two decades ago, it was demanded that the perception of the completely established virtual academia will replace campus-based universities [3]. This is happening now.

The terms 'digitisation' and 'digitalization' are at times used interchangeably. However; an obvious difference occurs amongst the two. The Gartner IT Glossary defines 'digitisation' as "the transformation process of analogue information into digital information", while 'digitalization' is defined as "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business" [4].

Young and Rogers describes digital transformation as a technology-driven process of alteration resulting from universal data, connectivity and decision making [18]. In addition, digital transformation has an influence on the industry itself [5]. The digital transformation paves way to the transformation of critical industry functions and influences products and processes, including organizational structures and management frameworks. The purpose of digital transformation is to craft new options in the long-run as opposed to meek technological variations looking for tweaking past-errors.

Closing the Skills-Gap in the Digital Era in Malaysia, more-so during the pandemic struck surroundings the #MyDigitalWorkforce Jobs Platform and Digital Skills Training Directory is part of Malaysia Digital Economy Corporation's (MDEC), initiatives to narrow the gulf amongst capability fulfilment and resource requirements. Most of MDEC's digital economy efforts are focused on digitally competent Malaysians, digitally power-driven industries and digital investments – the three supports under MDEC's strategic model.

The pandemic resulted by COVID19 has increased the communication pathway to be more digital. However, will the increase in use of the notebook, knowledge/experience/practical delivery methodology equip a student to be industry ready? Will it close the gap? Can it bridge the academia and industry? The answer is, today digitalization MAY assist in conveying the objective, purpose, learning outcome of industrial training. During the industrial training, a hands-on training target / expectation of the related subject matter needs to be achieved. Let's ponder few of the following examples of industrial trainings:

- a. Ship berth on board merchant ships before being qualified to be a junior officer can he or she learn from home assuming he or she has all the software and hardware for simulation?
- b. Chambering before being called to the Bar as an advocate and solicitor the confidence and environment via a laptop video call seeing the judge, the secretary, the defense counsel, the accused, the prosecutor -will these enable him or her of giving the same competency and capability of an individual who gets the training physically?
- c. Clinical training for various medical and healthcare professions?
- d. Accountants? Probably possible
- e. Trainers / lecturers / public speaking possible: but the fear and environment of speaking to laptop and a crowd of three is totally two sides of a coin

Therefore, digitalization firstly may assist to a certain extent but to begin with is there a commitment, drive to make this happen? Why was there not a Digital CEO Faculty Programme? Probably the deliverables may defeat the purpose to bridge the gap - this could be a reason why the towel is not heated up to be reactivated.

VIII. RECOMMENDATION

Upon reviewing the reality on the ground, it is recommended that in order to further bridge the gap between the academia and industry, the core and basic ingredients are just not digitalization. However, the nation requires:

- a. Solid, progressive and future based academia cum industry bridging task force which should not receive natural death due to change in political landscape. The importance of political will to be led by MOHE.
- b. All registered companies to be provided with attractive tax exemption matrix and appropriate recognition in collaborating for industrial training placement with MOHE this will be in phases of bi-annual years i.e., 2022 2023 Encouraged and 2024-2025 Regulated. This will be enforced by SSM.
- c. The digitization and digitalization infrastructure as the enabler for the bridging, including to have the relevant digital tools, artificial intelligence, holograms, robotic, remote capabilities etc. to be reviewed and the quick wins to be closed out basis budget allocation. This will surely be led by MDEC, which may be given more authority, power and

control. MDEC's initiative in transforming Malaysia into the Heart of Digital ASEAN reflects the continuous partnership with regards the commitment of both the academia and MDEC.

d. Launch National Industry Research & Development Database (NIRADD) wherein industry entities will be required to submit their areas of research or development. From these database, Masters and Doctorate students to identify on the area/topic/title together with the industry prior to the submission of their dissertation. However, the HEI will control the research to maintain academic integrity. NIRADD will also ensure the right audience reads it so as to harvest the necessary ROI, instead of calculating total readings or total citation alone.

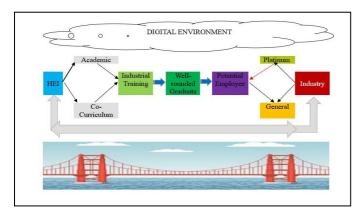


Fig. 1: Framework Towards HEI-Industry Gap Closure Blueprint Policy

It should be noted that other qualities required as given in the MEB (2015-2025), the qualities on good governance, synchronization of operational excellence are necessary in order to strengthen the mechanism of working together between the academia and the industry.

IX. CONCLUSION

As a conclusion, the gap between academia and industry does exist. This has been reconfirmed in a recent webinar in April 2021 entitled 'Reshaping Higher Education: Nurturing leaders for Pakistan's tomorrow', organized by Habib University, Pakistan [14].

Habib Metropolitan Bank CEO Mohsin Nathani requested the industry to part constructive criticism – instead of just mere lip service, with HEI on what they pursued in striving professionals so that their necessities can be fused into the programs.

If HEIs are continuing to function in a silo or even involving the industry insignificantly, the academia world is heading for a significant disaster. Hence, the requirement to develop what Dr Ayesha K Khan, CEO of Acumen Pakistan termed as "multi-dimensional intelligence", as reported in The Express Tribune Pakistan this year [14]. Building a robust talent resource and delivering industry-ready, employable resources by bridging the gap between academia and industry is necessary.

Strengthening the call to narrow the divide via the 6th International Conference on Soft Computing in Data Science 2021 (SCDS2021), hosted virtually will be held in November 2021 which aims participants from academia, government agencies and industries with the definitive goal of connecting the gulf amongst academia and the industry partnerships can pave way to the progression of valuable analytics and computing applications for offering actual acumens and recommendations [17].

A strong partnership and a concerted understanding amongst the government and HEI should be present towards 'Humanising Higher Education for Future-Proof Talents' IR4.0 model to prosper as mentioned by National Association of Private Educational Institutions (Napei). The model enumerated enticing and supporting academia, engaging in virtual learning and teaching, and transformation of the employment resources in the current workforce in the digital scenario as trials in Malaysia's HEI sector. The insufficient sustainable methods in IR4.0-related efforts by academia leadership, lack of IR4.0 mindfulness of opportunities amongst academia and students, and inappropriate data security and privacy management were also matters enlisted in the document.

Meanwhile, digitalization may only narrow the aforesaid gap. The bridge to close the gap needs to be improvised along with proper governance of managing the whole ingredients as analyzed above needs to be meticulously yet passionately addressed by both academicians and industry players towards operational excellence in achieving a prestigious status for the HEI and at the same time increase the return of investment for the industry, benefiting the stakeholders and our future generation.

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A Brief Investigation of Technological Innovation and Transformation Due to the COVID-19 Pandemic

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Abstract-Innovation and transformation are considered to be two of the most crucial elements to long-term success, and it is those industries that, when faced with changes in the marketplace, adopt transformative practices and new innovations who are most likely to succeed. The coronavirus pandemic has led to unprecedented changes in society, operations, and the way business is done. Many organizations have failed and a great many have risen to the occasion, allowing for even higher levels of success than were previously present. In order to explore this phenomenon in greater depth, this basic qualitative study will allow for the identification of how innovation and transformation have been applied in the field of business as a result of the coronavirus pandemic, with a focus on the integration of innovation and the transformation of business operations in light of the pandemic. Recommendations are made for additional areas in which innovation and transformation may be implemented.

Keywords—innovation, transformation, business, coronavirus

I. INTRODUCTION

The global coronavirus pandemic (COVID-19) has led to unprecedented changes, impacting how humans act, interact, and engage in society [1]. It may not be until years from now that humans know the true extent of the impact of the pandemic, however, now that the pandemic has been ongoing for more than a year, it is possible to assess some of the myriad ways in which changes have occurred during this time, allowing for the identification of both the innovations and transformations that have occurred, while simultaneously working to predict potential areas for the implementation of innovation and transformation in the future [2]. This process, often known as looking back to look forward, is one that has been commonly applied, within a historical context, when exploring previous pandemics that have occurred in world history [3]. However, due to the current and ongoing nature of the global pandemic, while researchers have written articles throughout the pandemic regarding changes that have occurred in real time, as society is reaching this milestone in the pandemic concurrently, there is a gap within the literature regarding summative reflections on these processes. As innovations and transformations have occurred in all aspects of life as a result of changes made due to the pandemic, there is a need to delimit these explorations to a particular aspect of societal life. To this end, the purpose of the current study is to explore some of the innovations and transformations that have occurred within the context of the business environment since the start of the pandemic, allowing for a deeper understanding of the ways in which the business environment, including the actions and interactions that occur therein, have changed as a

result of the global pandemic. The research question identified for resolution within the context of the current study was: What are some of the innovations and transformations that have occurred within the context of the business environment as a result of the current global pandemic?

II. LITERATURE REVIEW

A. The Pre-Pandemic Business Environment

There are many firsthand accounts written by individuals on different business environments, typically within the context of telling an anecdote or vignette regarding a workplace experience. There are still more present in entertainment media; movies, books, and video games all have presentations of different workplaces. There are even children's toys and costumes designed to allow young humans to play pretend, mimicking operations within different workplace contexts. However, even when directly relating to the exploration of a particular phenomenon occurring within a business context, pre-pandemic, researchers did not document the specific business environment present within the organization or industry in which study [4, 5].

There are several reasons for this lack of information. First, the broad category of business or industry encompasses a large number of different types of businesses, which means that there is no single uniform business environment. Second, and perhaps more importantly, the pandemic was unexpected [6, 7]. In essence, humans maintained a latent assumption that nothing like the current global pandemic was likely to happen during the course of this lifetime. This latent assumption is further compounded when taking into consideration the fact that the most common type of research in which environments are discussed is the ethnographic study, and while ethnographic studies do take into account the environment in which the given environment, the focus is on the observations of a particular culture or social organization within the group, as opposed to the environment itself [8].

Yet, in spite of the lack of this academic documentation, and in spite of the diversity across business environments and industries, there is still a great deal of similarity present across these disparate environments. Businesses offer either a product or service. There is a business owner who is responsible for overseeing the business, and as the business grows, employees will be present as well. The business must adhere to all local, state, and federal rules and regulations for its operation. Still further, although becoming more common, brick and mortar stores still overwhelmingly outperform online retailers [9, 10]. Each business, whether brick and

mortar or online, will have a base of operations, whether within a traditional office environment or not. Within that base of operations, if multiple people work within the office there will be some area in which those employees gather to talk, both about the company and their jobs as well as their personal lives.

The traditional office environment, whether for an online store or a brick and mortar store, most frequently required employees of that business to physically be present at work and may have required those employees to directly interact with customers and/or suppliers. People were often required to be in close proximity to one another, typically with those in the business environment maintaining a certain dress code and code of conduct. The business environment was one of repetition; a person would know roughly what was expected of them every day within the office environment and that expectation would remain roughly the same from one day to the next [11]. This type of repetition within the business environment, within each job position found within the business environment, was structured based around the job description of the individual, which told them the tasks that they would be responsible for within the context of maintaining their position within that organization; the routine of the business, which would be set by the industry and type of business in which they worked; and the company culture. A person would go to work, clock in, perhaps converse with their coworkers, and then start attending to their job duties for the day.

B. Innovations and Transformations in the Business Environment during the COVID-19 Pandemic

In the early days of the coronavirus pandemic, generalized guidelines were provided at the country government level by the World Health Organization regarding guidance for dealing with a new illness [12]. Yet, because it was not yet clear, in January 2020 what specifically was being dealt with, recommendations were not yet passed down at the country or federal level to the population [12]. Indeed, it was not until March 2020 that the first recommendations regarding lockdown measures, changes to businesses, and changes to the very way of life for many started to occur globally, though by this time, many countries in the Asian Pacific had already worked to implement changes [12].

In April 2020, the World Health Organization [WHO] made the first recommendations for the wearing of face masks by healthy people [12]. These recommendations were, and in many places still are, met with a heavy degree of skepticism. Yet, as these requirements became federally mandated in many locations, this was only the first of many innovations and transformations to have occurred within the business environment. The use of masks was closely followed by recommendations and guidelines regarding the cleaning and disinfecting of common surfaces and increased guidelines regarding the frequency and manner in which individuals should wash their hands or, if washing one's hands was not an option, using hand sanitizer [12]. People were also cautioned to maintain appropriate social distancing, keeping at least six feet apart wherever possible [12].

These seemingly innocuous changes – wearing a mask, cleaning as frequently as necessary, and washing or sanitizing one's hands, and maintaining a comfortable distance between oneself and others led to transformations within the business environment. Businesses now had to accommodate these

changes which, for many, meant finding innovative new ways of operation, particularly when taking into account the need to provide employees with time out of the office and away from their positions in the event of exposure through testing, and the need for time out of the office for those who tested positive for COVID-19. This meant finding alternative ways for employees to complete their job duties while they were exposed but not yet showing symptoms and/or not yet diagnosed with COVID-19. This meant implementing protocols that would allow their customers and their suppliers a decreased likelihood of exposure, and this meant working to hire additional people or change job descriptions to incorporate the new practices and procedures. In many cases, this also meant increasing the amount of supplies that were necessary for businesses to operate, including additional cleaning supplies, face masks for employees, additional hand sanitizer or hand sanitizer stations, and even additional signage, letting customers and employees alike know what the new protocols and procedures were. Some businesses were able to thrive through innovation and transformation, while others failed [13].

Several different factors of consideration went into the determination as to whether a business was most likely to succeed or fail [14]. Businesses whose owners had the highest level of experience, the greatest ability to scale, and a clear understanding of their scope of practice were more likely to succeed [14]. On the other hand, those businesses that were small to medium sized were more likely to fail due to the decreased availability of capital to make the necessary changes, as compared to larger companies [15]. Still further, those businesses who did not take the pandemic seriously were less likely to be able to adapt to and respond to the changes necessary for continued operation [15]. Innovation and transformation were critical to the continuation of business during this time.

III. METHODOLOGY

The methodology of a study is determined both by the purpose of the study and the research questions identified for resolution within the context of the given study [16]. Within this context, the purpose is a qualitative one, looking to collect data on the changes that have occurred within the business environment, changes that are not quantifiable in nature [16]. In light of this consideration, this meant exploring the different qualitative methodologies that would be best suited for use given the subject matter. Due to the purpose being stated as a means of collecting information on what innovations and transformations have occurred within the business environment as a result of COVID, and the previously mentioned delimitations, this meant a basic qualitative study was best suited as the research design for the current study [16].

A. Ethical Considerations

Due to the current global pandemic, ethical considerations have become more diverse than ever [17]. There is a need to ensure that any study with human participants works to ensure the safety of those participants, yet with a global pandemic, and with new information still becoming available daily regarding the virus and its mutations, there is no easy way for a researcher to guarantee the safety of the participant for in person research [17]. To this end, it was determined that a non-participant based study would be conducted, utilizing only secondary published data. This decision, while based in

appropriate ethical considerations for the use of human participants [17], does however require an explanation of the justification for and viability of the use of secondary data.

In order to ensure the validity of the data presented herein, care was taken to utilize references from peer-reviewed sources, ensuring that the information contained therein was true and accurate to the best of the researcher's ability. With the viability of the data confirmed, justification for the use of secondary data is assured. Secondary data is commonly used by researchers as primary source material in the completion of other studies, and only serves to indicate that the data being utilized in the study was collected by another individual for a different purpose [23]. Analysis of this data through the lens of an alternative research question allows for the greater exploration of a topic and has the benefit of a decreased risk associated with the data collection process, a primary consideration when exploring the ethics of human participation during a pandemic [17, 23]. Given that this is the first global pandemic since ethical considerations for human participants were set by the Belmont Report, there is a need to take into account the fact that, as the rest of the world has experienced changes to their professions through the use of technological innovations and transformations, so too has the world of research [17]. Indeed, the argument may be made that the adoption of this approach within the current study serves as a further example of the impact of innovation and transformation in technology across industries.

B. Data Collection

In order to collect data pertinent toward the fulfillment of the stated purpose and the resolution of the identified research question, only secondary data was collected. Further, because the data collected for the purposes of this study revolves around the changes that have occurred since the start of the global pandemic, this means that all data collected has been published within the past two years, as the pandemic has been going on for slightly more than one calendar year at the time of the current study. In order to ensure the validity and reliability of the data, taking into consideration the fact that much still remains unknown about the virus, its mutations, and its variants, the additional steps taken in the data collection process included ensuring that all data was collected from reputable published sources, that, where possible, the data was peer reviewed or published by global organizations, and that any corrections that were made to the material since the time of its publication were taken into account.

C. Data Analysis

As the focus of the current study is to identify the innovations and transformations that have occurred within the business environment as a result of the pandemic, the data collected for the purposes of this study were synthesized and presented by theme. Due to the myriad innovations and transformations that have occurred as a result of the pandemic, a representative sample are presented of the more common innovations and transformations that have occurred. Not all innovations or transformations may be present in all areas of the globe and not all innovations or transformations discussed herein may be appropriate for implementation in all locations or all types of business or industry.

IV. RESULTS

Several innovations were already discussed within the literature review, though these are not the only innovations to come out of the pandemic within a business context. Still

further, it is important to note that not all innovations are technological in nature. However, given the need to increase the amount of distance between individuals as a means of potentially limiting the transmission and possible vectors for transmission from person to person, a great many of those innovations have been technological [12, 13]. To this end, the predominant focus of the technological innovations and transformations that will be discussed within the context of the current study are those that have a technical component or aspect. The data presented herein was obtained using the literature search strategy described within the data collection procedures section of the methodology.

A. Technological Innovations and Transformations

The practice of telecommuting is not new; many technology companies have employed this practice since the late 1990s, however, before the pandemic, the use of telework was seen by many as a largely technologically advanced endeavor [18]. Given the need to provide socially distanced options, where possible, telework became a rapidly adopted practice [18]. While this approach required, for many, the additional purchase of webcams and the additional setup of hardware and software for both businesses and employees alike, the practice of telework was rapidly embraced by industries that had not used the approach in the past [18]. With work being able to be completed remotely, many businesses saw spikes in productivity [18]. Employees were happier, able to better manage their responsibilities at home and at work, even the additional responsibilities that came with school closures for those with school aged children. In many instances, people embraced the work from home lifestyle, dressing professionally in areas in which the camera, where required, would see, and wearing comfortable clothing that was outside of dress code where not visible. Gone were the days of uncomfortable shoes and constricting clothing, and the results showed in the work of the employees themselves. For those businesses that were previously hands on, including custom design businesses, innovations with webcams and screen sharing software allowed customers to be able to work more closely with businesses, contributing, for some, to a rise in growth [14].

The terms innovation and transformation are often used simultaneously, however, they refer to two distinct concepts; innovation refers to the ways to improve or change a preexisting concept, product, or approach for the better, while transformation is focused on the movement from one state to the next [19]. With this in mind, the integration of webcams, screen sharing software, and teleworking were not the only technological innovations and transformations to occur. In many industries, businesses found themselves, when faced with this unprecedented situation, with the need to update and improve their strategic planning [13]. These changes and updates to strategic planning processes allowed businesses to explore potential risk scenarios that may occur, identify new ways to respond, and create plans and protocols that would aid in mitigation of these risks. In this manner, businesses became more fluid, more adaptable, and more willing to think outside of the box in responding to situations like the current pandemic. This led to changes in procedures, changes to policies, and the creation and integration of new software that would allow for a higher level of management than was previously in place [13]. This ability to pivot and this willingness to explore situations that were not previously considered has led to a shift in mindset that will allow these

businesses to grow and thrive, both during the remainder of the pandemic and in the years to follow [15].

These findings lead to the identification of the innovation and transformational model that answers the questions raised in the completion of the current study, an expansion of the technology acceptance model with the constructs of tasktechnology fit [20, 21]. The technology acceptance model provides an understanding of the processes associated with the manner in which users come to accept and adopt a technology, whether that technology is a new innovation or the adoption of a preexisting technology in a new way [21]. Tasktechnology fit, on the other hand, is used as a means of quantifying the effectiveness of a particular technology within the context of a given system or approach [20]. While both of these theories are older theories, the combination of the two to create an applied model has been proven effective in the assessment of real world phenomena, such as that which has been described herein [22]. Although many of the technologies that are being used during the pandemic have preexisting technologies, and although these technologies have been conceptualized for the type of application currently being seen within the workplace and online schooling environments, there was a need for an environmental catalyst to result in the adoption of these changes within the school and work environments [22].

Ultimately, the pandemic has led to the acceptance, and ultimately the embracing, of a new paradigm in which priorities have shifted, allowing a wide range of industries to identify and embrace alternative approaches to traditional tasks. The technology acceptance model, when combined with task-fit theory, provides an innovation and transformation model that allows for the identification of technological innovations and transformations that ensure the continued success of the business and school environments in spite of the difficulties associated with task completion within these industries in traditional ways [20, 21, 22]. By embracing these changes, it becomes possible to continue to operate in a manner similar to the familiar without identified risks associated with the familiar, creating a new normal.

V. CONCLUSIONS

The purpose of the current study was to explore some of the innovations and transformations that have occurred within the context of the business environment since the start of the pandemic, allowing for a deeper understanding of the ways in which the business environment, including the actions and interactions that occur therein, have changed as a result of the global pandemic. The research question identified for resolution within the context of the current study was: What are some of the innovations and transformations that have occurred within the context of the business environment as a result of the current global pandemic? In an effort to explore these innovations and transformations, secondary data was obtained from current published literature found in reputable sources. This information allowed the researcher to identify technological innovations and the associated workplace transformations that occurred as a result of their implementation.

The predominant transformation that has occurred as a result of the pandemic is a change in thinking and mindset. This change in thinking and mindset has in turn led to an increased adaptability within the business context, allowing for the integration of technological hardware and software,

keeping businesses, their employees, and their customers connected throughout the duration of the pandemic to date and ensuring that businesses are able to thrive. Those businesses that have experienced the greatest level of success are those that have proven themselves to be increasingly adaptable, those with the greatest levels of experience, those that have the ability to scale, and those who are willing to explore their scopes, their missions, and are willing and able to respond to these situations in light of the current global pandemic. While the innovations and transformations discussed herein are not the only innovations and transformations that have occurred within the business context as a result of these unprecedented times, they are some of the more commonly implemented solutions, showing that, while each business is unique based on its own composition, climate, and the industry in which it operates, there are certain factors within the business world that are universal across all organizations, regardless of location or industry. Given the ongoing nature of the pandemic, it is likely that additional innovations and transformations will occur within the business environment before the pandemic is through. It is recommended that businesses continue to explore new ways to integrate preexisting technologies in order to improve businesses, streamline processes, and work to maintain the connections necessary for the success of a business.

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The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first ..."

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished" [4]. Papers that have been accepted for publication should be cited as "in press" [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreignlanguage citation [6].

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Project Success Assessment based on Machine Learning

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Abstract—In the digital age, more people are getting connected and using digital technology than ever before. Consumers are surrounded by a variety of digital products and service offerings daily. The Information Technology (IT) industry is projected to have an annual growth rate of between 3.7% and 5.4% worldwide and has become one of the world's leading industries. The COVID-19 pandemic in 2020 has catalyzed the growth of the "digital economy" as more organizations are embracing digital transformation in their operations. This trend drives the demand for IT project practitioners. However, the high failure rate of IT projects has caused incredibly huge losses for many organizations. Existing models, tools, and techniques are incapable of predicting success, which could effectively enhance the project governance capability. This concept paper leverages the Machine Learning (ML) model to perform project success assessments. The study begins by reviewing the contributory factors to project failure, project management techniques, and various prediction models. A quantitative survey will be conducted to rank identified project risk factors. An appropriate ML model will be developed and verified for its performance outcomes in project cost and duration prediction. The proposed method is expected to enhance the prediction accuracy significantly compared to the existing project management techniques.

Keywords—IT project success failure; project forecast prediction; artificial intelligence; machine learning; project estimation

I. Introduction

The IT industry has become one of the leading sectors in the world with annual growth projections ranging from 3.7% to 5.4% globally since 2013 (Comptia.org, 2019) with a reach of US \$4.6 trillion in 2018 to US \$5.2 trillion in 2020, and it is expected to grow to the US \$5.8 trillion in 2023 (CompTIA, 2020). Information and Communications Technology (ICT) investment is expected to rise by 25% over the next 5 to 10 years (IDC Corporation, 2020). The strong IT industry trend drives huge demand for IT projects, and therefore, it triggers the opportunity for IT professionals to tactically and strategically align with the growing demand for organizational digital transformation projects continuously (CompTIA, 2020). The Project Management Institute highlighted in its talent gap report that 2.2 million new project-oriented roles will be created each year through 2027, out of which approximately 450 thousand IT project manager jobs will be created annually (Alexander, 2017; PMI, 2017).

Despite all the reported positive aspects in both the digital economy and the growing demand for IT projects, unfortunately, IT project success rates yet remain low without major improvement (Bloch et al., 2012). Significant projects collapsed or partially failed to result in huge losses to many

organizations. The literature indicates IT project success rate remains low over the past two decades. Statistically, approximately 20-30% of projects are complete failures and abandoned, and 30-60% partly fail with time and cost overruns or other issues (The Standish Group, 2015). A global survey conducted by PMI exposed US\$1 million misused every 20 seconds due to ineffective implementation and poor project management, which is translated into US\$1.5 trillion wasted a year equivalent to the GDP of Australia (PMI, 2018). The survey findings of 300 CIOs by a UK IT consultancy indicated £37 billion waste per year on failed IT projects (Hopping, 2017). According to Gartner, 85% of big data projects even failed to move beyond the preliminary phase (Asay, 2017).

IT project failure costs are considered incredibly high in which the estimated damage in both the public and private sectors was around US\$ 150 billion annually in the U.S. and US\$ 140 billion in the European Union (Taherdoost & Keshavarzsaleh, 2015). Singapore reported 1 in 4 organizations (approximately 26%) have experienced a failed IT project at an average cost of SGD788,354 (Low & Ling, 2018). Similarly, the 11th Malaysia Plan (11MP) suffered project delays costing 10.3% of damage (Idrus et al., 2019). Those statistics gave a ponder that there is still a gap for further research that the project management community can tackle

This study seeks to find a feasible solution to improve the current critical high IT project failure rate, which is impeding organization growth and causing significant losses to organizations and investors. This is due to the lack of effective tools and techniques to improve the project success rate (Janssen, 2019). Therefore, the contribution of this study proposes a novel machine learning-based project management assessment technique to increase the IT project success rate.

II. RESEARCH QUESTIONS

The study is deemed to answer the following research questions:

RQ1: What are the key contributors to high project failure rates? Consolidate key project contributory failure factors and investigate their root cause, degree of impact, and probability of occurrence at which stages of the project lifecycle. This approach gives the investigator an overall picture of how these risks and issues were developed; what causes, contributes, or triggers these risks. Identify which contributory attributes have the most significant impact.

RQ2: What are the feasible project management techniques for improving the project failure rate? The second research objective is undertaken through studies

related to the current most used project management techniques, particularly shortlisting techniques that possess prediction capability and are applicable for both conventional waterfall and agile project methodologies.

RQ3: What Machine Leaning model can improve project failure rate? In the same line of thought, the third research objective is to conduct a literature review of studies on existing artificial intelligence models that are capable of reducing the rate of project failure.

III. PRELIMINARY LITERATURE REVIEW

Despite decades of research into project success and failure, regrettably, the record of high IT project failure rates does not seem significantly reduced. Besides, there is a shortage of research information on this topic in the South East Asia region. Despite many studies concentrating on project performance and project success failure contributory factors, unfortunately, there is still a lack of an effective solution to mitigate some of these identified risks. Several studies have indicated approximately 60% of projects experienced failure, resulting in time and cost overruns or undesired production defects, because the existing models, tools, and techniques are not suitable to mitigate these risks and are incapable of predicting success, especially before initiation (Janssen, 2019; Magaña Martínez & Fernandez-Rodriguez, 2015). Many scholars stress that the current project management strategy focal point has to switch from a "monitoring-based" to a "predictive-based" approach by computational intelligence, intelligence (AI), or equivalent components, typically to improve forecasting capability in both time and cost dimensions (Bardsiri, 2020; Fasanghari et al., 2015; Fauser et al., 2015). This could enable and enhance the overall project management governance capability. Currently, there is still a lack of research to provide an effective solution to discharge these failure factors or inspire success factors to the next level, therefore leaving the research gap open for further investigation.

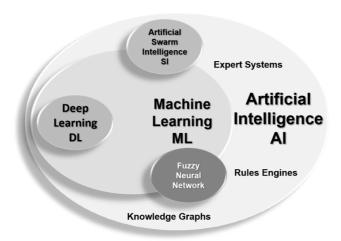


Fig. 1. The Artificial Intelligence Family

There were several studies on using AI in project management. A few examples include: evaluating project features using AI based on math, soft computing, and previous estimation methods (Bardsiri, 2020); proposing an AI method to predict the SPI and CPI of the projects in the earlier state of

the projects by computing the Earned Value Management (EVM) indexes (Fasanghari et al., 2015); and developing a new AI-based EVM tool to accurately forecast the DEAC (Sackey et al., 2020). AI is defined as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. It simulates human intelligence and animal intelligence in programmable machines to think like humans and animals and mimic their actions. Deep Learning (DL) is a subset of machine learning comprising more than one hidden layer with a specific algorithm aiming to provide much higher accuracy, typically in the application of image recognition and natural language processing. Machine Learning (ML) is a subset of AI that possesses the ability to modify itself when exposed to more data without human intervention. AI in a wider dimension includes other components such as the Rules Engine, Fuzzy Neural Network, Knowledge Graph, Expert System, and Artificial Swarm Intelligence (SI). Fig. 1 shows the relationship between the AI family.

IV. RESEARCH METHODOLOGY

This study begins with content analysis via a narrative review synthesizing insight into three different aspects: (1) project failure contributors, (2) project management techniques, and (3) machine learning models. The research both quantitative comprises surveys experimental-based. Fig.2 illustrates the research conceptual framework. Firstly, research gaps are identified via a literature review. Then further literature review is performed on three major aspects: Firstly, an investigation into Project Risk Factors answers RQ1 "What are the key contributors to high project failure rates?". Second, a study on effective project management techniques dealing with RQ2 "What are the feasible project management techniques for improving project failure rate?". Third, a study on various machine learning models, finds out their respective strengths and weaknesses attending to RQ3 "What Machine Learning model improve project failure rate?" Later, a Project Risk Ranking assessment is executed based on collected data from the quantitative survey. A suitable ML model is built to verify its performance in enhancing its prediction in both "cost" and "time" dimensions.

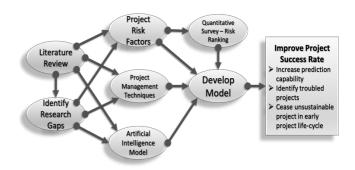


Fig. 2. Conceptual Framework

A. Research Design

The quantitative survey intends to use cross-sectional quantitative structured closed questionnaires to rank project risk contributory factors in both severity impact and frequency of occurrence to determine their risk exposure rating respectively. The experimental-based research leveraging

historical project information pre-processed in a specific format serves as a training and testing dataset for the machine learning model selection in the later stages. Various selected machine learning (ML) models will be evaluated based on their performance metrics *MMRE*, *RMSE*, *R*², *MAE*, *MdMRE*, *RMSLE*, and *Pred* (25). The best ML model will be shortlisted and put forward for live project verification.

B. Population of Study

The quantitative survey will involve a sample of 109 respondents with a target population of 150 project managers and project practitioners located in the Malaysia-Singapore region primarily, irrespective of their organization, gender, or age. The sample size is calculated based on the confidence level of 95% with a 5% margin of error.

C. Data Collection and Analysis

The quantitative survey will collect both primary and secondary data, and the quantitative data generated will be analysed using SPSS, JASP, or equivalent statistical software to perform descriptive and non-parametric statistical testing accordingly. The questions will be specific and detailed, seeking to gather information on identified key project risk factors in both impact and frequency of occurrence. Each key risk factor is then rated by risk exposure rating individually.

D. Experiment Design

In the experiment research, historical project performance data is collected from more than 600 IT projects with more than 8,000 records. Data is codified to maintain its anonymity. The data is filtered and pre-processed with relevant data fields then apply to ML for both the training and testing in the ratio of 70:30 as a guiding principle. It contains both the historical project EVM data and other codified project risk factor data. ML model will be developed using Python, Anaconda, or equivalent integrated development environment software platform with publicly available data/ML scientist API packages.

V. BENEFITS

This concept paper aims to provide an introduction to machine learning to enhance project management techniques in both cost and time prediction. The current shortcomings of project management models, tools, and techniques are not sufficient to mitigate these risks and are incapable of predicting success. The proposed model expects to see an improvement in prediction accuracy. This model is typically used by IT project practitioners and IT project governance bodies to identify troubled projects in the early project lifecycle, then enable proper decisions to be made and appropriate corrective actions to be taken.

From the project sponsored organization perspective, the proposed model can minimize potential wastage and losses by re-allocating precious limited project resources to higher success rate projects; maximizing project benefits and its return of investment (ROI); and indirectly boosting their confidence in approving more projects and dominate better project governance and decision-making capability.

In terms of stakeholders' benefit, they will be more satisfied and accepted of project performance due to the higher success rate. For consumers, the increment of IT projects introduces more innovative digital products and services, thus facilitating a positive contribution to consumer welfare. It improves the flow of timely relevant information such as market prices to any traders, substantially reduces costs in search, transportation, and reproduction, and therefore promotes market efficiency.

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Development of Secured and Reliable Safety VisionSystem Using Artificial Intelligence and Machine Learning for Marine Industry

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Abstract—This article will introduce the core concepts of an Artificial Intelligence and Machine Learning which could be used to develop a vision system for marine industry. It is to provide a robust autonomy capability system. Applications of this technology could be implemented in the development of safety system on the area where vision system can reliably detect humans or any other objects after the model training. This paper suggests on maximization on safe navigation with full regulatory compliance. This machine learning and artificial intelligence concept makes the job on board more efficient, allowing to do better data analysis and predictive analysis that will allow the crews onboard able to make a swift decision.

Keywords— Artificial Intelligence, Machine Learning, Marine Industry, Vision

INTRODUCTION

To monitor and check manufacturing processes, components, and equipment, vision systems are increasingly being employed in a range of industrial applications. This paper is written to describe the hardware and software requirement including machine learning, data persistence, web security, artificial intelligence model training, vision system tests and overall system integration. However the way these ships operate have remained practically the same with the exception of some world leading companies who have implemented great modernization initiative. Unattended Machinery Space, or UMS, is a revolutionary way of managing a ship's machinery and auxiliary services using a digitally controlled automation and monitoring system [1]. Introduction of these technologies in building secure and reliable vision system application will positively impact safety, productivity, and cost savings through monitoring and analytics. Artificial Intelligence and machine Learning could be used for high-speed predictions [2]. The autonomous will benefited the marine industry where communication are limited [3].

HARDWARE

NVIDIA® Jetson NanoTM Developer Kit is a small, powerful computer that lets you run multiple neural networks in parallel for applications like image classification, object detection, segmentation, and speech processing. All in an easy-to-use platform that runs in as little as 5 watts [4].

A. Jetson Module

Fig. 1 shows NVIDIA® Jetson Nano™ Developer Kit. This developer kit includes 128-core NVIDIA, Maxwell™ GPU, Quad-core ARM® A57 @ 1.43 GHz CPU and 2GB 64-bit LPDDR4 25.6 GB/s memory. It can be used to run

multiple neural networks in parallel for applications like image classification, object detection, segmentation, and speech processing. Maintaining the Integrity of the Specifications.



Fig. 1 NVIDIA® Jetson Nano™ Developer Kit, AI computer for makers, learners, and developers

Table 1 shows components included in the NVIDIA® Jetson Nano™ Developer Kit.

TABLE 1. NVIDIA® Jetson Nano™ Developer Kit

No.	Items specifications
1	microSD card slot for main storage
2	40-pin expansion header
3	Micro-USB port for 5V power input
4	Gigabit Ethernet por
5	USB 3.0 ports (x4)
6	HDMI output port
7	DisplayPort connecto
8	DC Barrel jack for 5V power input
9	MIPI CSI-2 camera connectors
10	microSD card slot for main storage

Source: https://developer.nvidia.com/

A.1 Write image to microSD card

Following command line instructions are necessary to complete the initial setup for the Jetson module. Following instructions works for Linux OS.

1. Open the Terminal application by pressing Ctrl+Alt+T

2. Insert your microSD card, then use a command like this to show which disk device was assigned to it:

```
dmesg | tail | awk ' $3 == "sd" {print}'
```

Use this command to write the zipped SD card image to the microSD card:

```
/usr/bin/unzip -p ~/Downloads/
jetson_nano_devkit_sd_card.zip | sudo
/bin/dd of=/dev/sd<x> bs=1M status=progress
```

4. When the dd command finishes, eject the disk device from the command line:

```
sudo eject /dev/sd<x>
```

A.2 Unit Setup and first boot

There are two ways to interact with the developer kit:

- 1. Using display, keyboard and mouse attached
- 2. The "headless mode" via connection from another computer

We will be using the headless mode. Once initial setup is completed, we can connect to the device using VNC (Virtual Network Computing) which enables the control of Jetson developer kit from another computer on the same network, by viewing and interacting with the desktop of the developer kit from the other computer [4].

Referring to fig. 2, Insert the microSD card (with system image already written to it into the slot on the underside of the Jetson Nano module. Complete the setup by following below steps for Linux OS [4].

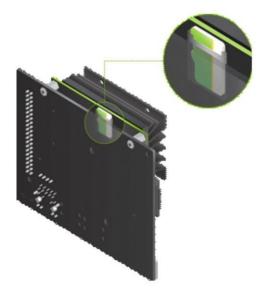


Fig. 2 NVIDIA® Jetson Nano™ Developer Kit, microSD location

1. Locate the tty device. Before connecting to your Jetson developer kit for initial setup, check to see what Serial devices are already shown on your Linux computer.

```
$ dmesg | grep --color ' tty'
```

2. Connect your Linux computer to the developer kit's Micro- USB port and run the same command to find what's newly added.

```
$ dmesg | grep --color ' tty'
[xxxxxx.xxxxxx] cdc_acm 1-5:1.2:
ttvACMO: USB ACM device
```

3. The new serial device is for your Jetson developer kit.

```
$ ls -1 /dev/ttyACMO
crw-rw--- 1 root dialout 166,
0 Oct 2 02:45 /dev/ttvACMO
```

 Screen command. Install the Screen program on your Linux computer if it is now already available. For example, use this command to install Screen if you are running Ubuntu.

```
$ sudo apt-get install y screen
```

5. Use the device name discovered previously as a command line option for the 'screen' command.

```
$ sudo screen /dev/ttyACMO 115200
```

- 6. Terminate screen. To terminate your screen session, press Ctrl + a + k (Ctrl + a, then k), then press y on confirmation.
- 7. Once connected to the developer kit, hit SPACE if the initial setup screen does not appear automatically.

SOFTWARE FOR IMAGE CLASSIFICATION

There are multiple types of deep learning networks available, including recognition, detection/localization, and semantic seg- mentation. The first deep learning capability explained below is image recognition, using classification networks that have been trained on large datasets to identify scenes and objects.

The ImageNet object accepts an input image and outputs the probability for each class. Having been trained on the ImageNet ILSVRC dataset of 1000 objects, the Google Net and ResNet-18 models were automatically downloaded during the build step. Refer to Jetson Inference repository for other classification models that can be downloaded and used as well [4].

B.1 Using the ImageNet Program on Jetson

ImageNet program is used to test ImageNet recognition on some example images. It loads an image (or images), uses TensorRT and the ImageNet class to perform the inference, then overlays the classification result and saves the output image [5].

- 1. After building the project, make sure your terminal is located in the aarch64/bin directory:
 - \$ cd jetson-inference/build/aarch64/bin
- 2. Next, images are classified with the ImageNet program, using either the Python variant. Docker container can also be used and it's recommended to save the classified output image to the images/test mounted directory. These images will then be easily viewable from your host device in the jetson-inference/data/images/test directory (for more info, see Mounted Data Volumes).
 - \$./imagenet.pyimages/example.jpg
 images/ test/output_0.jpg
 - # (default network is googlenet)

By default, the project will download the GoogleNet and ResNet-18 networks during the build step. There are other pre-trained models that can be used as shown in Table 2.

TABLE 2. PRE TRAINED MODULES

Network	CLI argument	NetworkType enum
AlexNet	alexnet	ALEXNET
GoogleNet	googlenet	GOOGLENET
GoogleNet-12	googlenet-12	GOOGLENET_12
ResNet-18	resnet-18	RESNET_18
ResNet-50	resnet-50	RESNET_50
ResNet-101	resnet-101	RESNET_101
ResNet-152	resnet-152	RESNET_152
VGG-16	vgg-16	VGG-16
VGG-19	vgg-19	VGG-19
Inception-v4	inception-v4	INCEPTION_V4

Source : https://github.com/

B. Deploying for production environment

Once the application is developed locally, following consideration have to be made before it can be deployed to the production environment.

C.1 Containerizing applications

For ease of deployment and reliability, all applications will be containerized using Docker [6]. Docker is an open platform for developing, shipping, and running applications. Docker enables separation of applications from infrastructure so software can be delivered quickly. With Docker, infrastructure is managed in the same ways as applications. By taking advantage of Docker's methodologies for shipping, testing, and deploying code quickly, this can significantly reduce the delay between writing code and running it in production. Applications that communicate to one another can be put into the same network and this can be managed by Docker Compose [6]. Compose is a tool for defining and

running multi-container Docker applications. With Compose, a YAML file is used to configure application's services.

Fig. 3 shows three services composed using Docker Compose. Front facing application, server-side application and database for persistence.

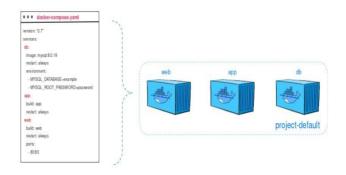


Fig. 3 Docker Compose services

B.2 Data persistence

In order to persist data reliably, it is important to save the data to a database. This ensures that the data is persisted even when the application restarts and when the data is no longer available in memory. This is important since there will be output from the live feed camera for analytical and for records purposes. MYSQL database is used in a Docker container similar to what was explained above.

One important consideration while using Docker containers is volumes. Volumes are the preferred mechanism for persisting data generated by and used by Docker containers. While bind mounts are dependent on the directory structure and OS of the host machine, volumes are completely managed by Docker. Volumes have several advantages over bind mounts:

- Volumes are easier to back up or migrate than bind mounts.
- Volumes using Docker CLI (command line interface) or the Docker API (Application programming Interface).
- Volumes work on both Linux and Windows containers.
- Volumes can be more safely shared among multiple containers
- Volume drivers let you store volumes on remote hosts or cloud providers, to encrypt the contents of volumes, or to add other functionality.
- New volumes can have their content pre-populated by a container.
- Volumes on Docker Desktop have much higher performance than bind mounts from Mac and Windows hosts.

Fig. 4 shows the architecture for docker volume. The mounted space is outside of the container on the host itself so that the data is not lost when the container is destroyed.

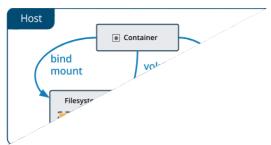


Fig. 4 Docker volume for data persistence

B.3 Authentication and authorization

Authentication can be added to the front facing app for role-based access control and for a simple authentication. JSON Web token (JWT) is used and then passed in the HTTP request header as a bearer token to authorize and authenticate the user before a request can be made to the server [7].

JWT token is set to expire within minutes for security purposes. Another token, which is called a refresh token can be used to refresh the JWT token by verifying the signature against private key or by issuing a new JWT token from the authorization server. Details for authorization server is out of scope from this research paper.

JWT Structure JWTs consist of three parts separated by dots., which are:

- Header The header *typically* consists of two parts: the type of the token, which is JWT, and the hashing algorithm such as HMAC SHA256 or RSA.
- Payload The second part of the token is the payload, which
 contains the claims. Claims are statements about an entity
 (typically, the user) and additional metadata. There are three
 types of claims: reserved, public, and private claims.
- Signature To create the signature part you have to take the encoded header, the encoded payload, a secret, the algorithm specified in the header, and sign that.

Fig. 5 shows how JSON Web tokens work. Whenever the user wants to access a protected route, it should send the JWT, typically in the Authorization header using the Bearer schema.

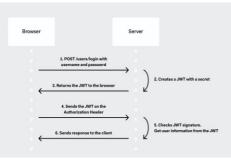


Fig. 5 How JWT works

Therefore, the content of the header should look like the following.

Authorization: Bearer <token>

APPLICATION DEVELOPMENT

This section describes the development of the vision system and a sample application section where it will be used in a production environment on ship in marine industry.

A. Image Classification and Object Detection

This section explains the usage of two programs:

· imagenet: Image classification

• detectnet: Object detection

Object detection is using a network called *SSD Mobilenet* and this will be used in the final application.

Fig. 6 shows the run script which will boot into the docker container and mount volume on the host as shown in fig. 7. Images and test outputs are mounted on the data/images directory.



Fig. 6 Running docker script inside Jetson Nano

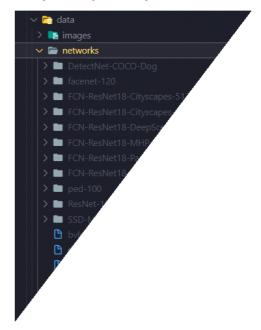


Fig. 7 Docker Volume mount

B. Image Classification

Following images which is captured by the system were fed into the ImageNet program and the resulting output is shown on the images as in fig. 8,9 and 10.



Fig. 8 Detected as can or tin opener by 13.3%



Fig. 9 system detected as miniature pincer by 13.7% accuracy



Fig. 10 Detected as a seatbelt by the system with 17.9% accuracy

C. Object detection

Following images were fed into the DetectNetprogram and the resulting output is shown on top of each images.

The fig. 11, 12 and 13 shows the object has been detected with the highest degree of accuracy.



Fig. 11 detected as motorcycle 76.2% accuracy



Fig. 12 Cat has been detected by 99.4% accuracy



Fig. 13 Detected as a person 94.9% accuracy

Fig. 14 shows the flowchart for the entire system process. Person detection using current pre-trained model is reliable enough with average detection of more than 90% confidence. If needed, additional model training could be included to increase object categories for

detection. The system will only focus on person detection and additional training is not required.

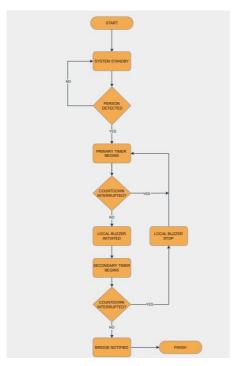


Fig. 14 System flowchart

SAFETY WITH VISION SYSTEM

Artificial Intelligence (AI) becoming important technology in economic and daily human life [8]. There are unlimited possibilities for the usage of artificial intelligence (vision system) in enhancing maritime industry. Once the basic setup is done, the system can be configured to achieve any desired possibilities with great improvement in many aspects of marine industry such as safety, reliability and enhancing work experience. Artificial intelligence (AI) is gradually useful in most of the industry. One of the applications of AI is the face recognition system [9].

Some examples of where this system can be applied are:

- 1. Enclosed space or hazardous space access monitoring
- 2. Piracy control
- 3. ISPS compliance
- 4. Safety systems
- 5. Visitor monitoring
- 6. Collision avoidance system
- 7. Work rest hours records

CONCLUSION

For research purposes, application of vision system to be demonstrated in a controlled environment in refrigerated compartment onboard vessel. Almost all vessels will have some sort of refrigerated compartments. From refrigerated tanks onboard fishing vessels to refrigerated rooms for storage of provisions. All of these compartments require constant access by human being for work related needs. Temperature inside these compartments can be as low as 25 degree Celsius. This possesses a great threat to anyone working in these environments. There is a need to ensure a system is in place to alert someone in case the person working there is in danger or requires assistance. By using vision system, a configuration can be made to alert officer on the bridge in case the person inside the refrigerated compartments is incapacitated.

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Machine Learning-based Security Model for Lowpower and Lossy IoT Networks

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Abstract— Internet of Things is a paradigm in digital technology that has revolutionized various life domains. However, it has also caused an escalation in critical security challenges because of intrinsically insecure IoT devices that are placed in sensitive environments. IoT's vulnerability to network and routing attacks has notably exacerbated. Therefore, it is crucial to address routing attacks in IoT networks. IoT networks commonly use the IPv6 Routing Protocol for Low-power and Lossy Networks, also known as RPL. This protocol fulfils the communication and networking needs in IoT. However, it is equally susceptible to security attacks as well due to its lightweight core which is designed to meet the resource constrained nature of Internet of Things. Thus, it is necessary to investigate the security attacks in RPLbased IoT networks and propose remedial solutions. In recent literature, researchers have proposed various solutions including protocol optimization in terms of security and intrusion detection system placement in the network for attacks detection. In this paper, these methods are critically reviewed and analyzed. Furthermore, a machine learningbased security model is presented for addressing rank and wormhole attacks. Finally, a discussion is staged concerning the use of machine learning-based security techniques for IoT networks along with the future directions in this research area.

Keywords— Internet of Things, Wireless Sensor Networks, RPL, Security Attacks, Routing Attacks, Machine Learning

I. INTRODUCTION

Internet of Things (IoT) is a network of small devices comprising sensors, Radio Frequency Identification (RFID) tags, and actuators. They are embedded in systems that are now a part of telecommunication infrastructures, smart homes, smart cities, smart electronic healthcare systems [1], and intelligent transport systems [2]. IoT devices connect the internet, perform machine-to-machine communication, and are partially or fully involved in the decision-making processes. This interconnection and communication lead to smartness and automation, which is the eventual goal of IoT. Some examples of IoT in the intelligent environment are heart patients with pacemakers connected to the relevant stakeholders for monitoring purposes. RFID tags, small sensors, and actuators are embedded in the system for intelligent communication. The surface area of interconnection has gradually widened and is continually increasing.

IoT has gained tremendous attention due to the smartness and automation that it induces in the infrastructure of a domain. However, security is a major concern in terms of communication, routing, and other methods used for delivering information from one place to another. Several attack detection and mitigation approaches have been proposed to overcome this challenge. These include authentication schemes, encryption schemes, monitoring and attack detection frameworks, secure routing protocols for Internet of Things, etc.

The main properties of IoT nodes include high loss rates, low data rates, instability, and wide-scale interconnectivity of nodes. Based on these characteristics, the routing protocol for IoT should comprise features like energy efficiency, low power expenditure, and internet enablement [3]. IPv6 Routing Protocol for Low-power and Lossy Networks (RPL) was introduced by Internet Engineering Task Force (IETF) to fulfil these requirements. However, like traditional protocols, RPL is also vulnerable to significant range of security attacks. One way to classify these attacks is RPL-specific and Wireless Sensor Network (WSN)-inherited which are discussed in Section II.

With wide-scale implementation of IoT systems and use of RPL for routing in such low-power and lossy networks, it is necessary to address these attacks. Several attack detection and mitigation strategies have been proposed for improving security in RPL-based IoT networks including Intrusion Detection Systems (IDS) [4], protocol optimization using trust-based approaches [5], and Machine Learning (ML)-based [6] solutions. The following contributions have been made through this research:

- Categorically highlighting the various routing attacks in RPL-based IoT networks, i.e., RPL-specific and WSN-inherited attacks.
- Review of recent proposals for improving security in RPL-based networks.
- Presenting a machine learning-based security model for addressing the security attacks in RPL.

This paper is organized as follows: Section II discusses various routing attacks in RPL-based IoT networks with a focus on RPL-specific and WSN-inherited attacks. Section III critically reviews recent methods proposed concerning the security improvements in RPL networks. In Section IV, a machine learning-based model is presented for mitigation of rank and wormhole attacks. Section V discusses the potential of machine learning for development of security solutions for IoT and RPL-based networks. Section VI concludes the paper with a summary of final remarks and future directions of this research work.

II. ROUITNG ATTACKS IN RPL-BASED IOT

The routing attacks in RPL-based IoT networks can be broadly classified into protocol-specific and WSN-inherited attacks [7]. Some of them include decreased and increased

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rank attack, version attack, Directed Acyclic Graph (DAG) and Destination Oriented DAG (DODAG) inconsistency attacks, wormhole attack, blackhole and other variants of denial-of-service attacks. In the next sub-sections, these attacks are described and discussed.

A. Protocol-specific Attacks

Some of the more severe attacks specific to the RPL-based low-power networks like IoT are rank, version, DAG and DODAG inconsistency attacks.

- 1) Rank Attack: Rank is one of the fundamental features of an RPL network which is related with almost every ongoing operation in RPL. Its main functions include prevention from loop formation, provision of optimal network topology and management of control overhead [8]. However, these responsibilities also pose threat to the overall network in case if an attacker finds a way to target the rank. It will not only affect the rank property itself but also other components of the network. It may also lead to other derived attacks. An attacker can manipulate the rank by increasing or decreasing it, or in another case leading child nodes to select a parent node with worst properties. These categories of rank attack are further discussed in [9][10][11].
- 2) Version Attack: This attack is also known as version number attack. In this type of attack, the attacker node uses DODAG Information Object (DIO) message to falsely transmit a higher version number to neighbor nodes which leads to the construction of a new DODAG tree and reestablishment of trickle timer [12]. The damages caused due to this attack include network operation disruption, increased control overhead, unavailability of communication routes, routing loops, packet delivery loss, and doubled network delay [13].
- 3) DODAG Inconsistency Attack: In this attack, an attacker can track DODAG inconsistencies in an RPL network by manipulating header options in the protocol [14] and use them to cause denial of service. It also increases the control overhead which leads to network disruption and resource consumption.

Some other RPL-specific attacks include local repair attack, DODAG Information Solicitation (DIS) attack, neighbor attack, and RPL storing-mode attack.

B. WSN-inherited Attacks

In most IoT infrastructures, wireless sensor networks lie at the core and play essential role in the system architecture. Consequently, many WSN-based routing attacks affect the IoT networks correspondingly with some changes in the attack pattern to adjust to the IoT paradigm. Although, many attacks in this category are not as detrimental as the RPL-specific attacks, there are some which can lead to severe damages. These include wormhole attacks, sybil attacks [7], and blackhole attacks.

1) Wormhole Attack: Wormhole attack is originally known to target wireless networks through wired or wireless links with low latency [15]. Over the years, wormhole attack has evolved in regards with its mode of targeting and launching an attack. It can occur in the following three ways: out of bound link, packet encapsulation, and packet

relay. In an RPL-based IoT network, it is evidently easier to launch it. Moreover, it can trigger other attacks, like replay attacks and denial of service, once it finds its way into the network [16], which is more destructive for an RPL network due to its restricted resources availability. A wormhole attack sniffs, listens, and records the network traffic, steals the information and uses it for malicious purposes. Some other effects of wormhole attack on a network include decreased throughput, loss of privacy and severe network disruption [17].

- 2) Blackhole Attack: In a blackhole attack, one or more malicious nodes drop the network packets instead of forwarding them. This does not only disrupt the normal network activity but also triggers other attacks like denial of service [18]. This attack can cause more damages if the packets are maliciously modified before being forwarded and then selectively forwarded. The most significant effects of blackhole attacks are increased end to end delay, advertisement of false route, and low packet delivery ratio.
- 3) Sybil Attack: In a sybil attack, the attacker node(s) imitates the identities of normal nodes to increase its influence on the network and disrupt network topology [19]. There are three classifications of the attack based on their bond and adjustability with other nodes in a network. They are known as SA-1, SA-2, and SA-3. Additionally, there are some variants of the sybil attacks as well, more common of which are clone ID, simultaneous and non-simultaneous sybil attacks. The common impacts of these attacks include degraded data integrity, redundancies in the protocol and unlawful use of network resources.

In the next section, a critical review of recent literature is performed concerning the methods proposed by researchers to detect and mitigate various security attacks in RPL-based low-power and lossy networks.

III. RELATED LITERATURE

In this section various methods and schemes proposed by researchers for improving the security in low-power and lossy networks like IoT and WSNs are reviewed.

In [20], authors have proposed a deep learning-based machine learning method for detection of routing attacks for IoT. Authors have focused on hello flood, version number and decreased rank attacks. Similarly, [21] has also used various machine learning approaches to propose an architecture for intrusion detection called Ensemble Learning based Network Intrusion Detection System (ELNIDS). It is visible from the chosen dataset, i.e., RPL-NIDDS17, that they have prioritized the focus on WSN-inherited attacks while adding one RPL-specific to the list for detection.

Similarly, [22] has used machine learning to propose a rank attack detection technique. The authors have used k-NN approach in their work, called MLTKNN. Authors suggested that during the DODAG creation process, the malicious node with fake rank is potentially capable of attracting the sink node in order to build a routing path through it which may cause severe damage to the network. MLTKNN detects malicious node while utilizing distance based matric. The detection algorithm is injected into the sink node. Other nodes are divided into regular and attacked nodes, by injecting rank attack code into the latter group. Neerugatti

and Reddy have also proposed a wormhole attack detection technique called ADWA in [23]. In their work, authors have used acknowledgment based process to detect the malicious node. Likewise, [24] has proposed an intrusion detection scheme which focuses on analysis of the data in an IPv6 packet's compression header in order to alleviate individual as well as combination of attacks.

In [25], authors have presented an anomaly detection system specifically for three single mote attacks, i.e., version number, blackhole and hello flood attacks. Kernel Density Estimation (KDE) model lies at the base of this proposed solution. The system consists of following steps: 1) different models are trained, optimized and generated with differing number of nodes which are later used in the anomaly detection, 2) every node sends its received data packets to anomaly detection tool where feature extraction process takes place, 3) pretrained model as mentioned in step 1 is selected based on the criterion of number of neighboring nodes which are within a certain node's communication range, 4) model is evaluated by testing it on the test data.

Similarly, [26] has also presented a hybrid anomaly detection system for detection of selective forwarding attack, clone attacks and packet flooding attacks. The detection is node monitoring-based, where each sensor node monitors its neighbor and participation of every node in this process is necessary. [27] has proposed a distributed anomaly-based intrusion detection approach. Each node in the system performs the anomaly detection procedure which means that every node independently monitors every other neighboring node in order to detect suspicious behavior.

[28] has proposed an algorithm for detection of DDoS attack in RPL and identification of secure route for nodes to transmit the data packets. The authors have used clustering approach where clusters of nodes with similar properties form a cluster, such as root node cluster, legitimate node cluster and attacker node cluster. First the proposed CBC algorithm is used to select the most favorable root node in terms of its distance from the border router. Thereafter, the typical DODAG formation process takes place. In order to identify a distributed denial of service attack, E-ACO algorithm is launched which performs sequentially in five steps including initialization, traffic evaluation, fitness calculation, probability detection, and attack identification. Similarly, [29] has proposed a trust-based approach to address two WSN-inherited attacks, i.e., wormhole and grayhole attacks in RPL. In [30], authors have used the similar approach, i.e., trust-based strategy to propose an attack detection scheme in RPL. They have focused on three WSN-inherited attacks, which are, wormhole, sinkhole and blackhole attacks. In [31][10], authors have proposed an algorithm called RIAIDRPL to detect a type of rank attack,

i.e., increased rank attack that sub-optimizes an RPL network by creating loops. Similarly, in [32], authors have also addressed rank attack and proposed a sink-based centralized intrusion detection approach called SBIDS.

From various research works, it has been observed that there is a gap in addressing rank and wormhole attacks using a single security solution. The rank and wormhole attacks are among the most harmful ones belonging to RPL-specific and WSN-inherited attacks categories, respectively. Once launched in a network, they can potentially cause loop formation, increased control overhead, network disruption, topology inconsistency, reduced throughput, and triggering of other derived attacks. Therefore, a security model is presented in the next section based on machine learning techniques to address these attacks.

IV. PROPOSED MODEL

In this section, a machine learning-based model is presented for detection of rank and wormhole attacks in RPL-based IoT networks. Support Vector Machine (SVM) is used to design the model. SVM is a supervised machine learning approach used in classification problems which are mainly binary in nature. The main objective of using this technique is to classify maximum data points into the classes correctly. This can be achieved by maximizing the margin between the hyperplane and support vectors. Support vectors are the data points closest to the hyperplane and determine as well as affect the position of the hyperplane. Maximizing the margin will increase the chances of correctly classifying the items leading to improved accuracy.

In this research, multiclass Support Vector Machine (SVM) is proposed to be employed for detection of rank and wormhole attacks in RPL-based networks. The use of this approach will allow the classification of RPL network traffic to be classified into benign, rank attack carrier, or wormhole attack carrier, based on parameters set for classification and differentiation of malicious traffic from normal traffic.

The selection of parameters as well as optimization of the model is crucial as it should be both accurate and generalizable. Generalization is important because the purpose of utilizing machine learning is to be able to develop solutions which can be implemented in other domains in future. Therefore, multiclass SVM is proposed to be a suitable choice because it will fulfil both the conditions. Firstly, it is highly reputable for producing accurate results more unbiasedly as compared to other techniques. Secondly, the employment of multi-class version may allow, in future, further optimization for detection of more than two attacks which behave similar to the attacks addressed in this research. This will satisfy the required condition of solution

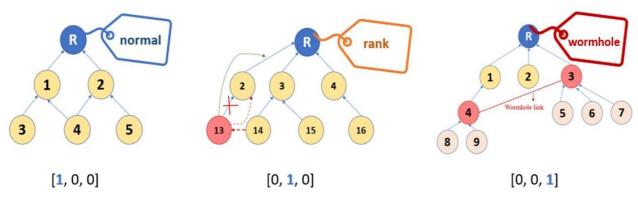
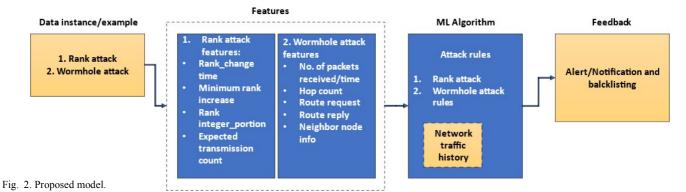


Fig. 1. Classification of three classes using multiclass support vector machines with one-hot vector encoding.



generalization.

A. Multiclass Support Vector Machines

Traditional Support Vector Machines (SVM) classify the data into two classes, also called as binary classification. However, we can extend binary functionality to solve multiclass problems. There are two ways of extension. First, we can compute a function which can be optimized, represented as $\mathcal{G}_W(x_i)$ and round it off to nearest of classes 1 to k. The value of k is 1 to 3 in case of our problem. However, this method places the classes in order which is not optimal. For example, it will order normal traffic into order 1, rank attack into order 2 and wormhole attack into order 3. This ordering will mean that wormhole attack traffic is more than rank attack traffic which in turn is more than the normal traffic. This will cause problems and bias in the classification. Therefore, this approach cannot be used to solve the problem.

To solve this issue, another approach can be used which is as follows. If the *ith* observation has class k=3, then we can use $y_i = e_k$. This method is known as one-hot vector encoding [33] which removes any relative ordering of classes in the model. For instance, to classify the network traffic into normal or carrier of any of the two attacks, the labels will be encoded into 0s and 1s. A graphical representation of vectors is shown in Fig. 1.

The classifier will classify the instance to the class that it belongs to, based on the parameters while encoding the corresponding vector to 1 and the remaining two classes to 0 as shown in Fig. 1. The order of vector elements to their corresponding labels is independent of the order and can be different depending on the underlying code or the library being used for one-hot coding. Therefore, the chances of bias are minimal when this technique is employed in SVM to classify the data. As mentioned earlier, multiclass SVM, also known as multinomial SVM is a type of SVM used for classification of data into one of three or more classes. It is different from multilabel classification where multiple labels for one class are required to be predicted. In multiclass classification, one instance should be categorized into only one class. Therefore, it is very important to use the parameters which can significantly differentiate among three classes to allow accurate classification of the network traffic.

B. Parameters for Benign Network Traffic and Attack Dataset

This is one of the most important steps in development of the model. Here, parameters are selected for classification of network traffic into normal, carrier of rank attack, or carrier of wormhole attack. In this research, decreased rank attack is addressed.

The rank of a node in RPL is the scalar representation of its place in the network or the node's radius within one DODAG iteration. The value of rank is typically calculated by the objective function of that specific network. The parameters for detection of decreased rank attack include the time taken for a node to change its rank, minimum increase in the rank between a child node and the parent node, rank quantity, and integer portion of rank which is calculated using (1) for rank comparison between child node and possible parent node. These parameters are specific to the properties of rank of nodes in an RPL network based on RFC6550. If any of the nodes displays abnormal values of these parameters, the traffic from that node is classified into rank attack class.

DAGRank(rank) = floor(rank/MinHopRankIncrease) (1)

Similarly, for the detection of wormhole attack, the classification parameters must be specific to the behavior of nodes under this attack. Typically, when a network is under this attack, two nodes place themselves in relatively powerful positions in that network and attract the network traffic from legitimate nodes to pass through them in order to listen, record and replay it. This leads to resource consumption and network disruption. Therefore, the parameters for classification of this attack must be very specific to avoid the attack consequences. A summary of network traffic parameters particular to the attacks is shown in Table 1.

TABLE I. PARAMETERS CLASSIFICATION OF RANK AND WORMHOLE ATTACKS

Benign Network Traffic	Carrier of Rank Attack	Carrier of Wormhole Attack	
Time taken for a node to change its rank	Time taken for a node to change its rank	No. of packets received/time	
Minimum increase in the rank	Minimum increase in the rank	Hop count	
Rank quantity	Rank quantity	Route request	
Integer portion of rank value	Integer portion of rank value	Route reply	
Expected transmission count	Expected transmission count	Immediate neighbor node data	

C. Model Design

Fig. 2 presents the proposed model for handling rank and wormhole attacks. It shows various elements of the attack management. Every time a node passes through the network, machine learning algorithm immediately checks it for any suspicious behaviour to verify whether or not it is malicious.

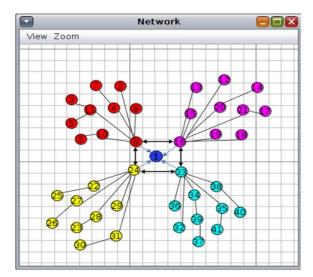


Fig. 3. Cluster-based system modelling.

In order to do this, the algorithm looks at the features of the two attacks, such as minimum rank increase, rank quantity, number of packets received per unit time, hop count, route request and route reply. If the node is found to be malicious, it is blacklisted and stopped from passing through the network. The model is optimized, and parameters are further tuned to improve its performance. This is followed by cross comparison with a baseline model for evaluation purposes.

D. System Modelling

An RPL network of 41 sensor nodes grouped into clusters is assumed to be running on a 6LoWPAN IoT network. Each cluster has a cluster head where attack detection unit will be implemented. Fig. 3 shows four head nodes, i.e., nodes 8, 16, 24 and 33. All nodes have their own unique ID for identification and tracking purposes. We assume that the attacker node will start launching the attack a few seconds (120 to 180 seconds) after the start of simulation, so the network is settled and there is a stable network topology. In this use case, in rank attack scenario, at least one node is malicious while in wormhole attack, two nodes will work together to trigger the attack.

E. Implementation Scenario

In this research, IoT-enabled smart home use case is considered for deployment of attack detection module in the cluster heads of the clusters. These clusters are formed based on the functionality of nodes. Nodes which perform uniform or similar tasks are grouped together to create a cluster. Each cluster head is assumed to be a conventional router. An example could be a Cisco router which is connected to other clusters through their cluster heads. A schematic diagram of



Fig. 4. Schematic diagram of IoT-enabled smart home representing the implementation of smart sensing nodes grouped into clusters based on uniformity of their function.

the use case is represented in Fig. 4.

V. DISCUSSION

Security of IoT infrastructure as a whole and particularly the routing protocol security is crucial for secure and wide-scale adoption of the IoT systems. Considering the inability of traditional security solutions to function in resource constrained IoT networks, alternative solutions need to be developed to fulfil the security requirements, specifically the confidentiality, integrity and availability. Additionally, the security solution should be adaptable for flexibility of application in diverse IoT domains. In addition, it should be able to handle the routing and other security attacks.

Some of the approaches used for mitigating RPL attacks in IoT networks are ML-based, intrusion detection systems and trust-based schemes [34]. Machine learning provides embedded intelligence across the IoT spectrum and has the potential to be leveraged to deal with various security problems. For instance, machine learning is used in the development of different types of IDSs which are then placed centrally or distributed throughout the network to handle the attacks.

ML models are significant in the security domain of IoT and RPL because they can effectively use the stored data and network traffic to make assumptions as well as discover new patterns. This factor helps in identification of malicious activities in the network. In recent years, ML algorithms have been used for preventive protection, automated response, and infringement detection. In 2021, the notion of tinyML has gained popularity and it is being studied by researchers to develop lightweight machine learning-based security solutions for low-power and lossy networks, such as IoT.

IoT is a continually growing aspect of industrial revolution and has reached almost every major domain of life such as healthcare, homes, cities and various systems operating within these domains, like transportation, smart metering, etc. Therefore, efficient and scalable security solutions are required for reliable IoT system deployment. ML models fulfil these requirements proving that it is a promising field for developing solutions for IoT security as a whole and particularly for RPL-based networks due to the following reasons:

- ML offers detailed scanning processes for detection of any malware and other security attacks.
- ML provides fast data and network traffic analysis.
- It provides endpoint protection via swift remediation.
- The development of tinyML to offer lightweight security solutions for low-power and lossy networks is a vital enhancement.

VI. CONCLUSION AND FUTURE DIRECTIONS

RPL is specially designed as routing standard that caters to the routing requirements of IoT networks, such as light-weighted-ness and limited resource consumption. This standard, however, is equally vulnerable to security attacks as any other traditional protocol in wireless networks and IoT. Several solutions have been presented by researchers to

counter some of the attacks including security-wise optimized protocol and intrusion detection systems. In this research, a machine learning-based security model is presented to improve secure routing in such networks. The attacks addressed are rank and wormhole which can severely affect the network.

Secure deployment of RPL is a novel field of research and it is observed that a potential amount of work is being done in the area of security for routing protocol for low-power and lossy networks. However, the improvement is still in its age of infancy while insecure implementation of IoT is exponentially growing. It is also observed that the existing solutions are limited for implementation on a few individual components of IoT infrastructure. In future, a uniform security approach is expected to be developed using machine learning techniques, that will be applicable to large-scale networks such as smart cities, urban infrastructures and interconnected transportation systems.

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Potential Chemical-Based Inhibitors for Human Glutathione S- Transferase P1 (GSTP1) Enzyme Using CB Docking Tool

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Abstract — Overexpression of human Glutathione S-Transferase P1 (GSTP1) enzyme in tumour cells have led to chemoresistance, one of the major challenges faced by medical practitioners. Ethacrynic acid (EA) was reported to be the first generation of established GSTP1 inhibitor back in early 1990s. Restricted usage of EA inhibitor had then been reported as it seems to cause significant side effects with poor efficacy. Thus, the main objective of this research is to determine potential GSTP1 inhibitor which capable to exhibit an effective inhibition on the overexpression of GSTP1 enzyme with lowest possible side effects. Auranofin (AF), ezantiostat hydrochloride of TLK199 and canfosfamide hydrochloride of TLK286 are known to be the potential chemical-based GSTP1 inhibitors. Rather than using conventional AutoDock software, protein-ligand blind dockings were conducted using latest CB-Dock web-server. For the first aspect, top Vina scores of each inhibitor EA, AF, TLK199 and TLK286 were known to be - 6.7, - 6.6, - 8.3 and -7.8 respectively. Those Vina scores were compared with reference EA inhibitor in which more negative top Vina scores will represent higher binding affinity. For the second aspect, protein-ligand interactions were evaluated in terms of whether potential GSTP1 inhibitors had binded to critical amino acids of "1eoh" as similar with reference EA inhibitor. According to the findings, TLK199 was found to bind with highest number of amino acids which consists of 13 out of 14 amino acids in comparison with reference EA inhibitor excluding P9 (Pro). In conclusion, TLK199 may emerge as the most potential GSTP1 inhibitor to reverse current chemoresistance problem. Yet, further studies on this proposed inhibitor are essential in order to open new insights in providing highly effective chemotherapy treatments to the cancer society.

Keywords — Glutathione S-Transferase P1 (GSTP1), ethacrynic acid (EA), GSTP1 inhibitors, TLK199, CB-Dock

I. INTRODUCTION

Human Glutathione S-Transferase P1 (GSTP1) is a phase II metabolic enzyme which acts as the most universal member of the soluble GST protein superfamily with versatile functions in human systems (Allocati et al., 2018). The main physiological function of human GSTP1 enzyme is based on its catalytic function where it catalyses the conjugation of glutathione (GSH) to exogenous and endogenous electrophiles as a mechanism of cellular detoxification. GSTP1 enzyme also aid in regulating Jun N-terminal kinase (JNK) through protein—protein interaction with JNK that results in suppression of apoptosis and cell signalling (Niitsu et al., 2020).

Proposed mechanism of GST P1-1 mediated resistance to cis-DDP, an anticancer agent is divided into two. The first mechanism explained on how cis-DDP is able to be highly effective in normal levels of GST P1-1. Firstly, the presence of normal level of GSTP1 is complexed with GSH and c-Jun N-terminal kinases (JNK). This condition will maintain low JNK activity which cause inhibition of cell death (apoptosis). Following cis-DDP treatment and intracellular activation, Pt ions will coordinate subunits of GST P1-1 through the cysteine residues. GST P1-1 oligomerization then induced JNK release with subsequent activation via phosphorylation that leads to apoptosis. Thus, cis-DDP was found to be an effective anticancer agent. However, for the second mechanism of overexpression level of GST P1-1 in cancer cells, GST P1-1 monomers and dimers are complexed with JNK. Upon cis-DDP treatment, the released Pt ions are both sequestered by GST P1-1 and cause conjugation to GSH (GS-Pt). However, overexpression of GST P1-1 enzyme will cause only a small amount of GST P1-1 dissociates from JNK which led to inactivation on apoptotic signaling cascade. Thus, cis-DDP could not works and results in chemoresistance (De Luca et al., 2019).

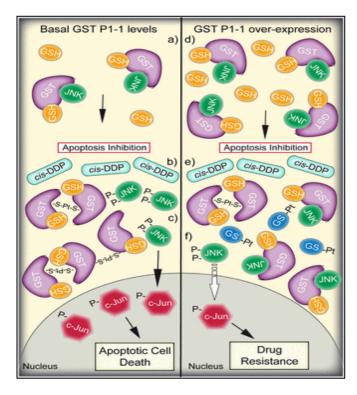


Fig. 1. Proposed mechanism of GST P1-1- mediated resistance to cis-DDP (De Luca et al., 2019).

Ethacrynic acid (EA) acts as reference inhibitor for this study. This diuretic drug is known as the only and first well-established inhibitor who had undergone clinical application in overcoming the overexpression of GSTP1 enzyme ever since early 1990s (Pljesa-Ercegovac et al., 2018).

EA inhibitor works to reduce the overexpression level of GSTP1 enzyme through two steps. Firstly, EA inhibitor is capable to bind directly to substrate-binding sites of isozymes for effective inhibition of GSTP1 enzyme. Secondly, EA inhibitor has the ability to cause induction on combination of α , β -unsaturated ketones and GSH via nucleophilic addition reaction. This reaction will cause depletion of available GSH to combine with chemotherapeutic agents which eventually led to an overall GSTP1 inhibitory effect (S.-C. Dong et al., 2018). However, this classic GSTP1 inhibitor was reported to have poor efficacy besides causing some adverse health effects such as lack of isozyme specificity and diuretic properties of water and salt imbalance (J. Dong et al., 2018).

Fig. 2. Chemical structure of ethacrynic acid (EA).

Auranofin (AF) is previously known as a common drug for treatment of rheumatic arthritis. Lately, few proposed studies had reported that auranofin do exhibit anticancer activity (Zhang et al., 2019). AF is known to aid cells in overcoming resistance to platinum-based drug (Pljesa-Ercegovac et al., 2018). Based on a research study, AF has been reported to be an ideal alternative for colon cancer treatment due to adverse health effects and chemoresistance that occur in conventional platinum-based chemotherapy. Due to its lower affinity in DNA strand, AF is capable to prevent cross-resistance to platinum derivatives and focus on interactions and targeting the proteins that are overexpressed in cancerous cells (Mármol et al., 2019). For instance, AF is capable in targeting thioredxin reductance, TrxR, a critical enzyme in antioxidant defense system which will result in overproduction of reactive oxygen species (ROS) followed by DNA damage and apoptosis that eventually led to radiosensitization of tumour cells (Wang et al., 2017).

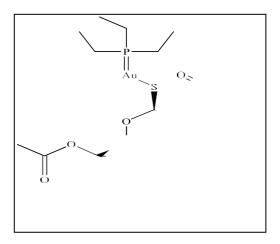


Fig. 3. Chemical structure of auranofin (AF).

Ezatiostat hydrochloride, TLK199 is a glutathione-analog molecule of small-peptide (S.-C. Dong et al., 2018). TLK199 is previously used to treat myelodysplastic syndromes (MDS), a form of blood cancer (Bonadies et al., 2021).

Recently, TLK199 is found to be capable in suppressing the overexpression of Human GSTP1 enzyme. Upon entering human body after oral consumption or infusion, TLK199 will undergo esterase hydrolysis process that led to production of TLK117, an activated form of TLK199 that has anti GSTP1 activity (S.-C. Dong et al., 2018). This process will result in improvement of potency in antineoplastic agents against various tumour cell lines through inhibition of Melanocortin Receptor Accessory Proteins (MRAP1), an ATP-binding cassette transporter protein that mainly responsible in chemoresistance by its ability to efflux a vast array of anticancer drugs to sub-lethal levels and interfere the combination of GSTP1 and c-Jun N-terminal kinases (JNK) interaction. Hence, JNK activation will triggers tumour-cell death by apoptosis process of cancer cells which led to effective chemotherapy (Zhang et al., 2021).

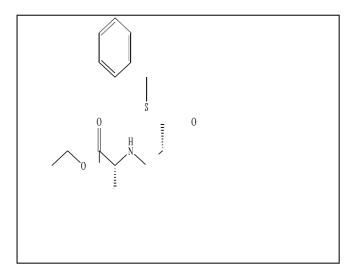


Fig. 4. Chemical structure of TLK199.

Canfosfamide hydrochloride, TLK286 is a modified glutathione analogue and nitrogen mustard of promising GSTP1 prodrug. It has been reported to exhibit some major advantages as compare to other prodrugs such as can be either applied alone or in combinations with conventional anticancer drugs besides showing no overlapping toxicity (Pljesa-Ercegovac et al., 2018).

According to a study, TLK286 was reported to aid in GSTP1 enzyme activation. A catalytic water molecule is responsible for activation of TLK286 which led to alkylating metabolite production that forms covalent linkages with nucleophilic centres in DNA of tumour cells. Inhibition of DNA-dependent protein kinase enzyme by TLK286 is crucial as this enzyme upregulation will likely cause induction of cytotoxicity and cellular stress response that eventually led to resistance to other anti-cancer drugs which results in common chemoresistance problem (Ściskalska & Milnerowicz, 2020).

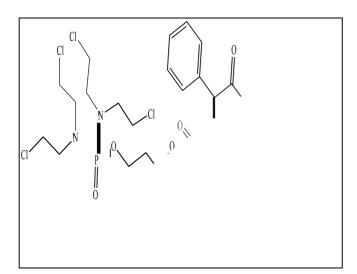


Fig. 5. Chemical structure of TLK286

Protein-ligand docking is a computational technique responsible in prediction of the conformation and orientation of a ligand when it is bound to a specific protein (Vieira & Sousa, 2019). Unlike other previous studies, CB-Dock, a novel bioinformatics web-server developed back in year 2019 was chosen for this study. The reason on why CB-Dock was chosen is due to its user-friendly criteria where users are only required to input specific protein file and ligand file in provided columns. CB-Dock will then work automatically by conducting docking on the entire protein surface to search for the most ideal binding mode. CB-Dock scoring function under Autodock Vina format is mainly used for interpretation of binding free energy of a ligand to a protein while NGL Viewer tool that provides interactives 3D visualization will be utilized for further analysis of protein ligand interactions (Masters et al., 2020). According to an experimental study, CB-Dock was found to greatly outperformed other blind docking tools such as SwissDock in terms of success and accuracy rate (Liu et al., 2020).

This research will study in details about GSTP1 enzyme and factors that led to occurrence of chemoresistance followed by subsequent preliminary studies of chemical-based GSTP1 inhibitors of reference inhibitor, ethacrynic acid (EA) and 3 other potential inhibitors that consists of auranofin (AF), ezatiostat hydrochloride, TLK 199 and canfosfamide hydrochloride, TLK286. CB-Dock, a latest docking tool was utilized to conduct those preliminary studies of chemical-based GSTP1 inhibitors. The findings of this study will likely be led to discovery of the most ideal and effective GSTP1 inhibitor. This proposed inhibitor may be incorporated by medical practitioner for future chemotherapy treatment. Higher effectiveness of chemotherapy with fewer side effects will enable cancer survivors to restore their health and live life to the fullest.

II. MATERIALS AND METHODS

IDENTIFICATION OF GLUTATHIONE S-TRANSFERASE P1 (GSTP1) ENZYME (PROTEIN)

Protein Data Bank (PDB) was chosen as bioinformatics platform to study and search for the most ideal GSTP1 enzyme where "1eoh" of Glutathione S-Transferase P1-1 was selected. This protein enzyme file was downloaded in PDB format for further use in protein-ligand blind docking process in this study.

IDENTIFICATION OF CHEMICAL-BASED GSTP1 INHIBITORS (LIGANDS)

Reference inhibitor, ethacrynic acid (EA) (CID:3278) and potential inhibitors, auranofin (AF) (CID:138402869), ezatiostat hydrochloride, TLK199 (CID:74424727) and canfosfamide hydrochloride, TLK286 (CID:78171805) were downloaded in SDF format from PubChem. For better illustration, ChemDraw 20.0 was used to draw GSTP1 inhibitors of ethacrynic acid (EA) (Fig 2.), auranofin (AF) (Fig 3.), TLK199 (Fig 4.) and TLK286 (Fig 5.).

PROTEIN-LIGAND BLIND DOCKING USING CB-DOCK

A total of 4 protein-ligand blind docking were performed. The first docking involved protein and ligand of GSTP1 enzyme, "1eoh" that was uploaded into protein column as PDB format while reference EA inhibitor was uploaded into ligand column as SDF format. "Submit" button was then clicked to generate results. Subsequent docking involving protein and ligand of 3 inhibitors of "1eoh" and AF, "1eoh" and TLK199 and lastly "1eoh" and TLK286 were also performed with same parameter and the results were collected and analysed. Top 5 vina scores will be analysed while specific amino acids binded by inhibitors (ligand) to hydrophobic binding site of "1eoh" were identified based on top 2 Vina score.

III. RESULTS AND DISCUSSIONS

RESULTS

Vina Scores

The first docking of "1eoh" and reference EA inhibitor generated top 5 Vina scores of - 6.7 followed by - 6.6, - 6.5, - 6.2 and - 6. The second docking of "1eoh" and potential inhibitor of AF had found to generate Vina scores of - 6.6 followed by - 6.1, - 6, - 5.9 and - 5.2. Meanwhile, the third docking of "1eoh" and potential inhibitor of TLK 199 had generated top 5 Vina score of - 8.3 followed by - 8, - 7.5, - 7.4 and - 7 while the fourth docking consists of "1eoh" and potential inhibitor of TLK286 had identified to have Vina score of - 7.8 followed by - 7.5, - 7.2, - 6.8 and - 6.2 (Refer to Vina scores shown in Table I).

Table I. Vina scores of GSTP1 inhibitors

RANK	VINA SCORES			
	EA*	AF	TLK199	TLK286
1	- 6.7	- 6.6	- 8.3	- 7.8
2	- 6.6	- 6.1	- 8.0	- 7.5
3	- 6.5	- 6.0	- 7.5	- 7.2
4	- 6.2	- 5.9	- 7.4	- 6.8
5	- 6.0	- 5.2	- 7.0	- 6.2

(Ethacrynic Acid EA*: Reference)

Protein-Ligand Interactions

For first docking between "leoh" and reference EA inhibitor of vina score - 6.7, EA inhibitor of unsaturated ketone derivatives had binded to amino acids of Y7 (Tvr). F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), I104 (Ile), Y108 (Tyr), I203 (Ile), N204 (Asn), G205 (Gly) and N206 (Asn) (Fig 6.) while in vina score of -6.6, inhibitor had binded to Y7 (Tyr), F8 (Phe), P9 (Pro), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), I104 (Ile), Y108 (Tyr), N204 (Asn), G205 (Gly) and N206 (Asn) (Fig 7.). For second docking between "leoh" and potential AF inhibitor with vina score of - 6.6, AF inhibitor of lipophilic, organogold compound had binded to amino acids of Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), W38 (Trp), G50 (Gly), Q51 (Gln), L52 (Leu), I104 (Ile), Y108 (Tyr), I203 (Ile), N204 (Asn) and G205 (Gly) (Fig 8.) while in vina score of - 6.1, AF had binded to Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), G50 (Gly), Q51 (Gln), L52 (Leu), P53 (Pro), I104 (Ile), Y108 (Tyr), I203 (Ile), N204 (Asn) and G205 (Gly) (Fig 9.).

For third docking between "leoh" and potential TLK199 inhibitor with vina score of - 8.3, TLK199 inhibitor of liposomal small molecule had binded to amino acids of Y7 (Tyr), F8 (Phe), V10 (Val), R11 (Arg), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), Q51 (Gln), L52 (Leu), R100 (Arg), Y103 (Tyr), I104 (Ile), Y108 (Tyr), D157 (Asp), I161 (Ile), I203 (Ile), N204 (Asn) and G205 (Gly) (Fig 10.) while in vina score of - 8, inhibitor had binded to Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), K44 (Lys), Q51 (Gln), L52 (Leu), R100 (Arg), Y103 (Tyr), I104 (Ile), Y108 (Tyr), D157 (Asp), I161 (Ile), I203 (Ile), N204 (Asn), G205 (Gly) and N206 (Asn) (Fig 11.). For fourth docking between "1eoh" and potential TLK286 inhibitor with vina score of - 7.8, TLK286 inhibitor of hydrochloride salt had binded to amino acids of Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), Q51 (Gln), L52 (Leu), P53 (Pro), D98 (Asp), C101 (Cys), K102 (Lys), Y103 (Tyr), I104 (Ile), S105 (Ser), Y108 (Tyr), N204 (Asn), G205 (Gly) and N206 (Asn) (Fig 12.) while in subsequent lower vina score of - 7.5, inhibitor had binded to Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), G50 (Gly), Q51 (Gln), L52 (Leu), P53 (Pro), E97 (Glu), D98 (Asp), C101 (Cys), K102 (Lys), I104 (Ile), S105 (Ser), Y108 (Tyr), N204 (Asn) and G205 (Gly) (Fig 13.).

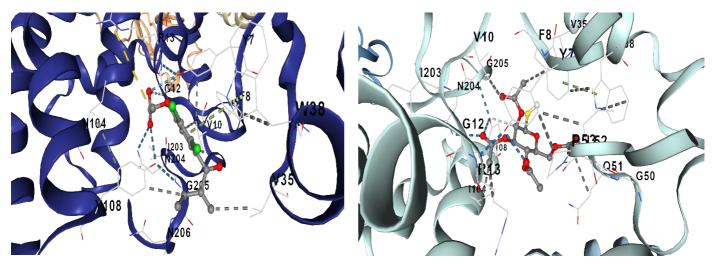


Fig. 6. Protein-ligand interactions of reference ethacrynic acid (EA) with top vina score of - 6.7.

Fig. 9. Protein-ligand interactions of potential auranofin (AF) with second top vina score of - 6.1.

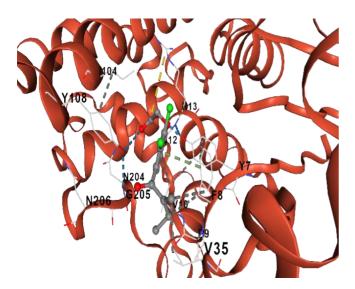


Fig. 7. Protein-ligand interactions of reference ethacrynic acid (EA) with second top vina score of - 6.6.

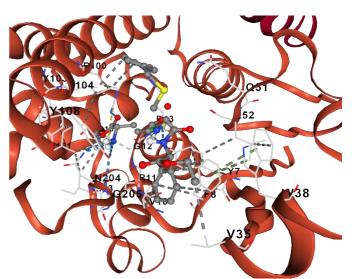


Fig. 10. Protein-ligand interactions of potential TLK199 with top vina score of - 8.3.

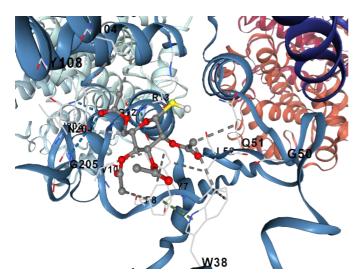


Fig. 8. Protein-ligand interactions of potential auranofin (AF) with top vina score of - 6.6.

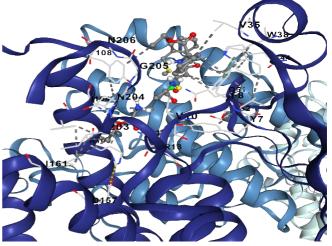


Fig. 11. Protein-ligand interactions of potential TLK199 with second top vina score of -8.

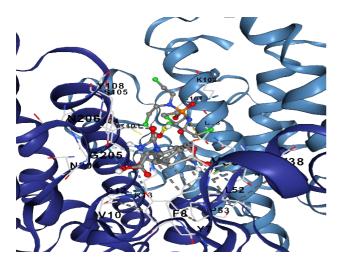


Fig. 12. Protein-ligand interactions of potential TLK286 with top vina score

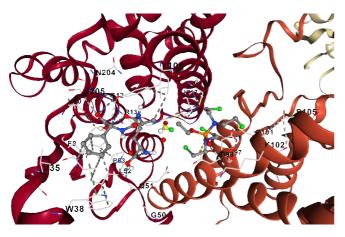


Fig. 13. Protein-ligand interactions of potential TLK286 with second top vina score of - 7.5.

Table II. Protein-ligand interactions of GSTP1 inhibitors

GSTP1 INHIBITORS	AMINO ACIDS BINDED TO "1EOH"
Ethacrynic acid (EA)* (Total of 14 amino acids)	 Y7 (Tyr), F8 (Phe), P9 (Pro), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), I104 (Ile), Y108 (Tyr), I203 (Ile), N204 (Asn), G205 (Gly) and N206 (Asn)
Auranofin (AF) (12 out of 14 amino acids)	 Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), I104 (Ile), Y108 (Tyr), I203 (Ile), N204 (Asn) and G205 (Gly) excluding P9 (Pro) and N206 (Asn)
TLK199 (13 out of 14 amino acids)	• Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), 104 (Ile), 108 (Tyr), 1203 (Ile), N204 (Asn), G205 (Gly) and N206 (Asn) excluding P9 (Pro)
TLK286 (12 out of 14 amino acids)	 Y7 (Tyr), F8 (Phe), V10 (Val), G12 (Gly), R13 (Arg), V35 (Val), W38 (Trp), I104 (Ile), Y108 (Tyr), N204 (Asn), G205 (Gly) and N206 (Asn) excluding P9 (Pro) and I203 (Ile)

(Ethacrynic acid EA*: Reference inhibitor)

DISCUSSIONS

According to various studies, a good binding affinity score has to be approximately - 8 or - 9 (Durai et al., 2020). Higher negativity score will represent stronger binding affinity which indicates that the inhibitor may be more ideal than others and achieve better outcome in development of drug discovery (Pantsar & Poso, 2018). Based on the findings in terms of Vina scores, TLK199 had the highest negativity Vina score of - 8.3 followed by TLK286 of - 7.8 and lastly AF with Vina score of - 6.6. In comparison with reference EA inhibitor with top Vina score of - 6.7, TLK199 and TLK286 were shown to have more negative top Vina scores while AF was the only inhibitor that had more positive top Vina score as compare with EA. Thus, TLK199 can be identified as the most ideal potential GSTP1 inhibitor based on its most negative Vina score followed by TLK286. Meanwhile, AF with more positive Vina score may be less suitable to replace current reference EA inhibitor.

However, Vina scores are not necessarily the best predictor for determination of the most suitable inhibitor (Jofily et al., 2021). Researchers are strongly recommended to interpret both scoring functions together with additional aspect to assure the selection of an accurate inhibitor (Ramírez & Caballero, 2018). One of the aspects is known to be protein-ligand interactions where this aspect is necessary for understanding on the mechanisms of biological regulations as well as providing a theoretical basic for design and discovery of novel drug targets (Fu et al., 2018).

For this research, protein-ligand interactions were evaluated in terms of whether potential GSTP1 inhibitors had binded to critical amino acids of "leoh" as similar with reference EA inhibitor. Ligand of reference EA inhibitor had form binding to "leoh" with a total of 14 amino acids listed on Table II. Based on studies, glutathione binding site of GSTP1 was identified to be the hydrophilic G-site while ligand binding site will be the hydrophobic H-site (Yadav et al., 2020). Inhibitor was identified to bind to a hydrophobic H-site consists of Tyr 7, Phe 8, Pro 9 and Val 10 and the aliphatic portions of Arg 13, Val 35, Ile 104 and Tyr 108 (Harshbarger et al., 2017). Further investigation such as in silico studies should be conducted on other identified amino acids of G12 (Gly), W38 (Trp), I203 (Ile), N204 (Asn), G205 (Gly) and N206 (Asn) as there is still no any proven studies been discovered on those amino acids in terms of their importances in GSTP1 binding. In comparison with similar amino acids that had binded by reference EA inhibitor (refer to Table II), potential AF inhibitor was found to form binding to "leoh" with a total of 12 out of 14 similar amino acids excluding P9 (Pro) and N206 (Asn) while potential TLK199 inhibitor was found to form binding to "leoh" with a total of 13 out of 14 similar amino acids excluding P9 (Pro). Lastly, for the third potential TLK286 inhibitor, it was found to bind "leoh" with a total of 12 out of 14 similar amino acids excluding P9 (Pro) and I203 (Ile).

Hence, further research should be conducted on the absence P9 (Pro) amino acid as it has been identified as one of the critical amino acids that binds on hydrophobic H-site of GSTP1. Researchers must also focus on possible side effects that may occur especially in TLK199, the most ideal GSTP1 inhibitor of this study as various side effects had been reported in previous studies of reference EA inhibitor which has results in poor efficacy (Li et al., 2019). Based on a study, TLK199 was reported to have few minor side effects under grade 1 and 2 gastrointestinal that consist of diarrhea, nausea and vomiting (Raza et al., 2012). Thus, researchers must take extra considerations on this matter to ensure the eligibility of TLK199 an ideal inhibitor. Moreover, advanced studies have to be conducted to achieve higher precision of CB-Dock besides verifying the effectiveness of potential inhibitor as analysis of this study are mainly based on its Vina score and protein-ligand interactions (Liu et al., 2020). For instance, researchers should analyse on cavities size of particular inhibitor when interacting with protein or by conducting molecular docking of the similar sets using different softwares such as AutoDock (Temml & Kutil, 2021).

IV. CONCLUSIONS

Based upon the findings and discussions, TLK199 may be the most ideal GSTP1 inhibitor with highest negativity top Vina score of - 8.3 together with highest total number of similar amino acids of 13 out of 14 as compare with reference EA inhibitor. This novel discovery is crucial as it acts as an alternative solution of chemotherapy in overcoming chemoresistance among cancer patients. Nevertheless, continuous research has to be conducted in terms of numerous aspects especially on the possible side effects that may affects the overall efficacy of this potential inhibitor for future clinical uses in cancer research.

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Communication Effectiveness in Teaching Delivery via Digital Communication

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Currently

Abstract

Technology today, has a great impact in the educational system and online education is increasing rapidly. The unprecedented phenomena of Covid-19 pandemic have forced the educational institutions to be closed down and thus resulted a gap in teaching delivery and reduction in the syllabus. This has resulted to the increasing number of online classes with many challenges for the teachers and students and many educational institutions were forced to adopt to the online education to address the gap. Effective online teachers connect and work in synchrony with students to obtain quality and success. The use of technology has facilitated teachers across borders and proved to be an effective teaching aid. The faculty needs to possess the skills necessary to positively impact student's learning outcomes and it is vital for the educators to know the tools and apps for easy access for virtual lectures. This paper investigates the effectiveness of E-learning through an integrated review on various methods of teaching approach digitally to reduce the barriers to communication among teachers and students. This paper also discusses the advantages of technology to be implemented for the best teaching practices online. By identifying and utilizing of tools and apps for both teachers and students leads to effectiveness of the teaching and learning process. As online teaching includes a number of computers assisted instruction methods in web-based environment, findings and implications are discusses for the adoption of ICT by teachers. Interviews were conducted among educators of elementary and high school to share their opinions and discuss on how they reduce barriers of communication by using digital platform.

Keywords: (effectiveness, e-learning, tools, technology, online classes).

I. INTRODUCTION

Effective communication in teaching plays an essential role and teachers are constantly imparting new knowledge, or transmitting information. To teach in accordance with the ability and capability of the students a teacher needs to adopt such skills of communication which motivates the students towards their learning process. (Sng Bee, 2012). The progress of technology and globalization has now changed the way people communicate in the teaching field. A teacher has to be cautious and constantly ready to make suitable adaptations from time to time. (Roma Singh, June 2019). Teachers have to try to minimize barriers to communication. In the present situation one of the barriers is not having the classroom environment and absence of physical appearance of teachers and students.

However, the teaching and learning must continue. A virtual classroom is an online learning environment in which students and teachers interact via the technical tools provided by a software remotely while maintaining the functionality available in a traditional classroom environment offering the same collaborative tools and level of interaction possible in a physical classroom. Educational institutions utilize virtual classroom software to provide access to students who may not be able to attend inperson. Through the virtual classroom environment, teachers can interact with students and students can engage with lesson materials, view presentations and videos, and take tests, all in real time. The use of technology can help teachers alternatively and have effective teaching delivery online.(Adam Webster 2013, Beyond the classroom walls). There are various Learning Management System (Digital Learning) Tools to get connected with the educational institutions so that the classes can be organized

and the process of learning can be assessed and regular

attendance, assessments, exams, results and grades can be

implemented same as the classroom environment with the

best results in meeting the quality standards of the institute.

"Technology" is transforming education empowering the students by giving them access to resources beyond classroom walls. Technology, used well can break down boundaries (Adam Webster 2013, Beyond the classroom walls). Technology gives more chances to interact and communicate in new conditions and with new, less formal rules. Technology can also help educators create blended learning by using digital tools. In an infused classroom, the teaching and learning outcomes are the most important aspect, and technology simply enhances an already purposeful learning environment. (Holly clark 2017). The educational institutions should be aware of what devices

can educators and students use. Technological Pedagogical Content Knowledge (TPACK) framework expands on the focus of Pedagogical Content knowledge (PCK) to also technology knowledge as a (Mishra&Koehler, 2006). Virtual lesson plan grading software and online assessments can help teachers save a lot of time. Teachers, in these situations will thus more frequently use technology when they believe that it connects directly with their specific content areas and/or grade levels, allowing them to more readily meet their classroom goals. (Hughes, 2005; Snoeyink & Ertmer, 2001).

II. LITERATURE REVIEW

E-Learning – or electronic learning – has been referred to as "technology-enhanced learning," and more recently as "digital learning." e-Learning describes a set of technologymediated methods that can be applied to support student learning and can include elements of assessment, tutoring, and instruction. Learning using technology is not the same as learning through technology. In fact, e-learning systems contain software application and features that allow for easy access and management of learning content (Asiri, Bt Mahmud, Bakar, & Bin, 2012). Learning using technology implies that the technology is being used as one method amongst many others, whilst learning through technology suggests that the technology is the sole conduit through which the student receives instruction and communicates with his instructor. (Wheeler S. (2012) e-Learning and Digital Learning. In: Seel N.M. (eds) Encyclopedia of the Sciences of Learning. Springer, Boston, https://doi.org/10.1007/978-1-4419-1428-6 431).

Personal factors have also been associated with barriers to E-learning adoption in higher learning institutions. Factor such as teachers' e-learning understanding can also have impact in e-learning adoption because through their past experiences and interactions with others, they can construct multiple meanings about e-learning, which eventually can shape their attitude towards it. Literature shows that if teachers do not understand the meaning and impact brought about by e-learning to education, then they are likely to resist or avoid using it resulting in institutional failure to adopt e-learning (Avidov-Ungar & Eshet-Alkakay 2011) and cause barriers to communication especially in the present situation.

A. Tools for Digital Learning

Online Collaborative Learning (OCL)

Proposes a modern learning theory with such a framework that takes into account the universality of the Internet and the societal shift toward collaborative learning. It features the intellectual growth rather than the conventional teaching approach

The proposal is an Online Collaborative Learning (OCL) which renders a model of learning in which students are encouraged and supported to work together toward knowledge. To invent, to explore ways to innovate, and, by so doing, seek to understand, therefore, stimulate a sharp solution-finding rather than presenting literature statements. This learning method is collaborative so that students are expected to work collectively through it, alternatively to the approach that merges individual and closed decisions to accomplish an outcome.

A constructivist framework approach points to the value of educators as key drivers for the OCL instructional process and encourages curiosity and discussions that support their autonomy. In addition, the term participatory pedagogy represents a shift in educational paradigm that combines instruction with a net-worked and connected education. The results mentioned above ends in a promotion of the student's engagement and their enthusiasm to focus on enhancing theoretical transmission of knowledge.

Digital Learning Success

It is the use of Information and Communication Technology (ICT) as a digital learning resource for OCL, educational stakeholder's attitudes and perceptions of ICT's significantly impact their student's digital literacy. The student's use of ICT is related to teacher's confidence level of their digital competencies. Evidence shows a significant relationship between the efficient use of ICT as a learning methodology and the "respondents' age", as well as, high relationship between teachers "technological anxiety" and age. Nevertheless, educators may require continuous professional development and training regarding their ICT capabilities. Proficient teachers in a poor ICT learning environment can perform better. Moreover, a survey reported that 20 to 25 percent of European students are taught by digitally competent teachers.

ICT supports the learning process by the use of text, images and audio and by that, each person can create their story and engage in an in-depth learning. Digital Storytelling stands as one technology application that is well positioned to take advantage of user-directed content and to help instructors use technology productively in their classes. There is evidence to favor that digital storytelling (DST-OCL, here and further on) is more effective than a lecture-based. Adopting a DST-OCL strategy promotes student's cooperation in learning activities, such as script review, image selection and storyboarding as well as, "online communication". There is evidence to conclude also that using a DST-OCL students are relatively more motivated.

To what regards digital problem-based learning (PBL) research, concludes that students that are provided with autonomy support have a greater sense of autonomy and those who received structural directives, clear expectations, guidance and procedures contributes experience greater sense of competence. This study(paper)also concludes that both autonomy support and structure in a OCL promotes a positive effect on intrinsic motivation. However, if both are absent, autonomy support and structure, evidence shows a low intrinsic motional usage of ICTs creating barriers to teaching and learning. Nonetheless, this study also confirmed that structure OCL strategy has positive learning outcomes but autonomy support doesn't. Yet, if both are combined, autonomy support is able to stimulate greater outcomes. (Maria José Sousa1; Rui Cruz1 & Jorge Miguel Martins, Universidade Europeia, Lisboa, Portugal).

E-Learning TOOLS for education

The Most Popular Digital Education Tools for Teachers and Learners. Digital education tools have been created with the purpose of giving autonomy to the student, improving the administration of academic processes, encouraging collaboration, and facilitating communication between teachers and learners.

Edmodo is an educational tool that connects teachers and students, and is assimilated into a social network. In this one, teachers can create online collaborative groups, administer and provide educational materials, measure student performance, and communicate with parents, among other functions. Edmodo has more than 34 million users who connect to create a learning process that is more

enriching, personalized, and aligned with the opportunities brought by technology and the digital environment.

<u>ClassDojo</u> is a tool to improve student behaviour: teachers provide their students with instant feedback so that good disposition in class is 'rewarded' with points and students have a more receptive attitude towards the learning process. ClassDojo provides real-time notifications to students, like 'Well Done David!' and '+1', for working collaboratively. The information that is collected about student behaviour can be shared later with parents and administrators through the web

Animoto is a digital tool that allows you to create highquality videos in a short time and from any mobile device, inspiring students and helping improve academic lessons. The Animoto interface is friendly and practical, allowing teachers to create audio-visual content that adapts to educational needs.

<u>Thinglink</u> allows educators to create interactive images with music, sounds, texts, and photographs. These can be shared on other websites or on social networks, such as Twitter and Facebook. Thinglink offers the possibility for teachers to create learning methodologies that awaken the curiosity of students through interactive content that can expand their knowledge.

<u>TED-Ed</u> is an educational platform that allows creating educational lessons with the collaboration of teachers, students, animators—generally people who want to expand knowledge and good ideas. This website allows democratizing access to information, both for teachers and students. Here, people can have an active participation in the learning process of others.

Storybird aims to promote writing and reading skills in students through storytelling. In this tool, teachers can create interactive and artistic books online through a simple and easy to use interface. The stories created can be embedded in blogs, sent by email, and printed, among other options. In Storybird, teachers can also create projects with students, give constant feedback, and organize classes and grades.

cK-12 is a website that seeks to reduce the cost of academic books for the K12 market in the United States and the world. To achieve its objective, this platform has an open-source interface that allows creating and distributing educational material through the internet, which can be modified and contain videos, audios, and interactive exercises. It can also be printed and comply with the necessary editorial standards in each region. The books that are created in cK-12 can be adapted to the needs of any teacher or student.

Project is a tool that allows you to create multimedia presentations, with dynamic slides in which you can embed interactive maps, links, online quizzes, Twitter timelines, and videos, among other options. During a class session, teachers can share with student's academic presentations which are visually adapted to different devices.

B. Challenges and Barriers

This paper has presented the opportunities for using technological tools in teaching and learning. However, it is true that not all teachers are embedding technology into their teaching. A significant body of research has investigated why this occurs. The barriers to using

technology in the classroom are many and include, among others, resource limitations, teacher knowledge and skills, and teacher attitudes and beliefs (Hew & Brush, 2007). Teachers tend not to use technology if they become frustrated when it does not work properly or when there is a lack of technical support. Teachers also report having limited time to review and learn about new technology tools that they can use in their teaching.

Teacher knowledge and skills are important factors in the use of technology. However, those teachers who take the opportunity to build skills through professional development activities are much more likely to integrate technology into their teaching than those who do not (Mueller et al., 2008). But teachers realise that the knowledge and skills they need to be able to use technology goes beyond understanding what functions are under the menu items and what buttons to click. Teachers are faced with challenges and barriers all the time. Technology's place in society causes teachers to consider the implications for them in their role as educator and as lifelong learners themselves. The constant challenge for teachers is to constantly develop knowledge and skills about what to teach and how to teach digitally.

III. METHODOLOGY

Gathering Information that would be relevant to this study a descriptive research methodology is used. Questionnaires, interviews were the methods used. The interviews were conducted among educators on how do they reduce barriers of communication by using digital platform and which is the most helpful digital platform for such tasks for students so that they can share their perspectives. Other questions include what tools and apps do they use for easy access of teaching delivery and do they know how to use the tools and apps.

The data obtained in the study were gathered under two main themes based on the related literature and within the scope of the open-ended questions directed to the teachers regarding technology use. These themes were determined as "Problems experienced by teachers regarding technology use in teaching delivery" and "Suggestions for effective use of technology" and were supported with direct quotations regarding the themes. Direct quotations were used regarding the teachers' views, and from the participants of the elementary and high school teachers. Number of Teachers interviewed were 5 from elementary school and 5 from High school. The Interview was conducted recently online during the initial phase of the pandemic situation through Zoom in the year 2020.

IV. FINDINGS AND DISCUSSION

Regarding the sub-theme of "Problems due to failure to keep up with the technology", one of the participants, emphasized one common problem saying, "Though they have established Internet connection; and have made the schools technologically efficient it is important that the teacher use all of these. Also, they have other responsibilities besides effective use of technology. The area of technology-related duties, that is, it is the area in which they should develop themselves and should keep up with the

technology". Regarding this theme, which other teachers agreed on with similar views, it was in fact pointed out that keeping up with technology was a responsibility and necessity and that other responsibilities expected from them limited their interest, though one of the participants, mentioned the need for keeping up with technology saying some of the teachers, do not follow technology at all. We should follow the up-to-date information. This is a responsibility expected. Regarding the sub-theme of "Problems due to failure to use current technologies", one of the participants emphasized the need for updated and renovated technologies saying "As technology constantly changes, there are also changes in computer equipment and in programs in technological sense. Thus, some of them run quite slowly. And sometimes, although some of the programs are installed without any problem, they get halted. The need for using up-to-date technologies, which was one of the most important issues that the teachers addressed with similar views, was a priority for them in the process of effective use of technology. Most of the teachers agreed on the time lost in making technology available for use, on the decreasing motivation and on ineffective use of technology. With respect to the sub-theme of "Problems due to technical faults caused by incorrect use of technology", the teachers mentioned the problems they experienced regarding technology use due to incorrect use of technology and stated that this was an important problem. And they could not use the computer for a long time". A majority of the teachers agreed on the problems reporting similar examples regarding incorrect use of technology. Regarding the same theme, another teacher, emphasized the importance of teacher's efficacious regarding incorrect use of technology saying "if they can use technology effectively, it will be better and more effective". Most of the participants reported common views regarding the problems that occurred due to the Internet connection such as classes not conducted, classes rescheduled. Similarly, the participants mentioning the negative reflections of ineffective use of the Internet onto the course thought that the Internet could contribute to the establishment of a more effective learning environment when used effectively.

To sum up, some of the problems mentioned above lead to barriers in communication in teaching delivery.

- Internet Connection
- Technical Issues
- Attention Barriers
- Software Issues
- Emotional Barriers
- Time Management
- Syllabus not Covered
- Un-familiarity with the technology, types and tools of communication technology.

The first sessions of the focus-group interviews focused on the problems the teachers experienced while using technology.

Table 1 presents the sub-themes regarding the main theme of "Problems experienced by teachers regarding technology use in teaching delivery".

Problems Experienced by the Teachers Regarding Technology Use.

Table 1

Tuble I	
Problem	Description
Problems due to failure to keep up with the technology	Some of the teachers do not use technology as they are unaware and limiting their interest in using technology.
Problems due to failure to use current technologies	Some of the teachers work on outdated versions of technology and equipment run slowly hence need up-to- date technologies.
Problems due to technical faults caused by incorrect use of technology	Due to the incorrect use of technology some of the teachers cannot use the system for a long time.
Problems due to Internet connection	Most of the teachers cannot use the facility to conduct virtual classes due to poor internet connection
Problems caused by ineffective use of Internet	Some of the teachers felt that ineffective use of the internet led to poor learning environment.

CONCLUSION

The present study shows that teachers are to incorporate E-Learning in teaching their courses in the present situation. However, it is an obvious fact that they need constant support regarding technology use in their courses. According to the research findings, the teachers participating in the study emphasized solutions that the process of effective use of technology with the help of execution of courses in cooperation of both teachers and students, to increase the interaction between them and to decrease teachers' anxiety in technology use during lessons. According to Asiri et al. (2012), the faculty members' acceptance of technology plays a key role in optimal utilization of LMS in higher education. Thus, the success of the implementation of LMS greatly depends on the teachers' or instructors' attitudes toward technology and LMS specifically. In this respect, technology-based interactions between teachers and students which will allow them to use technology effectively could lead to effective technology integration.

In summary, this paper identified the main digital learning advantages, context and tools and barriers to communication in teaching delivery and the results show that the teachers of digital learning are increasing in education with the goal to prepare students to work collaboratively, communicate effectively and have more autonomy an independence in the learning process. I highly recommend effective teaching with technology in this digital educational arena as digital learning through technology strengthens the student's learning experience with a mix of tools and practices, including formative assessments, focused and quality of teaching resources and time; online content and courses, applications of technology in the course curricula and to avoid learning gap to gain communication effectiveness in teaching delivery via digital platform.

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Microstrip Patch Antenna in Skincare Field

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Abstract

The widespread application of wearable antennas in the medical field, its efficiency and the absence of side effects from the emitted radiation offered great possibilities for its implementation in the skincare field. In this study, an initial design of wearable antenna was tested on human skin to determine the feasibility of wearable antennas for skincare applications, which will benefit from its ease of manufacture and low cost. The effectiveness of radio frequency (RF) in treating skin problems such as pigmentation and wrinkles was studied. The wearable antenna was operated at 5 GHz with a wideband and high gain of 6.8 dBi. The simulation results of the antenna showed good performance on the skin tissue model. The antenna was simulated and designed by CST 2014 as a programming tool to test it on human skin. The notable performance of the designed antenna would prove beneficial in skincare applications.

Keywords

Radio-Frequency Treatments, Skincare, Microstrip Patch Antenna, Wearable Antenna

I. INTRODUCTION

The significant increase in population, high ageing rate, and the growing number of patients with chronic diseases, such as diabetes, heart diseases, and high blood pressure, make patient care more difficult nowadays. Consequently, the use of remote health monitoring and wearable devices has increased. The development in the field of remote health monitoring requires advanced and suitable components for its devices so it can be applied in watches and clothes. The wearable antenna is one of the most important components in remote health monitoring devices and has been used in many health applications. The component has proven to be highly efficient in health care and in providing remote follow-up of patients' health status [1-4].

The human body has an effect on the performance of the antenna, and this effect is a negative effect, as the absorption of the antenna radiation occurs through the layers of the body, but researchers are still providing solutions and techniques to overcome the impact of the human body on the performance of the antenna, but there is opposite effect as these wearable antennas has a negative effect on the human body as well. Since this type of antennas sometimes work in direct contact with the human body, the safe use of this type of antennas is one of the most important factors that researchers must work on developing and ensuring high safety while using wearable antennas on the human body.

The SAR is the parameter to determine the level of electromagnetic waves absorbed by the human body. Limits, referred to as the American and EU standards, have been set for the SAR to comply to. The SAR has to be well below the 1.6W/kg American standard and 2 W/kg EU standard. to work on developing the element of safety in the use of the antenna and reducing SAR as much as possible, researchers have recently worked on modern techniques that have a role in reducing SAR, such as Artificial Magnetic Conductors (AMCs), this technique called also Electromagnetic Band Gap structures (EBGs) and High Impedance Surfaces (HISs).

Subsequently, radiation towards the human body surface is substantially lowered and the antenna exhibits an improvement in its overall gain and Front to-Back Ratio (FBR) [5]-[6], [7]-[12], [13]-[18]. Other tactics for reducing SAR have been considered and studied. One is using a simple ground plane [19]-[20], [21]-[25] One of the methods also used to reduce SAR, which is placing the antenna away from the human body, a distance sometimes up to 20 mm. The distance between the antenna and the human body has a major role in reducing the absorption of radiation emitted by the antenna by the human body.

Aside from that, beauty-conscious has become a recent important and common issue in the population because it is linked to an individual's self-respect and self-confidence, which may affect their performance in career and life in general. Skincare is one of the most common requirements in external care as people strive to diminish the signs of ageing, such as sagging, dark spots and wrinkles. This is often done by going to specialized aesthetic clinics and beauty centres that use advanced devices that rely on radio frequency (RF), especially to treat skin laxity. This is a therapeutic modality that produces a selective and controlled rise in tissue temperature from a high-frequency alternating current (0.3 to 10 MHz). The radio frequency-based devices in clinics are highly efficient, but they are expensive, the treatment is costly and it requires patient's physical presence.

This paper studied the use of RF in skin treatment and aimed to employ the relatively inexpensive microstrip patch antennas for home or clink use.

II. MICRO STRIP PATCH ANTENNA IN TELEMEDICEN APPLICATIONS

Wearable antennas have evolved gradually to become more effective, and recent studies demonstrated their development and high efficiency in the medical field. This type of antenna is characterized by its lightweight, high gain, wideband and low cost. Specific absorption rate (SAR) is a measure of the amount of transmitted RF energy absorbed by human tissue. Accordingly, the SAR limitation is important in wearable antennas because it is occasionally in direct contact with the human body. The maximum safe limit for 1 g of human tissue is 1.6 w/kg by the US standards and 2 w/kg for 10 g of human tissue according to The International Commission on Non-Ionizing Radiation Protection (ICNIRP), the European standards. Table 1 shows the recent studies on microstrip patch antennas in the medical field.

TABLE I. WEARABLE ANTENNA IN TELEMIDCIN APPLICATION

Author	Application	Frequency (GHz)	SAR (w/kg)
J. Lai et al.,2021	Capsule Endoscopy System	2.4	Satisfy
M. El Atrash et al.,2021	wireless body area network (WBAN) and medical applications.	2.4	Satisfy
A. E. Omer et al.,2020	Monitoring of Glucose Level	1-6	Satisfy
M. Haran et al.,2020	monitoring of blood glucose	2.4 -2.5	Satisfy
Sameer Alani et al.,2020	Early stage cancer detection	2.7-4.16	Satisfy
Z. Xia et al.,2019	Skin cancer diagnoses imagining	2.4	Satisfy
Rexiline Sheeba I et al.,2019	biomedical applications	2.4	Satisfy
Rexiline Sheeba I et al.,2018	Brain tumor	7.3	Satisfy
Araújo et al.,2015	thyroid gland in the detection of cancer cells	2.4	Satisfy
Chipps LK et al. 2013	detecting brain cancer	2.4	Satisfy

III. RADIO-FREQUENCY TREATMEANTS

The RF equipment available in the market has great variability with the parameters offered. The modulation range of these parameters includes the frequency of electromagnetic waves and thermal power. Most of the devices found on the market are international. According to the information collected in the respective manuals and websites of manufacturers, the frequency varies from 1 MHz to 6 MHz and the power ranges from 40 MHz to 240 W. Most of this equipment allows power settings according to the treated area. The RF application in each region takes about 2.5 seconds and the temperature in the epidermis is maintained at 40° C during the treatment, whereas it ranges from 50° C to 75° C in the dermis. The form of energy transmission to the tissue is through the capacitive method with bipolar, tripolar or multipolar electrodes. The main side effect is pain during treatment, and the patient will receive a topical medication to minimise it [38].

This study managed to manufacture an antenna that matches the specifications of the devices available in the market to provide an alternative to them and to test it. Most of these devices rely primarily on the thermal effect of the frequencies to raise the temperature of the collagen layer in the skin. This stimulates collagen production, which can improve wrinkles, tighten the skin and reduce pigmentation. The characteristics of the equipment available in the market are summarized in Table 2 [38].

TABLE II. RADIO-FREQUENCY EQUIPMENTS CHARACTERISTICS

Author	Equipment/	Frequency	Treated	No. of
	manufacturer	(MHz)	area	sessions
Vega JM et al.,2013	Skin Tightening System	4	Face and neck	2
Shapiro SD et al.,2013	Therma-Cool TC/Therma-age	6 Hace		4
Edwards AF et al.,2013	Ellman International	4	Hands	3
Taub AF et al.,2012	Tripolar (RF)	1	Face	8
el-Domyati M et al.,2012	Therma-Cool TC/Therma- age	6	Face	1
Javate RM et al.,2011	Ellman International	4	Face	6
Wollina U et al.,2011	Bio-Rad. Shenzhen G S D Tech Co	6	Face	6
Harth Y et al.,2011	Skin Tightening System	4	Periorbital wrinkles and midface laxity	8
Levenberg A et al.2010	RF-refacing TM (Meyer-Hake Medical Innovations	2.2	Face	3
Z. H. Jiang et al.,2014	Radiofrequency Bipolar	1	Face	4
A. Y. I. Ashyap et al.,2010	Apollo radiofrequency system.	1	Abdomen, thighs, face, buttocks and arms	7

IV. PROPOSED WEARABLE ANTENNA DESIGN

A proposed microstrip patch antenna for skincare application was designed and tested by CST 2014 as a simulation tool. The layers of human skin were simulated, and the proposed antenna was tested on it to obtain initial results of wearable antennas performance for skincare. The thickness of the skin layer model was 2 mm, the density was 1001 kg/m3, the permittivity was 37.95 and the conductivity was 1.49 s/m [50, 51]. The antenna designed for skincare applications must be within the industrial, scientific and medical (ISM) range and consider the SAR absorption coefficient as it must be at the lowest levels to reduce possible damage to the skin. The most important

characteristics of this antenna are it must be in direct contact with the surface of the skin to generate the heat required to stimulate the collagen layer. Also, it must be made of light and rust-proof materials and covered a sufficient skin area of the skin to obtain benefits from the antenna.

A. A proposed antenna charactristics

Figure 1 shows the designed antenna made of copper as a radiation material and felt material as a substrate. The electromagnetic band-gap (EBG) structure was attached at the back of the antenna to increase the antenna gain. Figure 2 Shows the copper and aluminium plates were placed in front of the antenna to reduce radiation absorption by the body and to distribute the generated heat evenly over a wide area of the skin. These plates can be considered as part of the metal that covers the antenna when it is placed in a device designed for skincare. Table 3 displays the antenna and EBG structure characteristics and measurements.

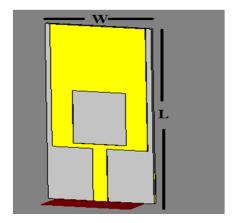


Fig. 1. Proposed Antenna.

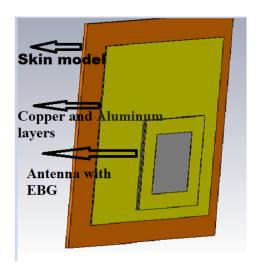


Fig. 2. Proposed Antenna with EBG.

TABLE III. PROPOSED ANTENNA CHARACTIRESTICS

	Anten na				EBG strue	cture
	Patch	Sub.	Ground	Patch	Sub.	Ground
Size	8x10x0.1	20x4 0x0.7	20x8x0.	10x10 x0.17	60x60 x0.7	60x60x0.
Mate rial	Copper	Felt	Copper	Copper	Felt	Copper

B. Results abd Discussion

The designed antenna operated at frequency 5 GHz with a bandwidth of 49.3 % and return loss -33.7. Figure 3 shows antenna S11 and Figure 4 shows the radiation pattern. This directional antenna radiated with IEEE slandered gain 6.3dBi and the SAR for 1 g of skin tissue was 0.5943 w/kg and 0.2318 w/kg for 10 g of skin tissue. The obtained SAR was less than half of the required rate of the international standards, which placed the antenna at the highest level of safety for human use and direct contact with the skin. To assess the performance of the antenna and to determine the possibility of using it for skin care purposes, the danger and safeness must be addressed. As previously mentioned, this antenna worked in the ISM frequency range designated for medical applications, and its radiation absorption coefficient or SAR showed low rates and a very low radiation loss. This increased the efficiency of the antenna as it provided a high gain of 6.8dBi. The good performance showed by the simulation results indicated that the antenna can work on human skin with high efficiency, and it can generate the required heat to stimulate the collagen layer. Therefore, the designed wearable antenna was considered qualified for further laboratory experiments.

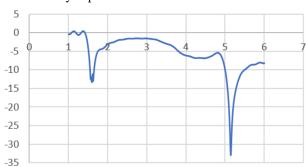


Fig. 3. Antenna S11.

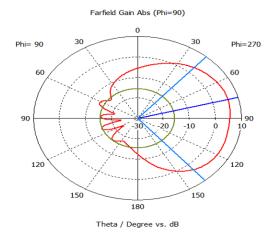


Fig. 4. Antenna Radiation Paterrin.

Table 4 shows the efficiency of the proposed antenna and its high performance compared to the recently published studies.

TABLE IV. RESULTS COMPARISSION

Author	SAR	Distance	Frequen	Gain	Size(mm)
		from	cy	(dBi)	
		body	(GHz)		
		(mm)			
M. El	0.068	331	3.5/5.8	9.37	86 × 86 x1
Atrash et	0.333	3		/	
al.,2019				6.63	
u.,201)				0.03	
A. Arif	1.57	-	2.45	2.06	39 x 39 x
et					0.503
al.,2019					
	0.01	10			
T. T. Le	0.91	10	2.45/5.8	2/3.2	-
et al.,	9/0.1		5		
2020	23				
K. Zhang	1.25	5	2.65	2.99	39.4x33.4
et al.,					
2020					
Yao, L.	0.23	0	from	-	70x70x3
et al.,			2.38 to		
2021			2.58		
This	0.23	0	5	6.3	60x60x2.08
work	18				

V. CONCLUSION

Radio frequency treatment sessions are prevalent in the market today and proved effective in the treatment of various skin problems, such as wrinkles and pigmentation. Thus, the devices have become a necessary need and, its benefits patients greatly. However, due to the complexity of use and its high price, this study determined to employ wearable antennas and presented an appropriate initial design for skincare applications. From the results, the designed antenna performed well and was effective when tested on a simulated skin model. Thus, this antenna can operate smoothly during its application on the skin and generate the required heat to stimulate the collagen layer. Consequently, this can help improve the appearance of the skin and treat wrinkles and pigmentation. This study recommended the wearable antennas for laboratory experiments to further test their efficacy and to be subsequently applied in the field of skincare.

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A Comparative Analysis of Machine Learning Algorithms for Intrusion Detection in Edge-Enabled IoT Networks

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Abstract— A significant increase in the number of interconnected devices and data communication through wireless networks has given rise to various threats, risks and security concerns. Internet of Things (IoT) applications is deployed in almost every field of daily life, including sensitive environments. The edge computing paradigm complemented IoT applications by moving the computational processing near the data sources. Among various security models, Machine Learning (ML) based intrusion detection is the most conceivable defense mechanism to combat the anomalous behavior in edge-enabled IoT networks. The ML algorithms are used to classify the network traffic into normal and malicious attacks. Intrusion detection is one of the challenging issues in the area of network security. The research community has proposed many intrusion detection systems. However, the challenges involved in selecting suitable algorithm(s) to provide security in edge-enabled IoT networks exist. In this paper, a comparative analysis of conventional machine learning classification algorithms has been performed to categorize the network traffic on NSL-KDD dataset using Jupyter on Pycharm tool. It can be observed that Multi-Layer Perception (MLP) has dependencies between input and output and relies more on network configuration for intrusion detection. Therefore, MLP can be more appropriate for edge-based IoT networks with a better training time of 1.2 seconds and testing accuracy of 79%.

Keywords—Intrusion Detection, Security, Machine Learning, Internet of Things, Edge Computing

I. INTRODUCTION

Cybersecurity has emerged as a crucial research aspect in Internet of Things (IoT) due to the increasing cyber threats. The purpose of IoT security is to reduce risks for critical applications and sensitive data. IoT has been a fundamental component for many applications such as smart cities, smart grids, smart manufacturing, healthcare, and many more. As the number of IoT devices increases, potential security exposures are also growing exponentially. The pervasive nature of IoT devices and the associated applications shows the importance of addressing these security threats [1]. For instance, in IoT-enabled smart home appliances connected to the local network, the attackers can hack sensitive data to alter or interrupt the workflow. Similarly, another instance of extracting personal information through a patient's pacemaker and changing the device's behavior [2]. Currently, there are many innovative techniques to mitigate cybersecurity issues, such as deploying encryption technologies, frequent device updates, develop documented guidelines, and many more. However, by 2025 more than 30 billion devices are expected

globally, it can be challenging to provide cyber security to these abundant devices [3].

Edge computing is an emerging decentralized computing paradigm that aims to enhance security, prevent data theft, minimize data flow and improve the efficiency of IoT applications. Many IoT applications have benefited from edge computing, like reducing network bandwidth, computing time, and the frequency of two-way communication between devices and the cloud. Since many IoT devices are resourceconstrained, the attackers can make them vulnerable to security threats. But the edge nodes in the edge computing architecture can perform sophisticated security functions and secure IoT devices [4]. Real-time services, transient storage, data dissemination, and decentralized computation are some of the security solutions which edge computing can provide to IoT devices. Edge nodes provide real-time services like intrusion detection and identity authentication by performing computing near the data generation points. The sensitive data acquired from IoT devices is protected and shared securely by edge nodes temporarily through transient storage. Finally, encryption techniques during data dissemination and verifiable or server-aided decentralized computation are the solutions incorporated by edge computing. Among all these, intrusion detection by edge computing is an efficient solution that can identify the attacks targeting local services. Edge nodes identify any policy violations or malicious activities and prevent them from affecting the whole infrastructure. In a complex attack situation, they collaborate with the adjacent nodes or the nodes in a higher hierarchy to detect the attack. With a reliable intrusion detection system in edge-enabled applications, this cooperation of edge nodes can improve malicious attack detection success rate [5].

The area of Machine Learning (ML) has a significant interest in many domains. It is widely used in IoT security to provide defense against attacks compared to traditional methods. Integrating intrusion detection on edge nodes with ML algorithms offers a promising platform to overcome the challenges for securing IoT devices from cyberattacks. The role of ML is to use and train the algorithms to detect anomalies or any suspicious activities in the network. ML algorithms can perform two-step processes such as learning and classification steps whenever the available data is labelled. The learning step trains the model, and during the classification, the model predicts the new label of the data. This process makes the model detect any new attacks that traditional security algorithms could not detect [6].

This paper compares ML classification algorithms adopted on edge nodes to analyze the input data stream and network traffic. The study uses the NSL-KDD dataset since it contains the labelled records of simple intrusion detection networks. The labels, as normal or attack, and scores indicating the severity of attacks makes it suitable to compare the efficiency of ML classifiers. Jupyter on Pycharm tool is used to analyze the algorithms.

The organization of the rest of the paper is as follows: Section II describes the recent trends in existing literature for intrusion detection in edge-based IoT applications. Section III presents the comparative analysis of different machine learning classification algorithms. Section IV discusses the findings for the research domain under study. Section V provides the conclusion.

II. RECENT TRENDS IN EDGE-BASED INTRUSION DETECTION

IoT comprises various interconnected devices to gather, process, refine, and exchange data over the internet. These devices have respective identities or IP addresses to send or receive data over the network. IoT devices are getting closer to users in their day-to-day activities due to ease of usage and applications-based task performance. This development is raising security concerns, and there is considerable literature in this area. Few IoT-based applications are home automation systems, air pollution monitoring, smart health monitoring, smart traffic management, early flood management, anti-theft and smart agriculture [7]. In these applications, any security concerns can steal sensitive data, launch attacks like blackhole, sinkhole, flooding, or degrade the applications' efficiency, performance, and reliability [8]. Therefore, existing security solutions to address these security issues, particularly edge computing-based intrusion detection systems, are reviewed and discussed in this section.

The Intrusion Detection System (IDS) continuously monitors the incoming data stream from the IoT devices and detect any possible intrusions in the system. There are two major types of IDS: signature-based and anomaly-based IDS. In signature-based, IDS compares the predefined rules, defined as a signature, with the event and reports a threat when there is a match. In comparison, an anomaly-based IDS observes a sequence of events and builds a model for normal behavior. Then the trained model detects the anomalies if there is any change in the pattern. These IDS have their own advantages and limitations. Based on the requirements, the applications can adopt an appropriate IDS. Passban is an intelligent IDS that benefits from edge computing and analyses incoming data on the edge gateways to detect attacks. This system detects various types of malicious traffic like port scanning, HTTP, brute force, and flooding with minimal falsepositive rates [9]. IMPACT is a lightweight ML-based IDS to detect impersonation attacks using auto-encoder and feature extraction. This system uses a Support Vector Machine (SVM) method for feature reduction using gradient descent on resource-constrained devices. This step provides efficient training time in identifying the attacks. This ML based-IDS has set a new benchmark on resource-constrained devices for feature reduction [10].

Fair resource-allocation-based IDS secures IoT devices from malware, data hacking, unauthorized access and other system vulnerabilities. Resources are allocated recursively for each node in the edge network. If any edge nodes incur more resource requirements, then an alarm is raised to indicate intrusion in the network. Dominant resource fairness algorithms are used for distributed resources [11]. This approach can restrict the users from demanding more resources and ignore the resources and abilities criteria.

Packet-based IDS employs TCP packets and extracts multiple features of data packets to analyze the intrusions using the Bayesian model. In this approach, data processing is crucial in converting network traffic data into a document, thus making this method the best suitable for applications with multiple data formats and data origins [12]. Similarly, there is another smart data-based IDS using an artificial immune system. Here the cloud server makes a cluster of edge nodes to detect the attacks and generate an alarm in case of intrusions. The smart data concept is an efficient, lightweight method that assists in identifying any silent attacks as well [13]. IDS based on data processing provides critical safety and security to the system since it can alter the system in case of intrusions while sourcing the data from the IoT devices.

Sample selected Extreme Learning Machine (ELM)-based IDS, adaptive ML-based IDS, semi-supervised based, online sequential ELM are all ML-based approaches used to identify intrusions in IoT devices [14]–[17]. In these systems, the edge nodes main functionality is to collect data, process, store and provide services. During training the model with labelled data, the ML algorithms classify attacks accurately and send them to the cloud for decision-making. The cloud server performs the global management of the applications and controls the system during anomalies. There is a proven instance of edge nodes detecting the attack at a 25% faster rate using ML algorithms. Apart from these, there are Deep Neural Network (DNN)-based IDS. The deep neural network is a subset of ML, and it is widely used in the cyber security system to identify unknown data patterns. It uses multiple layers of transformations to find higher-level features. Like ML algorithms, even DNN uses feature selection, training, and testing [18], [19]. Based on the overall literature review considering the advantage and ease of deploying IDS using ML algorithms, the following section includes a comparative study of ML classifiers.

III. COMPARATIVE ANALYSIS

In ML-based IDS, feature selection is an important step to improve the efficiency of the input data from IoT devices. It is the process of selecting required data by excluding irrelevant, redundant, and noisy features, thus bringing a noticeable effect for intrusion detection [20]. The proposed work considers the following six algorithms for the comparative study: Linear Discriminant Analysis (LDA), Logistic Regression (LR), Support Vector Machine (SVM), Decision Tree Classifier (DTC), Random Forest Classifier (RFC), and Multi-Layer Perceptron (MLP). The algorithms first train the dataset so that the classifiers will not be biased towards the most frequent records. Later it is tested to find the accuracy in the prediction. The following section includes brief definitions of these algorithms before analysis.

A. Linear Discriminant Analysis

LDA is a linear and binary supervised algorithm that distinguishes the data between two classes and assigns the label to known and unknown data. There are three discrimination rules in LDA. This study uses Fisher's linear discriminant rule, which maximizes the ratio between class

and within-in class groups to predict the attacks [21]. This data separability between the classes simplifies the dimensions and significantly support in identifying the intrusions.

B. Logistic Regression

LR and LDA are similar discriminant analysis methods, but LR is suitable for smaller sample size data. If the sample size during analysis is considered smaller, then the prediction can be more accurate. LR considers sigmoid logistic functions and interprets the probability of the dependent variables [22]. The precise prediction for a smaller sample size with no assumption is the main advantage of this approach.

C. Support Vector Machine

SVM is an infinite-dimensional space algorithm suitable for classification, regression or any outliner detection. Unlike prevision methods, SVM creates a line or hyperplane to distinguish the data between the classes. It uses kernel tricks to transform the data and find the optimal boundary between the possible outputs [21]. SVM solves complex optimization problems analytically and returns optimal hyperplane parameters.

D. Decision Tree Classifier

DTC is a predictive modelling classifier for continuous values. It is simple and interprets efficiently with little data preparation. Compared to the above methods, there is no data normalization since the trees can handle qualitative predictors with no dummy variables [23]. The rich set of rules available in DTC supports integrating it in real-time applications.

E. Random Forest Classifier

RFC is an ensemble learning method for classification that operates by constructing many decision trees during training and selects the appropriate decisions from the output. Compared to DTC, RFC influences the data characteristics and provides better predictions [24]. The automatic balance between huge data is the main advantage of RFC.

F. Multi-Layer Perceptron

MLP is a pattern recognition classifier sometimes referred to as a feedforward network. It performs the backpropagation technique for training the data and distinguishes the data that is not linearly separable. It has activation functions that create a linear function between input, output and the hidden layer and support the data interpretations [25]. MLP can predict the projection given a new situation.

IV. EXPERIMENTAL SETUP

The Jupyter on Pycharm tool has been used to perform the comparative analysis using the NSL-KDD dataset, a benchmark for modern-day traffic. It includes train and test data with the most challenging internet traffic records. It contains four different classes of attacks like Denial-of-Service, Probe, User-to-Root, and Remote-to-Local. This dataset includes a total of 43 features per record, out of which 41 features are traffic input, and the last two labels indicate normal or attack data and scores indicating the severity of the attack [26]. The comparative analysis uses a training time and confusion matrix to evaluate the efficiency of the algorithms.

The confusion matrix is a summary of the prediction results of the classification problem. Table 1 shows the confusion matrix that includes the following values: TP (True

Positive) represents the intrusions correctly classified; FN (False Negative) represents intrusions misclassified; FP (False Positive) represents non-intrusions misclassified; and TN (True Negative) is the correct prediction of non-intrusion.

TABLE 1. Confusion Matrix

	True class							
		Positive	Negative					
Predicted class	Positive	ТР	FP					
Predic	Negative	FN	TN					

A. Training Time

The total time required to train the model is training time. Table 2. illustrates the training time of the considered methods. The results show that SVM has a higher training time of 193.27 seconds due to kernel techniques.

Table 2. Training Time

ML Algorithms	Training Time (seconds)
LDA	2.54
LR	2.77
SVM	193.27
DTC	1.73
RFC	12.61
MLP	1.20

B. Training and Testing Accuracy

The number of test cases correctly identifies the intrusions is the accuracy of the model. The accuracy obtained by applying the model on the training dataset is called training accuracy. To verify the accuracy obtained, the model is tested with the unknown test dataset, and it is called testing accuracy. Equation (1) shows the evaluation of these accuracies. Fig. 1 shows the training and testing accuracy of the algorithms. DTC has significantly lesser test accuracy than the other methods due to the analytical comparison of the obtained results, and any slight change can drastically change the results.

$$\frac{TP + TN}{TP + TN + FP + FN} \tag{1}$$

C. Other Performance Evaluation Parameters

In addition, the following performance evaluation parameters are evaluated using a confusion matrix.

Precision: The ratio of all positive labelled instances to the notion of the positive cases that the model accurately recognizes, is known as precision. Equation (2) shows the evaluation of precision.

$$\frac{TP}{TP + FP} \tag{2}$$

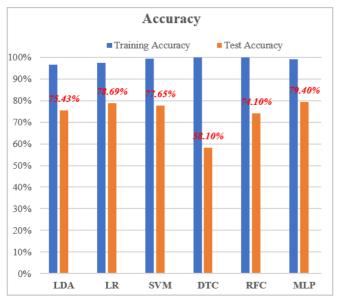


Fig. 1. Training and Testing Accuracy comparison.

Recall: The proposition of the positive cases that the model correctly recognizes is called recall. Equation (3) shows the evaluation of recall.

$$\frac{TP}{TP + FN} \tag{3}$$

F-measure: A harmonic mean of precision and recall is used to calculate the F-measure and to test accuracy. Equation (4) shows the evaluation of the F-measure.

$$\frac{2X \operatorname{Precision} X \operatorname{Recall}}{\operatorname{Precision} + \operatorname{Recall}} \tag{4}$$

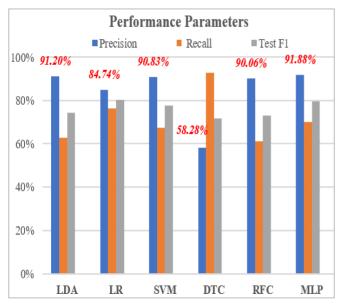


Fig. 2. Performance evaluation comparison.

Fig. 2 shows the overall results obtained from the confusion matrix. The results show that DTC has comparatively less precision, although it has a better recall of 92.8%. And all the other methods have an appropriate harmonic mean balance showing an F-measure of above 70%.

V. DISCUSSION AND FINDINGS

The comparative analysis discussed shows that MLP and DTC have a better training time. MLP is an efficient classifier based on network patterns. MLP has dependencies between input and output; the output significantly predicts it if the input data has an intrusion data stream. Moreover, there is no normalization in data preprocessing with no scaling in DTC, so the training time is comparatively less. But when confirming the attack, the accuracy is not good enough. It is mainly because a small change in input data causes a larger change in the tree structure, which causes instability. Therefore, it shows a significant difference in the accuracy of the algorithms.

The algorithms considered in this paper have efficient training accuracy of 99%. These algorithms are capable of mapping inputs to the desired outputs efficiently for a given set of predictions. But for edge-based IoT applications and networks, providing the prediction at a faster rate is most important. Apart from SVM, all the other algorithms have better training time, mainly due to many parameters considered during SVM classification. Moreover, to identify the one best algorithm for edge-based IoT applications, these algorithms are further evaluated. The test precision in Fig. 2 indicates that DTC has the least prediction due to the absence of normalization. Finally, LR and MLP have better recall and F-measure, as illustrated in Fig. 2, confirming the balance between recall and precision. However, considering faster training time for predicting attack as a requirement for edgebased IoT network, MLP can be an appropriate algorithm with a training time of 1.2 s, accuracy 99% and F-measure of 79.46%.

Apart from security issues, there are also other areas of improvement for edge-enabled IoT networks. Due to the resource limitations of the edge IoT devices, the efficient resource allocation and intrusion detection system is a challenging research area. In addition, the benefits of using machine learning-based intrusion detection include the reduction in load for edge nodes, the possibility of deployment of fine-grained security mechanisms, and the reduction of interaction among nodes for security purposes. Moreover, federated learning techniques are emerging further to enhance intrusion detection systems [27].

VI. CONCLUSION AND FUTURE WORK

As IoT devices are increasing in day-to-day activities, ensuring the security of these devices has become more prevalent. Although IDS is a mature research area, it still requires intense effort towards securing IoT applications through edge computing. Unlike conventional security methods, IDS deployed in edge computing need significant support to identify intrusions efficiently with minimal resources and computational capabilities. In this paper, we performed a comparative study of ML algorithms for edgebased IoT applications. ML algorithms can improve efficiency over time and support computationally intensive edge-based applications without overloading them. From the comparison, we observed that MLP has better training time. MLP has

dependencies between input and output and is an efficient classifier for edge-based IDS. And it provides better prediction with minimal time and makes it suitable for edge-based IoT networks. In future, we will further enhance this algorithm to develop a secure edge-enabled IoT network.

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Framework Analysis of the Concept of Self Expression in Professional Identity Construction Among Young Graduates on Social Networking Sites

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Abstract—This paper explores the concept of professional identity construction among young graduates on social media. It is a process when graduates transformed their image following the assemble of their professional identity, which includes the attributes, beliefs, values, motives, and expression. Most often, these identities were portrayed online by showcasing their professional capacity through a curated self expression on social media. This paper covers the following area: professional identity construction, self expression, and social networking sites. To guide the study, it utilises Social Identity theory, particularly Individual Mobility, and Uses and Gratification, to establish a feasible framework. The specific scope of this study is young graduates who are new in embarking the professional world. In regards to the theme of digitalisation and transformation, this research will discuss how media is being utilized in curating one's professional front, while constructing their identity on social networking sites. This is significant to the academic knowledge in gaining a deeper understanding of values in the contexts of professional and interpersonal communication, alongside to strengthen the theoretical implication of the field.

Keywords—Self Expression, Professional Identity Construction, Social Networking Sites, Young Graduates

INTRODUCTION

This study explores the concept of self expression in constructing young graduates' professional identity on various social networking sites. The research looks into the angle of professional identity construction through the areas of Individual Mobility, established from one of the concepts of Social Identity Theory (Tajfel, Turner, 1979). Self expression and social media is studied quite comprehensively, and sometimes in complex manner, as its complexities are usually multi-dimensional and multi-disciplinary (Williamson, Stohlman, Polinsky, 2017, Lee, Lin, 2019, Ruane, Wallace, 2015). The basics and history of self expression is defined by Derlega and Grzelak (1979), who proposed that self expression, self-clarification, social validation, relationship development, and social control, were the five basic functions of self-disclosure.

Professional identity has been extensively studied by scholars in social sciences, medicine, business and management, communication and information sciences (Inglehart, 2008; Inglehart & Oyserman, 2004; Kasperiuniene, Zydziunaite. 2019). The professional roles of employees in different professions as a part of professional identity are empirically tested from time to time (Akkerman and Meijer, 2011).

It has also been studied in many dimensions of identity, such as race, culture, class, religion, gender, or sexual orientation.

Within the study of professional identity construction, one study showed how professional identity can gradually change over time, but have been mostly limited to cases where professionals adapt their identity as they follow established pathways through socialization (Ibarra, 1999; Pratt et al., 2006). Additionally, not many recent studies have explored the concept of professionals restructure or reconstruct one's identities during times of imposed change; such as job redesign, where work tasks or positions can be dramatically altered (Chen, Reay, 2020). A study by Hong et al (2017) explored dimensions of professional identity development regarding the unity of self, the way the social environment is negotiated, and the shifting or continuing pattern over time. These dimensions explain the process of becoming a professional in different social contexts, but still this process is not well defined and within a certain context just yet.

On the other side of self expression and SNS, it has been noted before that SNS, like Facebook or LinkedIn, have become a norm in personal communication, online self expression seems to have lost some of its potential for identity experimentation (Strano, 2008; Zhao et al., 2008), favouring instead the tension between the portrayals of actual and ideal selves (Ellison, Hancock, & Toma, 2012; Lampe, Ellison, & Steinfield, 2007; Manago et al., 2008). It has been established that situational context dictates influence on self expression motives on Facebook.

College students are in a unique situational context, which will inform their self expression motives (Wallace, Buil, Chernatony, 2017). It was found that users who believed that their network is characterized by higher social ties, they will get more likes, and that they will spread a positive word of mouth directly and indirectly to the people who surrounds them.

The overall study of professional identity construction has not been studied extensively under the lens of self expression. The literature suggests that relatively little is known about the idea of self expression and its relation to professional identity construction (Chen, Reay, 2020, Kuhn 2006, Caza, Vough, Puranik 2018). Therefore, this research aims at understanding and narrowing down the gaps between both of self expression and professional identity construction. Another aim for this study would also draw an understanding on the severity of the impact of self expression in the context of professional identity communication, and

through usages of different SNS and the aspirations of the users of SNS in this topic that is currently proposed to be studied. The direction of this paper is guided with the following question:

- 1. What undertakes one's professional identity construction?
- 2. How does one manage their self expression on social networking sites?
- 3. How does one's self expression on social networking sites relate to their professional identity construction?

LITERATURE REVIEW

Self expression and social networking sites (SNS) are studied quite comprehensively, and sometimes in complex manner. Its complexities are usually multi-dimensional and multi-disciplinary.

The basics and history of self expression is defined by Derlega and Grzelak (1979) who proposed that self expression, self-clarification, social validation, relationship development, and social control, were the five basic functions of self-disclosure.

According a recent study, SNS affordances amplify and make more visible a set of strategic concerns and motivations that shape self-disclosure characteristics. By analysing the content of self-disclosing posts and messages on one hand, and the goal behind these disclosures on the other, a study revealed self-disclosure goals characteristic of different media affordances on SNSs, depending on their privacy/publicness and interaction directed-ness. The results from the study found that that users of SNSs utilise different social media functions for disclosures with different levels of intimacy, depending on their motives and goals, which help to reconcile traditional views on self-disclosure as selective behaviour typically shared in dyadic contexts with public self-disclosure on SNS (Bazrova, Choi, 2014).

Additionally, self expression needs to be understood in relation to how those expression is heard and responded to (Couldry, 2010, McNamara, 2013), and that self expression needs to be understood as more than just speaking or writing, but it should be understood equally about the capacity to devise and enact experiments with our bodies, identities, and moods (Lupton, 2014, Nafus & Sherman, 2014).

There's a notion of understanding that professional identity is not important, Marc Zuckerberg has said that: "You have one identity. The days of you having a different image for your work friends or co-workers and for the other people you know are probably coming to an end pretty quickly.... Having two identities for yourself is an example of a lack of integrity." (Kirkpatrick, 2010).

The evolution of a person's career is a process that involves identity transition, whether in the course of the educational journey, job promotion, or in the process of moving from one professional domain to another, noting that the average person changes career five times in their life time (Barrett, 2017).

Professional identity has been extensively studied by scholars in social sciences, medicine, business and management, communication and information sciences. It has also been studied in many dimensions such as identity such as race, culture, class, religion, gender or sexual orientation. The professional roles of employees in different professions as a

part of professional identity are empirically tested. Akkerman and Meijer (2011) elaborated a professional identity as (a) simultaneously unitary and multiple, (b) continuous and discontinuous, and (c) individual and the same time social. The authors revealed that the coherent and consistent sense of a professional self within the professional identity could be maintained through a variety of individual and group participation, and self-investment throughout their professional career (Akkerman & Meijer, 2011).

Elsewhere, the Social Identity Model of Identity Change (SIMIC) often defined as "distinct contribution to recognise that successful adjustment to any life transition involves a process of social identity change in which existing group memberships are likely to be altered in some way—by becoming more or less important, or by being lost—while new group memberships are potentially gained." (Haslam et al, 2019).

SIMIC model has been studied and applied in different fields of study under the banner of social sciences, such as parenthood, education, illness, or retirement (Iyer et al., 2009; Jetten and Pachana, 2012; Steffens et al., 2016; Tabuteau-Harrison et al., 2016; Praharso et al., 2017; Ng et al., 2018).

The plethora of studies between SIMIC model and other fields of study correlates with the notion that SIMIC builds itself in important ways on the social identity approach of which consists of Social Identity Theory and Self-Categorisation theory (Jetten et al, 2018).

The SIMIC model has been studied in the context of professional identity change. In their qualitative study, the scholars noted that SIMIC is an ideal model that highlights the changes on processes of identity construction (Bentley et al, 2019). Figure 1 demonstrates the SIMIC model more clearly.

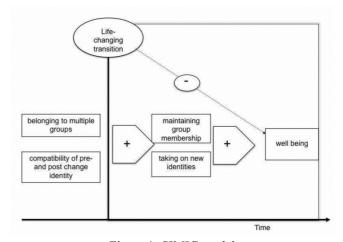


Figure 1: SIMIC model

This section has addressed the literature and the areas of study that concerns the topics involved. However, on closer examination, there is lack of understanding in the areas of study and topics as discussed before.

It has been noted that self expression and creative production are not well integrated into traditional models of media use and gratifications because it does not consider expression of production because of the long standing dominance of the reception effects of communication; therefore, this should be studied on the work of expression effects and recognising how messages production both reflects underly-

ing traits and indicates active processes (Ekstrom, Ostman, 2015, Baraket, Moran, Shahar, 2016).

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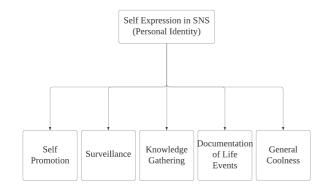


Figure 2 : Self Expression in SNS (Personal Identity) (Sheldon & Bryant, 2016)

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It has been noted that self expression and its relation to SNS often has an impact on relief of distress that allows one to release emotions through a form of self expression. Internet communication encourages people to engage in a "selective self-presentation" that ends up depicting a positive disclosure (Walther, 1996, Fox, Vandemia, 2016). Furthermore, Hum et al (2011) argues that the main motivation of social media use is to 'create and enhance a self-image'. A great example for this case can be seen by this example: in a study about selfies and its relation to self expression, a selfie would be that form of self expression, information sharing to benefit others comes from a desire to share information with others that may be of a personal nature, or may emerge

from a desire to let others in on something the communicator has discovered (Williamson, Stohlman, Polinsky, 2017).

The need for self expression through self-disclosure use of media predicts positive valence/image (Al-Kandari, Melkote, Sharif, 2016). In the same quantitative study conducted through Instagram users, under visual self expression, "users cited the following needs and motives: enable others to view my life's happenings in pictures, document the details of my daily life in pictures, let others know about my daily activities and share with people the things I am interested in." (Al-Kandari, Melkote, Sharif, 2016).

Another point worth highlighting is that, "Within 'experiment with new medium and hobby,' needs and motives included honing skills in photography, practicing photography as a hobby and sharing other creative pictorial work." (Al-Kandari, Melkote, Sharif, 2016).

Overall views of self expression and SNS are often divided thanks to different purposes and different mediums. Facebook use have centred on the social value of social media as it relates to interacting and connecting with friends. For example, earlier studies on Facebook showed that connecting and staying in touch with friends, family, and acquaintances; maintaining social ties; and keeping up with old friends, among other socially relevant motivations were the primary motives for using a platform like Facebook (Quan-Haase & Young, 2010; Raacke & Bonds-Raacke, 2008).

One key factor of this research is that this research aims at looking at the content uploaded by the respondents. In order to do so, this research needs to carefully look at the types of content that and the idea behind the self expression posed by the respondents themselves.

There is not much knowledge on how professionals restructure or reconstruct their identities during the times of imposed change, where their career can be dramatically changed in ways the professionals cannot manage (Chen, Reay, 2020)

Because the target respondents are new graduates, this gap mentioned above will be cross examined with the respondents' insights of how they managed their transition from fresh graduates to recently hired professionals.

In the articles discussed, constructing a professional identity in social media is usually understood as a multidisciplinary self-presentation with text, pictures, and video. Such a type of studies, although still looking futuristic and techno-utopian, begins a new trend in social media identity investigation. Therefore, Professional identity construction is a changing concept, always under development (Kasperiuniene & Zydziunaite, 2019).

Social media has a growing importance in the construction of professional identities in society, as it offers places where individuals "showcase" their living and professional experiences. Social media enables professional identity expression, exploration, and experimentation. It is important to comprehend the motives of agencies to understand group interactions on social platforms (Kasperiuniene & Zydziunaite, 2019, Chen & Reay, 2020).

For theoretical application of this research topic, the Social Identity Theory is a conceptualisation of the psychological theories and behaviours that form the way we define ourselves while involved in groups. Social Identity Theory, first

suggested in 1979 by Henri Tajfel and John Turner, includes three cognitive mechanisms that influence how we view others and ourselves (Reid, 2009).

Individual mobility is often defined as which members of low status groups can improve their social identity is by attempting to leave or psychologically distance themselves from groups that are socially devalued. Additionally, they can join or affiliate themselves with groups that enjoy higher standing individual mobility (Ellemers, 2001a; Wright & Taylor, 1998 both cited in Derks, van Lear and Ellemers, 2007.).

Individual mobility can take many forms, the most obvious one being when group members leave a low status group and gain membership in a group with higher societal status. The use of individual mobility to improve social identity is restricted by contextual factors as well as individual differences. In terms of context, individual mobility will only be a feasible strategy in contexts in which boundaries between groups are perceived to be permeable, so that individuals can leave or dissociate themselves from one group, and gain entrance into another group (Derks Laar, Ellemers, 2007).

The use of individual mobility is also affected by individual difference variables, such as individual ability, and the degree of identification with the devalued group. Individual mobility is used especially by group members who perceive their individual ability on status-defining dimensions to be as high as that of high status group members (Boen & Vanbeselaere, 2002; Taylor & McKirnan, 1984, Derks, 2007). In addition, even though low status groups negatively contribute to social identity and are. Therefore, likely to foster lower identification than high status groups (Ellemers, 1993; Simon, 1998, Derks, 2007), group members can be highly committed to their low status group.

So far the previous sections have addressed the relevant understandings of professional identity constructions, self expression and social networking sites, and a general understanding of the theoretical understandings of SIT and Individual Mobility. The relevant academic components such as problem statement, aim of the study, research questions, significance of study, scope and contributions will be discussed below.

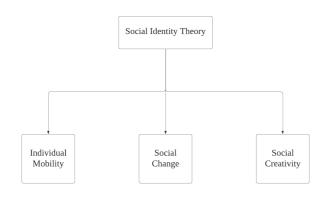


Figure 3. Social Identity Theory (SIT) (Tajfel, Turner, 1979)

When engaging in group processes, our social identity is concerned with our social categorisation, our social recognition, and social comparison. Based on how the members of our communities view us, whether this interpretation is positive or negative, we attempt to establish our personal identity. Group behaviour will result in the consequences of having a poor social identity. They work for their shared goals and group identity when members of an in-group behave together, whereas collective group activity can be volatile and can easily escalate when people behave in the interest of their "in-group".

For this particular research, the underpinning theory that supports the identity perspective of this research borrows the Uses and Gratifications (U&G) Theory. The theory attempts to make sense of the fact that people consumes media messages for all sorts of reasons and that the effect of a given messages is unlikely to be the same for everyone (Katz, Blumer and Gurevitch's, 1974). The theory concerns with the social and psychological organs of needs, which generates expectations of the mass media, and other sources, in turn, lead to a differential pattern of media exposure and/or engagement in other activities, resulting in need gratifications and other consequences, mostly unintended ones.

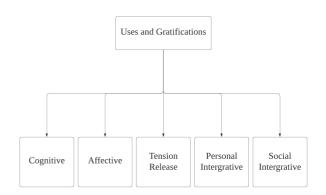


Figure 4: Uses and Gratifications (Branston & Stafford, 2010)

This theory has five assumptions: the first is that people use media for their own particular purposes; secondly, people seem to gratify needs; thirdly, media compete for our attention and time; fourthly, media affects different people differently; and lastly, people can accurately report their media use and motivation.

Furthermore, U&G has a typology that has been covered before. Rubin (1981) concluded that his typology of eight motivations can account for most explanations people give for why they watch televisions. Passing time, companionships, escape, enjoyment, social interaction, relaxation, information, and excitement. Though, this was mostly examined on the effects of TV rather than social media.

For social networking sites, social networking sites users may frequent three platforms, such as Facebook, Twitter, and Instagram. A research done by Pelletier et al (2020) examines uses gratifications analysis of social media platforms. The results have shown that Facebook can be used to communicate with millions of users through text based posts, pictures, video, or chat based communications. It has been proven before that the lowest social usage intentions of the three social networking sites demonstrated higher levels of not only social usage intentions but also exhibited higher levels of co-creation intentions (Pelletier et al, 2020). What this research pointed out is that, in the context of U&G, different social networking sites have the opportunity to display the users' intentions and motivations of their usages. The authors pointed out that "a majority of research to date has been conducted using a sample obtained from a single

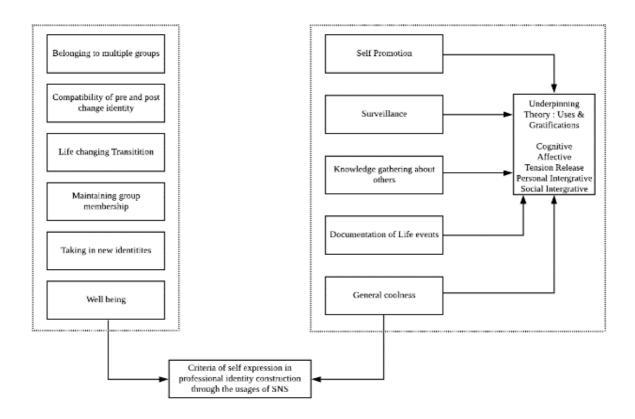


Figure 5. Research Framework

social media platform." (Pelletier et al, 2020). The authors suggested that future research should further explore the role of social media platforms fit in examining how social media contributes to different results across multiple social media platforms. U&G has also been studied in specialised contexts like Virtual Community (VC). A few virtual communities (VC), like the transaction community, such as eBay, the education community, such as Smart Force, and the financial community, Intuit's Quicken, have proved to be commercially successful by generating revenues and profits (Sangawan, 2005). The results gained from this specific research highlighted that there were three key motivators for VC use, namely, Functional, Emotive, and Contextual. The overall results were a mixture of needs, but related to the information acquisition and the usages for information for pleasure.

Also worth noting is that U&G research often look at the motivations of users from wide range of research topics and fields of study. (Karimi et al, 2014; Sjoblom, Hamari; 2016. Lampe et al 2010. Chen 2011; Dunne et al. 2010; Smock et al. 2011).

For this research, the application of U&G will serve as an underpinning theory, and focuses on the effects that the participants get. It will be evaluated by the five assumptions that was discussed above. From what was discussed, a research concept was generated to explore the possible connections on the following concept: SIMIC model, self expression, individual mobility, and uses & gratification.

RESEARCH CONCEPT & DISCUSSION

The left-hand side of the proposed framework model borrows all of its elements from SIMIC model, and the right-

hand side borrows all of the elements from Self Expression in SNS (Personal Identity) (Sheldon, Bryant 2016). Beside Self Expression in SNS (Personal Identity) is Uses & Gratifications, from Branston & Stafford (2010), that serves as underpinning theory for this research.

For this proposed framework, the chosen theory is the small component from The Social Identity Theory, which is Individual Mobility. Individual mobility is defined as which members of low status groups can improve their social identity by attempting to leave or psychologically distance themselves from groups that are socially devalued. Furthermore, they can join or affiliate themselves with groups that enjoy higher standings.

For this proposed framework, the relation to the theory is significant due to the fact that SIMIC model is the further extension of SIT and Individual Mobility, as pointed in Figure 1. Therefore, the components that constructs SIMIC are belonging to multiple groups, compatibility of pre and post change identity, life changing transition, maintaining group membership, taking in new identities, and lastly, well-being. On the other end of the framework is the SNS components that comprises self-promotion, surveillance, knowledge gathering about others, documentation of life events, and general coolness. Therefore, SIMIC model addresses the first research question of the study.

With the brief literature understanding presented above, this research aims at understanding the changes from being a student to shaping their professional identity through the usage of SNS. Self expression and personal identity, which is self-promotion, surveillance, knowledge gathering about others, documentation of life events, and general coolness, will address the second research question. Afterwards, combining the two elements will yield criteria for self expression within the context of self expression in professional

identity construction through the usages of SNS as highlighted in the proposed framework will answer the third and last research question.

CONCLUSION

This paper addresses the overall understanding of self expression and professional identity construction, and together with the questions posed, it gives a reason for this topic to be studied in great detail.

This paper aims at providing solutions to the problem of high unemployability of recent graduates due to lack of skills. Therefore, by conducting this research, this study can identify what needs to be done for the recent unemployed graduates, and better help them understand what the correct methods for them to undertake in the future.

Secondly, this research will also add to more of understanding of social identity theory, particularly individual mobility. Through the variables of self expression and professional identity construction, the findings will highlight new understanding and preferably new model that many researchers haven't explored. The contributions of this study would be helpful in both fields of new media and professional identity construction, since the results gained from this research will provide new insights for both aspects of the field of study.

Thirdly, this research aims at a deeper understanding of the role of self expression from young Communication university graduates, and how it affects them within the professional context. This research should be able to give a further understanding on the role of self expression within the context of professional identity construction, as well as their chances of being employed in a professional context.

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Exploring Students' Acceptance of Microsoft Teams as an Online Collaboration Platform for Tertiary Education

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Abstract—The COVID-19 pandemic has severely affected education globally at an unprecedented scale. The challenge the COVID-19 pandemic posed to tertiary education in Malaysia has been profound and game-changing. Higher educational institutions in the country had to rapidly adjust from face-to-face teaching to a fully online delivery mode. This transition initiated the urgent utilization of various online collaboration platforms that was not meant for teaching and learning. As a result, it has imposed unsurmountable pressure on the educators and students to adapt. The hastiness for change adoption did not provide an opportunity to evaluate how well the students accepted the online collaboration platforms used as the new mode of learning. Although the advantages of online collaboration platforms have been discussed in various previous studies; a closer understanding of the factors affecting learners' technology acceptance and online learning experience is warranted. This study investigates the critical factors affecting students' acceptance of Microsoft Teams as an online collaboration platform, based on the Three-Tier Technology Use Model (3-TUM). The three tiers in this model are namely, tier one that investigates the individual experience and system quality; tier two that investigates the affective and cognitive domain; and tier three that will investigate behavioral intention. This is quantitative research where a five points-Likert scale was used to collect the data. 265 samples were collected from various undergraduate programmes. The preliminary results from the study demonstrated 3-TUM to be a suitable theoretical tool to understand students' acceptance of online collaboration platforms. Results have indicated perceived usefulness and perceived satisfaction positively influenced the behavioral intention to use Microsoft Teams. In conclusion, there were useful insights on the effective use of online collaboration platforms and this paper also presented the potential of further investigation into this area.

Keywords—online collaboration platforms, Microsoft Teams, student acceptance, behavioral intention, 3-TUM

I. INTRODUCTION

The COVID-19 pandemic has impacted modern society with significant changes impacting our daily lives,

perception of work and the delivery of education. There needs to be a prioritization for educational institutions to adapt to changing norms to minimize the effects to teaching and learning practices. The pandemic has caused a shift of physical classes to online delivery in many universities and schools globally. According to Abdullah, Husin, and Haider [1], many institutions of learning are struggling with the constant challenge of conducting online classes from student engagement to technical issues; to even addressing the equity gaps in students access to bandwidth. Within 24 months, the education landscape has evolved to online learning where teaching is remotely conducted through a plethora of digital platforms [2]. The pandemic resulted in many educators seeking innovative methods and mechanisms to actively engage learners [3]. According to Pal and Vanijja [4], while online or electronic learning is not a novel concept due to online self-learning platforms like Coursera and Udemy, it has never been used as a mainstream and primary form of teaching. With a plethora of online learning tools, educators are scrambling to find the gold standard; most of which were not designed as learning tools. These tools are now regarded as the de-facto choice due to the wide-spread availability or ease of use.

II. LITERATURE REVIEW

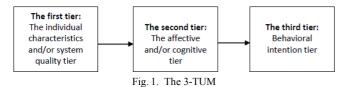
A. The Application of Microsoft Teams

This paper will report on the use of Microsoft Teams as an online learning platform in UOW Malaysia KDU University College, an Australian Tertiary entity in Malaysia, through its enterprise subscription for its academics and students. Microsoft Teams, has the advantage of learning management features with its scheduling system, attendance tracking and file-sharing. Students and lecturers have the flexibility to upload and download files without having to create an online session; termed as a persistent online environment. Other advantages include the feature of breakout rooms which allows smaller group participations from the main discussion. Microsoft Teams allows the ability to include plug-ins that enhances the learning experience with leaderboards, quizzes and automated graded tests [4]. So, whilst the University has selected Microsoft Teams as its

primary online learning platform, the big question remains – how receptive are the learners of the University, towards Microsoft Teams as an online learning platform? As research into this area, within Malaysia is still new; this paper aims to contribute to the literature and provide a baseline for future research conducted. This paper utilizes 3-TUM to elaborate that students' perceptions (perceived usefulness and perceived satisfaction) have positively influenced the behavioral intention to use Microsoft Teams. This is consistent with the study by Oye, Iahad, Madar, and Rahim [5] that states positive user perception on online learning use is critical.

B. The Three-Tier Technology Use Model (3-TUM)

The 3-TUM (Fig. 1) is a model proposed by Liaw [6] that explores the attitudes of the users towards online systems at three tiers: the individual experience and system quality (first tier); the affective and cognitive domain (second tier); and behavioral intention (third tier). The model suggests the first tier of individual characteristics and system quality can influence the second tier, and thoroughly in a domino effect, it will continue to influence the third tier of behavioral intention.



Based on the findings and propositions suggested by Cigdem and Ozturk [7], the factors identified to determine students' behavioral intention to use a learning system are as follows: self-efficacy, multimedia instruction and interactivity at the first tier, and perceived usefulness, perceived satisfaction, and perceived ease of use at the second tier.

Self-efficacy is defined as the belief users have in their confidence to perform specific tasks using a system [8]. Selfefficacy also plays a major role in the context of technology usage and information systems [9]. In a quantitative study by [7], the results show that self-efficacy significantly influences perceived ease of use and perceived usefulness. For this reason, learners' self-efficacy was selected as one of the factors in the first tier of the 3-TUM. The environmental characteristic is another determining factor for online learning effectiveness, satisfaction, and usefulness [10]. It comprises the quality of the online learning content, quality of the multimedia instructions delivered, and the interactive activities that the learner can enjoy while using the system [8]. Presenting course materials through multimedia have positive effects on learners' satisfaction within the learning environment and is likely to promote learners' participation in the learning process, was also observed in [6]. Interactivity is the interaction between learners and the said system, the communication between the instructor and learners, as well as the collaboration among the learners supported by the system under use [7]. Microsoft Teams as an online collaboration platform allows learners to actively explore and interact with the course materials; a key factor for improving learners' positive feelings such as perceived satisfaction, perceived ease of use and perceived usefulness [6]. Thus, the effect of factors like multimedia instruction and interactivity

can positively influence the behavioral intention of learners to use Microsoft Teams. Therefore, the correlation between these two factors is considered significant in the proposed paper.

The level of perceived satisfaction is a significant predictor of outcomes related to behavioral intention in technology use and acceptance [11 - 12]. Perceived satisfaction can be defined as user acceptance of a system and the degree of comfort involved in using them [13]. Therefore, in an online collaboration platform like Microsoft Teams, a greater degree of satisfaction when using the platform implies a higher degree of willingness to use it. Previous research supports the proposition that perceived satisfaction is an important factor of learners' behavioral intention to use online learning systems [6 - 7, 14]. According to Davis [15], perceived usefulness is defined as the degree to which a user believes that using a system would enhance his/her performance; whereas perceived ease of use refers to the degree to which a user believes that using a system would be free of effort. The 3-TUM demonstrated that both perceived usefulness and perceived ease of use are two key factors of system adoption and perceived satisfaction [6 - 7]. Within the context of this paper, perceived usefulness would indicate the degree a learner believes that using Microsoft Teams would enhance his/her learning, while perceived ease of use signifies the platform's ease of use.

Finally, behavioral intention is the measure of likelihood a learner utilizing Microsoft Teams for online learning. Through the behavioral intention tier of 3-TUM, the individual behavioral intention to use technology for a particular purpose can be predicted [6]. In the context of this paper, the behavioral intention to use Microsoft Teams depends on the learner's perceived usefulness, perceived ease of use and perceived satisfaction of Microsoft Teams.

III. THEORETICAL FRAMEWORK

The theoretical framework for this paper adopts the 3-TUM model proposed in [7]; to determine students' behavioral intent to use Microsoft Teams based on the following factors: self-efficacy, multimedia instruction and interactivity at the first tier, and perceived usefulness, perceived satisfaction and perceived ease of use at the second tier (Fig. 2).

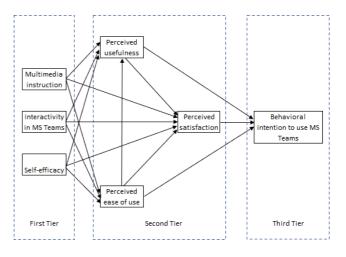


Fig. 2. The theoretical framework

Based on this theoretical framework, this paper aims to answer the following research questions:

- Does self-efficacy, multimedia instruction, interactivity and perceived ease of use of Microsoft Teams predict perceived usefulness?
- Does self-efficacy, multimedia instruction and interactivity of Microsoft Teams predict perceived ease of use?
- Does self-efficacy, multimedia instruction, interactivity, perceived ease of use and perceived usefulness of Microsoft Teams predict perceived satisfaction?
- Does perceived ease of use, perceived usefulness and perceived satisfaction predict behavioral intent to use Microsoft Teams?

IV. RESEARCH METHODOLOGY

A. Participants

The data was collected from undergraduate students enrolled in subjects offered from the School of Computing and Creative Media that used Microsoft Teams as the online collaboration platform. All subjects were delivered fully online during the pandemic period. The participants of this research consisted of 265 undergraduates. The questionnaire was administered online during class at the end of the January 2021. Data cleaning was performed, and two questionnaires were discarded for incompleteness.

B. Research Instrument

To investigate the factors affecting students' acceptance of Microsoft Teams as an online collaboration platform, a Google form survey questionnaire was developed. The survey instrument is based on 3-TUM constructs validated in [6-7] and adapted to the context of this research. The questionnaire consisted of four sections. Section 1 consisted demographic data such as gender, subject name, programme enrolled in and most frequently used features of Microsoft Teams. The remaining sections were composed of psychometric data divided according to the 3-TUM tiers. Section 2 consisted of 11 survey items for three first-tier factors: perceived self-efficacy, multimedia instruction and interactivity. Section 3 included 18 survey items for the three second-tier factors identified as perceived usefulness, perceived ease of use and perceived satisfaction. Section 4 of the questionnaire consisted of 5 survey items of the third tier; the behavioral intent to use Microsoft Teams. All variables were measured using the five points-Likert scale, with 5 being "Strongly Agree" and 1 being "Strongly Disagree". Survey items for each factor are presented in Table I.

TABLE I. DISTRIBUTION OF SURVEY ITEMS TO FACTOR

Factor	Survey Item	Mean	Std. Deviation
I1	I feel confident using Microsoft Teams.	4.02	0.82
12	I feel confident operating the features of Microsoft Teams.	3.94	0.86
13	I feel confident using the contents on Microsoft Teams.	4.00	0.78

Factor	Survey Item	Mean	Std.
Total Self-	Efficacy	11.95	Deviation 2.30
14	I like to use the audio (voice) instruction.	3.54	0.89
15	I like to use the video instruction.	3.57	0.97
I6	I like to use the text (chat) instruction.	4.01	0.85
17	I like to use the graphic (images) instruction.	3.75	0.84
18	I like to use the animation instruction.	3.65	0.86
Total Multi	imedia Instruction	18.51	3.47
19	Microsoft Teams enables interactive communications between instructor and students.	4.01	0.77
I10	Microsoft Teams enables interactive communications among students.	3.87	0.87
I11	The communication features (video conferencing, chat, channels, etc) in Microsoft Teams are effective.	3.96	0.83
Total Intera	activity	11.84	2.23
I12	I believe the contents on Microsoft Teams are useful.	4.04	0.71
I13	I believe Microsoft Teams makes it easier to do my school work.	3.83	0.89
I14	Using Microsoft Teams gives me greater control over my school work.	3.78	0.91
I15	Using Microsoft Teams allows me to accomplish learning tasks more quickly.	3.70	0.88
I16	I believe Microsoft Teams can assist in learning efficiency.	3.88	0.79
I17	I believe Microsoft Teams can assist in learning performance.	3.79	0.82
I18	I believe Microsoft Teams can assist in learning motivation.	3.65	0.94
Total Perce	vived Usefulness	26.68	5.12
I19	I am satisfied with using Microsoft Teams as a learning assisted platform.	3.97	0.81
I20	I am satisfied with using Microsoft Teams' features.	3.93	0.82
I21	I am satisfied with the learning contents available on Microsoft Teams.	3.94	0.77
I22	I am satisfied with the multimedia instructions in Microsoft Teams.	3.86	0.77
I23	I am satisfied with Microsoft Teams' features.	3.88	0.80
I24	I am satisfied with the Internet speed when using Microsoft Teams.	3.75	0.93
I25	I am satisfied with Microsoft Teams' interaction features.	3.88	0.76
Total Perce	eived Satisfaction	27.20	4.89
126	Learning to use Microsoft Teams was easy for me.	3.99	0.84
127	I found it easy to get Microsoft Teams to do what I wanted it to do.	3.89	0.87
128	Getting information on Microsoft Teams is easy.	3.86	0.84
129	Overall, I found Microsoft Teams easy to use.	3.98	0.82
Total Perce	eived Ease of Use	15.73	3.04
I30	I intend to use Microsoft Teams to assist in my online learning.	3.84	0.84
I31	I intend to use the content available on Microsoft Teams to assist in my online learning.	3.92	0.76
I32	I intend to use Microsoft Teams as an autonomous/self-directed online learning tool.	3.73	0.88
I33	I would like to see Microsoft Teams used in other modules.	3.79	0.93
I34	Having used Microsoft Teams, I would recommend it to other students to use for online learning purposes.	3.81	0.94
Total Beha	vioural Intention	19.10	3.89

C. Statistical Analysis

To ensure the reliability of the questionnaire, Cronbach's alpha coefficients were computed. In controlled environments, regression analysis can be used to infer causal relationships between the independent and dependent factors. To examine the relationships and influences between factors, Pearson correlation coefficient and multiple linear regression analysis were performed. To control the Type I error across the correlations, a *p* value of less than 0.01 was required for significance of the predictions to be accepted. In this paper, the relationships among multimedia instruction, interactivity, self-efficacy, perceived usefulness, perceived ease of use, perceived satisfaction and behavioral intention were investigated. There were four relationships examined to explore the coefficients and difference among these factors:

- The relationship among multimedia instruction, interactivity, self-efficacy and perceived ease of use on perceived usefulness.
- The relationship among multimedia instruction, interactivity, and self-efficacy on perceived ease of use.
- The relationship among multimedia instruction, interactivity, self-efficacy, perceived usefulness, and perceived ease of use on perceived satisfaction.
- The relationship among perceived usefulness, perceived satisfaction, and perceived ease of use on behavioral intention.

The statistical significance of the estimated parameters, such as R^2 , F-test of the overall fit, and t-tests of individual parameters, were also analysed.

V. RESULTS AND DISCUSSION

A. Demographic Data

Of the respondents, 55.1% were male (n = 145) and 44.9% female (n = 118). This shows an approximate even division between male and female students. 64.2% (n = 169) consisted of computing/creative media students whilst 35.8% (n = 94) consisted of non-computing/creative media students. Fig. 3 summarizes the percentage of Microsoft Teams features used in online learning. The top three features were the general channels, chat, and Assignments section. The three least used features were breakout rooms, whiteboard, and integrated applications. All the features available on Microsoft Teams at the point of writing, were utilized for online lessons. However, the percentage of utilization for each feature was not evenly distributed with the most used feature (i.e. general channels) scoring a high percentage of 82.1% while the least used feature scored only 6.5% (i.e. breakout rooms). This is a clear indicator that usage of Microsoft Teams' features by the individual educators when delivering online lessons, varied significantly.

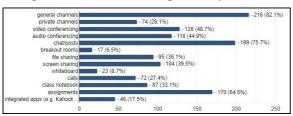


Fig. 3. Features used on Microsoft Teams

B. Reliability Analysis

A reliability analysis was conducted for the scales and subscales of the questionnaire using Cronbach's Alpha. All subscale values were between 0.80 to 0.95. Thus, all subscales were considered reliable. The reliability analysis indicated the strongest correlation was between perceived usefulness and perceived satisfaction. In this regard, learners' may perceive that using Microsoft Teams would enhance their performance; hence also reflecting a positive satisfaction level with Microsoft Teams. This result is consistent with other earlier studies conducted [6-7, 16-17].

C. Correlation Analysis

Table II provides a summary of the Pearson correlation analysis to test the relationships among the 3-TUM factors. All correlations were less than .85 and there were no high correlations (r xy > .90) among the predictors. The relationships indicated that most of the factors were significantly correlated with one another, thus suggesting a good discriminant validity. The strongest correlation indicated that perceived usefulness has a strong relationship with perceived satisfaction. The weakest correlation was the relationship between multimedia instruction and perceived ease of use.

TABLE II. PEARSON CORRELATION ANALYSIS RESULTS

	SE	MI	I	PU	PS	PEOU	BI
SE	1	0.631*	0.661*	0.675	0.750*	0.777*	0.693*
MI		1	0.661*	0.699	0.684*	0.595*	0.661*
I			1	0.755	0.768*	0.636*	0.677*
PU				1	0.839*	0.700*	0.751*
PS					1	0.814*	0.769*
PE OU						1	0.664*
BI							1

^{*.} Correlation is significant at the 0.01 level (2-tailed).

KEY: SE: self-efficacy, MI: multimedia instruction, I: interactivity, PU: perceived usefulness, PS: perceived satisfaction, PEOU: perceived ease of use, BI: behavioral intention.

D. Multiple Regression Analysis

Multiple regression analysis was used to understand which of the independent factors are related to the dependent factors. Table III summarizes the multiple regression results of the predicted path relationships between the respective dependent factors and their independent factors.

TABLE III. REGRESSION RESULTS OF PREDICTED PATH RELATIONSHIPS

Dependent factor	Independent factors	В	SE	β	t	p
	Multimedia Instruction	0.373	0.073	0.253	5.081	0.000
Perceived	Interactivity	0.883	0.119	0.384	7.393	0.000
Usefulness	Self-efficacy	0.133	0.134	0.060	0.989	0.323
	Perceived ease of use	0.437	0.097	0.259	4.502	0.000

Dependent factor	Independent factors	В	SE	β	t	p
Perceived Ease of Use	Multimedia Instruction	0.092	0.047	0.104	1.962	0.051
	Interactivity	0.233	0.075	0.171	3.109	0.002
	Self-efficacy	0.792	0.070	0.599	11.24 5	0.000
Perceived Satisfaction	Multimedia Instruction	0.067	0.055	0.047	1.220	0.224
	Interactivity	0.405	0.094	0.184	4.312	0.000
	Self-efficacy	0.162	0.096	0.076	1.687	0.093
	Perceived Usefulness	0.354	0.044	0.371	7.975	0.000
	Perceived Ease of Use	0.564	0.072	0.350	7.834	0.000
Behavioral Intention	Perceived Usefulness	0.189	0.055	0.248	3.426	0.001
	Perceived Satisfaction	0.228	0.069	0.287	3.289	0.001
	Perceived Ease of Use	-0.022	0.089	-0.017	-0.247	0.805

Note: B = unstandardized coefficients, SE = standard error of the estimate, β = standardized coefficients.

The results on whether perceived usefulness of Microsoft Teams could be predicted by multimedia instruction, interactivity, self-efficacy and perceived ease of use, revealed that three independent factors (i.e. multimedia instruction, interactivity and perceived ease of use) were predictors of learners' perceived usefulness (R^2 =0.688, F(4,258=142.499), p<0.05). However, self-efficacy did not predict perceived usefulness. Multimedia instruction and interactivity are key components of online collaboration platforms; vital in delivering quality online learning effectiveness, satisfaction, and usefulness [6]. Presenting multimedia-based course content that caters to both synchronous and asynchronous learning in an effortless manner makes a complex collaboration platform like Microsoft Teams easier to use. This in turn increases the likelihood of learners to interact with Microsoft Teams and all its features, to enhance their performance. Moreover, the system quality positively influencing the learners' affective and cognitive domains is a fundamental 3-TUM concept [6, 10]. In this study, learners' self-efficacy did not significantly influence perceived usefulness, which is caused by the underutilization of Microsoft Teams features that assist in learners' self-efficacy (i.e. whiteboard, classroom notebook and classroom breakout), shown in Fig. 3.

Investigating the relationship among multimedia instruction, interactivity, and self-efficacy on perceived ease of use of Microsoft Teams, the results of the regression analysis revealed that two independent factors (i.e. interactivity and self-efficacy) were predictors of perceived ease of use $(R^2=0.636, F(3,259=150.985), p<0.05)$, while multimedia instruction was not. This result is consistent with the statistical data presented in Fig. 3, whereby Microsoft Teams' most interactive features like video and audio conferencing, screen and file sharing were utilized the most. Students' self-efficacy could also have influenced perceived ease of use as all respondents in the study began using Microsoft Teams in March 2020; indicating respondents were already familiar with the platform. Previous research has shown that users who have more positive ease of use beliefs, have higher self-efficacy [18]. Multimedia instruction not influencing perceived ease of use is contrary to previous studies [6-7]. However, this can be explained through the relatively low use of integrated applications

within Microsoft Teams (Fig. 3). Another contributing factor was passive learners when live or recorded videos were used in the online lessons.

When evaluating the relationship among multimedia instruction, interactivity, self-efficacy, perceived usefulness, and perceived ease of use on perceived satisfaction of Microsoft Teams, three independent factors (i.e. interactivity, perceived usefulness and perceived ease of use) were identified as predictors of perceived satisfaction (R^2 =0.827, F(5,257=245.662), p<0.05). Two of the independent factors (i.e. multimedia instruction and self-efficacy) did not predict perceived satisfaction. Similar with the results of the dependent factors of perceived ease of use and perceived usefulness, interactivity is synonymous with any online collaboration platform like Microsoft Teams, and thus would be strong predictors to learners' acceptance and level of comfort using Microsoft Teams. The strong relationship between perceived usefulness and perceived satisfaction was already established in the Pearson correlation analysis shown in Table II. For this study, Microsoft Teams was the common platform used to deliver each module's content. The consistency of using the same platform may have also contributed to the strong correlation between perceived ease of use and perceived satisfaction. In this study, multimedia instruction may not have positively influenced perceived satisfaction due to external factors such as struggling to adapt to the new norm of fully online classes. The lack of face-toface social interaction and the sudden environment changes [3], may have affected the learners negatively and made them dissatisfied with using the platform.

Finally, the results on whether perceived usefulness, perceived satisfaction, and perceived ease of use could predict learners' behavioral intention towards Microsoft Teams revealed that only two independent factors (i.e. perceived usefulness and perceived satisfaction) were valid predictors (R^2 =0.664, F(6,256=84.202), p<0.05). Perceived ease of use did not predict learners' behavioral intention. This is a strong indicator that learners are satisfied with the features on Microsoft Teams, and thus, intention on future use. On the flipside, perceived ease of use did not influence learners' behavioral intention. This result is consistent with [7], but inconsistent with [6, 19]. This can be explained by learners needing to adapt with changes whenever added or new features are incorporated into Microsoft Teams.

Based on the results from the analysis, a modified model (Fig. 4) was created with removal of factors proven as non-predictors.

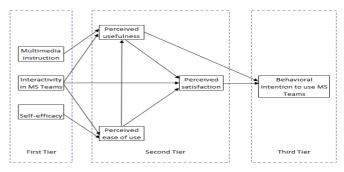


Fig. 4. Modified model for learners' behavioral intention to use Micosoft Teams

VI. CONCLUSION

The purpose of this study was to investigate the critical factors affecting students' acceptance of Microsoft Teams as an online collaboration platform during the COVID-19 pandemic in a private higher education institution in Malaysia. The empirical study used the 3-TUM approach. The study investigated the relationships between learners' self-efficacy and system quality (i.e. multimedia instruction and interactivity) on learners' affective and cognitive domain (i.e. perceived usefulness, perceived ease of use and perceived satisfaction), and further the learners' affective and cognitive domains on their behavioral intentions to use Microsoft Teams. There were three major findings of the study. Firstly, this study indicated that students' perceived usefulness significantly reflected a positive satisfaction level of Microsoft Teams. Thus, suggesting that the learners were highly receptive towards the University's decision to use Microsoft Teams as the online learning and collaboration platform. Secondly, Microsoft Teams' interactivity was the only factor in the system quality tier (i.e. first tier) that significantly influenced perceived usefulness, perceived ease of use and perceived satisfaction (i.e. factors in the second tier). This finding may imply that interactivity is the key system quality factor for online collaboration platforms to attract and satisfy learners. However, further comparative analysis with other online collaboration platforms e.g. Discord and Zoom is needed to confirm this finding. The third major finding significantly shows that perceived usefulness and perceived satisfaction in the second-tier influences learners' intention (i.e. third or behavioral intention tier) to use Microsoft Teams for future online learning and collaboration. Hence, educators should explore Microsoft Teams multimedia-specific features that support learner self-efficacy, to create immersive online learning. While the study has successfully examined the factors affecting students' acceptance of Microsoft Teams, it has several limitations. Firstly, the findings and implications of this study are obtained from a single institution making applicability and generalizability of the findings, limited. Future researchers can also validate the results of this study by using the same theoretical framework on Malaysian education, or even focus on cross-country studies to identify any differences. Finally, other external factors like social influence, learning styles, student motivation, student burnout and student anxiety should also be explored.

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Diffusion of Information about COVID-19 in Iran, Media Dependency and Public's Scepticism

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Abstract— This article traces some of the trends in diffusion of inconsistent information about COVID-19 by mainstream media in Iran which have caused public's confusion and scepticism. Soon after the first cases of coronavirus infection were reported in city of Qom in February 2020, Iran was listed among the top world's countries worst hit by coronavirus, maintaining its ranking with only a little variation ever since. Such alarming status has evidently been the result of the autocratic government's failure to acknowledge the immediacy of addressing the pandemic and providing transparent policies for containing the disease. Expectedly though, the authorities' inept responses to the crisis throughout this period were utterly influenced by elitism, with minimum regard to well-being of the people. Accordingly, in the course of the pandemic, the state-controlled mainstream media was actively engaged in disseminating a series of ideology-laden messages concerning coronavirus, ultimately resulting in public's scepticism towards the government. By drawing on data from various online reports published by the state-run news agencies, this study identifies five main phases through which the national media in Iran promulgated ambiguous and fallacious information about COVID-19 to perpetuate its political agendas. Subsequently, through the lens of media system dependency theory, some reflections are made on the devastating consequences of the public's reliance on during crisis within autocratic nation-states. Furthermore, it is suggested that the widespread of alternative media in Iran has clearly failed to equipoise the power of national media despite the lack of the general public's trust in their government.

Keywords— diffusion of information, COVID-19, mainstream media in Iran, public's scepticism, media system dependency theory

I. INTRODUCTION

It did not take long since Iran's Ministry of Health officially declared the death of two people contracted COVID-19 on February 19, 2020 in city of Qom until Iran became the epicentre of coronavirus outbreak in Middle East [1]. Indeed, official reports indicated that within a month and by March 20th some 19,644 infection cases and 1,433 deaths had been reported whereas just about a year after the outbreak in Iran (31 March 2021) these figures respectively soared to about 1.9 million and 63000 (worldometers.info). Yet, even according to some health officials in Iran, who had come to realize the obviousness of under-reporting in infection and death cases, these statistics represent only about 5 percent of the actual numbers [2]. Similarly, other sources like eye-witnesses on the street and front-liners who are in closer contact with what is truly taking place in the field have frequently pointed to such disparity [3].

Nevertheless, what stands out by looking at these numbers, apart from the gravity of the country's concerning social conditions and economic downturn, is the government's apparent failure to curb the spread of the virus and to decelerate the mortality rate.

Although averting or overcoming crises at national level an effective communication government and the public, the role of the former seems to be more critical particularly within authoritarian countries like Iran [4] where media institutions are owned or fully regulated by the state [5]. This is perhaps because of the fact that in totalitarian nations, government as the sole proprietor of the media decides on what messages are (dis)allowed to be conveyed to the public [6], [7], [8]. In such undemocratic contexts, the structure and function of communication systems patently adhere to the propaganda model in which mass media, particularly the news reporting agents tend to serve the hegemonic interests of the upper crust and remain sympathetic to the state's policies while marginalizing dissenting voices [9]. Hence, since mass media play an indispensable role in production and reproduction of beliefs and opinions as well as formation of public knowledge [10], there is little assurance for diffusion of unhampered and reliable information in authoritarian states where media alongside other social institutions are under the absolute control of the government.

This is especially the case in Iran where the outputs of national media have predominantly been influenced and controlled by the members of the ruling elite and their Shia, Revolutionary and anti-West ideologies since the inception of the Islamic Republic of Iran in 1979 [11], [12]. As a matter of fact, such ideological dominance has been discursively exercised at many levels and across various aspects of Iranian mediascape. In a similar manner the country's legislations and policies under Islamic regime have shown minimum interest or support for democratic practices in the country. The range of state's undertakings in this regard encompass relentless efforts such as imposing heavy censorship in content production, closure of news agencies, persecuting journalists and social media activists, adoption of various strategies in curbing Internet and interrupting free-toair satellite TV [13], [14].

Therefore, it is within such monopolized media environment that the domineering power of the state-run mainstream media implicated the volatility of diffusion of information in Iran. This in turn, has shown enormous potential for instigating detrimental and perturbing repercussions for the nation particularly at times of national or global crises when the crucial role of government-public communication is at its highest. In a similar vein, the

deliberate inconsistencies in dissemination of information the recent pandemic by the state-controlled mainstream media, besides worsening the social and economic conditions and risking the lives of the people in Iran, is seen to bring about public's scepticism and confusion. In this regard, Alimardani and Elswah [15] have pointed to issues such as "lack of public trust in officials, religiously charged narratives by unofficial fringe figures and political manipulation of the discourse", as factors shaping the misinformation of the public in Iran. Similarly, other authors with more optimistic views on how government has been raising awareness of the pandemic have also highlighted the impedance caused by the influence of religion and politics on disseminating information which has resulted in public cynicism [16].

This study, therefore, underlines and reflects on the politics behind the inconsistencies in mainstream media's diffusion of information about COVID-19, chronologically from the days when the earliest cases of coronavirus infections in Iran were reported, up until the period between the fourth and the imminent fifth waves of the pandemic. In so doing, by drawing on data from Iranian government's online news agencies, 5 main trends are identified to exemplify the junctures when the politics within the information delivery framework of these state-run media institutions have led to the public's confusion and scepticism. This is then critically reviewed and explicated in the light of Media System Dependency (MSD) theory.

II. DISCURSIVE TRENDS IN DIFFUSION OF INFORMATION ABOUT COVID-19

A. Politics of the Initial Trivialization of the Crisis

On 8 February 2020, just 2 days before the anniversary of the Islamic Revolution that is celebrated yearly by drawing large crowds to the streets as a form of public reaffirmation of the regime's legitimacy, Islamic Republic News Agency (IRNA) published two back-to-back news articles with the headlines: "No case of coronavirus has been seen in Qom" and "By attending the demonstration, the nation will send a clear message to the Machiavellians of the West". In fact, at the time of the publishing these articles some healthcare providers had already reported many patients with COVID-19 symptoms in the holy city of Qom, but such reports never found their way into the mainstream media for the fear of losing the public participation in this mass demonstration.

This case clearly illustrates the politics of representation within the framework of mainstream media at a critical point in time when authorities tried to cover up the initial indications of an upsurge in Covid-19 cases in order to move on with their political agenda. The motivation forcing the state to take such drastic measures at the expense of the national security and public health was apparently manifold. Firstly, Iranian regime covered up the news of the coronavirus for at least three days to avoid impacting the turnout at parliamentary elections. In other words the low turnout in elections which would be rendered as Islamic regime's waning popularity, led to such a whitewash. Secondly, the holy city of Qom, where the virus was first reported in Iran, is home to important Shiite religious sites that attract thousands of pilgrims from around the world. In this way, the city's lockdown would bring about a downturn in worshiping activities and thus, clerics' income, not to mention people's loss of faith in sacredness of the city which

was widely held by believers to be protected by the divinity. The precarious decisions that authorities made about not implementing any preventive measures in Qom, therefore, provide a glimpse into the regime's economic voracity and religious ideological orientation, regardless of the threats that their actions might impose to the safety and well-being of their people.

B. Untimely Politicking for Iran's Superiority

On 15 April 2020, an article appeared in Mehr News with the headline that said "The Islamic Republic Revolutionary Guard's (IRRG) new achievements in detecting the "corona" were unveiled". While this piece of news made headlines of perhaps every domestic mainstream news outlets which proudly bragged about IRRG's so-called 'technological feat', it was ridiculed by international reporters as well as oppositional groups who debunked the functionality of such unrealistic and impractical contrivance. In a similar vein and less than a week later on 20 February 2020, IRNA published another article with the headline which was a quote from Deputy Minister of Health who stated, "Iran is ready to provide help for the United States in order to control Corona". In this sarcastic statement he brazenly concluded that "The US healthcare system is incapable of controlling the corona epidemic", implying that Iran is in better position than the US in dealing with this crisis.

What the former article indicates is the Islamic Republic's obvious determination to demonstrate Iran's excellence in science and technology, sending a signal to the world about the nation's self-sufficiency and its independence from superpowers. Alternatively, the promotion of a farfetched COVID-19 detector could suggest that the concerns of Islamic Republic to maintain social order is much deeper than it appears, and this is a strategic attempt to provide reassurance and calm the situation down. Such futile endeavor also appears to be in line with the IRGC's attempts to improve its tarnished image after a number of recent fatal mishaps, such as the shooting down a Ukrainian passenger airliner killing 176 passengers onboard on 8 January 2020.

The latter article, however, is a clear example of IRI-West tension in which ironic and contemptuous rhetoric is used to construct a superior image of Iran vis-à-vis the West's. Similarly, in a symbolic attempt, a group of hardline university students self-identified as 'volunteers of the revolution' delivered a cargo of medical aids to be sent to Americans through Swiss embassy which represents the interests of the United States in Iran. Yet, this act took place in a period that the nation was undergoing the hardships caused by the government's maladministration in battling COVID-19 which left people with little to no healthcare and adequate medical aids. These premeditated projects, therefore, demonstrate just another series of humiliating in a guise of humanitarian gestures performed by the Islamic regime's internal sympathizers, a tactical but untimely boast about Iran's superiority over the West.

C. Promoting Sacred Formula for Curing COVID-19

As soon as WHO officially announced that Iran was the largest epicentre of the coronavirus outside China, Iranian authorities' further hesitance to acknowledge and address the growing number of the COVID-19 in the country became problematic. At this time, when underplaying the outbreak

by the government seemed outrageously perilous, a number of so-called Islamic medicine 'specialists' sprang up, claiming to hold the sacred formula for preventing or curing COVID-19. Supported by the Supreme Leader who has always been the protagonist of Islamic medicine (albeit as a deliberate way to show his discord with the West), various outputs of the national media began to promote these mysterious and unscientific prescriptions. These ranged from the recommending people to consume an unknown concoction called 'Imam Kazem medicine' to other more unrealistic methods such as application of a unknown liquid touted as 'Prophet's perfume'. Despite the risks that these alleged remedies would bring about to the public health, the mainstream media treated their unproven claims with utmost leniency, exactly because they were endorsed by the statebacked religious figures.

The absurdity of this kind of forbearance towards advocates of Islamic medicine becomes more pronounced when one considers the bureaucratic structure in which approving a Western medicine for general public use undergoes a systematic scrutiny by policy and law makers as well as several institutions such as Ministry of Health and Medical Education. An example of such discriminative acts can be seen in an article published on 29 November 2020 in Ensaf News titled "The official position of the Ministry of Health on Imam Kazem medicine" in which this news agency carefully tried to take a middle stance of neither approving nor dismissing the effectiveness of such products. In this way, one could imagine the grave consequences that such imprudent and unempirical therapeutic practices might entail in terms of both giving false hope to the affected people as well as accelerating the spread of the virus. For instance, a video of a member of the cleric community was circulated in television and social media going room by room in a hospital rubbing the same bottle of the Imam Kazem perfume around the patients' faces while reciting some verses in Arabic. A few days later there were also some reports that the very same people who were given such treatments died from COVID-19, resulting in public's negative response to the outcome of the ecclesiastic's exploitative involvement in medical field.

D. Western Vaccine: A Plot to Annihilate Islamic Republic

In a televised speech on 8 January 2021, the Supreme Leader, Ali Khamenei, said that he neither trusted the West nor their vaccines, particularly those from US and UK, because they may wish to test out their vaccines on people of Iran. Following this controversial pronouncement, the Iranian press came up with various explanations in support of Khamenei's remarks. Mizan News, for instance, published an article with the headline that asked "Why are some quarters still insisting to import American and British Corona vaccines?" This article was in response to a number of Iranian health experts and medical practitioners who dared to express their concerns over rapidly increasing rate of COVID-19 cases in the country and the authorities' apparent inabilities in dealing with the pandemic, bringing the already alarming situation close to the verge of a national disaster.

In this article the author(s) tried to fallaciously justify Khamenei's decision, by providing some cynical and misleading information that clearly had indications of political attitudes and paranoiac/conspiracy- based beliefs, trying to reinforce the anti-Western ideological disposition of the country's leadership. At one point, for example, the

article cautioned people about the Western administrations' sinister intentions behind the philanthropy to provide Iran with their vaccines. Here, it was further maintained that these vaccines are designed to slay or cause serious injuries to humans, as part of the West's master plan to eradicate the Muslim populations from the face the earth in conjunction with its historical animosity towards Islam. In another instance, the article pointed to the increasing cases in UK, US and other Western nations, arguing that if they had confidence in their vaccines they would be in a better position in controlling the pandemic, not appearing hapless and suffer from increasing number of COVID-19 cases in their countries. Beset by multiple irrational lines of reasoning, the article failed to acknowledge that such vaccines had already been deployed in Western countries, where a number of national leaders had been among the first to receive them in an effort to instill public confidence.

The prohibition of the vaccines from Western origin, however, resulted in a series of chaotic, hasty and often baseless speculations or resolutions by Iranian officials, including partnership with Cuba in developing vaccines, the import of vaccines from Russia, China or India, and even bragging about country's recent achievements in producing Iranian coronavirus vaccines. In effect, not only these promises turned out to be insincere, or at least never lived up to the nation's expectations at the time, but also they drastically shifted every now and then, adding to the public's mounting anxiety, hopelessness, and eventually cynicism. Nonetheless, the aftermath of Khamenei's reckless fatwa to ban the Western vaccines did not take long to show its injurious and distressing reverberations in large scale across the nation. The proscription of the safe and reliable vaccines, therefore, exemplified just another occasion in which Iranians were stripped form their lawful rights, needless to mention the ravages of it that consequently moved the country towards the fourth wave of coronavirus pandemic.

E. Fourth Wave: Beginning of the Blame Game and Prevarication

In early days of March 2021 shortly after Nowruz (Persian New Year) holidays, Iran entered the fourth wave of coronavirus pandemic. Despite the predictability of a nationwide spread of coronavirus during Nowruz when millions of Iranians travel locally, the government's extra measures to avert the fourth wave were limited only to a proclamation, adumbrating immediacy of a spike in COVID-19 cases after this thirteen-day public holiday. Moreover, after the situation reached a critical point, various parties began to impute such a monumental fiasco to one another. An example of this kind of blame game and prevarication can be seen in an article published in Mashregh News on 11 April 2021 with the headline "The reaction of press to the president's strange statements about fourth wave of Corona". This article criticized president Rouhani who is also the head of National Coronavirus Combat Taskforce (NCCT) for pointing his finger at the British variant of the virus, and not taking responsibility for the fourth wave. The article argued that if the British variant is the cause of the recent upsurge in COVID-19 cases, then as NCCT's head he still is at fault for allowing the international flights during Nowruz, to and from the countries that are considered hot spots for such highly transmissible strain. The article went on to further criticize Rouhani for his earlier statements when he alternatively tried

to blame the public for disregarding health protocols such as unrestricted travelling as well as attending large gatherings and other social activities.

By closely looking at this article alone, one can imagine the tenseness of the political climate in which various administrations with different orientations and interests engage in a series of discourse-exchanging activities. In so doing, they try to use their position in power together with their rhetorical capabilities to present a dutiful, guiltless and puritanical public image of themselves, while directing the faults to their immediate political rivals, or even the public itself. Naturally, the reflection of these tensions in mainstream media, not only solves any problem facing the society, but also deepens the level of the public's confusion and scepticism in their government's sincerity in dealing with the pandemic. This in turn, may cause further government-public communication breakdown, ultimately leading to a more concerning rates of human fatality, loss of morale and morality in society, and economic recession.

III. MEDIA SYSTEM DEPENDENCY THEORY

Media System Dependency (MSD) theory emerged to reformulate the question addressed by effects theory by asking: "under what societal and individual conditions do/don't media have substantial effects?" [17, p. 369]. The theory's main premise is that the implications of media system in the context of everydayness have effects on micro, meso, and macro levels, respectively impacting individuals. groups, and social systems, in the face of threat or at times of uncertainty [17]. Proposed for the first time by Ball-Rokeach and DeFleur [18], MSD posits that people are likely to be influenced by media information when they have little other experience that enables them to evaluate the new information. In other words, the degree of audience dependence on mass media sources of information is a key variable in understanding how, when, and why media messages influence audience beliefs, feelings, or behaviour [19]. As they observed, one of the factors for the degree of such dependency is the extent to which a person, group or society consider a specific medium important for receiving the information they need. Another factor, however, is social stability; that is to say, while during stable times dependency on media may incline, at times of social instability and crisis the reliance on the media for information increases [18].

Hence, the media system is best understood "as an information system whose powers vis-à-vis effects rest on the scarcity or exclusivity of their information resources" [17, p. 369]. Yet, there is considerable difference in people's adaptions or responses to the same social environments [17]. Moreover, Jung [20] explained that MSD is often misunderstood as a powerful media/passive audience theory mainly for what the word 'dependency' might imply. Indeed, as he further put, the term refers to the possibility of individuals-media relationship that is "shaped by the degree of importance and helpfulness of resources one party possesses for the other party" [20, par. 6]. Besides, one's needs are not always strictly personal but may be shaped by the culture or by various social conditions [21]. From a macroscopic societal perspective, if people become more and more dependent on media, media institutions will be reshaped to serve these dependencies, then the overall

influence of media will rise, and media's role in society will become more central [22].

IV. CONCLUSION AND DISCUSSION

This article began with making a case for the evident failure of Iranian government in addressing the COVID-19, arguing that the diffusion of information by the state-run mainstream media has compounded the gravity of the pandemic and its devastating consequences across the nation. In doing so, it was maintained that the national media as a powerful means for government-public communication has been used in line with the state's ideological disposition and political agendas, sending a multitude of mixed, ambiguous and at times fallacious information about coronavirus. This is in fact a common characteristic of many authoritarian countries where the mainstream media, just like other social institutions [23], constitute an imperative component of the ideological state apparatus, supplementing the functions of the repressive forces within boundaries of the nation-states [24]. The state's strong hold on media in this way is also explained by the contemporary propaganda theory which "argues that public discourse is shaped and limited by powerful elites to serve their own ends" [21, p. 94]. Moving further along these lines of thought Semetko [25] differentiated democratic countries from non-democratic ones and observed that the media-politics relationship in these countries varies depending on 1) how much media outlets are government funded 2) the degree to which the media's content and reporting are free of government control, and finally 3) how much the parties, interest groups, and political participants have access to the media. Accordingly, by reflecting on Iranian mainstream media within Semetko's framework, it can be said that these institutions receive large financial support from the government, while their contents are subject to maximum control and heavy censorship [26]. In addition, such extreme measures are augmented by Shiite clerics and other elite groups' exclusive power to convey messages through media [27]. Hence, by just considering these three parameters, Iran can be placed among the highly totalitarian countries, corroborating the notions about mediapolitics relationship in Islamic Republic which has long been characterized by all-out government domination [28].

In this view, the public's growing needs for reliable information during pandemic, not only were taken for granted by the state, but also such unsettling situation paved the path for even more exploitation. This was precisely the time when the state seized the moment to take advantage of people's temporary but high dependency on mainstream media, and sent a plethora of politically-driven messages, not to help people, but to fractionally ameliorate its shaky legitimacy in ruling the nation. This meant manipulating the masses by their supposedly 'own' national media, bringing about public confusion and scepticism at an unprecedented way. This in turn significantly contributed to the overall worsening condition of the country, preserving Iran's top place among the most affected countries in the world since beginning of the pandemic. Although the degree of the state's manipulations through media and its impacts on the public's confusion and scepticism about coronavirus pandemic requires further and continuing investigations at different levels, what this study initially intended was to exemplify some of the discursive trends that reflect the range of such manipulative efforts. That being said, apart

from the evidently growing sense of uncertainty and distrust among people during pandemic there have been several official reports and scholarly studies that pointed to these overwhelming social problems in Iran [29], [30].

In the course of the mainstream media's function from right before the pandemic up until the fourth wave, to reiterate this study's argument, there were several junctures when unreliable, politicized and misleading news made their ways to the headlines of the Iranian press. Furthermore, it was maintained that these junctures collectively constituted discursive trends that manifestly transpired through news reports whereas each of them presented a novel agenda set by the state and in line with the developing affairs in inter/national stage. In this study, however, five instances that typified some of these trends were identified and critically reviewed in order to elucidate some of the strategies employed by the state in order to diffuse inconsistent and ideology-laden information about coronavirus through the mainstream media in Iran.

The needed data for this analytical review, however, were gathered from a number of government's online news agencies, in the form of headlines and their articles, each of which presented a specific topic that drew mass attention at a certain point in time throughout the pandemic. In addition, this study sought to explicate the developments of these trends in the light of MSD theory, and to show how the mediascape in an autocratic political system like the one in Iran is influenced by the state's intervention and control, and in the face of the globalization of the media. In this regard, as it has already been shown, the mainstream media in Iran inherently exists to serve the elite's interest and to perpetuate the continuity of the states' power over the people. Here at this point, however, it is believed that in such undemocratic setting, people are seen to increasingly depend on, and consequently be influenced more by mainstream media than alternative media at times of national or global crises during which government-to-public communication is at its highest degree of importance.

As pointed out earlier, the availability of new forms of cross-border media (mainly Satellite TV and Internet) in Iran and the growing influx of their unfettered contents is not only incapable of completely neutralizing the messages from mainstream, but also it appears to exacerbate the public's struggle for accessing trustworthy knowledge. Such rather ineffectiveness might be on the one hand, the result of the fact that these transnational channels of mass communication usually impart information that goes against the grain of mainstream media's output, and consequently affecting the mass audience, particularly those with inadequate media literacy. This is because the uncritical audiences are more likely to oscillate between these dichotomous news sources in order to find their needed information, only to end up with greater amount of uncertainty and confusion, not to mention infoxication (information overload). On the other hand, even though people are unsure about the authenticity of the information within the national media's coverage, they tend to adhere to mainstream's output simply because such media outlets represent the government who is the sole entity for outlining the rules and regulations during crisis in the sovereignty of the nation-state.

Likewise, Internet and social media prospects in Iran also appear to be not so constructive, despite their extensive use by majority of people of Iran, particularly the younger

segment of the population [31]. Although there might be a commonsensical notion that social media and other Netbased communication channels are powerful and beneficial means for crisis management, at least, it is not the case for Iran where the results of several studies and reports during the COVID-19 pandemic have shown otherwise. In actual fact, these accounts have pointed to a wide range of negative effects of misinformation within these digital platforms, except a few others that are associated with some wellknown and reliable healthcare providers and medical professionals. In this way, digital means of mass communication have not only been adequately mobilized for fight against coronavirus pandemic, but they are also widely used by officials for political rivalry, often through providing manipulative data for the mass to gain popularity and public support. Additionally, the digital environment during the pandemic has more than ever turned into a commonplace for spreading misinformation, rumours and fake news, some of which leading to the escalation of anxiety, distrust or even physical harm among people[32], [33], [34].

Therefore, it can be said that although the emergence of satellite TV and Internet have significantly improved the democratization process in Iran and many other countries around the world, especially during the past two decades or so [35], [36], they have evidently not been so helpful in taking pressure off the Iranians in their battle against COVID-19. As a result of this, mainstream media seems to have maintained its prominence for providing the needed information during coronavirus pandemic, even though satellite TV and Internet still attract the majority of Iranians who seek quality entertainment, inviolate information or alternative news. For that reason, during pandemic people of Iran have been caught in a condition where, on the one hand national media remains the major source for immediate and relevant information, despite public's increasing distrust and scepticism towards these highly political means of mass communication. On the other hand, alternative media have not seemed to live up to the normative and emancipatory expectations that are anticipated from these so-called counter-hegemonic forms of mass communication. Such outcomes, therefore, should all draw attention to the importance of considering social, political and cultural contexts as well as spatial/temporal scope in which a communication phenomenon is taking place, especially when MSD theory is to be used as an analytical tool for research. This is also explained by Loveless who studied the media dependency in democratizing countries, and within the uses and gratifications framework. The focus of his study was on information-seeking behavior within "societies in states of crisis or instability" [37, p. 162]. Loveless was largely concerned with how citizens in countries undergoing a democratic transition sought information and assumed that there would be a "positive correlation between informationseeking and levels of media use" [37, p. 162]. His findings suggested that the instability in such politically volatile contexts motivated people to seek political information from the media. In other words, the democracies in their embryonic stage motivated citizens to get highly involved in seeking information through the media. Despite he saw the media's great capacity for providing information "to understand political transition," he cautioned that any interpretation in this regard should take into consideration the "historically and culturally differentiated media space" [37, p. 178]. That is to say, understanding citizens' media

dependency during national (or global) crises requires one to consider "institutional and cultural variations" within each country, and in relation to a specific situation [37, p. 178]. In this regard, and to reiterate what Ball-Rokeach [18] noted, a society's dependency on a specific media increases, as uncertainty or ambiguity grows more and more among members of that society. This was supported by a number of studies, including Lowrey's [38] inquiry about September 11 terrorist attack, revealing that during this crisis the age factor as well as the level of uncertainty and perceived threat significantly influenced the degree of Americans' media dependency.

In conclusion, and to put it in a perspective, it can be said that the long term dependency on mainstream media in Iran has been challenged by the emergence of the new forms of media such as Internet and satellite TV since early 1990s [39]. This has evidently given people of Iran a chance to break away from the national media's absolute dominance, and to access unrestricted information beyond the authorities' control and oppression [39], [40]. The short term dependency on mainstream media, though, seemed to be taking place during coronavirus pandemic when Iranian 'fourth state' gained more power as the ambiguity across the nation surged to an unprecedented point. Nevertheless, while many academic studies in the past variously addressed media dependency in democratic countries, there have been limited efforts to link such theoretical perspective to the struggles and complications facing the public under authoritarian states, particularly during the time of crisis [41]. The critical reflections in this study which dealt with mainstream media's function in an undemocratic context and public's dependency on delivery of information through the statecontrolled media institutions, therefore, are considered to be among such limited efforts. Its main aim was to draw attention to the struggles of Iranian people who are now, more than ever, undergoing a period of hardship and uncertainty caused by a range of imprudent, amoral and unsympathetic actions and decisions of the authorities during pandemic.

Like the time of political crises and other times of change and conflict, during natural disasters, the public becomes highly dependent on mass media for information, and the mass media in turn become even more dependent on government officials and political elites for providing instructions, updates, and other health and safety related news [42]. Under these circumstances, the interdependencies among officials, media, and society rise, and apparently, the impacts of those interactions also become more noticeable. Thus, this study recommends a robust and equitable collaboration and supervision at different levels and across various forms of media as key requirements for ensuring the accuracy and avoiding distortion of data. Furthermore, as also noted by other authors [43], [44], the authorities in Iran minimize bureaucracy and formalities scientifically proven aids and methods, instead of relaxing procedures for unscientific solutions recommendations. Although it seems to be far-fetched, but the government must feel the urgency to put people first and focus on providing reliable and consistent real-time data, instead of politicizing the crisis or seeking to project an unrealistically positive, popular or powerful image of Islamic Republic merely for meeting some political objectives [45]. One more lesson to be learnt from Iranian government's mishandling of the pandemic is that simply announcing some

instructions or advice, and then waiting for people to follow them is deemed to fail. This means that while the enforcement of regulations during crisis should be in place early enough and effectively conveyed to the public, the citizens' compliance with those rules and guidelines should be monitored and confirmed on a regular basis. Lastly, giving precedence to extremist beliefs over scientific measures, on the one hand, and abandoning responsibilities, making wrong decisions, and disregarding human rights and democratic values, on the other hand, are all among the factors that have contributed to the deepening of the magnitude of coronavirus pandemic in Iran. Thus, any improvement regarding public health especially during national crises seems to be only possible when necessary steps are taken to immobilize the ideological state apparatus that operate to manipulate the mass for the benefit of the elite.

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Sustaining Learner Experience Amidst Migration to Online Learning: Learning and Development Lessons from COVID-19

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Abstract—The impact of COVID-19 on the working and education sectors have been immeasurable. Within the first half of 2020, a global lockdown had forced offices and schools worldwide to move online. In the learning and development (L&D) sector, corporate training providers were forced to shift their programmes into the virtual environment overnight. The urgent and immediate requirement was not only critical to ensure continuity of talent development needs of organisations, but also the survival of training providers in the sector. In this study, we analysed the migration of corporate training programmes, focusing on the way providers responded, adapted, and shifted amidst the pandemic. L&D was already on a trajectory towards digital and hybrid learning in the past decade but COVID-19 had simply accelerated the process demanding practitioners, learners, and organisations to adapt immediately, or risk losing out in the market or falling into irrelevance. This study explores the background of this dramatic shift and provides recommendations on how stakeholders in the ecosystem can potentially transform these challenges into opportunities.

Keywords—learning and development, online learning, virtual training, digital transformation, virtual instructor led training

I. INTRODUCTION

At the point of writing this paper, most countries had gone into a period of over 18 months of lockdown, or on-and-off lockdown, forced by the COVID-19 pandemic. One profound impact of the outbreak has been the shift of work from an in-office (WIO) endeavour to an at-home (WFH) practice and even currently a more popularly term Work From Anywhere (WFA). Similarly, the education sector has also been significantly impacted as schools and universities moved online. At the intersection of work and study, is the learning and development (L&D) sector which had also seen a transition of corporate training programmes from physical classroom delivery to virtual instructor-led training (VILT) that is conducted online.

One could perhaps point to the first quarter of 2020 as the turning point of the shift as it was around this time that COVID-19 cases rose exponentially in major economies on global scale and both work and school were forced to move online amidst the temporary immediate closure of office buildings and learning institutions. Across the L&D sector, chaos ensued as both clients and training providers

scrambled to decide on the best way forward to sustain people development needs and inevitably survive as a business respectively. Decisions had to be made fast, and the future grew increasingly uncertain as public health officials, governments and public continued to be perplexed by the dreaded and lethal virus that everyone was learning something new about on a daily basis. It was a race against time.

Questions began to emerge as the true agility and adaptability of L&D practitioners were put to the test. How do we move training online? What do we need to get up to speed? Most importantly, how do we ensure that the learning is still effective in an online environment? These were some of the key questions that meandered across the minds of people in the industry namely HR managers, programme managers, training providers, and course designers. Many factors had to be considered specifically on programme design, curriculum content, and learning experience delivery.

These were also the questions that we were interested in when we decided to conduct the research on this paper. Today, 18 months on, it would be worth investigating and reminiscing the response of the L&D industry to the pandemic. We believe that it is important to document the lessons from this period to identify opportunities that can be leveraged on towards improving L&D for the long term especially within the online medium. While the migration of programmes to online delivery posed significant challenges, there could also be opportunities that is applicable towards shaping the industry in the long term.

To do this, we interviewed a group of L&D practitioners who were in the thick of the action over the past year-and-a-half. Some of our queries include key considerations in their online migration process, main challenges in addressing technological and instructional obstacles, as well as key lessons that have been gained over the period. As L&D practitioners become more familiar with the dynamics of online learning, programme design and delivery had also been adapted to sustain learner experience into a more positive experience as if it was conducted physically/face-to-face interaction.

II. LITERATURE REVIEW

While the body of literature on online and distance learning is wide and varied, articles on the impact of COVID-19 towards online migration of learning is relatively sparse, yet growing -- given the increasing interest in the subject. Further, data and trending on developments on L&D coming out of the pandemic is still relatively immature as organisations and practitioners are still learning and navigating the opportunities that lie ahead at the back of the global acceptance towards online learning.

Pre-COVID-19, the subject of corporate training being delivered online has garnered vast interest given the advent of technology and the benefits that come with it such as flexible learning in terms of its timing and logistical aspects and social learning feature which allow learners to provide feedback and being seen by others. Kimiloglu et al framed the conversation in the organisational and personal context [1]. Specifically, the factors of cost, functionality, and feasibility to enable community learning.

An early review and prediction of the outlook on online learning at the back of the pandemic was the perspective of Szabo which posited the movement of business to digital would also raise the need for training to simultaneously go digital [2]. Yet, at the point of commentary, there was the contemporary view of companies that could struggle in adapting to the move online. This view might have change over the year that has passed.

More recently, a research similar to this study was noted in the work of Charalambous and Vrasidas which documented a localised perspective of the challenges faced [3] in adapting face-to-face into online learning delivery in Cyprus. The report further proposed several recommendations in ensuring effective learner experience while the setting shift from a physical to a virtual environment. This finding is also resonated by Yusoff which alludes on 'relevance' of course content or module in encouraging learners to adopt online learning as a mode of knowledge acquisition [4].

Malureanu et al investigated the relationship between cognitive and non-cognitive factors such as self-confidence, self-efficacy, and grit with the 'ease of use' of e-learning platforms amidst the pandemic [5]. It was proposed for the online learning to also take into consideration these factors as employers re-design their courses for online delivery. This is an indicator that continuity can still occur as programmes move online.

A case study that exemplifies the shift to online formatting is the developmental work of Yamada which transferred the curriculum and delivery of a business ethics training programme from a classroom to virtual setting [6]. One takeaway from the experience includes the need for formative evaluation which could progressively assess the design as its was developed.

In general, the range of literature pertaining to online migration of corporate training is relatively limited. This is primarily driven by the nascent nature of the subject, as the world is practically still in the pandemic. There are still emerging trends to be analysed and developments to be assessed. While this may be a constraint, it could also promise an intriguing outlook as the lessons from the

emerging literature could build the foundation that can shape the future of the L&D and corporate training sector.

III. RESEARCH METHOD

The objective of this study is to understand and document key challenges and potential mitigations that can be taken as learning moves to an online mode amidst the pandemic. The two perspectives that the study aims to capture are that of the facilitator (e.g. instructional designer, programme manager) as well as the learner (e.g. participant, employees).

There are two primary data points referenced to for this qualitative study. First, insights from interviews conducted with L&D practitioners and second, feedback received from participants of corporate training programmes from April 2020 – April 2021 as the period when the shift from inperson to online learning took place across organisations. The objective is to gather first-hand experience of the practitioners and complement and validate the findings through the data gathered from participant feedback.

A total of 15 L&D practitioners were interviewed in this process comprising of programme designers, facilitators, and programme managers. As for participant feedback, the insights were gathered from analysis of feedback received across three leadership development programmes comprising of 70 cohorts of 490 participants in total.

From the data gathered, assessments were conducted on emerging themes and trends, as well as key words that are observed across the input given. From these common denominators, several clusters of findings were categorized for further comparison in terms of degree of importance, impact, and scale of effect to both the instructor and learner perspective. The aim is to cover both the dimensions of teaching and learning in an online environment -- given the adjustments required when a programme undergoes migration.

IV. FINDINGS AND DISCUSSION

The findings of this study can be divided into two sections namely L&D practitioner perspective, and learner perspective. The intent is to demarcate the different views that were experienced by both groups as they undergo the online experience. The L&D practitioner perspective will take into considerations key challenges and benefits from migrating course content online. Meanwhile, for the learner perspective, the views would cover mainly the experiences felt in absorbing lessons and optimizing the time spent through an online interaction.

A. L&D Practitioner Perspective

The key decision points that drove and influence the migration of programmes to online were mainly government lockdown as well organisational policy on health and safety. Therefore, as parts of the organization, most client-side parties required training to be done fully online, or during a specific period, over a shortened period of time indoors within a classroom sitting with reduced number of participants and observing the standard operating procedures such as wearing of masks and demonstrating compulsory social distancing. These were some of the governance factors that practitioners had to comply to in carrying out their programmes.

From this experience, the range of lessons can be framed across three categories:

• Technology upskilling needs to be continuous:

The dimension of an L&D session comprises of many factors namely facilitator-side, learner-side, and programme management end whereby behind-the-scene works commenced throughout. In this regard, given the technological elements of online learning, it is highly important to ensure that everyone is upskilled accordingly across the platforms that are used in a learning programme.

At the beginning of the pandemic, the challenge and urgent need for upskilling was apparent and prevalent. These include upskilling of facilitators to be able to navigate the platforms used to create good virtual presence for successful virtual facilitation. For organisations that engage external parties to conduct their learning, there could also be differences in the platform used such as Microsoft Teams, WebEx, Google Meet, Skype and Zoom; whereby certain company restrictions might only allow one or the other. Given the variety in user interface and functionality, this proved to be a challenge as instructors shifted from environment to other. Nevertheless, the exposure to other platforms empower facilitators, learners and programme management to experience and leverage on each platform features for more engaging learning experience.

For the programme management end, administering the changes between sessions within a programmed proved to be a daunting endeavour. These include ensuring attendance, sustaining engagement level, handling technical glitches, and setting up break-out groups for smaller discussions within the session. While these activities posed their own complexities, most administrators felt that the learning curve has been managed well over the past one year as both instructor and learner end get familiarised with the tools used and also feedbacks gathered from them during sessions. Apart from that, daily usage of the technology and platform for work purposes has helped them in acquiring the required skills.

These impending challenges highlight the need for continuous upskilling to take place, for everyone involved. As online learning limits the ability to express emotions and even verbal tone clearly, the factor of technical features compounds on to the adjustments required by all parties involved. Periodic upskilling is a potential way forward and some organisations are moving to pre-recorded online video for self-learning to take place in administering, running, and facilitating online classes.

• Levels of engagement may vary: At the onset, online learning poses the constraints of limited interpersonal engagement as compared to face-to-face learning in a classroom setting. Online behaviours are difficult to gauge, body language reactions aren't able to be read, facial expression of the audience can't totally be seen, and tone of voice or messages in the chat box could lead to points getting lost in translation as they are being conveyed.

Other factors such as time zone and geographical location differences are equally important consideration for the organiser to anticipate challenges in creating an inclusive environment for active participation virtually. Effective virtual learning requires much more preparation to ensure connectedness of facilitators and learners. These are some of the immediate challenges felt by both instructors and learners as they shifted to online learning.

While the above is true, several tools and techniques have been adopted to improve level of engagement throughout the training process. These include the adoption of online quizzes, breakout activities and interactive games between participants. These include the adoption of online quizzes and interactive games between participants known as 'energisers'. These 'energisers' are felt to be effective in adding excitement to the learning experience which can potentially be dry, flat, or monotonous as the participants are mostly sitting and facing their display screens.

Over time, the hurdle of sustaining engagement levels in an online setting has been able to be addressed by most practitioners as tools and new methods of engagement improvement were adopted. The utilisation of pre-programme and in-programme modules and surveys, for examples, has enabled learners to come prepared for the sessions thus allowing more assessment of learning input towards creating a participative and inclusive environment. Some practitioners even argued that the time for prominent speakers or thought leaders are becoming more accessible and optimised as their ability to move from one session to another is improved.

There is opportunity for cost optimisation: While online learning has affected its stakeholders with challenges in terms of technology and level of engagement, there has been views on the cost optimisation opportunities that have-emerged from the new way of learning amidst the pandemic. As everyone involved is at home, or within a specific location with internet connectivity, the interest and ability to attend and commit to learning has improved. Although, it needs to be acknowledged that the experience is very individualised and different from one person to another -- given their circumstances at home i.e. family commitments, Internet connectivity, conducive environment.

Some of the cost-saving opportunities that have been leveraged include costs for venue reservation, refreshment, travel, and logistics, which constitute the majority of operational expenditure of training programmes prior to the pandemic. These expenditures have also contributed to challenges in organisations to commit to investments for their people, given the differences in the amount allocated in their budget for learning fund versus the price of training programmes in the market as well as calculating and realizing the ROI (Return of Investment) of the training programmes.

As the cost structure of training programmes are reduced to facilitator and technical services online, the affordability of programmes has in some instances improved across relevant organisations e.g. small medium enterprises. Granted, the spending of companies has also been re-prioritised at the back of the pandemic. These dynamics have also led to executive education and training providers to structure their pricing and commercial structure in response to the ability of clients to procure their services.

B. Learner Perspective

• Online is good, but not all the time: The views of learners on online training have been similar to their views on online working in general. It can work, with specific limitations. The advent of online learning over the past year has enabled professionals to explore how productivity and efficiency can be maintained together with deliverables committed even in an online setting. Touted as the 'biggest work from home (or anywhere) experiment ever', the pandemic had certainly introduced a new dimension on the way we work, engage, collaborate and learn.

Learners highlighted how instructional learning can still happen within an online environment. These include lecturing of materials that are more one-way as compared to question-and-answer conversations or debate. In this regard, synchronous learning could just be as effective as asynchronous learning whereby prerecorded videos can be used for learners to understand specific concepts or theories. Learners highlighted that pre-recorded video need to be in short duration preferably less than five minutes duration. Using videos also learners can be engaged in discussion which promoting the social learning and learning from others perspective.

In contrast, when simulations or group works are introduced, most learners find the online setting as a limiting factor. Online familiarisation briefing is used as to ensure that each learner is able to understand and test the online tools prior to the actual session thus allowing optimal experience achieved by learner during the simulations or group works. These include challenges in Internet connectivity affecting clarity and/or interruption of sound quality during conversations and to simply constraints in drawing diagrams to illustrate ideas. The level of interpersonal interaction and participation can be indicators of how an activity can be moved online. While these remain as obstacles, the adaptation is an on-going process that remains to be further explored.

• **Distractions remains unavoidable:** Prior to the pandemic, one of the main challenges of learners in a corporate training session is the 'call from work' that often come their way during the course of the class. This is despite several efforts by the facilitator side to set house rules such as no laptops on the table or even ban the usage of cell phones during a classroom. In an online setting, this multi-tasking situation is more prevalent as communication is made simpler as messages come in across the conference platform used.

Similarly, the challenges faced by work-from-home professionals such as children, for example, remains consistent in the training context. These, despite efforts to 'isolate' and focus for the training endeavour. Regardless, this remains a struggle not only for training but also for work, and school, therefore the coverage of this factor goes beyond the dimension of online corporate training.

Blended learning is the way to go: The insights received from the learner perspective seems to highlight that online learning is appreciated as it gives the flexibility both in the synchronous and asynchronous settings. However, it is clear that full online delivery has posed specific challenges especially in the areas of collaboration, interaction, and context.

In this regard, it can be deduced that blended learning which has both components of online learning and in-person delivery (or self-directed) is a likely way forward coming out of the pandemic. Learning effectiveness seems to be shifted from one level to another as the transition to online happens, and the types of learning that can and cannot be delivered virtually should be able to be ascertained over time.

V. CONCLUSION

The focus of this study is a subject that is still be experienced, researched, and discovered by all the stakeholders involved. The documentation of the lessons captured from the early days of the pandemic, as it has developed until the point of writing of this paper, is important to be captured as it provides some foundation on changes that are abound in the horizon.

From the L&D practitioner perspective, we discovered how online migration requires continuous upskilling across all functions, leads to various levels of engagement, and encourages cost optimisation at both the client and vendor sides. This frame is a possible starting point in identifying, monitoring, and tracking how the industry could evolve in the coming months as the pandemic hopefully subsides.

From the learner perspective, embracing various approaches to virtual learning and balancing act to manage work and personal commitment remains a challenge. While instructional learning can happen virtually, action-based activities still require interpersonal engagement. Therefore, blended learning is a key consideration that should be assessed and explored by all parties involved.

VI. LIMITATIONS AND FUTURE RESEARCH

As noted in the conclusion, the focus of this study is an area that is continuously evolving as impact of the pandemic is being explored and assessed. Essentially, the horizon of this study has always been for the period of the year that has passed since the outbreak. In this regard, the information and data gathered from this study is limited to the coverage and practices over the past one-year period. Therefore, there is opportunity for further research to be continued in moving forward with this evolving subject. Future research could be done towards validating or invalidating some of the findings and proposals made through this study. Technologies and

learning behaviours might also evolve in tandem thus a concurrent assessment of both can be a practical way forward.

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Unconscious Gender Bias in Performance Evaluations: What Have We Learnt So Far?

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Abstract-Human resource management is one of the 10 core components that make up a project management plan per the Project Management Body of Knowledge. This component describes how project personnel performance management is carried out on a project. Managing personnel performance includes performance evaluations of that person to specific requirements, and this is typically carried out at every step of the way for members of any organisation. Ensuring that unconscious gender bias does not play a role in the performance evaluation process is key to ensuring that a level playing field exists, in order to create equal opportunities within global workforces in line with aspirations to achieve the United Nations Sustainable Development Goal No. 5 on gender equality. Whilst a lot of effort has been made to ensure that diversity and inclusion is actively promoted within organisations, studies have shown that unconscious gender bias remains a challenge and more effective strategies are required to address this problem. This paper presents literature review findings on methods that could be used to understand the extent of unconscious gender bias in an organization, contributing mechanisms as well as possible interventions that could be implemented to prevent this bias from occurring. Finally, three success factors to ensure successful implementation of the proposed interventions are presented, in addition to a review of the limitations of this paper with recommendations for future research.

Keywords—gender bias, unconscious bias, performance evaluation, sustainable development goal

I. INTRODUCTION

Gender refers to socially constructed characteristics of women, men, girls and boys, which varies from one society to another and can change over time [1]. Gender bias is broadly defined as 'the tendency to prefer one gender over another gender' [2]. Unconscious gender bias is also known as implicit bias which occurs when a person consciously rejects gender "stereotypes but still unconsciously makes evaluations based on stereotypes" [3]. This type of unconscious bias has long existed in organisational structures globally, leading to unequal treatment amongst different genders within global workforces [4]. Whilst many organisations have acknowledged its existence and have taken active steps to address this type of bias [5], it is noted that current practices are insufficient to affect the necessary change that is required to level the playing field [6].

From a project management perspective, human resource management is one of the 10 core components that make up a project management plan according to the Project Management Body of Knowledge [7]. Managing project personnel performance includes performance evaluations to specified criteria, and this is typically carried out at all levels of an organisation. Eliminating unconscious gender bias from

performance evaluations will allow organizations to gain a true understanding of the performance of their personnel, enabling appropriate interventions to be implemented, should they be necessary.

United Nations Sustainable Development Goal (UN SDG) No. 5 on achieving gender equality includes targets to end 'all forms of discrimination against all women and girls everywhere as well as ensuring women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life' [8]. A key component to allowing women to reach decision-making positions is the ability to ensure that they achieve positive outcomes from performance evaluations. Performance evaluations are carried out in many different ways and at different stages in a work environment. This includes evaluations of resumes, evaluation of prospective candidates during job interviews as well as periodic performance appraisals as part of regular performance management, promotion or employee compensation increase processes. Ensuring that performance evaluations are free from all forms of gender bias is key to ensuring that UN SDG No. 5 is achieved.

This paper provides the findings of a literature review on unconscious gender bias in performance evaluations in a general context. It includes a detailed definition of gender bias in the context of performance evaluations, outcomes of key quantitative studies, as well as an overview of interventions that have been recommended to address gender bias in performance evaluations.

II. WHY FOCUS ON GENDER BIAS?

Research has shown that there is still a limited number of women in leadership and managerial positions worldwide although it has been widely documented that having a more gender balanced workforce leads to higher performance levels in a company [9]. In order to capitalise on this performance edge, more companies have been focused on developing women as part of their leadership and development programmes. However, although the level of effort appears to have increased in recent years, this has not translated into increased effectiveness in organisational structure transformation [10].

Higher employee performance levels lead to better quality of work, better financial outcomes and consequently, higher stakeholder satisfaction levels [11]. Therefore, it is a business imperative for gender bias issues to be addressed, not only at the workplace, but within any organisation which has high quality and performance aspirations.

III. WHY FOCUS ON UNCONSCIOUS GENDER BIAS?

Equal opportunity laws have long been introduced [12, 13] and enforced in many countries globally, making it illegal to discriminate against a person on the basis of gender, and ensuring protection against retaliation for persons complaining about such discrimination. Removal of this explicit discrimination layer of overt sexism leaves behind an underlying implicit or 'unconscious' gender bias which is not subject to any legislation, yet forms a substantive barrier to achieving true gender equality at a leadership level [14]. Reference [14] defines unconscious bias as 'unintentional and automatic mental associations based on gender, stemming from traditions, norms, values, culture and/or experience.'

In line with the aspirations of UN SDG No. 5, there is a need to increase the number of women in the workplace, especially in senior positions. Whilst many efforts have been made to achieve this, women are still under-represented in global organisations. A recent global survey of mid-market businesses indicated that the proportion of women in senior management has risen by 10% in the past 15 years to 29% in 2020 [15]. Research has indicated that unconscious gender bias plays a key role in the hiring and promotion decision-making [16] and other performance evaluation processes [17]. Consequently, this indicates that unconscious bias has a knock-on effect on the level of gender equality at the workplace.

IV. WHY FOCUS ON PERFORMANCE EVALUATIONS?

Performance evaluations act as funnels through which thousands of aspiring candidates are filtered based on educational achievement, competence and experience criteria to name a few, allowing only those who are deemed suitable to become employees, supervisors and eventually, leaders of an organisation who will then go on to carry out the same process when considering other aspiring candidates ad infinitum. The fundamental role that this process plays in shaping an organisation presents itself as a key opportunity to affect the change necessary to achieve gender equality at the workplace. In the context of this paper, performance evaluations include evaluations of resumes, interview outcomes, probationary period performance reviews, ongoing performance reviews as well as reviews to ascertain suitability for promotions.

A study by Pinto et al. [18] which examined the stereotypes and bias experienced by women project managers, found that differences in the gender of a job applicant has a varied yet marked effects on hiring decisions. Experiments by Eagly, H. et al. [19] on the evaluation of men and women in leadership roles found a small tendency to favour men leaders over women, which became more pronounced under certain circumstances such as when non-gender-stereotypical leadership styles are used. Alarmingly, there is strong evidence of gender bias in performance evaluations even in a seemingly gender-equal country such as Finland, as found by [17].

In reflecting on the data from the selected aforementioned empirical studies, it is important to note that unconscious gender bias has long been the subject of multiple research papers and academic studies. The outcome of such pursuits have been the identification of numerous contributing mechanisms, frameworks and the like. However, as [15] indicates, we are still far from achieving gender equality, and this paper has been written as a summary of these findings to

assist with promoting further discourse on this subject as deconstructed into the following sections V to IX.

V. UNDERSTANDING THE STATUS QUO

The International Labour Organisation (ILO) [14] notes that the first step towards addressing unconscious gender bias is to assess the current state within an organisation and the impact that it has had on employees. Table I below outlines recommended assessment methods that can be used to achieve this, with examples of corresponding findings in recent publications.

TABLE I. ASSESSMENT METHODS ON GENDER BIAS

Assessment Method	Findings
Perception surveys	70% of the respondents on an Australian survey agreed that unconscious bias was a barrier to progression [20]. Interestingly, men were found to list unconscious bias as a main barrier that they have witnessed to women's career progression [21].
Language analysis	The existence of gender bias in talent management language including that of vacancy announcements, job descriptions and other forms of communications in a survey of 110 corporations was reviewed. It was found that stereotypically masculine behaviours were described in communications for senior leadership positions [22].
Analysis of gender gaps in wage and advancement	Studies have shown that the gender wage gap exists at multiple levels of organisations and that men earn more than women at every wage level percentile, with women earning 83% of men's hourly wages at the median level. This gap has shrunk in the past few decades, partly due to the stagnation in wages received by men and an increase in wages received by women associated with their increased participation in the labour force [23].
Experiments	Subjects who were presented with two equal candidates to be evaluated for a leadership position described 'Howard' i.e. a man, as likeable and highly competent. In comparison, when the name 'Heidi' i.e. a woman was used, the candidate was also described as competent yet not likeable or someone they would want to work with [24].

Perception surveys allow attitudes and feelings towards unconscious gender bias in performance evaluations to be uncovered. Survey questions are typically open-ended and resulting responses could be quantified using a range representing the degree to which something is agreed with or otherwise. Use of non-gender neutral pronouns, or specific descriptive words aligned with stereotypical behaviour of a particular gender in typical language used by an organisation are good indicators of the unconscious gender bias that exists within it. Such language may have been the product of years of institutionalization, rendering it acceptable and standard practice for continued use. Language analysis that highlights these instances will allow organisations to rethink their approach to such communications.

Analysis of data pertaining to different genders are commonly used to highlight gender bias, specifically data pertaining to wages and promotions. Some countries have mandated publishing this information in a bid to address the gender pay gap [25], making assessments of gender bias

wtihin organisations a matter of compliance rather than a nicety. Carrying out experiments to test responses of employees towards different genders allows for a data driven understanding to be achieved. The assessment methods that are outlined in Table I can be implemented by any organization to varying degrees, depending on the extent of resources available to support this effort. There is also the potential for them to be used in a training environment, allowing for existing unconscious gender bias to be uncovered as part of employee learning and development whilst simultaneously gathering data to ascertain the status quo in an organisation.

VI. UNCOVERING CONTRIBUTING MECHANISMS

Section V outlined how to understand the status quo or the 'what' when it comes to unconscious gender bias. This section attempts to uncover the 'why' with a reference to [26] which discussed the different contributing mechanisms that currently exist to unwittingly cultivate unconscious gender bias. The findings of [26] were based on a review of academic studies and experiments that have been carried out on this subject, as included in Table II. Examples of recent studies that are in line with these contributing mechanisms have been included for clarity where available.

Reference [27] found that women are subject to a higher bar and increased levels of scrutiny when carrying out or applying for roles as compared to men. This applied to both men and women evaluators who were more likely to hire a man instead of a woman with identical qualifications. In comparison, men were found to experience leniency when being evaluated. Consequently, this led to approvals that were carried out without fair or equitable evaluation as compared to that subjected to women [28]. This modus operandi is noted as another contributing mechanism.

Reference [29] found that performance evaluators redefined or shifted their criteria to justify their selection, implying that goalposts were moved to rationalize discrimination in favour of candidates of a particular gender.

A preference for a narrow, agentic leadership style with corresponding traits that emphasize independence, assertiveness and decisiveness that are typically associated with men was also observed. This was shown to affect how evaluators judge the appropriateness of candidates for management roles [30]. The opposite of this situation exists in the form of a 'likeability penalty'. This is when women who display agentic traits are deemed less likeable in response to their non-conformity to stereotypical expectations of feminine traits.

Ironically, when women are undoubtedly being feminine; such as when they enter motherhood, they are subject to a 'motherhood penalty' of being perceived as either less responsible or selfish, depending on how much or how little additional work time they put in. Lastly, the limited networks that women have tend to exacerbate the unconscious gender bias within organisations. In a somewhat cyclical process, having more men in an organization allows for a wider male network. This coupled with human tendency to gravitate towards similar looking peers results in men having a stronger support system to help push them up the ladder.

Possible interventions to address the contributing mechanisms to unconscious bias are described in the next section.

TABLE II. UNCONCIOUS BIAS CONTRIBUTING MECHANISMS

#	Mechanism
1.	Higher bar and increased scrutiny – evaluators were biased towards the resume of a male applicant 72% of the time compared to 44% of the time for female applicants using identical resumes differentiated only by gender [27].
2.	Leniency - this is the reverse of increased scrutiny and occurs when male candidates are treated with lenience as they are assumed to already have the required skills without a fair evaluation of their qualifications or performance by the evaluator [28].
3.	Shifting criteria – evaluators consistently shifted their evaluation criteria used to justify their selection when confronted with differing skill sets and experience, and consistently elected to choose men over women [29].
4.	Preferring a narrow leadership style – agentic behavioural traits associated with masculinity are preferred when evaluating the leadership style of a candidate, leading men to be judged as more appropriate for management roles based on gender stereotypes as compared to women who tend to exhibit more communal traits [30].
5.	Likeability penalty – women who display agentic behaviour experience backlash associated with non-conformity with societal expectations and are deemed less likeable. A self-confident and assertive woman is viewed as arrogant and abrasive. In parallel, women who display feminine traits are perceived as nice but less competent as a leader. Research has shown that highly competent female leaders frequently fail the likability test yet competence and likability are typically positively correlated for male leaders [31]. The mechanism commonly manifests itself in the form of criticism of the communication styles of women leaders.
6.	Motherhood penalty - mothers are perceived as less committed to the success of an organisation than non-mothers, leading evaluators to label them as less deserving to be hired. Mothers attempting to overcome this bias by putting in additional time and effort are seen as less responsible and even selfish. In contrast, fathers do not experience the same bias, and experiments have shown that they receive higher evaluations compared to child-less men.
7.	Lack of access to networks – women's networks tend to be smaller with fewer advocates who are key to unlocking development and promotion opportunities. Men are more likely to have powerful mentors within a wider male dominated network based on human tendency to gravitate towards persons similar to themselves.

VII. POSSIBLE INTERVENTIONS

There has been much effort to address and eliminate unconscious gender bias in recent years, with many different initiatives introduced with varying degrees of success. This section attempts to discuss the pros and cons of possible interventions.

Employee resource groups (ERGs) are relatively common in most large companies as of late. Specific to unconscious gender bias, ERGs usually exist in the form of women centric support groups acting as a designated voice to advocate for their needs. Whilst this is no doubt useful, the focus lies on bonding capital or within-group solidarity to work within the confines of existing organisational structures as opposed to creating bridging capital to promote structural changes that are needed to prevent this type of bias within organisations.

Many companies have begun introducing Unconscious Bias Training (UBT) as part of management training

programmes. UBTs are designed to create awareness of the implicit bias that exists within organisations and individuals. These have had mixed responses with some parties stating that they do not lead to the improvements that are necessary to eliminate unconscious bias in the long term, instead calling them a box-ticking exercise even though UBTs can have positive immediate effects [33]. In addition, UBTs could have unwanted effects of amplifying inequality by normalising bias instead of eliminating it altogether.

Another intervention that has been implemented is blind auditions, which have been shown to level the playing field by eliminating the ability of the evaluator to identify the gender of the applicant. Reference [34] noted how the use of blind auditions led to a marked increase in the number of women who were accepted into orchestras once it was implemented. It is noted that this intervention is not scalable or practical for all industries and evaluation decisions.

Ensuring that explicit and structured evaluation criteria are defined from the outset eliminates a situation whereby requirements are shifted during the performance evaluation process. This ensures that evaluators are held accountable for their decisions, especially if in contradiction to previously agreed criteria. Evaluators should be appropriately trained such that they are able to provide the clarity that is required.

Redefining what success looks like is an approach that can lead to more engagement from women. Reference [35] outlined several themes based on observations made during informational recruitment sessions held by a number of technology companies at a university. These included presentations and discussions that excluded women, pervasive use of gender stereotypes, extreme technicality, as well as frequent references to masculine geek culture. By reducing or countering these behaviours, for example by using more women role models in presentations, actively seeking opinions from women and calling out use of gender stereotypes, it is possible to increase the participation of women in these circles. This effort will typically require an organisation-wide review to be carried out, which may be a resource intensive undertaking.

Increasing transparency and accountability in the decision-making process also eliminates the shroud of mystery that typically accompanies all hiring and promotion activities in large private companies [36]. By ensuring that evaluators explicitly agree on the criteria to be used to evaluate a candidate beforehand, it is possible to avoid convenient changes to criteria that are justified in support of a particular gender. This will work to reduce 'performance reward bias' which exists when women and other minorities receive lower compensation as compared to men for equitable performance. Consequently, this intervention can be a positive step towards reducing the gender pay gap. Evaluators should be adequately trained on the process, with the suggestion of an oversight committee to be put in place to ensure good governance.

Finally, analysis of data can help provide basis for a business case that is necessary to drive change such as that used by Google [24]. Data driven examples of unconscious gender bias is a powerful way to highlight current trends as well as create awareness and understanding of how systemic unconscious gender bias is in an organisation. This will allow for evidence-based decisions to be made, which allows for any emotions, stereotypes and other biases to be eliminated.

In addition, specific metrics can be tracked to ascertain the impact of any interventions that are put in place.

The pros and cons of the interventions that have been discussed above are as outlined in Table III.

TABLE III. Possible Interventions: Pros and Cons

Intervention	Pros	Cons
Employee	Empowers marginalised	Emphasises 'bonding
resource	groups by providing a	capital' or within-group
groups	support network.	solidarity instead of
(ERGs)		'bridging capital' to
	Helps group to conform	address structural
	to and succeed within	company-wide issues.
	existing organisational	
	structures.	
Unconscious	Educates managers on	Unclear if this can
bias training	their own biases by	produce sustainable
(UBT)	allowing them to actively	long-term change as
	address this during	results can wear off.
	workplace evaluations.	
		UBTs could amplify
	Can result in positive	inequality by
	short-term outcomes.	normalising bias.
Blind	Eliminates gender bias at	Is not scalable or
auditions	initial stage evaluations.	practical for
	-	implementation in all
		evaluation decisions.
Explicit and	Eliminates shifting	Requires clear criteria
structured	criteria during the	from the outset and
evaluation	evaluation process.	associated training for
criteria	•	the evaluators.
	Allows evaluators to be	
	held accountable for their	
	decisions.	
Redefining	Promotes use of a	Requires an
success	gender-neutral approach	organisation-wide
	when seeking candidates.	review to ensure gender
		neutrality is achieved,
	Encourages more	which may be a resource
	engagement from	intensive effort.
	women.	
Increased	Reduces 'performance	Involves adding
transparency	reward bias'.	oversight committees for
and		evaluation processes.
accountability	Shown to reduce gender	
	pay gap.	Requires training all
		evaluators on process
		and criteria.
Analysis of	Allows for evidence-	Stereotypes and biases
data	based decisions to be	could make
	made.	interpretation and
		assessments of outcomes
		a challenge.

VIII. IDENTIFYING SUCCESS FACTORS

So far, this paper has defined what unconscious gender bias is, outlined how to assess its current state and discussed the various mechanisms that contribute towards it. In addition, the pros and cons of potential interventions that can be used to address this bias have been discussed. In bringing all these components together, there is a need to identify success factors that could play a role in ensuring the effectiveness of any interventions that are put in place to eliminate this bias. Three key success factors have been identified as included and discussed below:

1. **Leadership buy-in**: Reference [37] notes that a key contributor to the success of any gender bias intervention is engagement and buy-in from management. This senior leadership buy-in is key to ensuring that diversity messages are not faced with

resistance which could cause certain employee groups to feel threatened, increasing the potential stereotyping and disrespectful treatment of women.

- 2. Stop conforming: Interventions that help women conform to and navigate through existing organisational structures are likely to be helpful but insufficient in the long run to produce sustainable change [26]. Instead, the focus should shift towards revising policies to enable equal treatment of employees. For example, allowing equal parental leave applicable to all genders could lead to long term elimination of the 'motherhood penalty' that women are subject to.
- 3. Experience and research-based training: In reference to women's leadership development training, [6] noted that this should be created only by those who have the necessary background and experience in promoting leadership and organisational change. In addition, they note that all training should be based on current research and theory. In reference to the content to be included in training materials, [31] notes that unconscious gender bias should be 'a foundational element' of leadership development programmes.

IX. LIMITATIONS OF STUDY

This paper has reviewed unconscious gender bias in performance evaluations from a men vs women gender perspective. This is because much of the existing literature and studies that have been carried out on this subject has not at time of writing, ventured into other genders that are now commonly acknowledged to exist, such as agender, omnigender or non-binary, to name a few.

In addition, the role of cultural norms as a contributing factor to unconscious gender bias has not been accounted for. Eastern countries are typically known to have patriachal societies with both cultural and religious origins covering areas such as language, ethnicity and national origin. Specifically, this bias has not been reviewed in a Malaysian context, which requires consideration as an Eastern society that is layered with progressive ideation and gender equitable aspirations as it endeavours to transform itself into a fully developed nation.

X. CONCLUSION

This paper has attempted to consolidate the findings of many studies and experiments that have been carried out on the subject of unconscious gender bias in performance evaluations. The findings have been deconstructed into sections on understanding of the status quo, understanding the mechanisms that contribute towards the occurrence of unconscious gender bias in performance evaluations, and subsequently, a review of the pros and cons of the many interventions that could be implemented to address the aforementioned mechanisms in order to achieve aspirations in line with UN SDG No. 5 on gender equality. Finally, three key success factors that could help eliminate unconscious gender bias in organisations have been identified.

Many organisations have been actively working to address this bias via some of the interventions that have been

reviewed in this paper. Yet, as recent data indicates, this bias remains. Uncovering why this is so could be the subject of further research. In addition, as this paper is limited to a manwoman review in the context of gender bias, further exploration on how this affects other genders, as well as how cultural and religious norms play a role in this bias could be investigated in the future.

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Creative Strategies for Non-Formal Science Learning

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Abstract— Investment in science and technology programmes has always been a priority on the government's agenda. The National Science Centre (NSC) offers Non-Formal Science Learning (NFSL) for visitors from all ages and backgrounds through its physical exhibition, collection, and programmes. The pandemic brought about changes in the daily operation of the centre. The normal physical visit is now restricted, and the centre needs to identify strategies to appeal visitation through the new norms and means. This paper aims to examine the NFSL through visitors' service experience in a science centre and suggests creative strategies in promoting visitation physically and online. A quantitative method using questionnaire was utilised to gather data from 490 respondents, and analysis on the factors that contributed to effective non-formal learning are elaborated. The result shows that the servicescape quality, sensory elements of the centre, and the substantive communicative components are important contributors to the effectiveness of NFSL in the NSC. The article recommends various creative strategies to overcome the limited physical visit to the centre in enhancing the NFSL, especially the transformation of service delivery through digitalisation.

Keywords— visitor service experience, servicescape, non-formal science learning, sensory elements

I. INTRODUCTION

The pandemic that arose in 2019 and is still haunting the world has led to a change in the learning landscape. People are beginning to learn new things and have to adapt to the new norms. While taking care of oneself, ensuring hygienic measures, and following SOPs are becoming natural, people have to learn and study in different ways. Formal learning, as well as informal and non-formal learning, are also adapting to new methods. People and organisations need to take leap steps to adapt to the new norms, accelerating the usage of technology in our daily life. The non-formal learning of science and technology as provided by science centres or science museums needs to improvise the technology invested in line with the changing way of life. The vital question is how these centres can survive when the public can no longer patron these places physically?

Non-formal science learning (NFSL) is learning that is embedded in planned activities. It may not be explicitly designated as learning (in terms of learning objectives, learning time, or learning support). Still, it contains an important learning element, intentional from the learner's point of view and can occur in science centres, museums, science camps/clubs, or anywhere outside the classroom [1]. The flexibility and creativity of non-formal learning have seen vast financial investments. These investments include

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ensuring the non-formal centres like science centres and museums are equipped with artefacts and models that visitors can touch, feel, and play. However, the non-formal learning that takes place in the physical environment is now very restricted. How do organisations or institutions turn the physical investment into an applicable model in the pandemic era? This paper aims to examine the NFSL through visitors' service experience (VSE) in a science centre and suggests creative strategies in promoting physical and virtual (online) visitation.

II. OVERVIEW ON POLICY, THE NFSL AND VSE

A. National Policy on Science, Technology, and Innovation (NPSTI)

Science Technology and Innovation (STI) is essential for socio-economic development in today's innovation-led and knowledge-intensive economy. Its importance is further justified with the progress of Industrial Revolution 4.0 and 5.0 (IR 4.0 & IR 5.0). STI fostered communities, and their talents can be developed in various ways through the involvement of different stakeholders. The institutions like science centres and science museums are examples of stakeholders. They have a long history of promoting, stimulating interest, and creating awareness on STI. These institutions make science learning more fun and practical and often turn it into a great place in nurturing science in society

Aligning to this progress, the education policy in Malaysia has always placed science and technology as a pertinent initiative. Malaysia introduced the National Policy on Science and Technology framework back in 1986-1989. This policy was revised and updated with the current National Policy on Science, Technology, and Innovation (NPSTI) 2021-2030, strategising its previous six key thrusts. The NPSTI 2021-2030 emphasises the concept of STI as the accelerator for economic development and an essential platform for becoming a developed high technology country [2]. The strategies identified in the plan further boost the role of the National Science Centre (NSC) as a centre of excellence for the enculturation of Science, Technology, Innovation and Economy (STIE) in the country [3]. Investment in science and technology programmes has always been a priority on the government's list. The spending on the centres' operation cost was estimated at RM12 million yearly with returns of RM3 million from ticketing, rental of facilities, and the STI program's fees [4][5]. The current development of the pandemic restrict physical visits, and this further impacted the revenue collection. The challenge is to embrace the new norms and

enhance NFSL with reasonable returns on investment while balancing it with the national policy goal.

B. Non-formal science learning (NFSL)

NFSL is structured with pre-planned activities and a desired learning objectives or outcomes, but not necessarily designated with a specific syllabus to adhere. Basically, NFSL does not lead to certification [6]. The NFSL is available in settings like National Science Centre, National Planetarium, National Zoo, Petrosains, National Museum and other similar places. These non-formal learning institutions complement the way science was taught in school and facilitate science literacy levels among society. The learning activities are outside of the formal setting. It shares the same characteristic as non-formal learning and focuses only on STI content, including pure sciences and STEM (Science, Technology, Engineering, Math) subjects [6][7][8]. The basis of NFSL is on various preferences such as experiment by doing, reflect by watching, experience through feeling or theories through thinking. This led to the importance of services and facilities that encourages such learning via service experience.

C. Visitors' Service Experience (VSE)

The service providers within the NFSL institutions like science centres, museums, or planetariums need to understand VSE to assist them in having a holistic picture of how to enhance visitor's experience. Increasing the awareness and service experiences can encourage more visitors to their premise, and further aid the centres to generate revenue. This study explores the role of VSE from the perspective of service delivery, physical and social servicescape. The purpose is to understand how the VSE approaches can further be enhanced to embrace the new norms of the century. Perhaps technology can be utilised to introduce online magical VSE, available to all from anywhere.

Various factors determine the VSE. This includes all the sensory elements, sight, sound, touch, taste, and smell. In addition, the VSE involves a servicescape quality (as introduced by Booms & Bitner, 1981) related to the physical environment (surrounding) like the layout, traffic flow, temperature from its entrance, exhibitions, amenity areas (restrooms, gift shop, and food service) to the building [9] or referred to as physical servicescape [10]. These experiences are not limited to the settings of a centre. It relates to other objects, and interpretive materials such as labels, media, and brochures are also part of the physical context contributing to the VSE [9] [11].

Moving from the physical environment, VSE is also subject to substantive communicative components, such as politeness, concern, and culture delivery. These components are known as social service experiences. Many science centres, science museums, and planetariums have changed on how they manage their organisations. Currently, the focus is not only on products, collections, displays, or exhibits but emphasising on the VSE. The visitor's

emotional feeling during a visit to a museum (and science centre) is also dominated by utilitarian values, including learning and social interaction, besides hedonic values of relaxation and enjoyment [12]. Pleasant environments for purchasing products (and services) are seen as an opportunity for a favourable customer experience and, consequently, a new competitive advantage for the provider [13]. The visitor's learning experience and educational values that spark the visit's excitements are also among parameters used for NFSL's effectiveness [14][15]. Studying on the changes in the strategies for better VSE, illustrate the importance of delighting customer. The challenge to the service provider would be to appeal to visitors' experience and turn them into loyal customers. Loyal customers are repeat customers, and their promotion through word-ofmouth can be very powerful and effective publicity.

III. METHODOLOGY

Data was collected utilising an established questionnaire, papers, and iPad with offline software via SurveyMonkey. The target population focused on visitors aged 13 years old and above. The visitors were asked to participate in this survey at the end of their visit. This study utilised the purposive sampling technique. 750 walk-in visitors were approached; however, 10% of them rejected the offer. Thus, a total of 550 surveys were answered. Upon data cleaning, 60 surveys were eliminated due to incompleteness. Therefore, the analysis was based on 490 surveys.

The questionnaire consists of 68 items, divided into six sub-sections, in both languages, the Malay and English version. These sub-sections are the demographic profile, service delivery, physical servicescape, social servicescape, the effectiveness of NFSL, and visitor's responses. The 7-point Likert Scale was utilised with scale references, 1: Strongly Not Agree; 2: Not Agree, 3: Slightly Not Agree; 4: Undecided; 5: Slightly Agree; 6: Agree, and 7: Strongly Agree. This paper highlights the findings on the service delivery and servicescape dimension from the study.

IV. RESULTS AND DISCUSSIONS

Table I shows the demographic profile of the 490 respondents involved in this study. Female respondents were slightly higher in number compared to males; 285 (58.2%) of the respondents were female, while another 205 (41.8%) were male. The youngster appears to be the majority of the visitors at the science centre with 248 (50.6%) of the respondents, aged between 13-17 years old, thus emphasising the secondary school students. The majority of visitors at the science centre are Malays, while the rest are Chinese, Indian, and Bumiputera – Sabah/ Sarawak. A small number of the respondents were categorised as others, mostly foreigners.

Majority of the students, 190 (38.8%), are from the public schools, followed by 74 (15.1%) from the international and private schools, 23 (4.7%) from the boarding schools, and 2 (0.4%) from the Chinese schools. Respondents were also college and university students, 201

(41%) with different levels of educational background. 99 (20.2%) of them were either pursuing or already had a bachelor's degrees, 55 (11.2%) at the diploma level, 15 (3.1%) at the matriculation and STPM levels, 27 (5.5%) at the master's degree level and 5 (1%) at the PhD level.

Table I

Demographic Profile **Description** Frequency (%)Gender Male 205 41.8 58.2 Female 285 Age 13-15 135 27.5 23.1 16-17 113 28.8 18-36 141 20.6 37-54 (or older) 101 Race 78.6 Malay 385 Chinese 51 10.4 6.5 Indian 32 Bumiputera (Sabah/ 3 0.6 Sarawak) 3.9 19 Others Occupation Student 273 55.7 Government 12.9 63 Private 92 18.8 Self-employed 21 4.3 Housewife 38 7.8 Retiree 3 0.6 Education 38.8 National Secondary School 190 Chinese Secondary School 2 **Boarding School** 23 Private/ International 74 15.1 School

Table II shows the visiting trend of the science centre. A total of 354 (72.2%) of the respondents were first-time visitors to the science centre, while 136 (27.8%) were repeated visitors. In addition, 220 (44.9%) of the respondents came to the science centre via school trips organised by their teachers or school management, whereas the other 195 (39.8%) came with their families. Another 55 (11.2%) came on their own initiatives or were self-willed, and 20 (4.1%) came with their friends. The visiting trend implies that the science centre is one of the places of interest that the public would visit, and these visitors are from various education and occupation backgrounds.

15

55

99

27

0

5

3.1

11.2

20.2

1.0

5.5

Matriculation/Form 6

Diploma

Degree (Bachelor)

Degree (Master)

Others

Degree (PhD)

Table II The Visiting Trend

Frequency

Frequency of Visit

354

136

Reason of Visit

JJ

220

195

20

Percentage (%)

72.2

27.8

11.2

44.9

39.8

4.1

Description

Once

More than once

Sen-winea

School Trip

With Family

With Friend

With Filend	20	7.1	
Note: Nun	nber of respond	ents. n=490	
2 10 10 1 1 10 1			
The next finding	is on the servi	ce delivery dim	ension.
The results in Table	III showed th	at fair treatme	nt was
considered the most s	uccessful appr	oach within the	service
delivery dimension, w 7-point Likert scale, scale. Meanwhile, the in the service deliver	moving tightly accessibility	towards the ag	reeable e lowest
±0.971) within the s mean factors under t within the acceptable			
(scale of 5-6), which delivery aspect was respondent's point of v	deemed as		

Table III Mean Values for Factors within Service Delivery

Dimension

Factors (Variables)	N M SD
Timeliness	490 5.2922 .98379
Accessibility	490 5.2240 .97080
Fair Treatment	490 5.7404 .95530
Exhibition Outcome	490 5.3012 .87410
Technology Usage	490 5.4122 1.05156

In the context of the science centre, the primary source of education platforms is the exhibition outcome within the service delivery dimension, and the exhibition is the primary source of knowledge transfer [16][17]. The

descriptive analysis of the mean values of the exhibition outcome is depicted in Table IV. The exhibition contents were generally perceived as exciting and informative. Most visitors agreed that they learned at least one new fact about science and technology that they never knew before. This suggests that the current approaches used in delivering the exhibition contents at the NSC were succeeding in their objectives to excite the visitors in exploring the premise and educate them about Science and Technology (S&T). The NSC's recent efforts in developing their S&T content should remain as a key practice since their contents are usually validated and prepared by professional science officers. These officers are well trained in science communication skills and well versed in their subject matters, covering a diverse range of S&T disciplines in simplifying the scientific contents to meet the layman's preferable.

Table IV
Mean Values of the Exhibition Outcome

Items	M	SD
Most of the exhibits are attractive and encourage people to try on	5.42	1.228
Most of the exhibits in the galleries are functional and fully operational	4.39	1.275
The explanation texts, labels, and instructions used for the exhibits in the galleries are easy to understand	4.94	1.190
I learned at least one new fact about science and technology that I never knew before	5.89	1.030
The exhibition content is exciting and informative	5.87	1.038
Total Mean Scores	5.3012	.87410

Most centres strive to convey science concepts, issues, and technology applications to human life and the environment in strengthening science centres' engagements [18]. They added that the science centre's exhibitions should not neglect the social relevance of its contents towards the local society to enable more precise questions, curiosity and accelerated understanding. In fact, in the open-ended questionnaire, respondents suggested that for human development in STI and fundamental science concepts, explaining topics like natural disasters that commonly happen in the country can help attract visitors' attention when visiting the NSC. Further, some visitors suggested that the NSC add more content related to urban farming, local technologies, and local achievements in scientific discoveries. These topics could bring the NSC closer to fundamental science, potentially affecting local lifestyle quality. By doing so, the science centre would have higher social relevance in people's daily lives. They could relate to S&T topics more clearly and better understand the need for active involvement to ensure the nation's sustainable development. Places that reflect the local's history, lifestyle, and environments are more likely to draw people's attraction, mainly because it makes them feel part of it and the issues as having social relevance to their lives [19].

The open-ended questionnaire revealed that some exhibits needed further information to help the visitors understand the scientific phenomenon. For example, the giant pin pressure exhibit has the 'wow' factor in attracting the visitor's attention. However, it only provides minimal instructions texts. Visitors were hoping for further explanation on the science or technology concepts behind it. The idea of museums incorporating interactive multimedia display prototypes to enhance the visitors' experience and disseminate information in engaging ways is on the rise [20]. This technology allows the visitors to choose the level of details they need for the explanation text since it is equipped with the relevant IT technologies and suitable hands-on gadgets (e.g. touch screen for multiple choices, etc.). This digital setting has been found to enhance the learning experience and visitors' engagement with the displays within its exhibition galleries [21].

It is discovered that museums with the latest electronic equipment such as RFID technology, PDF, kiosk, and tablet PC for information provision positively affect the visitor's viewing experience (engagement) in the exhibition galleries [22]. Furthermore, the usage of virtual docents and digital technology for the explanation texts can potentially help visitors to access additional information about the objects/exhibits they are viewing, increase the likelihood for better interaction to take place between the visitors and the exhibits, and lengthen visitors' exploration hours in the exhibition galleries.

It was mentioned in the survey that the exhibits and displays should be upgraded to meet the upper learning level needs that suit them. The NSC should consider including more advanced STI content with technology blended applications to encourage the visitors to engage with the Other than that, gamification multimedia exhibits. applications are another alternative that can be used at the NSC to attract this group of students. This approach uses digital media education and game-based learning in delivering the STI contents within the exhibits or displays. The museum (and science centre) generally offers a highquality environment for the public (adult and elders) to learn and relax while exploring; however, the younger visitors would prefer more exciting equipment such as digital applications, games, and interactive items [23]. Even though gamification and interactive approaches in the science centre may elevate excitement to explore the exhibits, they need to be paired with thinking efforts, appropriate responses, and clear objectives for the scientific learning to take place. The NSC must take precautions in selecting its science collections since not all interactive and hands-on exhibits are considered minds-on.

In today's innovation-led and technology-based society, the NSC should employ the recent developments in terms of their information technology (IT) usages. In line with the findings, the science centre may want to focus on some of the strategies below:

1. Embrace the total capacity of the current Internet of Things (IoT) applications, artificial intelligence (AI) technology, and augmented reality (AR) technology to reach its audiences (visitors) virtually and effectively. The current IT technology offers various choices that enable visitors to explore and appreciate the whole experience of their visitation due to its ability to portray the events and the surroundings galleries within its real-time. In particular, the AR technology visualises a superimposes of digitised virtual information, including audio and visual, with the real-world view of the selected location [24] [25]. The mobile AR application has been actively utilised (especially in the tourism industries) because it offers visitors the opportunity to transform the way people visit a place while enhancing their knowledge and awareness [24].

The AR market (including its mobile applications) is expected to grow at a compounded annual growth rate of 79.6% in the nearest future. The Korean government had developed its own AR mobile application promptly to be applied in their museum and tourism industries, containing pictures, videos and three dimensional (3D) images related

to the products offered at the place of interest [24]. The implication is, it's the best tool for the NSC to connect to its national and international audience during this COVID-19 pandemic era. In fact, the Academy of Science Malaysia has indicated the usage of expression and application of creative contents and artworks in the tourism industry (including places like the NSC) as one of the socio-economic drivers in their 10-10 Malaysian Science, Technology, Innovation, and Economy (MySTIE) framework 2021-2030 [26].

- 2. Adopts technology equipment to enhance the exhibits and displays' contents, including informative wands with RFID technology, multi-touch tabletop technologies, interactive information kiosks, and a QR code system. This can be added with virtual media as it allows visitors to interact with the experts (or their subject of interest) online through smartphones or internet applications.
- 3. Engaging with government agencies and private sectors experts in AR technology to develop the science centre's mobile AR applications. In doing so, the NSC will be able to have its galleries virtual tour apps that can be customised for both free or paid viewing tours, based on the demand and level of advancement of the contents. This approach can help the NSC offer its content and programs creatively during this COVID-19 pandemic and promote it nationally and internationally. In the long run, this new technology approach can potentially create stronger trust and memories through the enhanced visiting experience provided, which would also help to increase the visitors' intentions to revisit and provide positive reviews for the NSC.
- 4. Collaboration with other well-developed science centres in all parts of the world. This collaboration should focus on online visitation or online access to other sciences centres through NSC. The collaboration allows nations of the world to continue learning and update knowledge without travelling physically but sharing the different resources and further improving the NFSL. For example, a visitor in Malaysia through the platform at NSC would be able to view and explore not only exhibits and display, more than that; one can interactively visit the places and do experiments virtually. This collaboration would beneficial for all parties, with mutual understanding and a win-win situation for all. The collaboration, of course, would include identifying the fee structure and the income for all parties involved. Just imagine how excited the young generations are, they are able to visit all parts of the world, learn new things and understand the different cultures from the comfort of their home or school.

The suggested strategies are in line with the idea of transforming digitally to address several issues faced by the science centre or any other institution in the same line. Technology transformation can offer an alternative platform for visitation. This kind of visitation can be visualised nationally or internationally, from all nations of the world and from all walks of life. Education in this manner fulfils the lifelong learning. The issue of income generation is also considered as this online visitation can be done via online paid visitation. The number of visitors is not limited; in fact, every science centre can have as many visitors as the system

can hold. The international online visitation further offers a challenging and interesting package suitable for all ages. Learning about science, history, culture, artefacts, just to name a few, is unimaginable.

V. CONCLUSION

The current change in delivering education has forced all stakeholders to think differently and be more creative. The NFSL offered by institutions and centres is at crossroads in terms of the approaches. The transformation into digitalisation allows a lot of new ventures which are not previously important. Learning must go on; the business must carry on, and an organisation must survive. Each and every one of us needs to embrace the change, unlearn, learn and relearn. The NCS's staff need to update their current STI knowledge to be able to impart knowledge to the general public on these latest applications. Thus, continuous STI's training and exposure are crucial to ensure the staff are competent in delivering the best STI content as inspired by the government's aspiration. Indeed, it is digitalisation in transformation, bridging academia and industries.

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Work Allocation and Time Management System

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Abstract—Time management and work allocation are some of the most important aspects of conducting business operations or completing projects. Various investigations by previous researchers have shown that issues that manifest as a result of improper work allocation techniques and time management procedures include (but not limited to) indelicate actualization of tasks, noncompliance with established regulatory procedures, and lack of total identification of workforce expertise domain. This paper discusses a proposed system that aims to adapt the characteristics of the ALPEN time management framework (ALPEN stands for Activity, Length, Planning, Establishment of priorities, Notation) in conjunction with the paradigms of work allocation, into a mobile application. The backgrounds, core introduction of the relevant elements, literature review, applicable development technologies, and potentially suitable methodologies are subsequently covered herewith. We deploy the proposed system on the Android platform with Firebase as the main backend. We analyse and justify the rationale behind the methodologies we applied in developing the proposed system. We deem the end results acceptable upon evaluating the usability of the proposed system using the ISO 9126 criteriabased assessment evaluation technique.

Keywords—time management, work allocation, Android development, ALPEN, Firebase.

I. INTRODUCTION

A. Prelude

Several researchers in the past have investigated the nature of allocating and assigning tasks to employees in the society. generic working Α (notwithstanding specially curated setups or organizations with specific rules as to hiring requirements) will have a wide range of individuals from various social groups within the workforce and by such, can be daunting to oversee and efficiently organize in order to materialize mandatory levels of productivity. Affirmatively, knowing how potentially difficult it is to assign tasks to employees, errors committed from such situations can materialize into condescending consequences like reduced efficiency as a counter-effect of absenteeism, job dissatisfaction, professional grievances, and sabbatical and/or diabolical relations with labour and business partners [1]. Similarly, research has been done on the effect of time management on the job satisfaction and motivation of educators in an institution, which focused specifically on personal skills and characteristics of the target participants [2]. Yet again, critical work planning activities such as designing, managing, implementing, and evaluating their teaching and learning objectives were used to build the framework structure of the said research [2]. Unsurprisingly, those researchers surmised that effective time management techniques can subsequently reduce stress, which in turn simplifies the cost of motivating employees to complete designated tasks.

Retrospectively, researchers from a public Malaysian university also argued that time management positively correlates with students' academic performance [3]. Certainly, attempts have been made to counter these problems, and significant solutions have been engineered too, however, a school of thought pertaining to this project aims to shed some spotlight on how to apply some of the paradigms of effective time management techniques and work allocation practices as potential solutions, into a mobile application.

Consider the possibility of a computer program centrally controlled by managerial personnel, with non-managerial employees on the receiving end, with the said program utilizing factually established paradigms and methodologies of work allocation and time management to organize, manage, balance, and maintain workloads within a workforce, with respect due to time and efficiency and considerable automation. Such a system, (hypothetically speaking at this stage of the research) could significantly save the workforce from unnecessary stress and accumulation of overburdened workers. And lastly, it should be noted that the concept being identified herewith is not roaster scheduling, which is profoundly different from work allocation [4]. This is because various companies might not be able to adapt to new scheduling techniques due to the volatility and dynamics of the workforce.

B. Problem Description

The core motive of conducting this research is to identify a well-established time management principle and adapt its associated paradigms into a computerized system that allows workforces (or other similar setups) to generally monitor and fluidly assess work allocations within their respective environments. Moreover, it is not entirely sensible to assume that every organization would spend so much time to research on a specific time management theory or principle in an exhaustively thorough manner, all in the name of creating a robust time management and work allocation system. Furthermore, evidence suggests that a high proportion of employees (generally speaking) do not pay attention to the importance of following theories or effective strategies for time management, which counterproductively impedes their performance and value of achievement, all of which would eventually weaken an organization's throughput and productivity [5].

This precisely, is where the proposed system comes into action: not only shall it catalyse and assist in monitoring the process of work distribution, but also implement a factually rooted framework/principle/theory, and more importantly, provide vital notification updates which then enables the managerial personnel to rapidly make organizational decisions with the click of a button all while adhering to principles.

C. Scope

- The proposed system will be centred upon usage in working environments, even though it might be suitable in non-working environments.
- While we evaluate the system using the ISO 9126 model with very limited test end users, the repository is still privately maintained as at the time of writing.
- The proposed system will be a work (or task) allocation and time management tool, and not a scheduling tool.

II. LITERATURE REVIEW

A. Time Management and Work Allocation in Discourse

Following the findings from similar works of research that has been centred upon the concept of time management and work allocation, it goes without saying that it plays a huge role in how organizations moderate and manage their employees to complete tasks within a given period. Thus, the purpose of this literature review is to uncover core aspects and influences that time management and work allocation paradigms have had in notable times hitherto. For concision, we do not cover specific time management frameworks except ALPEN (Activity, Length, Planning, Establishment of priorities, Notation) framework in our methodology section.

Work allocation (or task allocation/work planning) and scheduling are two things that are often misguided and used interchangeably whereas they ought not to. A prerequisite for an operation or activity to be considered as scheduling is due to the viability of all necessary activities that are important towards the project's outcome to be defined with respect due to the project's scope, albeit establishing correct and adequate sequence and precedence in addition to the resources and time taken to create the schedule [4].

Additionally, a schedule holds itself above simple allocation or planning of tasks because a schedule is a function of the rigor and pedantic labour that have gone into planning at the front end of the project where its scope was initially established. On the other hand, an interpretation of Nasseri and Aulin's [4] description of planning/allocation is the breakdown of an individually assigned series of tasks without much attention paid to the back end and domain of the entire project as is the case with scheduling.

Adding to the above, time management can be defined as a process for managing time according to the requirements of different assignments and activities with the objective of securing organizational success and optimizing benefits and productivity to maximum outputs by utilizing and not misusing energy or time [2]. To elaborate more, time management involves efficiently controlling and managing time in order to subsidize or mitigate the occurrence(s) of stress. As a result, to improve job satisfaction and interestbased undertaken in individuals (for example, employees, in a contextual sense), time management uses goal elicitation, performance prioritization, planning/allocation, and management in order to make them contended with their assignments [2].

As a statistical example, it is well worth noting that work allocation can be crucial when it is directly tied to the employee earnings or wage system, and as thus a particular

research revealed that when tasks are allocated rhythmically and non-rhythmically in such a way that the precedence of the current and previous tasks specific employees are subjected to becomes significant – the current ones become quantitatively important while the previously allocated tasks tend to materialize more from a given employee's labour contribution [6]. In fact, the same research garnered that shifting 10% of work duration from low level skilled workers to highly skilled ones increase those workers' yearly wage by 22% after a decade had elapsed. This just shows how significant and fundamentally effective work allocation can be when it is handled or dealt with properly.

B. Components and Techniques of Time Management

The actual techniques and skills associated with time management generally captures the contextual relevance of the scope pertaining to it. Time management and work allocation, quite often, are directly tied to an employee's performance and contribution to the workforce, ergo, time allocation is critical for managing instruction and improving performance [4]. It is also understood that time management behavioural patterns and techniques often possess intersecting characteristics and subsequently can be classified into various groups such as: short-range planning, long-range planning, and time attitudes. Evidently, time management majorly involves setting goals and priorities, generating item lists, identifying schedules, and administering the predefined set of activities related to the desirable aspects of the project [4].

In order to successfully attain optimum time management, these components are crucial: fulfilment, relaxation, time inter-compartmentalization, finite time assertiveness, and time freedom [7]. Fulfilment deals with treating project objectives and operational tasks with realism - plans cannot be fulfilled if adequate timing is not accounted for, ergo, good time management ascertains proper time creation in such cases. Relaxation deals with maintenance of labour – if time is well managed, then there should be enough room to rest, hence eliminating stress (which coincides with the findings of Sahito and Vaisanen [2]). Time inter-compartmentalization is where an individual learns to make and allocate time not just for his/herself, but for subordinate team partners too. Finite time assertiveness deals with the ability of a concerned individual to acknowledge the duration of available time for a specific operation, task, or event. And lastly, time freedom deals with an individual's own ability to make time for other personal events and not immerse themselves in an unhealthy manner in corporate plans alone.

C. Significance of Work Allocation in Project Management

When the right work allocation process is implemented in the context of a project, members can astutely facilitate the project management process and reduce the complexities that directly negate the project's success. As a result, a research noted that the challenging nature of work allocation then manifests when there is inefficient understanding of certain factors and project dependencies that are crucial to the aforementioned ideology [8]. The findings of that particular research included the specifications of two applicable task allocation phases: (1) identifying factors and dependencies that strongly influence the task allocation decision; (2) proposing a quantitative method that allocates tasks to team members who best match the task requirements.

Notwithstanding, the nature of a project describes how tasks ought to be allocated and managed, specifically, the expertise and skills of the related individuals or group members can be the hardest consideration to correlate with in such events. In specific scenarios, certain skills and expertise may be needed to meet up for certain types of tasks, therefore, technical skills and wide domain of expertise can strongly affect the task allocation decision.

Other influential characteristics such as intelligence and adaptability, and fundamental tactical approach to the problems being potentially tackled upon with existing solutions remain crucial to the task allocation process. Consequentially, one can categorize tasks based on various types of dependencies (prerequisites for subsequent tasks to be initiated hitherto). For example, a simple or basic task may require manipulation of task workflows and resources, or a social task might need coordinative reinforcement. Table I presents extra types of task dependencies and categories.

TABLE I.	Types of Task Dependencies [8]

Dependency	Category
Workflow, Shared and Fitting Resources	Basic
Workflow and Coordination	Work/Social
Knowledge Domain and Expertise	Main Methodology
Business Processes	
Entity and Technical Resources	
Distributed, Technical, Temporal, Informational, Communication and Organizational Environment	Supporting Methodology
Reciprocal, Sequential, and Team Tasks	Inter-Task

III. METHODOLOGY

A. Selecting the ALPEN Time Management Framework

There are several time management frameworks like the Pareto technique (achieving maximum results in limited time), the ABC technique (bureaucratic organization of tasks in terms of dependency and urgency), Eisenhower's matrix (classification of tasks in terms of importance and relevance), Covey's time matrix (an extension of Eisenhower's model) [5, 9] and many more. We select the ALPEN method created by Lothar J. Seiwart [10] due to the lack or scarcity of existing applications that have implemented this particular time management framework (as at the time of writing).

Inspired by the German Alps, the ALPEN method is a simple and highly effective time management technique that enhances the planning of tasks on a weekly or daily basis by splitting complex tasks into smaller parts which allows for deconstructed manipulation and hastening short-term completion of tasks [11]. ALPEN precisely stands for:

- 1) Activity: This refers to the complete lists of tasks that the subject intends to complete within a given time frame to be elicited in detail. This involves noting down the goals, accomplishments, associated milestones, appointments, and fixed routines. Essentially, each individual constituent should be divisible as much as possible.
- 2) Length: This deals with asserting and assigning constrained time for each of the identified tasks in the first

step throughout the day. Notwithstanding, important tasks are given time advantage over less important ones.

- 3) Planning: When applying this methodology, one should always aim to complete the tasks listed in the first step within 60% of the total required time whereby the remaining 40% is reserved for unforeseen circumstances or even recreational activities in order to mitigate potential stress.
- 4) Establishment of Priorities: With the first three steps established, it is now time to ensure the other tasks are prioritized accordingly with respect due to the overall mission and accomplishment.
- 5) Notation: The progress made at the end of the day is recorded and the important observations are taken into consideration. Additionally, this notation stage is where the verification and validity of the completed tasks are confirmed for fulfilment and future reference. The tasks are also checked to see if they were completed within the given time frame.

B. Assessing Android Studio as a Valid Mobile Development Technology

The Android Studio IDE is Google's official development environment for Android programming. It is based on IntelliJ IDEA (a Java-oriented IDE from JetBrains, with advanced compatibility for various extensions, code refactoring, code inspections, Ant, Maven, Git version control, etc.). Android Studio extensively covers and implements the Android Software Development Kit (SDK) as well as the open-source Java Development Kit (JDK), and thus, providing the necessary software for creating, running, and debugging Android applications as well as exporting them for publishing/distribution [12]. Furthermore, Android Studio is available for free and its other workload-reducing features like pre-compilation code evaluation (IntelliJ is well-known for this), Android debugger, Logcat, XML mapping, resource manager, virtual device manager, plug-in assistant, etc. makes it a force to be reckoned with [13].

Applications developed with the Cordova cross-platform framework for example, often accumulate lag and redundancy, and require high end devices in order to reach a mere 60 frames per second (fps) [14]. Whereas applications developed natively with Android Studio (and Flutter, a compile-to-native development tool) can reach as high as 120 fps on devices that allow such refresh rates on their displays [15]. This again ties back to the previous point – natively built apps are rendered via the activity manager on the topmost layer of the Android Platform Framework Hierarchy, hence, allowing seamless transmission and communication between modules; but cross-platform apps on the other hand need to have their code interpreted by the Web Kit module (in the second layer) which is then natively converted and then returned back to the user. It is obvious that this will not look good on a big scale and would not contribute positively to the user experience when response time and fluidity of the application is being considered. As such, the decision taken for the proposed system is to use Android Studio to attain a higher level of fluidity and performance maximization. Furthermore, we develop the proposed system with the Java programming language, with layouts and resources in XML. Android Studio also supports Kotlin, and C++ for Android NDK (Native Development Kit).

C. Deploying Firebase as a Suitable Database System

Before the days of Android Studio, developers had to merge traditional PHP/MySQL databases with their apps, an extremely daunting task. But in recent times, with the introduction of Firebase, developers no longer have to go through the aforementioned hectic process [16]. The Firebase Realtime Database (a component of the Firebase stack) is a JSON-formatted cloud-hosted NoSQL database [16, 17]. Firebase has an intuitive console interface on the web, a plugin assistant inbuilt in Android Studio, hosting, analytics, and many other standard and paid features. This simplifies the implementation of the proposed system, as opposed to other development technologies with inevitable reliance on cryptic command line utilities. Rather than building an entire backend management application separately, we took advantage of Firebase's authentication management, and Firebase Cloud Messaging (FCM) for notifications via Google Cloud Platform and Node.JS. Consequently, we implemented Firebase UI builder libraries for completeness.

D. Personal Extreme Programming (PXP) as the Selected Software Development Technology

Agile development by default is accustomed to projects involving with many developers teams members/contributors as identified by researchers [18, 19]. As software development evolved, developers decided to explore the possibility of adapting and indoctrinating Agile processes into individual one-man projects, thus the birth of the Personal Extreme Programming (PXP) methodology [20, 21]. Inspired by Extreme Programming (XP), PXP initially came up as a modification of the Personal Software Process (PSP) coined by Watts S. Humphrey of Carnegie Mellon University [22]. XP/PXP is an excellent choice for developing systems whose requirements cannot be easily established from the onset.

Given the nature of the proposed system, suitable candidates to consult for the potential usability are the employees within the associated institution (IUMW). This can be quite informal if Waterfall or Prototyping is to be applied as this requires extremely formalized requirement engineering, as opposed to XP/PXP where emphasis is placed on physical communication between the potential users throughout the development life cycle. Time management is not directly related to computer science hence various uncertainties are prominent. With PXP, mechanisms will be introduced to adapt to uncertainties in order to readjust delivery dynamics.

E. List of Functionalities

- 1) Staff Portal Access: A repository of all members to be assigned a task, with their profile displayed.
- 2) Notifications: Cloud messaging technique that allows real-time update on allocated work progress.
- *3) Task Prioritization:* Delineation and ranking of importance of allocated work.
- 4) Workflow Monitoring: Prior to being notified, tasks can be monitored and recorded at any point in time.
- 5) ALPEN Specifications: The components of the time management framework is presented to users.
- *6) Spatial Crowdsourcing:* Ability to assign tasks to a given classification or associated set of individuals/staffs.

IV. DESIGN AND IMPLEMENTATION

A. NoSQL Database Model

Fig. 1 illustrates the Document Data Model (DDM) for the proposed system using UML class diagram embodiment – a formally recommended approach for modelling NoSQL databases (as is the case with Firebase) [23, 24]. The database design is presented as a Conceptual Data Model and not a Logical Data Model, and not even close to being an Enterprise Data Model. Thusly, the following applies:

- Once the user enters the system, several details are taken and stored in the *Users* node as children attributes. The most important of which is the User ID which is prominent across all other tables (or nodes) for referencing.
- The core functionality of the proposed system, ability to create powerful time constrained tasks, justifiably gets its own dedicated and highly detailed node with at least 29 attributes required to comply with the ALPEN framework.
- From there onwards, specific entries corresponding to the live workflows of specific tasks from the *Tasks* node will trigger real time notifications in four other nodes (Notifications, Completions, Help, StartedTasks).
- PK stands for Primary Key; FK, Foreign Key.

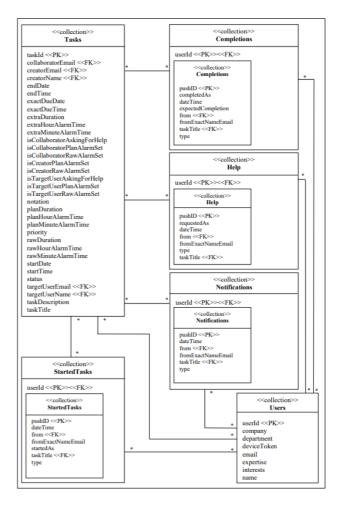


Fig. 1. Document Data Model via Class Diagram

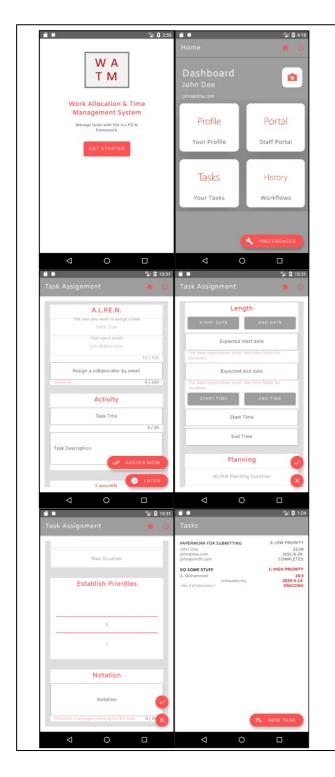


Fig. 2. Screenshots Featuring ALPEN Functionalities

B. Program Description and Technical Overview

The proposed system implements the ALPEN time management framework as previously discussed and provides a means to allocate tasks whilst abiding by the framework, either as an individual or in groups. It contains a main fragment where the user can transit to other utilities contained within their own fragments in the program such as Profile (for updating the user's profile where information relating to organizational preferences are stored), Portal (where organizational members can be accessed and assigned tasks), Tasks (where list of tasks can

be seen and transition to a fragment where new tasks can be created is made), and History (or Workflows, where real-time monitoring is carried out). Users can also upload their profile pictures. Upon reaching the welcoming page, the program takes the user to the authentication page where the Gmail IDP (Identity Provider) or other ordinary email providers are offered to log in or register onto the system in order to arrive at the home fragment (or home page). Once the user arrives at the home page, the user is presented the five main options as shown in Fig. 2.

C. Experimental Setup

We developed the project on a Windows 10 device, thus, project path directory on disk ought to be short, accessible, and preferably without spaced characters to avoid errors relating to compiler automations (this issue is particularly purulent on Windows devices). Table II shows the main software and hardware components we employed.

TABLE II. EXPERIMENTAL SETUP ARTEFACTS

Software	Hardware
Android Studio 3.5, JDK 1.8.0	Windows 10 (1909/64bit), Intel i5
(Java 8), Firebase (Auth:19.3.0	quad-core CPU @ 2.5GHz, 12GB
/Core: 17.2.3/Database: 19.2.1/UI:	DDR4 RAM @ 2400 MHz, Nvidia
6.2.0), Gradle (Model: 3.5.3/Build:	GTX 1050 GPU @ 875MHz, Test
5.4.1), Google Play Services 4.3.3,	Device: Samsung Galaxy A7,
API Level 23, SDK version 23	AVD: Nexus 6 (API 23)

V. EVALUATION

A. Evaluation Strategy

To evaluate the proposed system, criteria-based assessment was used to determine product quality, usability, sustainability, and maintainability – all of which are based on the specifications of the ISO 9126 model [25]. The ISO 9126 model was first developed in 1991 to provide a framework for evaluating software quality in terms of engulfing the feature spectrum of a program by assessing its attributes/criterion and sub-attributes/sub-criterion [26]. The mobile application is given to end users from the IUMW FCAM faculty. We evaluate their feedbacks (deployed via Google Forms) in terms of functionality, usability, reliability, efficiency, and portability.

B. Evaluation Outcome

We summarize the feedback from the test users in Table III. The first column represents the 5 assessment criteria of the ISO 9126 model, while the 3 cells next to each criteria represent the number of positive, negative, and neutral feedbacks. We record generally favourable feedback from the test users.

TABLE III. EVALUATION FEEDBACK SUMMARY

Criteria	Response Count		
Functionality	9	0	1
Usability	5	0	3
Efficiency	3	0	1
Reliability	1	2	3
Portability	0	1	5

VI. DISCUSSION

At the moment of writing, there is no strong evidence that suggests the existence of a specific software implementation of the ALPEN framework. We begin our implementation by creating references corresponding to GUI elements such as buttons, selectors, and text fields for specifying task preferences. The collected inputs are sent for processing, starting with the evaluation of task duration by calculating time difference and representing the value in long data type. Four extra variables are created to convert the duration to seconds, minutes, hours, and days format, all stored as double data type. This is immediately followed by planning duration (60% of the initial duration) and extra time duration (40%) for each of all four variables. From here, three date objects corresponding to the planning, extra, and initial durations are created in order to allow the user(s) being assigned the tasks to locally set alarms within the program. Prior to registering the task being assigned, the credentials of all associated users (the creator of the task, the person assigned to the task, and an optional collaborator) are subsequently verified via name and email variables.

With exception handling and input validation mechanisms in place, and all ALPEN related properties identified, the necessary values are then sent to the *Tasks* and *Notifications* nodes (as illustrated in Fig. 1) in the Firebase Realtime Database, effectively registering the creation of a task governed by the ALPEN framework. Fig. 3 illustrates a behavioural model for this routine, while Fig. 4 shows how the division of task duration into planning time and extra time is presented to users.

VII. CONCLUSION

In this paper, we deployed the ALPEN time management framework on the Android platform in an effort to propose a computerized solution for efficient allocation of tasks to individuals in a working environment or any relevant group or independent setting. The ISO 9126 model indicated generally positive feedbacks from test users upon evaluating the application. While we adapt agile development methodology for onedimensionality via the PXP technique, a better approach would have been the Model-Driven Software Engineering (MDSE) methodology, this is because cyclic repetition of steps or iterative deliveries may not be necessary, thus requiring only models to be drawn to represent the foreseen module to be developed subsequently. The developed system can be improved in the future by implementing advanced notification features in order to elevate real-time user experience. Adding to this, the ALPEN utility can also be extended to support advanced task management routines such as sharing of files. Likewise, Firebase has strict limitations on the free tier usage such as the number of times FCM routines or cloud functions can be invoked, therefore, an efficiently robust database system can be deployed with the application in the future.

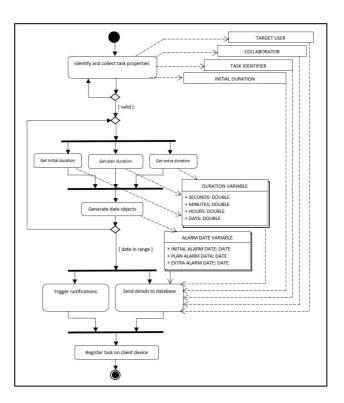


Fig. 3. ALPEN Execution Activity Diagram

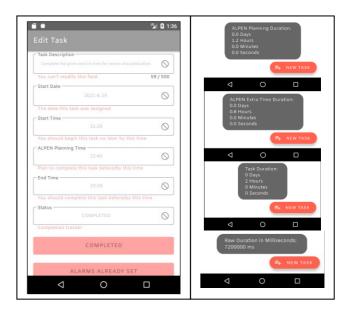


Fig. 4. Screenshots Featuring ALPEN Division of Task Duration

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Ease of Social Media Usage and Cyberbullying Behaviour Among Private University Students in Malaysia

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Abstract—The constant expansion of digital communication technologies and high social media usage among the young generation have made it easier for them to participate in cyberbullying behaviour. Factors that lead to the perpetration of cyberbullying behaviour needs to be recognised and understood so appropriate measures can be taken to tackle the ever-growing issue. Using the Theory of Planned Behaviour (TPB), this study analyses the contribution of perceived behavioural control or perceived easeness of social media in influencing cyberbullying behaviour among Malaysians youths. 93 private university students in Malaysia participated in the study and using Pearson correlation method, this researcher found that there is a weak correlation between the factor and the behaviour in question. Overall, the findings indicate the need to address the anti-social behaviour by related-parties and preventive measures need to be taken in order to promote prosocial behaviour and ethical usage of social media.

Keywords—social media, cyberbullying, theory of planned behaviour, perceived behavioural control, pro-social behaviour

I. INTRODUCTION

Technology advancement such as the computer and Internet have paved the way for advance methods of telecommunication. The creation of social media is highly considered as one of the key inventions since the millennium. Facebook, Twitter, TikTok, Instagram and many more allow its users to communicate with people from all over the world within seconds. However, despite its many advantages, social media also being used as an outlet for antisocial behaviour such as cyberbullying. Sexist and racist remarks, threats, and catfishing are some of the common misbehaviours that can be seen online (Willard, 2004). Being the biggest contributors to the world's Internet usage, the young generation spent hours on entertainment and social media (Zalaquett & Chatters, 2014). Offensive postings and comments can be found easily on social media pages. The easiness of these new technologies allows the perpetration of cyberbullying, intentionally or unintentionally.

Research problem: The quick rise of internet usage among Malaysian youths saw a sudden increase with cyberbullying cases. According to New Straits Times (2019), three out of ten Malaysians youth have been cyberbullied and this is considered as high among Asian countries. With relatively

low number of literatures and existing studies found on cyberbullying cases in Malaysia, there is a need for studies to be done on this phenomenon.

Research objective: To examine the relationship between perceived behavioural control on cyberbullying and the intention to cyberbully among private university students in Malaysia.

Research question: What is the relationship between perceived behavioural control on cyberbullying and the intention to cyberbully among private university students in Malaysia?

II. LITERATURE REVIEW

A. Cyberbullying

Early studies have described the Internet as a virtual community where people shared their expertise and experience (Barnes, 2003). But recent studies show how the Internet introduced profound social changes as growing number of Internet users are using their computers and devices to communicate with each other and build social relationships. But rapid growth of the internet has paved ways for online misbehaviour, such as cyberbullying.

Defined as "an aggressive, intentional act carried out by a group or individual, using electronic forms of contact, repeatedly and over time against a victim who cannot easily defend him or herself" (Smith et al., 2008), bullies use the new access to electronic media to reach their victims without having physical interaction, allowing constant perpetration.

Hinduja and Patchin (2011) explained in their study that cyberbullying is becoming a problem moving on an alarming speed. They stated, "cyberbullying is a growing problem because increasing number of young people use computers, cell phones, and other interactive devices as their main form of social interaction."

Instead of physical harm, cyberbullying takes different forms of aggression, including flaming, harassment, cyberstalking, denigration, masquerade (catfishing), outing and trickery, exclusion, impersonation, and sexting (Willard, 2004) and these are conducted through e-mail, instant messaging services, and social networking sites (Smith et al.,

2008; Zych, Ortega-Ruiz, & Del Rey, 2015). Social media became a gateway where bullies can always reach their targeted victims.

According to Whittaker and Kowalski (2015), mediums used by cyberbullies are constantly changing and often reflected by the technology most used at the time. Thanks to the ever-increasing popularity of social media, they emerge as the common avenue for the perpetration of cyberbullying and victimization today. Facebook, Twitter, Instagram, Snapchat, and many more became channels for such antisocial behaviour.

The ability to create an account easily and to stay anonymous removed the concerns of being caught and punished (Kowalski, Limber, & Agatston, 2008). Such feature of recent Internet technologies allow disinhibition among its users thus cyberbullies do not feel the impact of their action.

B. Theory of planned behaviour

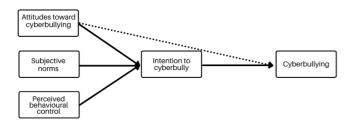


Fig. 1. The theory of planned behaviour

The Theory of Planned Behaviour (TPB) served as the fundamental theory behind this paper and was recommended as a good foundation for behavioural research (Tokunaga, 2010; Heirman & Walrave, 2012; Rashid, Mohamed, & Azman, 2017).

The theory predicts that a person's purpose and conduct are significantly influenced by their attitude, subjective norm, and perceived behavioural control. The latter is an extension of the theory of reasoned action (TRA) (Ajzen, 1985) and has a better chance than the original theory of properly predicting behaviour (Madden, Ellen, & Ajzen, 1992).

Behavioural intention, which may be described as an impact on whether or not a behaviour must be executed, is a crucial component of TPB (Ajzen, 1991). According to Beck and Ajzen (1991), intention can be seen as a direct antecedent to the studied behaviour.

Furthermore, TPB assumes that the three conceptually independent factors listed below can predict behavioural intention (Beck & Ajzen, 1991);

- Attitude: Refers to the level of "favourable or unfavourable evaluation" towards certain behaviour.
- Subjective norm: It's a social factor, which refers to the perceived social pressure whether to act or not to act the behaviour in question.
- Perceived behavioural control (PBC): This factor was absent from the original theory. It refers "to the perceived ease or difficulty" of performing the behaviour in study.

The original TRA believes that attitudes toward the behaviour, as well as subjective norms, can predict behaviour

intention. However, additional analysis reveals that behaviour may be anticipated if individuals are regarded a control component (Beck & Ajzen, 1991). As a result, PBC was successfully evaluated and incorporated to the theory of planned behaviour's extension (TPB).

Figure 2 below shows the conceptual framework of this paper:

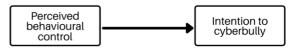


Fig. 2. Conceptual framework of this study

III. METHOD

According to de Vaus (2002), survey research design is well suited to provide certain types of factual and descriptive information. Using a survey questionnaire adopted from one of the previous studies mentioned in the literature (Rashid, Mohamed, & Azman, 2017), it is constructed into three segments; demographic, perceived behavioural control on cyberbullying, and the intention to cyberbully. The last two segments used 5-point Likert scale.

The Cronbach's alpha result is between .830 to .898, which implies reliable and consistently measured constructs.

TABLE I. RELIABILITY TESTS

	Details of the questionnaire adopted				
Sect	Variable	Scale	No. of Items	α	
1	Demographic profile	Dichotomous scale Multiple choice Short answer	4	N/A	
2	Perceived behavioural control on cyberbullying	Likert-scale Level of agreement	10	0.830	
3	The intention to cyberbully	Likert-scale Level of agreement	10	0.898	

The data was collected using self-administered survey questionnaire via Google Form. The data collection period took place in the first week of March 2021 for one week. The researcher distributed the survey questionnaire together with an introduction explaining the objectives of the survey, the importance of the respondents' participation, the person responsible for the survey, and a statement assuring the respondents' confidentiality.

The survey questionnaire distributed via email to private universities in Malaysia and social networking sites. The completed questionnaires then analysed using Statistical Package for the Social Science (SPSS).

The researcher employed nonprobability sampling method using voluntary response sampling. The survey link was shared to university students via email and social media. A total of 93 respondents (n = 93) participated in the study.

IV. RESULTS

Means and standard deviations for the samples are shown in Table 2. More female private university students (63.4%) responded to the survey than male (36.6%). A higher number

of undergraduate students participated in the study (72%) than the others (certification 1%; foundation 16%; diploma 6.5%, and postgraduate 3.4%).

TABLE II. DEMOGRAPHIC DETAILS

Demographic characteristics of respondents				
	N	Percentage	Mean	SD
Gender				
Male	34	36.6		
Female	59	63.4		
Total	93	100		
Age				
18	5	5.4		
19	17	18.3		
20	16	17.2		
21	10	10.8		
22	16	17.2		
23	12	12.9		
24	8	8.6	21.6	3.416
25	2	2.2	21.0	3.410
26	1	1.1		
27	1	1.1		
30	1	1.1		
34	3	3.3		
35	1	1.1		
Total	93	100		
Nationality				
Malaysians	84	90.3		
Non-	9	9.7		
Malaysians	9	9.7		
Total	93	100		
Level of Study				
Certification	1	1.1		
Foundation	15	16.1		
Diploma	6	6.5	3.624	.846
Degree	67	72.0	3.024	.040
Postgraduate	4	4.3		
Total	93	100		

Table 3 below shows the results of Pearson's bivariate correlations analysis. This was used by the researcher to study the relationship between the independent variable (perceived behavioural control towards cyberbullying) with the intention to perpetrate cyberbullying.

TABLE III. PEARSON'S BIVARIATE CORRELATION RESULT

Pearson's bivariate correlation for perceived behavioural control (PBC) and the intention to cyberbully				
Variable	Mean	SD	PBC	Intention
PBC	3.675	.764	1.00	.257
Intention	1.451	.621	.257	1.00

The analysis implied there is a weak relationship between PBC and the intention to cyberbully. In other words, there is no significant relationship between the ease or difficulty of performing cyberbullying via technology to the respondents' intention to cyberbully. There, the following hypothesis is approved.

H1: There is a negative relationship between perceived behavioural control and the intention to cyberbully.

V. DISCUSSION

This study examines the association between perceived easiness of cyberbullying and the intention to cyberbully among private university students in Malaysia. The study findings suggested that perceived easiness of technology does not predict students' intention to perpetrate cyberbullying.

The current findings confirmed by several studies done in the past. Jafarkarimi, Saadatdoost, Sim, and Hee (2017) and Rashid, Mohamed, and Azman (2017) both found perceived behavioural control, one of the key variables in the theory of planned behaviour, to not reflect any significance to the study of cyberbullying. This shows perceived easiness of technology does not contribute to the perpetration of such misbehaviour among private university students.

However, even though the variable is weak, it would be a mistake to ignore it. Various studies indicated its importance in facilitate the motivation to perform a certain behaviour. Studies done on cyberbullying among younger respondents in schools indicated the importance of technological advantages (Kowalski, Limber, & Agatston, 2008). The ability to stay invisible and anonymous within technology like social media removed the concerns of being caught and punished. Therefore, the finding from the current study has suggested that it is possible, no matter how weak it may seem, for the respondents to perpetrate cyberbullying because they perceived it is as easy due to technological control.

Extensive usage of the Internet has made it a common ground for the perpetration of online misbehaviour (Gilroy, 2013; Whittaker & Kowalski, 2014). By spending more time in Internet than the others, cyberbullies learn of the features exist, such as the easiness to create new anonymous account, sending unsolicited comments or pictures, gossips, and many more. Several studies revealed that cyberbullies and its victims are heavy Internet users and spent more hours online (Balakrishnan, 2015; Kowalski et al., 2008; Kowalski & Witte, 2006).

VI. CONCLUSION

University is a place where youths get to develop their interpersonal and intrapersonal skills through socialization with their peers. The introduction of social media has radically changed the socialization process among today's youths. With rampant cases of cyberbullying increasing on yearly basis, social media usage should come with a warning. Studies are needed to be done to address the issues, especially on its shortterm and long-term effects. Responsible use of technology should also be promoted by all parties involved (parents, school, policymakers, and more) and social networking platforms need adopt stronger measures to ensure safe user experience. Psychologically, seeking professional help should be culturally and socially accepted in order to combat the feeling helplessness felt by most cyberbullying victims. The findings from this paper contribute to advancing understanding of cyberbullying behaviours and the impacts of advance technologies on promoting this antisocial behaviour.

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Child Protection and Privacy to Prevent Paedophilia: A Content Analysis on National and International Legislations

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Abstract— Paedophilia is seen sociologically as one of the heinous social issues involving the 'silent monsters' who usually among adults and the victims at a very young age. Due to globalisation and technological advancement, this issue has evolved to become a terrifying problem in the world, yet there is still no key solution to it, since it requires high attention from many parties including policy makers. Following this argument, this paper presents a content analysis involving the national and international legislations related to child protection and privacy which narrowly focused on paedophilia. The laws and policies have been selected from three main countries which were Malaysia, Singapore and the United Kingdom via online sources including the government's official websites, relevant agencies' official websites and other available sources. The findings from the content analysis revealed that the paedophilia issue received less attention in the Malaysian legislation as compared to the comprehensive laws and policies in the United Kingdom. However, a part of paedophilia-child pornography, child grooming and sexual assault involving children-are covered under the policies and Acts. Further, through analysis of the policies and Acts from Singapore, surprisingly it revealed similar trends as Malaysia. This study concluded that a massive gap in the Malaysian laws and policies emphasises on paedophilia hinders effective implementation efforts by policy makers and relevant agencies to prevent children from being the victims. It takes a village to raise a child-hence, the responsibility to protect children and uphold their privacy does not rely on parents solely, but on the laws and policies in the particular country as well.

Keywords— Paedophilia, national and international legislation, child protection and privacy

I. INTRODUCTION

One of the early works by Kraftt-Ebing in 1886 documented an evidence of a paedophilic case involving who became a paedophile at the age of twenty-five years old. The man who was identified as a paedophile was found emotionally disturbed and never had a normal inclination towards adult women. However, he was sexually and immorally attracted to the touch of little girls which gave him the highest sexual pleasure. In this regard, paedophilia, as an issue, is existed centuries ago, yet received a big spotlight in Malaysia in 2014 when media reported a news of 23 Malaysia children been abused by a British paedophile,

Richard Huckle (The Star, 2016a; The Star, 2016b). This case sparked massive grievances and anger among Malaysians during that time since it involved victims as young as 6-months-old. However, as time goes by, this issue seems have been forgotten and faded away although the abusive scar remains forever with the children.

After three years of the tragedy, Malaysian government took an initiative to strengthen the child protection and privacy by implementing the Sexual Offences against Children Act 2017. This initiative implies the government concern towards children's well-being and healthy development. Further, it also portrays that the government roles through its policy makers and relevant agencies are vital in protecting and securing the children's privacy. Thus, this situation drives this study to conduct a content analysis involving national and international laws and policies related to child protection and privacy to prevent paedophilia, as one of the initiatives in assisting the government in formulating relevant laws and policies or strengthening the existing ones. Another initiative that reflected the government concern is through rectifying the Convention on the Rights of the Child (CRC)—this international policy is one of the main documents involved in the content analysis undertaken by this study. Hence, the findings of this study further will contribute to the government efforts in upholding the Sustainable Development Goal 16: Peace, Justice and Strong Institutions.

II. MALAYSIAN LEGISLATION ON CHILD PROTECTION AND PRIVACY TO CURB PAEDOPHILIA

In discussing on the legal landscape of child protection and privacy in the Malaysian context, the government has implemented several major initiatives. Among the major initiatives are: (1) 5-Years Malaysia Plans; (2) Child Act 2001 [Act 611] and Child (Amendment) Act 2016 [Act A1511]; (3) Sexual Offences against Children Act 2017; (4) National Child Policy 2009; and (5) National Child Protection Policy 2009. The discussion on each initiative is presented below.

A. 5-Years Malaysia Plans

Reviewing 5-years Malaysia Plan reveals that there is no specific attention to the phenomenon of paedophilia in Malaysia. Although Malaysia rectified the Convention on the Rights of the Child (CRC) in 1995, it was only after 10 years that the children issues became one of the main agendas highlighted in the national plan. In the Ninth Malaysia Plan (2006-2010), the children issues related to child care and protection started to receive attention by relevant government agencies-particularly on the issue of child abuse and neglect. Since the children issues became one of the government agendas during that time, the National Child Policy 2009 and National Child Protection Policy 2009 were introduced. Notably, the government's initiative to curb the children issues continued to be highlighted in the recent plan, Eleventh Malaysia Plan (2016-2020). Although the government emphasised on the programmes and activities related to the needs and interests of the children by improving protection against abuse, abandonment and neglect, as well as increasing educational outcomes for underprivileged children in the plan, however, as mentioned earlier, there is no specific attention given to paedophilia. This may be due to paedophilia being encompassed as child sexual abuse cases. Despite that, this thesis argues that paedophilia needs to be discussed separately due to its complexity which involves sexual abuse, child pornography, cyber-crimes, child grooming and many others. Thus, this is considered as one of the gaps that this study aims to fillscrutinising the policies gaps related to paedophilia in Malaysia.

B. Child Act 2001 [Act 611] and Child (Amendment) Act 2016 [Act A1511]

The Child (Amendment) Act 2016 [Act A1511] was introduced to amend and improve the previous Child Act 2001 related to children issues. According to Azlee (2016), the amendment made to the Child Act 2001 [Act 611] was in-line with the Convention on the Rights of the Child (CRC) rectified by Malaysian Government in 1995. Based on the preliminary analysis undertaken involving these Acts, although the Child Act 2001 and the Child (Amendment) Act 2016 were implemented mainly to protect the children in Malaysia, however, there is no specific attention is given to paedophilia.

Further, the amendment was made based on only four main aspects: (1) child registry (contains records of convicts who committed crimes against children to allow screenings to be conducted on individuals who working with children as an added safety measure); (2) community service order (CSO) (a rehabilitation programme for children who committed crimes and for adult offenders including, mother, father and guardians who abuse and neglect the children); (3) a family-based care (increase the awareness among all citizens and relevant agencies); and (4) heavier penalty (enables the individuals to be fined up to RM50,000.00 and prisoned up to 20 years for offences under Section 31) (Bernama, 2016). Although Datuk Seri Rohani Abdul Karim, Minister of Women, Family and Community Development stated that the amendment of this Act is one of the good initiatives taken by the government which takes into account the current issues related to children including paedophilia (Bernama, 2016).

C. Sexual Offences against Children Act 2017 [Act 792]

Sexual Offences against Children Act 2017 [Act 792] was introduced by the Malaysian Government on 10 July 2017 to protect the children from any form of sexual abuse. Similar to the previous Act, the implementation of the Sexual Offences against Children Act 2017 is also in line with the global frameworks including the Convention on the Rights of the Child (CRC) (New Straits Times, 2017). By reviewing this Act, this study discovers that although paedophilia does not receive specific attention via this Act, however, there are several important aspects which can be recognised as parts of paedophilia which have been highlighted by the government to protect the children from being abused.

This study finds that the Malaysian government has taken good initiatives to include child pornography offences in the Act. There are 10 sections which are found as presented below:

- Section 4: Child pornography
- Section 5: Making, producing, directing the making or production of, etc., child pornography
- Section 6: Making preparation to make, produce or direct the making or production of child pornography
- Section 7: Using a child in making, producing, directing the making or production of, etc., child pornography
- Section 8: Exchanging, publishing, etc., child pornography
- Section 9: Selling, etc., child pornography to a child
- Section 10: Accessing, etc., child pornography

Following that, the Malaysian government has also started to highlight the offences related to child grooming which is closely related to paedophilia. There are three main sections developed to cover the offences of child grooming for sexual exploitation involving children which are Section 11, Section 12 and Section 13. The related sections are listed below:

- Section 11: Sexually communicating with a child
- Section 12: Child grooming
- Section 13: Meeting following child grooming

Additionally, sexual assault also is found as one of the sexual offences under this Act. There are two main sections allocated to cater to the sexual assault offences by the Sexual Offences against Children Act 2017. The related sections are listed below:

- Section 14: Physical sexual assault on a child
- Section 15: Non-physical sexual assault on a child

Based on the preliminary review, the implementation of the Sexual Offences Against Children Act 2017 illustrates the government concern towards upholding child protection and privacy in the country. The next phase that requires attention from the government is 'implementation'. Whether this Act is being implemented effectively is also determined by the mechanisms and approaches adopted by its relevant agencies.

D. National Child Policy 2009

The implementation of the National Child Policy 2009 emphasises on the welfare and lives of children including their survival, protection, development and participation (Department of Social Welfare, 2013). After the rectification of the Convention on the Rights of the Child (CRC) on 17 February 1995, Malaysia started to become more concern and committed to the tasks to ensure the safety and well-being of the children. There are several objectives highlighted in the National Child Policy 2009 in upholding child protection (Department of Social Welfare, 2013), which are:

- Every child has the right to live in custody, receive care, love, health services, support and social assistance;
- Every child, including children with disabilities, have a right to be protected from any form of neglect, abuse, violence and exploitation and subsequently be habilitated, rehabilitated and integrated into the family and community;
- 3) Every child has the right to the holistic development of the physical, cognitive, language, social-emotional, and spiritual character;
- 4) Every child has a right to be heard, participate and engaged in matters relating to the best interests and well-being according to their capacity;
- 5) Increase the awareness among the children, parents, caregivers, community and society regarding the children's rights to survival, protection, development and participation, and
- 6) Research and development on the survival, protection, development and participation of children need to be carried out from time to time.

Under Objective 2, the government has given serious attention towards child protection in Malaysia including child prostitution and child pornography. Among the aspects that have been highlighted by the government are (Department of Social Welfare, 2013):

- Increase the training to all parties on how to deal with children—to have sufficient knowledge, qualifications and skills and a positive attitude in handling cases of abuse, neglect, abuse, violence and exploitation of children.
- 2) To provide care, protection and rehabilitation to the victims (children) that have faced torture, neglect, abuse, cruelty, exploitation or uncontrolled children as well as providing treatment to offenders (perpetrators).
- 3) Provide protection to the victims, complainant and family from the threat of harassment or other parties.
- 4) Ensure children are given the right to legal and support services.
- 5) Provide support system to high-risk families.
- 6) Ensure that all relevant parties provide services to children by developing and implementing a policy and child protection protocols.
- 7) Provide special programmes for street children, children without documents, dropped out children, children involved with drug addiction and children who are in critical situation, difficulties and other hazards (under difficult circumstances).

- 8) Ensure that the victims (children) receive proper treatment for recovery, development and integration into the society.
- 9) Ensure that the victims (children) of sexual exploitation (such as child prostitution and child pornography) and human trafficking will be given adequate protection, rehabilitation and integration into society or deported to their country of origin.
- 10) Establish an early warning mechanism and strengthen child protection mechanisms at national and international level.
- 11)Encourage the provision of a safe and healthy environment for children.

Based on the above discussion, the implementation of the National Child Policy 2009 shows that the government provides various initiatives to protect the rights of children. However, this policy will be more comprehensive and holistic if the government can give an attention not only to the protection of children but also to the children's privacy. In the era of rapid technological advancement, children are exposed to high risks and threats. Thus, this study argues that the aspect of children's privacy should be included in the National Child Policy 2009 as an effort to uphold child protection and privacy in Malaysia.

E. National Child Protection Policy 2009

The National Child Protection Policy 2009 aims at ensuring children receive proper protection from neglect, abuse, violence and exploitation as well as instil the awareness and commitment to all parties including the community to protect all children (Department of Social Welfare, 2013). There are seven objectives which have been highlighted in this policy, which are:

- increase the awareness and commitment of various parties to protect the children as a shared responsibility;
- 2) create a safe and child-friendly environment;
- encourage all organisations that deal directly and indirectly with the children issues to establish policies on child protection;
- 4) protect all children against any form of neglect, abuse, violence and exploitation;
- 5) restrict to only the appropriate individuals can deal with the children directly;
- 6) improve the support services to deal with child neglect, abuse, violence and exploitation; and
- 7) increase research and development to improve the protection of children.

The initiative to implement the National Child Protection Policy 2009 shows that the government is no longer tolerant in regards to issues related to child protection in Malaysia. However, similar to the above policy, the National Child Protection Policy 2009 also does not highlight about the privacy aspect related to children. There is an urgency for the government to emphasise on the issues related to child privacy since children nowadays are highly exposed to technology especially social networking sites. In fact, there are many parents still exposing their children on the internet and other electronic mechanisms. Thus, this is considered as one of the gaps that this study intends to fulfil—to scrutinise the policy gaps related to child protection and privacy in the Malaysian context.

III. METHODOLOGY

In exploring the policies' gaps related to child protection and privacy in preventing paedophilia in Malaysia, this study takes into consideration both national and international policies and Acts. Notably, there are several government policies and Acts from two selected countries which are also involved in the content analysis, which are from Singapore and the United Kingdom. The rationale of selection of these countries are presented below:

- Singapore—In the Southeast Asian region, Singapore has been recognised as a developed nation as compared to other Southeast Asian countries. Due to this situation, Singapore has become the leading country in the Southeast Asian region in terms of economy, politics, social and others. At the same time, Singapore also shares almost the similar traits with other Southeast Asian countries including Malaysia. Hence, the selection of Singapore's perspective towards the legal and policy aspects is relevant in this study.
- United Kingdom—The United Kingdom is one of the developed countries in the world. Historically, Malaysia was colonised by the British and a majority of the systems adopted by the government were adopted based on the British system including the three main government branches which are Executive, Legislative and Judiciary. Other than that, literature also shows that among the first paedophilia cases that received global highlight was in the United Kingdom, involving the paedophile ring known as 'The Wonderland Club' (Bocij, 2004). Thus, the selection of United Kingdom's perspective towards the legal and policy aspects is also relevant in this study.

In addition, this study also reviews and analyses another international policy which is the Convention on the Rights of the Child (CRC) to comprehensively explore the potential gaps that can be improved in strengthening national policies and Acts. Table 1 illustrates the three countries' government policies and Acts involved in the content analysis undertaken by this study.

Table 1: National and International Policies and Acts: Malaysia, Singapore, the United Kingdom

Level	Policies and Acts
Malaysian Policies and Acts Related to Children	 National Child Policy 2009 National Child Protection Policy 2009 Child Act 2001 Child (Amendment) Act 2016 Sexual Offenses Against Children Act 2017
Singaporean Policies and Acts Related to Children	 Children and Young Person Act 1993 Penal Code 2008 Child Protective Service Children and Youth Policies
United Kingdom	Children Act 1989Sexual Offenses Act 2003

Policies and Acts Related to Children

- Serious Crime Act 2015
- Child Protection System

The United Nations for Human Rights Convention on the Rights of the Child (CRC)

The purpose of conducting content analysis in this study is mainly to scrutiny the policy gaps related to child protection and privacy in the Malaysian compared to United Kingdom and Singaporean context. The findings of the content analysis of relevant document provides the current status of policies and Acts related to child protection and child privacy in dealing with paedophilia in Malaysia and its gaps compared to the two developed countries.

IV. FINDING AND DISCUSSION

The findings from content analysis from three selected countries were gathered, which are Malaysia, Singapore and the United Kingdom. Singapore's legal perspectives are relevant in the context of this study due to its similarities, as the closest neighbour to Malaysia, especially in terms of Asian nature, culture, context and environment. In addition, Singapore has also been recognised as the leading Asian country in the region. Thus, its legal emphasis on child protection and privacy in preventing paedophilia can be taken into consideration by the Malaysian Government in filling the policy gaps. Similar to Singapore, the United Kingdom's legal perspectives are also taken into account. However, the reasons that anchor the selection of the United Kingdom are completely different from Singapore. Historically, Malaysia (which was known as Malaya long time ago), was colonised by the British. Since then, the Malaysian government's system including legislation has been influenced by the British system. Moreover, one of the major cases involving paedophilia prevailed in the United Kingdom which was known as the 'Wonderland Club' who offered membership to over 100 serious paedophiles all over the world (Bocij, 2004). Due to these reasons, it is also crucial to thoroughly reviewed the law and legal perspectives of the United Kingdom in upholding child protection and privacy to prevent paedophilia. Hence, the analysis conducted involving the policies and Acts of these three countries provided a clearer picture on how to uphold child protection and privacy of children, not only in Malaysia but also children around the world.

Furthermore, the content analysis of this study is divided into seven main criteria which are: (1) year; (2) definition of 'a child'; (3) paedophilia; (4) child pornography; (5) child grooming; (6) sexual assault involving children; and (7) parental roles and responsibilities. The seven criteria are developed based on the literature discovered related to paedophilia across the globe. The summary of legal emphasis on child protection and privacy to prevent paedophilia according to criteria and countries are presented in Table 2.

Table 2: Legal Emphasis on Child Protection and Privacy According to Countries and Criteria

Criteria	Malaysia	Singapore	United Kingdom
Year	Since 2001	Since 2001	Since 1989 Below 18 years old;
Definition of 'a child'	Below 18 years old	Below 14 years old	and in some circumtances below 16 years Emphasis given on
Paedophilia	No emphasis given	No emphasis given	offenders who possesses paedophile mannual
Child pornography	in three documents (National Child Policy 2009; Child Act 2001; Sexual Offences Against Children Act 2017)	No emphasis given	Emphasised in two documents (Sexual Offences Act 2003; Serious Crimes Act 2015)
Child grooming	Emphasised in one document (Sexual Offences Against Children Act 2017)	Emphasised in two documents (Penal Code 2008; Children and Youth Policies)	Emphasised in two documents (Sexual Offences Act 2003; Serious Crimes Act 2015)
Sexual assault involving children	Emphasised in one document (Sexual Offences Against Children Act 2017)	Emphasised in one document (Penal Code 2008)	Emphasis given on children aged below 13 years (Sexual Offences Act 2003)
Parental roles and responsibilities	Emphasised in three documents (National Child Policy 2009; Child Act 2001; Sexual Offences Against Children Act 2017)	Emphasised in one document (Children and Young Person Act 2001)	Emphasised in four documents (Children Act 1989; Sexual Offences Act 2003; Serious Crime Act 2015; Child Protection System 1995)

Criteria 1: Year-Based on the analysis undertaken, among the three countries, undoubtedly, the United Kingdom is the first please in regards to emphasising on child protection and privacy since 1989, followed by Malaysia and Singapore in 2001. Notably, although the policies and Acts of the three countries are believed to exist much earlier; however, the discussion on the findings only involves the recent amended policies and Acts. The emphasis given by the United Kingdom on child protection and privacy is considered as the earliest among the other two countries which are Malaysia and Singapore considered as relevant since it has been recognised as one of the developed countries since the era of Industrial Revolution in 1760 to 1830 (Shafaeddin, 1998). On the other hand, the acknowledgement of children issues in the United Kingdom also is far ahead as compared to Malaysia and Singapore, for example the paedophilia issue that has been emphasised by the United Kingdom since 2003 in Sexual Offences Act.

Although the year of establishment of policies and Acts related to child protection and privacy did not determine and guarantee the effectiveness and efficiency in dealing with paedophilia and other child sexual abuse issues, however, the earlier establishment of policies and Acts depict prominently that the country is concerned on children's development, protection and security. Due to this situation, Malaysia needs to move towards the acknowledgement of numerous abuse issues involving children and able to formulate and implement relevant initiatives at an early stage.

Criteria 2: Definition of a child—In discussing the definition of a child between the three selected countries, Singapore's legal definition of a child is completely different from the other two selected countries whereby a child is defined as a person who is aged below 14 years old as stated in Children and Young Persons Act 2001. In the United Kingdom's context, a child is defined as a person who is aged below 18 years. However, in some circumstances of special cases, a child can be defined as a person who aged below 16 years old. It is prominent that the United Kingdom practices legal flexibility to suit the crime cases involving children. On the other hand, Malaysia still holds to the definition of a child, as a person who is aged below 18 years.

The discussion on the definition of a child may be perceived as less critical in research. However, this study argues that the definition of a child influences child protection and privacy to prevent children from being the victims of abuse issues. According to a report prepared by Youth Policy Labs to the UNICEF Regional Office for Central Eastern Europe and the Commonwealth of Independent States in 2016, the importance of legal definition of a child on their accessibility and realisation of rights is apparent. In the report, Youth Policy Labs claim that children have been defined differently according to context and situations. For example, in terms of health, a young woman aged 17 could be married, assume legal emancipation but require parental consent for contraception. However, in the context of child protection, predominately, countries around the world agree to the definition of a child developed by the Convention on the Rights of the Child (CRC) as a person who is aged below 18 years. In this sense, there was a contradiction between these two aspects, whereby female children who are aged 17 years old are allowed to be married, even though they have been

recognised as part of the vulnerable group who still require protection and care. Hence, the report concluded that the definition of a child has a lack of uniformity across legal domains. The report further argues that the definitions are riddled with exceptions, additions and considerations. Before it ended its discussion, Youth Policy Labs has found the major gap which is adolescents' digital security and privacy remained as areas that receive little legislative attention. However, this study believes that not only adolescents should be concerned in today's globalised and modernised world but digital security and privacy involving children at a young age also need to be highlighted as one of the agendas in countries around the world. This is because children at a young age are fragile and cannot protect themselves, especially when they expose themselves on the internet such as Facebook, Instagram and other social media platforms.

In discussing further on the definition of a child, Ahmad (2018) provides the similar inconsistency of classification of children in the Malaysian context. Ahmad (2018) in her book, entitled 'Empirical Evidence on Child Abuse in the Malaysian Context', asserts that one of the challenges faced by the three main agencies dealing with children's issues in Malaysia (which are Department of Social Welfare, Royal Malaysian Police and Hospitals) is that the age which someone is considered as a child varies depending on the type of abuse. In the discussion, Ahmad (2018) illustrates the inconsistency through one significant example, which is although the official definition of a child stated in the Child Act 2001 is a person under the age of 18 years, different ages are specified for a child who is the victim of sexual abuse, for instance, rape and incest of a child cover a girl under 16 years of age but for unnatural intercourse, the victim must be under the age of 14 years, according to Penal Code Act 574. Hence, the author further argues that these inconsistencies can be one of the reasons in failure to effectively deal with the issue of child abuse and maintaining accurate data. As the consequence, Ahmad (2018), through her research, reveals that this inconsistency also influences the Malaysians' understanding on the definition of a child, which later affect their overall attitudes and perceptions of child abuse.

The above discussion on the definition and age of a child plays an important role in determining the children's protection, security and privacy. The inconsistencies of the definition of a child can be seen through the findings of this study in three different countries, Malaysia, Singapore and United Kingdom. However, after scrutinising further each of the country's definition, the root of these inconsistencies exists within the country itself, such like mentioned by Ahmad (2018) in the Malaysian context. Less emphasis on the inconsistency of the definition of a child within the country, as the consequence, will remain the society in the extreme confusion, especially parents. Hence, this study argues that the Malaysian government should reconstruct the definition of a child and apply the universal definition to all aspects pertaining to children's issues in order to increase the level of effectiveness and efficiency in dealing with the children's development, protection, security, privacy, survival, participation and care.

Criteria 3: Paedophilia—The findings from the content analysis undertaken by this study reveals that among the three selected countries, only the United Kingdom has provided serious attention towards the paedophilic offences

by implementing provisions under the umbrella of Sexual Offences Act 2003 and Serious Crime Act 2015. However, none of the Acts and policies in Malaysia and Singapore emphasise on the paedophilic offences. This finding is considered relevant because among the three selected countries, the United Kingdom was far ahead in acknowledging and recognising child abuse issues as compared to Malaysia and Singapore. The compilation and discussion of literature surrounding the child abuse issues conducted by Ahmad (2018) evidenced that the United Kingdom emphasises on the abuse issues involving children since 1860s.

This is consistent with the literature discovered by this study pertaining to one of the earliest discoveries on the paedophilic massive case in the United Kingdom which was back in late 1990s (Stout, 1998). The existence of the internet paedophiles ring, popularly known among paedophiles as the 'Wonderland Club', marked the dark global history at that time. The four-year-operating paedophile ring became a major concern to the United Kingdom police department. By utilising the technological advancement, paedophiles around the world massively exchanged their paedophilic materials and over 750,000 pictures of child pornography and 1,800 videos depicting children suffering from sexual abuse were discovered at the end of the investigation (Bocij, 2004). The paedophiles' sexual desires for children continue to grow and once again this urged the United Kingdom police department to combat this issue in 2011. During that time, the world's largest paedophile ring, the 'boylovers.net', was discovered and investigated (Casciani, 2011). Over the three years of investigation, the United Kingdom police department managed to save more than 200 victimised children which can only be regarded as merely 'the tip of the iceberg' (Casciani, 2011).

This study believes that following these heinous cases involving paedophiles and victimised children globally, the United Kingdom government has taken good initiatives to include paedophilia as one of the legislative agendas and later translated the initiatives into two important Acts which are Sexual Offences Act 2003 and Serious Crime Act 2015. The initiatives undertaken by the United Kingdom government should be benchmarked by other countries including Malaysia and Singapore. This is because paedophilia in these two countries, literally, is no longer alien. Malaysia and Singapore has begun to suffer from the negative implications of paedophilia. Since 2014, a deep scar has remained in the Malaysian children's lives after they were abused by the British paedophile, Richard Huckle, who masqueraded himself as an English teacher and offered tuition classes to these children. However, in return, he purposely snatched the most precious pride from the children (The Star, 2016a; 2016b). Similar to the Malaysian children, Singaporean children have felt the same monstrous pain after they were abused by an Australian man, Boris Kunsevitsky, who coercively desired for sexual relationship with children (Tang, 2019). Based on these two evidences, paedophilia began to strike the Asian region due to several factors, including endless poverty. Regardless of the factors, this is considered as an alarming situation which requires intensive attention and action from the Asian governments, including Malaysia. If paedophilia remains as a third-class agenda,

thousands more children will be silently abused by these 'silent monsters'.

Criteria 4: Child pornography; Criteria 5: Child grooming; and Criteria 6: Sexual assault involving children—Although this study emphasises more on the policies and Acts related to child protection and privacy to prevent paedophilia, however, the analysis undertaken also involves aspects of child pornography, child grooming and sexual assault involving children. This is because these are the three main aspects that are interconnected with paedophilia as discovered from literature. Child pornography is recognised as a popular strategy among paedophiles in unleashing their sexual desires toward little children. In order have numerous child pornographic materials in possession, including pictures and videos, these sexual predators have to sexually abuse children or make the children follow their sexual instructions. Additionally, before the abuse episode is filmed and recorded, these silent monsters need to groom the children, and in some situations, they have to force or blackmail the children. Thus, this interconnection between paedophilia and other three different issues, which are child pornography, child grooming and sexual assault, urge this study to further analyse these aspects through legal perspectives.

Based on the findings, the United Kingdom and Malaysia have given comprehensive emphasis on these three important aspects. On the other hand, Singapore only emphasises on two aspects in its legislation which are child grooming and sexual assault. The findings also reveal that the emphasis on these three important aspects in the legislation of the country commenced in the United Kingdom, followed by Malaysia and Singapore. As these three aspects are closely related to paedophilia, the early intervention from the governments, especially through the legislative initiatives, can prevent more children from becoming victims of paedophiles.

Criteria 7: Parental roles and responsibilities—As the closest people to children, parents have heavy commitments to protect and secure their children's protection and privacy. The findings from the content analysis reveal that among the three selected countries, the United Kingdom has the earliest recognition on the importance of legal parenting responsibilities. The legal parental responsibility imposed by the United Kingdom's Act not only covers biological, single and married parents, but also unmarried, same-sex spouses and adopted parents which can be considered as holistic.

In the simplest definition, responsibility means 'duty', 'obligation' and 'authority'. By combining two different words which are 'parental responsibility', it is referred to "all the rights, duties, powers and responsibilities as well as authority which by law a parent of a child has in relation to the child and his property" (Children Act 1989 of the United Kingdom). Although, parental responsibility must be practiced and undertaken by parents in raising their children; however, many parents still neglect their responsibility and perceive it as a 'burden'. By legalising parental responsibility, this study argues that parents' perceptions can be shaped from burden to 'accountability'; which they must obey without failure.

In research, the singular and plural form of parental responsibility or responsibilities are used interchangeably. However, the plural form of 'parental responsibilities' does not mean parents can pick and choose, it is a whole package,

so the use of the singular form of 'parental responsibility' is preferred in discussions and debates (Suykens, 2015). Although the parental responsibility is globally recognised as one of the important aspects in child development and protection, however, this topic of discussion still remains under-research, especially in the Malaysian context, in relation to legal perspective of child protection and privacy. This study believes that limited attention on parental responsibility in the legislation documents in Malaysia influence parents to treat their children as property rather than amanah (trust).

V. CONCLUSION

In moving towards the developed nation, Malaysia should not only need to focus on the development of the country in terms of facilities and infrastructures, however, the social development also needs to be strengthened and most importantly, the new generation which refers to children, should be nourished with quality care, education, development, protection and privacy. With regards to the protection and privacy, the Malaysian legislation on paedophilia requires augmentation. Based on the findings gathered from this study, the implementation of law provisions on paedophilia imposed by the United Kingdom's legislation benchmarks the initiative that needs to be undertaken in the Malaysian legislation.

The comparison made between the three selected countries, which are Malaysia, Singapore and the United Kingdom, reveals that the long-developed country, the United Kingdom, has comprehensive Acts and policies in tackling this issue. As compared to the other two countries, the United Kingdom has imposed specific attention in its legislation pertaining this issue. Since paedophilia has been recognised as one of the heinous issues in the world, the United Kingdom's legislation provides special attention towards this issue in its Serious Crime Act 2015. This initiative shows the serious concern of the United Kingdom's government in upholding child protection and privacy to prevent paedophilia and it also shows that the negative consequences of paedophilia are serious. In that sense, the attention on this issue that has been given in the Serious Crime Act 2015 is relevant and significant.

In the context of Malaysia, the new formulation and implementation of Acts and policies related to child protection and privacy, specifically to cater to paedophilia, can be transformed into child protection and privacy's strategic plan and comprehensive plan of action. The initiative to develop the strategic plan can further outline the relevant objectives and strategies to precisely address this issue. Even though there are objectives and strategies which have been developed in order to strengthen Malaysian children's development, protection, survival participation, however, none of the objectives and strategies are developed in the National Child Policy 2009 and National Child Protection Policy 2009 to specifically deal with paedophilia. On the other hand, the plan of action that is suggested to be developed can later organise relevant programmes and activities for parents to prevent their children from becoming victims of paedophilia. However, all the strategies, programmes and activities that will be highlighted in the child protection and privacy strategic plan

and plan of action need to be closely monitored and reviewed. This is because similar to globalisation, the seriousness of paedophilia has also evolved over time.

Furthermore, as the findings of this study depict that Malaysia has a huge gap in its legislation to strengthen child protection and privacy to prevent paedophilia, this study proposes the Malaysian government to review and revise the current policies and Acts. Even though Malaysia has showed that it is moving towards strengthening its legislation on the child protection and privacy as evidenced by the implementation of Sexual Offences Against Children Act 2017, however, only a part of paedophilia is catered, as there are some provisions which have been implemented to address child pornography, child grooming and sexual assault involving children. The review of the current policies and Acts needs to be undertaken by considering all important angles, including parents, society, children, relevant agencies and many other related parties. For example, in the United Kingdom, the compulsory reporting can be considered as one of the good initiatives undertaken by the government in combating child abuse including paedophilia. This situation enables the society to be more responsible towards, not only their children, but also to other children who require care and protection. This is because, in some situations, parents themselves are the abusers who use their children as sexual objects. Subsequently, Sustainable Development Goal 16: Peace, Justice and Strong Institutions can be uphold effectively.

Thus, this study proposed three main recommendations, which are: (1) inter-agency cooperation in dealing with paedophilia issue; (2) enhancing the protection and privacy of children in the aspect of cybersecurity; and (3) strengthening the existing policies and Acts related to child protection and privacy. Other than that, this study also suggested to expand the analysis to other countries in exploring further the policy gaps that can be benchmarked to the current policies and Acts in Malaysia.

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Student Resilience During the Covid-19 Pandemic: Inculcating Healthy Learning Habits with Yoga Therapy

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Abstract - According to a survey conducted by UNESCO, globally more than 1.73 billion students have been affected by the temporary closure of schools and higher education institutions due to the Covid -19 pandemic. Their survey revealed that nearly 192 countries been forced to close the education institutions affecting nearly 99 percent of the world's student population. Students not only lost an academic year but were also affected physically, mentally, and socially. In India, the nationwide lockdown from 24th March because of the outbreak of the Covid-19 pandemic has strictly upset the academic calendar with schools, colleges, universities, teachers, faculties, students, and parents looking for the ways to keep the learning process going, without a break. With the onset of the Covid -19 pandemic, online classes have become the order of the day. The temporary closure of institutions and the new norm of attending online classes, reduced students' physical activity, thus causing anxiety, physical health psycho social issues, and underachievement. To address these issues, various Indian cities introduced yoga therapy as a way to healthy learning. The Vellore city in Tamil Nadu, India is one of the cities that inculcated yoga as a means of developing student resilience during the Covid-19 pandemic. The current empirical study, explores students' perception of inculcating healthy learning habits through yoga therapy. The findings show a statistically significant difference between nativity and the greater benefits of inculcating healthy learning habits through yoga therapy during Covid-19 pandemic among undergraduate students in Vellore city.

Keywords— Inculcating Healthy learning, Yoga therapy, Global pandemic, holistic approach and Covid-19

I. INTRODUCTION

Yoga is basically the most important ancient art that aims at the building of a healthy mind within a healthy body. For this reason, it is considered to be a consistent system that revitalizes the body, mind as well as soul. The great saints of India, therefore, have mentioned yoga to be a common attribute of mind which enhances the physical, spiritual and intellectual status of the human body. Hence, the balanced development of these three specifications led to the condition where the individual will improve the positive attitude towards life. According to McCall (2007) and Collins, (1998), yoga whilst cultivating a sense of calmness

and wellbeing, promotes strength, endurance, flexibility and facilitates better self-control. The Western world therefore widely recognised Yoga as a holistic approach to health (Williams et al. 2003). There is currently a growing body of research that supports mind body therapy such as yoga to improve the physical, mental and emotional well-being of students (Guendelman et al., 2017; Tang et al., 2015; Gard et al., 2014; McCall, 2013). India, the birthplace of yoga, has always encouraged the practice of yoga as part of its educational curriculum.

With the onset of the Covid-19 pandemic, the nationwide lockdown in India, from 24th March 2020, has strictly upset the academic calendar with schools, colleges, universities, teachers, faculties, students, and parents looking for ways to keep the learning process going, without a break. The adaptation to an online teaching and learning environment has become the order of the day in India and the rest of the world. This new norm has its own set of challenges. There are growing concerns on decreased physical activity (Ammar et al., 2020) and other psychological distress (Wang et al., 2020 and Rodriquez-Rey et al., 2020) associated with the lockdown due to the pandemic. For instance, Galle et al. (2020) found that a significant reduction in physical activity with increased sedentary behaviour among Italian undergraduate students during the lockdown.

Due to the lockdown, all the higher education institutions in India, are exploring the possibility of having their own learning apps as they do not want to break the learning process. Generally, Zoom, Google meet, and WhatsApp platforms have been widely used as learning apps and digital smart boards around India. In many places, the apps not only include online teaching and learning but also digitalized textbooks, online submission of assignments, quizzes, and writing semester exams. Thus, the temporary closure of institutions has led to attending regular classes through online mode for more than five to six hours per day and this may cause more stress among students. Besides stress, it has also reduced the students' physical activity, causing health problems like low muscular fitness, weight

gain, vision problem, psycho social issues and of course, educational underachievement. To address these issues, various Indian cities introduced yoga therapy as a way to healthy learning.

In the context of education, yoga has various important effects. The key benefits of yoga are it helps in dealing with various difficulties, conflicts, distractions, problems, and dissipation faced by students (Sajath and Subha R Kurup, 2019). Drawing on the benefits of yoga, schools, and higher learning institutions, in India have long been advised to integrate yoga into their education curriculum (Patal, 2019). More recently the potential relevance of yoga amidst the Covid-19 pandemic has been strongly acknowledged by researchers (Bartos, et al. 2021 and González-Sanguino et al., 2020). Amidst the COVID-19 pandemic, the integration of yoga into the education curriculum, system, has become more relevant in many cities in India.

The researchers as academics, have observed that many students under lockdown conditions, have developed more anxiety, been pressured to succeed, increased social media and technology addiction, lack of sleep, lack of exercise, increased obesity, less attendance rate, less self-confidence, and less concentration on studies. All these issues may directly affect all schools, colleges, and university students. Currently, a number of studies have been conducted on the benefits and need for yoga therapy at school levels, but no studies have been conducted at higher education institutions in Vellore city, Tamil Nadu in India. This study aims to fill this gap. Hence, the purpose of the current study and to explore the applicability and potential perceived benefits of yoga therapy, administered during the lockdown at higher institutes of learning in the city of Vellore, India.

II. SIGNIFICANCE OF THE STUDY

Yoga and its techniques yield a positive effect in the management of stress in students. The regular practice of yoga improves personality, attention, and concentration and will create a healthy atmosphere among the students. The present study helps to understand the relationship between healthy academic learning and voga therapy and the results would help the stakeholders to make appropriate decisions for bringing yoga as one compulsory course in arts, science, and engineering program at higher education institutions. In the present pandemic conditions, there is an increasing need and understanding of the benefits of yoga in higher education for inculcating better healthy learning among students. So, the researchers have made a sincere attempt in this direction to bring out the relationship between yoga therapy and inculcating healthy learning habits among students amidst Covid-19 pandemic.

III. RELATED LITERATURE

A. Concept of Yoga

The word "yoga" comes from a Sanskrit root "yuj" which means union, or to join, and to direct and concentrate one's attention (Lasater, 1997). Basically, yoga practice involves the union of the mind, body and spirit. Yoga is a form of mind-body fitness practice (Collin, 1997) that produces a sense of balance and union between the mind and body (Arora and Bhattacharjee, 2008). Using a holistic approach, "Yoga improves the health of all alike and wards off illnesses of one who tirelessly practices yoga whether they are young, old, broken-down, diseased or weak, provided they abide by the rules and regulations properly". Yoga, is not only a solution for grownups, but also for students studying in higher education institutions too. Integrating yoga practices in the education curriculum helps students to lead a better lifestyle as they mature (Meera, 2020).

B. Yoga Practice

Meera (2020) suggests that introducing the students to yoga at colleges helps them learn healthy lifestyle habits and also sets the foundation for a fit future. He also stressed that yoga and meditation improve balance, strength, endurance, and the aerobic capacity in students improves focus, memory, self-esteem, academic performance, classroom behavior, and reduces anxiety and stress in students. However, his study does not cover the need for yoga therapy at college levels. Schonert Reichl and Lawlor (2010) observed students who practiced yoga (asanas) three times a day in brief segments of attention training and mindful breathing and found it improved their well beings, social and emotional competence. The author did not mention the impact on academic achievement among students. Linda Harrison et.al (2007) showed improvements in students' behavior, self-esteem, and relationship quality and the authors did not cover the basics for student's good physical health. Bharathwaj and Agarwal (2013) found that the yoga group showed a significant increase in the level of total, general and social, and self-esteem after one month of the comprehensive yoga program. However, their paper does not relate the benefits of yoga in addressing the challenges students faced in terms of attentiveness.

According to Nagalakshmi (2017), yoga not only improves flexibility, stress, balance, and stamina but also reduces anxiety and stress, improves mental clarity, and helps the students or practitioners of yoga sleep better. Meena and Krishna Reddy (2018) analyzed the increasing demand for yoga in schools and colleges for achieving better mental health or better learning of the students as it is defined as the wellness of human beings. Their results showed a positive correlation between yoga performance and improvement in the learning habits of the students. Marsha Wenig (2019) commented that children these days live in a challenging world of busy parents, school pressures, incessant lessons, video games, malls, and competitive sports. Although many do not think of these influences as stressful for kids, nevertheless, they are. The bustling pace of todays' children's lives can have a profound effect on their innate joy - and usually not for the better (Marsha Wenig, 2019). Marsha's study however did not cover the academic achievements of the students.

As per Gaiswinkler, L, and Unterrainer H. F, (2016), the aim of their study was to examine how different levels of yoga involvement are related to different parameters of mental health and illness. A total sample of 455 participants (410 females) was investigated by means of an internet survey. 362 yoga practitioners (327 females) rated their degree of yoga involvement on the Yoga Immersion Scale. In accordance with the literature, yoga practice might have its biggest impact on mental health when it is part of a practitioner's worldview. Noggle et al., (2012), claim that yoga may serve as a preventive role in adolescent mental health. Bhatia, and Premlata (2005) in their work highlighted some major exercises to improve posture and balance as excellent examples of movements based on integrated sensory information.

C. Inculcating Positive Healthy Lifestyle Habits Among Students

Amidst the global COVID-19 pandemic, students studying in schools and colleges realized the importance of health and many are changing their ordinary lifestyle into inculcating positive healthy lifestyle habits through yoga and meditation. In a recent survey conducted on students from a Higher Conservatory of Music in Spain, it was found that 95% utilised yoga and or meditation practices as coping strategies in response to the lockdown demands elicited by the Covid-19 pandemic (Bartos, et al. 2021). importance of yoga in education institutions, has also be noticed in the increase in rationality, emotional structure, and creative output amongst students in India. According to Patal (2019) yoga techniques provide improved attention in studies, better stamina and co-ordination for sports and a heightened awareness and balanced attitude for social activity.

Determined to increase the physical activity amongst students and to cultivate healthier outcomes, various local authorities in India are beginning to acknowledge the importance of yoga in higher education institutions. The Haryana Government for instance took the lead to include yoga in the school curriculum as a separate subject (Chandigargh, 2020). The distinctive features of yoga will help in establishing positive healthy lifestyle habits among students during, before and after education. Yoga enhances the self-realization or self-awareness, mental, physical, and spiritual attributes of an individual, which eventually inculcates the ecological as well as social awareness (Patal, 2019). In pursuit of uplifting state of psyche, yoga promotes individuality and perseverance as well as will power within the students. Yoga also helps in unfolding the creative awareness, stepping the physical difficulties by making the body active, promotes ease to the respiratory system, neuroendocrine system, cardiovascular system Musculoskeletal systems (Patal. 2019; Atkinson and Permuth-Levine, 2009; Arora and Bhattacharjee, 2008). Thus, integrating yoga in the education curriculum, enhances students' determination and also helps manage stress more effectively.

IV. BENEFITS OF SIMPLE ASANAS FOR INCLUCATING HEALTHY LEARNING HABITS WITH YOGA THERAPY

Learning physical posture builds confidence, strength as well as the mind-body connection. Through yoga, students start to realize that they are strong and able to take that strength, confidence, acceptance, and compassion out into the world. The following Table depicts the importance of simple asanas for students learning and health benefits.

TABLE I. Asanas for Students Learning and Health Benefits

Simple Asanas	Learning and Health Benefits
1.Bhujangasana	Since students spend hours sitting in front
	of laptop/desk, helps relief to their back.
2. Dhanurasana	Good for developing confidence and more
	focus on studies.
3. Savasana	Helps to relax and de-stress students.
4. Sethubandanasana	Strengthens the core.
5. Sukhasana	Students can learn to sit straight and get
	the feeling of meditation.
6. Virabadrasana	Helps to stretch the shoulders.
7. Vrikshasana	Helps students build balance and alertness.

a Source: Meera, 2020.

V. DRAWING ON THE LITERATURE AND FIDNINGS FROM A PILOT STUDY, THE RESEARCH QUESTIONS, OBJECTIVES AND HYPOTHESIS FOR THIS STUDY ARE DELINEATED BELOW:

A. Research Questions

- 1. Is there any need for students to practice therapeutic yoga to inculcate healthy learning habits.
- 2. Are students aware of the benefits of yoga through which they can inculcate healthy learning habits.

B. Objectives of the Study

- 1. To study the demographic profile including native (rural or urban) of the respondents from the study area.
- 2. To identify the students need for inculcating healthy lifestyle learning habits through yoga therapy
- 3. To find out if there are greater benefits in inculcating healthy lifestyle learning habits through yoga therapy among Undergraduate students.

C. Hypothesis

- 1. Ho1: There is no significant difference between nativity and students' need for inculcating healthy lifestyle learning habits through yoga therapy.
- 2. Ho2: There is no significant difference between nativity and greater benefits in inculcating healthy lifestyle learning habits through yoga therapy among Undergraduate students.

D. Research Methodology

The nature of the study was based on empirical. Both primary and secondary data were used for the study. Primary data was collected through a questionnaire by using the survey method. The secondary data was collected through journals, magazines, annual reports, newspapers, the internet, and working papers. A convenience sampling method was applied for the study. A pilot study was conducted and accordingly some modification was done as per the inputs and suggestions received from the respondents and from yoga experts. A total of 130 questionnaires was distributed among undergraduate

students pursuing arts, science, and engineering residing in rural as a well urban area in Vellore City, Tamil Nadu in India. Out of 130 questionnaires only 112 questionnaires were received and finally, the researchers selected 100 respondents for the final study who regularly do yoga at home or at the yoga centre. The remaining 12 questionnaires were not considered for the study due to incompleteness.

The structured questionnaire used Likert scale by applying five points ranging from 5 strongly agree to 1 strongly disagree with two sections. The first section of the questionnaire contains a demographic profile and the second section contains inculcating healthy learning habits among students through yoga therapy. Statistical tools like percentage analysis, frequency distribution, and t-test analysis were applied for the study. The reliability and validity tests were also applied. The results of the reliability test were 0.837, this shows that all the variables taken for the study have good internal consistency. The content validity test was applied by getting subject area experts from the field. The main limitation of the study is that this study was restricted to only Vellore City to only 100 samples. The opinion of the respondents may not be similar if the same study was conducted in another Metro City in Tamil Nadu, India.

VI. DATA ANALYSIS AND INTREPRETATION

A. Demographic Profile

The data relating to the demographic profile of the respondents like gender, nativity, and educational qualifications were presented in Table 2.

TABLE II. Demographic Profile of the respondents

Variable	Category	Frequency	Percentage
Gender	Male	61	61
	Female	39	39
	Total	100	100
Nativity	Rural	44	44
	Urban	56	56
	Total	100	100
Educational qualification	B. Com	43	43
	B. Sc	33	33
	B. Tech	24	24
	Total	100	100

b. Source: Primary data

Interpretation

Table 2 shows that, the majority (61%) of the respondents fall under the male category. The majority (56%) of the respondents were from an urban area and the majority (43%) of the respondents were pursuing Bachelor of Commerce (BCom) undergraduate degree program in higher education institutions in Vellore city.

B. Need for Inculcating Healthy Lifestyle Learning Habits with Yoga Therapy

The data relating to nativity as independent variables and students' need for inculcating healthy lifestyle learning habits through yoga therapy as dependent variables by applying an independent sample t-test are presented in Table 3.

TABLE III. Student Need for Transforming Healthy Lifestyle Learning Habits Through Yoga Therapy

Particulars	Native	N	Mean	F- Value	Sig.	Null
1 I Du 4-	D1	75	Score 4.37	45 (70	0.000	Hypothesis
1. Less Pressure to	Rural	75		45.679	0.000	Not
succeed	Urban	25	3.88			accepted
2. Avoid social	Rural	75	3.75	66.735	0.000	Not
media and technology addiction	Urban	25	3.00			accepted
3. For good sleep	Rural	75	4.05	6.950	0.010	Not
and more exercise	Urban	25	3.00	0.550	0.010	accepted
4. Reduce obesity	Rural	75	4.11	17.705	0.000	Not
,	Urban	25	3.00			accepted
Improves more	Rural	75	3.84	9.547	0.003	Not
attendance rate	Urban	25	2.92			accepted
6. Improve self	Rural	75	3.89	0.563	0.455	Accepted
confidence	Urban	25	3.00			
7. Improves	Rural	75	3.83	38.913	0.000	Not
concentration on studies	Urban	25	3.00			accepted
8. Improves healthy	Rural	75	3.92	15.718	0.000	Not
learning habits and	Urban	25	3.00			accepted
reduce learning						
barriers						
9. Yoga subject is	Rural	75	3.72	20.279	0.000	Not
must in higher	Urban	25	2.68	20.277	3.000	accepted
education		23	2.00			-

^{c.} Source: Primary data (at 5% level of significance) Interpretation

Table 3, shows that out of nine variables only eight variables, the mean score value is more for rural students compared to urban students. It is very clearly denoted that

all rural students have strongly agreed and all urban students agreed that they need to inculcate healthy learning habits through yoga therapy. The output of T-test results showed that the significant value of 0.000 for seven variables is less than the hypothetical value of 0.05 at 5% level of significance. Hence, the null hypothesis is not accepted for the seven variables, therefore, there is a statistically significant difference between nativity and students' need to inculcate healthy lifestyle learning habits through yoga therapy amidst the Covid-19 pandemic. The significant value for only one variable like improves self-confidence (significant value is 0.455) accepts the null hypothesis.

C. Benefits in Inculcating Healthy Lifestyle Learning Habits with Yoga Therapy

The data relating to nativity as independent variables and benefits in inculcating health lifestyle learning habits through yoga therapy among students as dependent variables by applying an independent sample t-test were presented in Table 4.

TABLE IV. Benefits in Inculcating Healthy Lifestyle Learning Habits with Yoga Therapy

Particulars	Native	N	Me an Sco re	F- Value	Si g.	Null Hypo thesi s
1. Reduce the stress	Rural Urban	75 25	4.53 3.88	93.858	.00	Not accep ted
2. Improves memory and attention span	Rural Urban	75 25	4.73 3.08	24.334	.00	Not accep ted
3. Helps to manage weight	Rural Urban	75 25	4.15 3.00	30.218	.00	Not accep ted
4. Teaches correct breathing techniques	Rural Urban	75 25	4.15 3.00	28.535	.00	Not accep ted
5. Promotes mindfulness	Rural Urban	75 25	4.20 3.00	39.391	.00	Not accep ted
6. Helps to bring peace of mind	Rural Urban	75 25	4.01 3.00	8.062	.00	Not accep ted
7. Improves self-control and enhances coping skills	Rural Urban	75 25	3.89 3.00	31.987	.00	Not accep ted
8. Reduces absence in classes	Rural Urban	75 25	3.88 3.00	38.040	.00	Not accep ted
9. Boost's immunity to safeguard from Covid- 19 and improves physical appearances	Rural Urban	75 25	3.87 3.00	41.590	.00	Not accep ted

d. Source: Primary data (at 5% level of significance) Interpretation

It is interpreted from the above Table 4, for all the nine variables, the mean score value is more for rural students compared to urban students. It is very interesting to denote that all the rural students have strongly agreed and all urban students agreed that they benefited and inculcated healthy learning habits through yoga therapy. The output of T-test results showed that the significant value of 0.000 for nine

variables is less than the hypothetical value of 0.05 at 5% level of significance. Hence, the null hypothesis is not accepted for all nine variables, therefore, there is a statistically significant difference between nativity and greater benefits in inculcating healthy lifestyle learning habits through yoga therapy among undergraduate students amidst the Covid-19 pandemic.

VII. SUMMARY OF FINDINGS

A. The following findings are drawn from the study.

- 1. 61% of the respondents belong to male categories, 56% of the respondents were from an urban area and 43% of the respondents pursuing B.Com degree programme.
- 2. There is a statistically significant difference between nativity and students' need to inculcate healthy lifestyle learning habits through yoga therapy during the Covid-19 pandemic. This result shows that there is a need for yoga therapy courses among students who pursue under graduate programs at the higher education institutional level.
- 3. One variable like it improves self-confidence among students has no statistically significant (value 0.455) difference between nativity and students need to transform healthy lifestyle learning habits. This negative result shows that the students need long yoga practice daily, so that, they will get self-confidence on their studies and academic performance.
- 4. There is a statistically significant difference between nativity and greater benefits in inculcating healthy lifestyle learning habits through yoga therapy during post-Covid-19 among under graduates' students. The findings resulted that, there is good transform healthy learning habits through yoga therapy among students during the Covid-19 pandemic. In India, the proposed new education policy 2020 insist holistic, multi-disciplinary, futuristic education and this is possible only when they include yoga course in the curriculum. Practicing yoga therapy also inculcates human values through arts, literature and encourages liberal arts.

B. Conclusion

It is concluded from this research study, that generation Z students live in a challenging world with busy parents, academic pressures, never-ending lessons, video games, malls, and competitive sports. Encouraging co-operation and kindness instead of opposition is a great gift to give our students. Hence, when students learn the techniques of selfhealth, relaxation, and inner fulfilment through yoga, they can navigate life's challenges with more ease. Yoga at a higher education level encourages self-esteem and awareness with physical activity brings marvellous inner light/peace. Finally, it concludes that the ultimate objective of education is to create good citizens with all-around development. In order to prepare the students for all-around development, all institutions should integrate yoga with the curriculum with qualified yoga masters for better learning with practical support. Yoga is therefore viewed not only as a physical exercise, but a mental and spiritual discipline that promotes a sound body and a sound mind. Yoga also helps to create a positive effect on stress among students.

C. Managerial Implications

The following education implications are offered on the basis of the results of the study.

Sarcopenia Physical Frailty Prediction Models Among the Elderly Population

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Abstract—Obesity has become widespread in the Asia Pacific region. Malaysia ranks sixth in Southeast Asia for obesity. This research reveals a strong relationship prediction baseline association between obesity and physical frailty. We propose a correlation between obesity and physical fragility in older adults using predictive analytics. The extent of infirmity among elderly adults is worsening. Methods. The longitudinal study included a total of 1947 community-dwelling, aged 60 and older. Analyses were adjusted for gender, age, status, ethnicity, level of activity, hospitalization, smoking, afraid of fall, eat peanut, non-communicable chronic diseases, activities, muscle strength, and smoking. Results. BMI 25-30 had the lowest frailty index (FI) scores and the lowest prevalence of Fried fragility. The goal of this study is to predict the prevalence of obesity and frailty in community-dwelling obese elderly (OE) individuals by examining the correlations between body composition, physical frailty, and quality of life [1] In achieving this aim, the following objectives need to be accomplished: 1) to define the prevalence of obesity, relates with physical frailty. 2) to identify obesity and physical frailty risk factors. The contribution of this study is to produce a new prediction model among obesity and physical frailty as the novelty of this research. A matrix of accuracy, classification, and feature selection is used to compare deep learning models to the current models. The findings revealed that there are relationship prediction association between obesity and physical frailty, which influences the level of quality of life in older adults.

Keywords—Obesity, physical frailty, older adults, quality of life, correlated.

I. INTRODUCTION

Malaysian obesity has increased dramatically for decades. However, very little is known about the population-level efficacy of treatments. Essentially, obesity is a lack of awareness about the causes of fat. [1] Many obesity-related factors are interconnected, making it challenging to identify the essential elements and apply statistical modelling approaches to help overcome this problem. Obesity is a disease in which one's body fat percentage is harmful. The method for classifying body composition vary by age and gender, as it is intended to explain obesity and correct misinformation. The body weight is usually far higher than the allowable or ideal weight. But just half of all noncommunicable disease patients are fat. Obesity is demonstrated to increase the risk of non-communicable diseases. The number of obese elderly individuals (OE) is increasing because of an increase in the old and obese population. [2] In old age, physical decline worsens because of age-related functional limitations. When you age, your

muscle mass diminishes, and your body fat increases. [3]. More research is needed on changes in body composition among OE individuals who may be more sensitive to incapacity due to a loss in muscle mass and muscular quality due to age [4-6].

The study's main objectives were to predict and evaluate the association between body composition, physical function, and quality of life in community-dwelling OE people. We assumed that OE participants are at increased risk of fragility and impairment in quality of life due to lower free fat mass FFM in body weight and poor muscle quality despite their larger free fat mass (FFM) [7].

II. PROBLEM BACKGROUND

Research has shown that overweight and obesity can lead to fragility, especially when accompanied by muscle mass and strength loss. It is essential to point out that obesity (BMI of 30 kg/m2 or larger, referred to as OB) is a separate condition from being overweight (BMI) of 25 kg/m2 or greater, referred to as overweight (OW) in terms of health consequences; in fact, being OW is not related to bad health outcomes at all [8,10]. Conversely, substantial excess adiposity is correlated with numerous poor health outcomes in elderly populations, including severe disease, disability, a reduced quality of life, and even mortality [11,12]. Geriatric obesity is on the rise in the United States, with more than one-third [13] of people over the age of 60 having body weights (BW) that fall into the over-weight category [14–19].

Since the world's population is growing older, it is having an unforeseen negative influence on economic growth and health-care provision. According to demographic forecasts for 2019, the senior age group will account for 10.3 percent of the overall population in Malaysia. In comparison to the previous year [20], this result showed a statistically significant increase of 0.3 percent in the senior population. According to projections, Malaysia will be an ageing country by 2040, with an old population of around 14.5 percent [21] and the fourth-fastest ageing nation, with 69% increase in the span of eight years between 2008 and 2040 [22].

Public health care faces a distinct challenge as the rising number of older individuals causes increased health-care costs to meet rising medical costs and expenditures for the elderly, which is a unique obstacle. Moreover, according to the data, a growth in the old-age dependency ratio, which has increased from 7.4 (2010) to 21.7 (2040), is responsible for an increase in the overall dependency ratio [23]. Total health-care spending was predicted to be RM57.36 million, or 4.24 percent of GDP, according to the projections. RM1790 per capita [24 - 25] was the average cost of health care in Malaysia in 2017. Obesity contributes to the development of new health problems, particularly when they manifest themselves as other diseases, many of which affect the elderly. Precision measurements combined with crossvalidation sampling techniques may be performed to validate the constructed predictive model. Overfitting on the datasets become a great issue to the accuracy of the prediction.

When there are too many categories, the conclusions of the data and the procedures used become unbalanced. [25]. As a result, each evaluation has erroneous outcomes in terms of increasing the accuracy of the forecast made. On top of that, it is often susceptible to overfitting and has poor performance as a result of these impacts. Prediction models based on imbalanced datasets are more likely to be skewed against consensus definitions, which is extremely important because there is a higher cost associated with misclassifying minority examples, such as the detection of rare diseases, than with consensus definitions. [26].

Traditional failure to classify disorders is associated with predictors and difficulties in recognizing comorbidities. Obesity has recently been discovered to spread through social networks, implying that these networks could be used for prevention or therapy. [27] There is a lack of models available which can handle the obesity and complexity datasets, to foresee the obesity effects on our health condition. Due to the limited parameters used to predict the accuracy of the findings, it has affected certain dimensionality. [28] Because of the cross-sectional nature, causal relationships between clinical variables and the investigation's outcome cannot be established. Longitudinal and multi-center research should be performed to further investigate these associations and to confirm the transitions between degrees of frailty in relation to the magnitude and reversibility of cases over time. [29 -32]

Several factors might explain why researchers continue to develop a new prediction model from scratch, including a perceived absence of predictive models for their target group (ethnicity, minorities or the elderly), or real-world results (such as mortality) (e.g., ischemic stroke). Materials and Methods

A. STUDY DESIGN

This study is a component of a longitudinal cohort study among older people in Kuala Pilah, Negeri Sembilan. The research population consists of elderly individuals who are 60 years or older and who live in Kuala Pilah. [50]

B. AREA

Kuala Pilah is one of seven areas in the state of Negeri Sembilan primarily rural area and is about 100 kilometers from Kuala Lumpur.

C. INCLUSION AND EXCLUSION CRITERIA

In Figure 1, it shows the study flow chart. Eligible participants were individuals above the age of 60 at the time of the data collection and who resided in the Kuala Pilah district. Based on the Malaysian national laws for older persons [22], the 60-year-old cut-off age was established. The date of birth on their identification cards served as a means of determining their age.

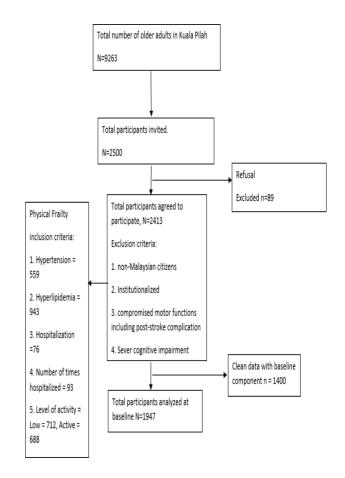


Figure 1 - Study Flow Chart

There were 900 over-null values, of which about 900 were labelled "Not App" and "Not Avail," and the other 300 were renamed. In some cases, it just means that the information for that particular column was not relevant or could not be found. Due to the Filter Operator's parameter change, only rows that do not have any missing data will be displayed. Only rows with no missing data were shown on the screen. 78 columns and 1947 rows completed the cleaning and sanitization process.

III. ANALYTIC APPROACH

A. ANALYSIS & PREDICTIVE MODEL

Analysis and prediction are categorized to better grasp their properties. The topics addressed here include the uses of obesity prediction and analysis in tackling various problems in many categories. more improved data analysis is required for obesity predictions Integrating various machine learning algorithms with machine learning modelling specialists will result in this objective being attained. Various modelling approaches were used to discover which was the most effective. Machines learn using a deep and non-artificial learning technique. A critical instrument for guaranteeing the validity and reliability of the outcome [33,34].

In the field of health research, logistic regression (LR) is utilized to explain the relationship between explanatory variables and binary response variables [35]. By estimating probabilities, LR describes the relationship between an event and one or more independent variables and is used to formulate a generalized linear model. The number of regression coefficients is the number of measurements correlated with each variable. The relationship of diabetes condition predictors is assessed using Odds Ratio (OR). [36]

In the study, the main component analysis (PCA) approach for (linear) dimensionality reduction was used to do an exploratory analysis of the data [37]. PCA components are ranked in terms of how much uncertainty they describe in the data. For example, the first main component is the position in the data space in which most of the variation in the data is clarified. The association between the prevalence of an obesity and national level was evaluated with a supervised approach.

B. DATA SOURCES

A BMI of between 18.5 and 24.9 is generally considered to be ideal (kg). In the underweight category, the BMI is less than 18.5. BMI is generally accepted between 18.5 and <25. Overweight is defined as a BMI of 25.0 to <30. If your BMI is 30 or more, you are fat. As we age, our weight tends to grow while our BMI decreases. The increased risk of suffering from disease and death increases with age [40]. However, the fat content, as well as the delivery pattern, differs. Visceral fat, or the accumulation of fat around other regions of the body, is associated with cardiovascular disease, while fat tissue is not. [41]

Vaupel and colleagues coined the word frailty to describe the variation in life expectancy among people of the same age group. Because of subsequent studies on frailty, the term is now understood to refer to the variation in the probability of an adverse event among people who have been exposed to the same level of risk [42]. Frailty as a psychiatric condition [43] or frailty have been used to operationalize frailty clinically since 2001. Frailty index (FI) is a rationalization of this concept, [44] which allows for measurement of an individual's FI by calculating the number of deficits in that individual and dividing that number by the

overall number of deficits evaluated. This metric allows researchers to see how age-related variability develops over the course of an adult's life [32].

C. CORRELATED DISEASES – HYPERLIPIDEMIA

The number of obese elderly Americans is increasing as the population ages and the proportion of fat elderly people increases [45]. Obesity exacerbates age-related physical function degradation, and this may lead to frailty and loss of independence in the elderly. Obesity is connected to greater rates of nursing home admissions. Skeletal muscle mass and body fat also decline with age [47]. If your muscle mass is low enough that you can no longer do your daily activities, you have a disability. Conversely, some researches have shown that sarcopenia is a prominent indication of obesity, while others have argued that fat mass is the most relevant indicator. Additionally, little is known about how various physical changes could affect a person's ability to function as they age, particularly if the person has a lot of body fat. Several studies have shown higher mortality above a specific BMI. Overweight and obese men and women were observed in the Framingham Heart Study. Data from the NHANES III Mortality Report demonstrated a reduction as found in the NHANES III Life Expectancy Among Obese Young Adults Compared to Non-Obese Adults. Evidence suggests that the body fat percentage and BMI distribution, not merely fat mass measured by the BMI, affect mortality.

D. HYPERTENSION

The field found participants with hypertension to have a blood pressure of 140/90 mmHg or greater. weight (kg) divided by height squared (in squared terms) (m2). Under Chinese rules, BMI \geq 24 kg/m2 and \geq 28 kg/m2 were recognized as being overweight, respectively [25]. 90 cm or larger in men, and 80 cm or greater in women Males with a WHR of 0.9 or above are obese.

E. PHYSICAL FRAILTY AND SUBSET

As defined by the World Health Organization, frailty is a state of significant vulnerability to unfavorable health outcomes such as incapacity, dependency, falls, the need for long-term care, and mortality. Because it's difficult to come up with a universally accepted and acceptable definition of frailty, any estimate of the prevalence is speculative. According to the American Medical Association, as many as 40% of people over the age of 80 are frail [22], and this number is increasing. According to the Centers for Disease Control and Prevention, the vast majority of the 1.6 million elderly nursing home patients in the United States are also considered fragile [19]. As a result, frailty affects a large proportion of older persons; if right, this provides some proof of its importance. There has been much confusion between frailty and disability/dependency because of the similarities in connected outcomes (with the exception of frailty itself being a cause of impairment) and the incidence of co-occurrence of frailty and disability. However, there is a growing consensus that distinguishing frailty from disability can help us better understand the ageing process

and provide new preventative and treatment options in clinical geriatrics. Recent research defines frailty as a physiological condition marked by increased sensitivity to stressors as a result of decreased physiological reserves and even dysregulation of several physiologic systems, as opposed to the more traditional definition. This decreased reserve makes it harder to maintain homeostasis in the face of disturbances (20–24), such as temperature extremes, exacerbations of a chronic condition, acute illness, or injury. Scaphoid syndrome and decreased muscle fiber function, osteopenia, dysregulation of the hypothalamus axis, inflammation, and immune function, and even heart rate variability are some of the systems in which physiologic decrements of bulk or function have been observed with age [21,24]. Scaphoid syndrome and decreased muscle fiber function are two examples of neuromuscular diseases that have been observed with age. Frailty is a collective expression of risk caused by the accumulation of sub thresh old decrements in numerous physiologic systems as a result of ageing or disease. The above-mentioned predicted subclinical frailty dysregulations are now being researched [24,25-32]. Loss of muscle contractile or material characteristics makes physical activity exceedingly risky [35]. Lipid penetration related to age leads to fragility by reduced muscle strength [36,37] Obesity is also linked to a significant increase in lipid accumulation in muscle fibers [38, 39] This lipid infiltration reduces muscle density and causes muscular strength loss irrespective of muscle mass shift [40,41] There may also be a significant loss of strength in the muscles of older adults who are also obese. Either when unmasked by stressors or in a clinical phenotype of a final common pathway [21,22]. There has been widespread agreement among researchers that this syndrome manifests itself as wasting (both muscle mass and strength loss as well as weight loss), loss of endurance, decreased balance and mobility, slowed performance as well as relative inactivity, as well as potential declines in cognitive function [21,34].

F. CORRELATED QUALITY OF LIFE

Lifestyle is a characteristic of individual behavior that is related to social relationship, interest, opinions, behaviors with the group or culture. [47] As a matter of fact, the general definition differs from the context of adult populations who are interested in being classified according to their overall quality of life. There is a vast range of biological, psychological, and sociological elements that influence people's general health, level of behavioral expression, objectives, and aspirations as they get older. Elderly people are a demographic community that is heterogeneous in terms of ethnic characteristics, social class, health problems, financial and social situations, living arrangements and family relations [48].

The risk of mortality according to BMI is beginning to rise by 23 kg/m2 relative to the lowest risk group (BMI, 19.0 to 21.9 kg/m2) [45]. More than 80 percent of the estimated deaths attributed to obesity-related comorbidities occur in patients with a BMI of at least 30 kg/m2 [49]. In Table 1.1 listed the illnesses that are linked to obesity, and an estimate of the proportions of sickness that is due to

obesity, are displayed here. It shows the main phenotype characteristics of the study is BMI. Due to obesity, the most prominent diseases are diabetes that achieved 61% from the studies that associated with being obese.

Table 1.1: Baseline characteristics of Kuala Pilah Longitudinal study of Aging participants Ages 60 years and older

	Obesity &	NonObesity	Obesity &	Pre-Frailty
	Frailty	& Frailty	Non-Frailty	rie-i iality
Variables			int = 1947	
Total No of respondent	Number = n, (%)	Number = n, (%)	Number = n, (%)	Number = n, (%
Gender				
Men	201	145	34	164
₩omen	292	213	121	230
Age				
60 - 69	245	176	91	193
70 - 79	195	138	52	155
≥80	53	44	11	46
Status				
Married	313	234	96	264
Widowed	168	115	52	123
Divorced	4	6	2	3
Single	8	3	5	4
Ethionicity				
Malay	483	348	147	384
Chinese	4	6	4	7
Indian	5	3	4	3
Others	1	1	0	0
Diseases				
Hypertension	236	0	134	189
Hyperlipidaemia	394	0	155	394
Physical Frailty				
Level of Physical	Low = 281	Low = 166	Low = 75	Low = 190
Activity ,	Active = 212	Active = 192	Active = 80	Active = 204
Active(Often+Sometim	Active = 212	Active = 132	Active = ou	Active = 204
Hospitalisation over	0	65	0	11
the past year	۰	65	٠	"
Number of times				
hospitalized over the	0	77	0	16
past year				
Energy	Yes = 359	Yes = 270	Yes = 106	Yes = 291
Lifeigy	No = 134	No = 88	No = 49	No = 103
	Yes = 63	Yes = 43	Yes=7	Yes = 50
Smoking?	No = 384	No = 270	No = 135	No = 305
	Ex= 46	Ex = 45	Ex = 13	Ex= 39
Fall?	Yes = 59	Yes = 85	Yes = 90	Yes = 85
	No = 434	No = 273	No = 65	No = 309
Peanut	Yes = 482	Yes = 334	Yes = 142	Yes = 363
	No = 11	No = 24	No = 13	No = 31
Fat Mass	17.16389452	17.33603352	17.30195531	17.69492386
	27.3010142	27.26368715	29.58198324	27.33172589
Body Fat %	27.3010142			
	32.09634888	31.90027933	32.20893855	31.92030457

Table 1.1 shows the comparison of other attributes from the previous studies that can be taken into consideration on the risk factor and guidelines on the type of disease outbreaks. Each researcher has indicated BMI classifier as the most important feature to indicate the outbreak of diseases. BMI and AGE are widely agreed to be important contributors to obesity, and therefore to an increase in illnesses. This has typically contributed to several potential communicable diseases related to obesity. The activity on the level of physical is low in general of all the categories of frailty and obesity. Fragility individuals are scared about falling, and these participants are eager to eat peanuts that have a high likelihood of leading to an increase in caloric intake. Their overall body composition is rather high, with total body weight being over 32.

IV. RESULTS

As a result, the dataset was split into a "70:30" configuration ", containing 70% training and 30% testing. The confusion matrix for predicting Obese and Frail patients

can be found in Table 1.2 as below. Naive Bayes and K-Nearest Neighbour had the highest true positives and true negatives, respectively, while Nearest Neighbour and Logistic Regression had the lowest. The models that have the highest accuracies for Obese and Frail are Logistic Regression and K-Nearest Neighbour with their accuracies being 70.83%.

Table: 1.2 - Confusion matrix - between Obese and Frail

Confusion Matrix	True	True	False	False	Accuracy
	Positives	Negatives	Positives	Negatives	(%)
Model					
Naïve Bayes	100	11	105	0	51.39
Logistic Regression	70	83	33	30	70.83
Random Forest	68	79	37	32	68.06
Decision Tree	67	82	34	33	68.98
K-Nearest Neighbour	90	94	26	37	70.83

Table: 1.3 – Confusion matrix – between Non-Obese and Frail

Confusion Matrix Model	True Positives	True Negatives	False Positives	False Negatives	Accuracy (%)
Naïve Bayes	78	11	127	0	41.20
Logistic Regression	66	103	35	12	78.24
Random Forest	54	29	19	21	79.63
Decision Tree	59	113	25	19	82.87
K-Nearest Neighbour	49	111	27	29	76.39

Table 1.3 above, illustrate the confusion matrix obtained for the prediction of Non-Obese and Frail patients. Naive Bayes and Decision Tree had the most true positives and true negatives, respectively, while Random Forest and Naive Bayes had the lowest False Positives and False Negatives. Having predicted the highest true values, Decision Tree has performed the best amongst the 5 models with the accuracy of 82.87%.

The confusion matrix for Obese and Non-Frail prediction is shown in Table 1.4. Naive Bayes predicted the most true positives, whereas Logistic Regression and K-Nearest Neighbour predicted the most true negatives. Logistic Regression and Naive Bayes have predicted the fewest false

Table: 1.4 – Confusion matrix – between Obese and Non-Frail

Confusion	True	True	False	False	Accuracy
Matrix	Positives	Negatives	Positives	Negatives	(%)
Model		J		J	, ,
Naïve Bayes	27	108	81	0	62
Logistic Regression	5	189	0	22	89.81
Random Forest	6	182	7	21	87.04
Decision Tree	9	178	11	18	86.57
K-Nearest Neighbour	3	189	9	21	88.89

positives and negatives for these categories. Logistic Regression has the highest accuracy of 89.81%, having predicted the most true data and the fewest erroneous data.

Table 1.5 below, illustrate shows the confusion matrix for the prediction of Pre-Frailty. As can be observed, models with the true positives are Naive Bayes and Logistic Regression, whereas Decision Tree has the most true negatives. On the other hand, Decision Tree predicted the least False Positives, while Naive Bayes and Logistic Regression have the least False Negatives. The models that have performed the best in predicting Pre-Frail patients are Naive Bayes, Logistic Regression, and Random Forest

Table: 1.5 – Confusion matrix – Pre-Frailty

Confusion	True	True	False	False	Accuracy
Matrix	Positives	Negatives	Positives	Negatives	(%)
Model					
Naïve Bayes	97	114	5	0	97.69
Logistic Regression	97	114	5	0	97.69
Random Forest	96	115	4	1	97.69
Decision Tree	88	118	1	9	93.37
K-Nearest Neighbour	83	113	6	11	90.74

Table: 1.6 - Accuracy Model

	Obese	Frail	Obese and	Non-	Obese	Pre-
Model			Frail	Obese	and Non-	Frailty
				and Frail	Frail	
Naïve Bayes	81.02	87.50	51.39	41.20	62.50	97.69
Logistic Regression	81.02	87.50	70.83	78.24	89.81	97.69
Random Forest	81.48	84.72	68.06	79.63	87.04	97.69
Decision Tree	79.17	83.33	68.98	82.87	86.57	93.37
K-Nearest Neighbour	78.70	86.11	70.83	76.39	88.89	90.74

achieving the accuracy of 97.69%.

The accuracies of the 5 classification predictive models, such as Naive Bayes, Logistic Regression, Random Forest, Decision Tree, and K-Nearest Neighbor, is shown in Table 1.6. When the five prediction models are compared, the table shows that Logistic Regression is the best performing model. Regression is the only model that predicts the greatest number of the highest accuracies to be compared with other models.

As a conclusion, the best performing model amongst the five predictive models is Logistic Regression as it carries the "highest accuracy" as seen in Table 1.7. Obese considerably more likely to meet the frailty criteria such as lesser walking hours, seldom physical activity performed, and low energy level. It is important to conduct predictions on Obesity and Frailty to be able to promote early detection and prevention as it can help reduce the risk of contracting chronic diseases. Discussion.

The goal of this cross-sectional study is to examine and predict the correlation between body composition and poor physical performance in a population of older community-

dwelling individuals aged >60 years. Frailty was found to be strongly correlated with obesity in our study.

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Factors Affecting the Extent to Which International Students in Malaysia Contribute to Intercultural Competence

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Abstract—Intercultural competence can be viewed as a person's capability to comprehend other cultures and to interconnect effortlessly with individuals from those cultures. There exist multiple factors that affect international students to fully contribute intercultural competence in the host country. One factor is the standard of social support international students get from the host country and the community they interact within. Additionally; the 2020 social experience mainly the covid-19 impact reshaped the social interaction which in return affected the level of intercultural competence. This paper is a qualitative study that aims to recognize and examine these factors applying the primary method of data collection through in-depth interviews approach using a nonprobability sampling method of convenience on eight participants of undergraduate international students from International University of Malaya-Wales in Malaysia. Any findings could add value to the university's vision to be an exemplary and innovative international higher education institution and to help in providing better experience for international students hence enhancing their intercultural competence contribution. Besides, findings could help in pointing out the role of local students in providing better social support to international students thus spreading awareness on that issue. Therefore; lack of support could lead the international students to feelings of loneliness and that their perceptions are incompletely understood.

Keywords—international students, intercultural competence, social support, the 2020 experience, Malaysia

I. INTRODUCTION (HEADING 1)

Due to the advancement of certain factors, such as globalization and technology, the notion of intercultural competence has grown in significance in recent years leading to a much focus on it especially in higher education. Features like intercultural knowledge as well as attitude, skill and awareness directly contribute in sustaining a degree of intercultural competence. Furthermore, the desire to seek knowledge abroad has proven to contribute to the level of individual's intercultural competence according to NAFS (2003). Parallel, international students have a major part in increasing the diversity level of the host country and the higher education institute since they bring new experiences hence this raises the level of intercultural awareness in the campus (lee & rice, 2007). Also, the level of cultural interaction increases by the presence of international

students in the campus and this leads to a greater global competence among the students which helps in building their leadership skills as well as intellectual capability (Luo & Drake, 2013). This internalization of higher institutions contributes in one way or another in presenting a good quality education and upgrading the research level which will have a positive impact towards the society. In addition, the internalization of higher education can have a major impact on the economic and political status as well as academic strength and presentation and social development of the host country (Arokiasamy, 2012). Studying abroad could help in developing a positive image towards the host culture which will eventually boost intercultural competence (Carlson & Widaman, 1988). Despite the comprehensive literature higher education internationalization, relatively, there are not many findings regarding the experience of international students enrolling in institutions in the Asian region in general, or more precisely in Malaysia (Aphijanyatham, 2010; Yusoff, 2012 as cited in Singh et al. 2014). Malaysia strives to build a system of higher education that positions itself amongst the foremost education schemes in the world.

1.0 Research aim

This research's aim is to recognize the factors that affect international students in Malaysia to contribute to intercultural competence hence it will examine how social support and 2020 social experience affect the international students using students from International University of Malaya-Wales (IUMW) as a case study.

1.1 Research Problem

In recent years, the demand for studying has abroad increased, leading a lot of students to seek education outside their country, which brings back positive outcomes, such as cultural exchange and intercultural competence. On the other side, major challenges occur throughout. Similarly, the language barrier that gives the international students a very hard time trying to interact and communicate with the local community. Additionally, International students experience situations when local students are not good communicators using the English language which creates misunderstanding miscommunication among international and local students. In Malaysian context, the spoken language is mainly Malay. Therefore; the lack of awareness regarding international students, besides language and cultural barriers can create lack of social support received from the host country, and can make the international students feel that their perceptions are misunderstood and affect their contribution to intercultural competence. Therefore in order to get the maximum advantage from international students' experience and enhance the intercultural competence there exists multiple factors. In the Malaysian context, a study conducted by Julie, et.al. (2016) on the importance of international students having social support found out that International students desired frequent social support from the host country. In addition, Sana, et.al 2018 concluded that social support was associated with greater academic and psychological adjustment among international students. Furthermore, this study will examine the effect of social support as well as 2020 social experience mainly the covid-19 impact and how it reshaped the social interaction which in return will affect the level of intercultural competence. The author believes that any findings could be applied to add value to the university's vision to be an exemplary and innovative international higher education institution and that it could help in providing better experience for international students hence enhancing their intercultural competence contribution which will fulfil the university's vision to produce graduates who can meet the global demand and add value to the different fields of physical and social sciences. On the other hand, the findings could help in pointing out the role of local students in contributing towards providing better social support and experience for international students thus raising and spreading awareness on that issue.

1.2 Research Objectives

- To study the impact of social support on international students in Malaysia towards contributing to intercultural competence.
- To study the impact of the 2020 social experience on international students in Malaysia towards contributing to intercultural competency.

1.3 Research Questions

- 1 What is the impact of social support on the international students towards contributing to intercultural competence?
- What is the impact of the 2020 social experience on international students in Malaysia towards contributing to intercultural competency?

II. LITERATURE REVIEW

2.1 Intercultural Competence

Intercultural competence can be viewed as a person's capability to comprehend other cultures, and to be intelligent to interconnect effortlessly with individuals from those cultures. Deardorff (2006) defined this concept as the act of behaving in an effective manner while taking

into consideration the factors of intercultural knowledge, attitude, skills and reflections. It comprises skills and competencies, attitudes, awareness, behavior, and perceived views of other values which are vital for existing in a world that is shaped by globalization and technology (Deardorff, 2010). Intercultural competence expands on the basis of knowledge and attitudes towards other cultures; it also promotes contact with persons from other cultures and adaptation to a new culture for individuals (Günçavdı & Polat, 2016). Kim (1991) suggests that intercultural communication competency results from adaptability, or the individual's capacity to suspend or modify some of the old cultural ways, to learn and accommodate some of the new cultural ways, and to creatively find ways to manage dynamics of cultural difference/unfamiliarity, intergroup posture, and the accompanying stress. Holmes and O'Neill (2012) studied the peer (preparing, engaging, evaluating, and reflecting) model as an instrument for intercultural competence. It is grounded on an ethnographic approach to advance and evaluate intercultural competence by the means of thoughtful communication with somebody from a diverse culture. Meanwhile, an integrated model of intercultural communication competence (Arasaratnam & Banerjee, 2011) was established based on the findings of Arasaratnam and Doerfel (2005), who used an emic method to discover five variables linked with intercultural competence. These variables intercultural training/experience, empathy, motivation, attitude toward other cultures, and listening. Basically, actual intercultural communicators should necessarily have a thoughtful mechanism of cultural communication variances, a skill to overcome those obstacles, and a wish to use those talents. Moreover, The u-curve theory which was developed by Lysgaard (1955) and applied in crosscultural research (Black and Mendenhall, 1991) suggests four stages for socio-cultural adaptation. The first stage is known as the honeymoon stage where the individual is experiencing excitement for the new culture and environment. In the second stage the person will experience disillusionment or culture shock as they are trying to cope up with the living style of the new culture and this continues till the third phase of adjustment stage where they slowly adapt and develop behaviour patterns according to the new culture and that finally leads to the mastery stage where they will have the potential to fully function in the new culture (Black & Mendenhal, 1991) and this could be applied in the intercultural competence context where it is clearly observed that international students who spend more years in the host country like 5 or more can develop and achieve a better intercultural competence than those who spend less years, the more time spent the more international students can adapt and understand the culture and figure out ways to interact with it. it is about how long they stayed in the host country. Furthermore, Salisbury et al. (2013) on the effect of study abroad on intercultural competence among undergraduate college students applied Allport's (1954) contact hypothesis, which proclaims that communications among persons from diverse cultures decreases prejudgment and expands intercultural competence.

2.2 Social Support

Social support relates to the level of encouragement that a person recognizes from their close social network's in terms of general or unique supportive behaviors and this close network can include their friends or peer helpers which help them overcome adverse moments and excel their competitiveness (Dao, Donghyuck & Chang, 2007). Social support affects physical and mental performance positively (Piko, 1998). Students who decide to pursue studies abroad can experience lack of social support from their close network of colleagues and peer helpers that help them in coping up with stressful times (Chuah & Singh, 2016). Therefore, loss of a supportive environment could lead to depression, anxiety and loneliness (Sandhu & Asrabadi, 1994). In addition, van Gorp et al. (2017) discussed the direct correlation between getting social support and the degree of performance in the academic aspect. Cohen and Wills (1985) explored the "buffering hypothesis" and the "main effect hypotheses on someone's mental well-being from the effects of social support. They suggested that support serves as a "shield" from stress and tension, and that it helps to alleviate the level of stress by giving solutions to the issues that are concerning the individual at a certain occasion. Henceforth, they presented four magnitudes of social support namely emotional, practical, informational and social companionship. Stress and coping theory (SCT) discuss how people adjust and deal with new challenges that come with adjusting to a new culture and environment and how they navigate through using certain tools and skills (smith & Khawaja, 2011). On the other hand, positive communication among international and local students is viewed to improve social gratification and social support (Hendrickson, Rosen & Aune, 2011). These interactions are divided into co-national networks, host national networks and multi-national networks (Bochner, Mcleod, and Lin, 1977). In IUMW there is the international student association which acts as a cultural as well as welfare club for international students therefore we can view that as a level of multi-national networks. Malaysia is viewed to express high levels of success when it comes to attracting a great number of international students by presenting a low educational fees and high standards of education material (Ahmad & Buchanan, 2017). However, the variance between the students' particular prospects and the reality of their Malaysian experience renders them highly prone to the deleterious effects of acculturative stress, which can influence their academic adjustment and psychological well-being (Martirosyan et al. 2015). Numerous reasons have been described to influence the level of pressure and anxiety among international students in Malaysia. For instance, the struggle in fully grasping lecturers' accents or slang, given the multiethnic population in the country hence it could have an undesirable influence on international students' academic alteration.

2.3 The 2020 Experience (Covid 19)

Covid-19 (corona virus) has impacted everyday lives and affects the global economy. Many countries lock up their citizens and impose strict quarantine to prevent the spread and control the situation (Haleem et al.2020). Furthermore, these effects extend to the international students who study in Malaysia. Higher education institutions paused physical classes until further notice, and replaced them with online classes, many of the international students went back to their home countries and others got stuck in Malaysia. Thus, this pandemic has affected the social, educational,

emotional or mental experience of the international students as well as their contribution to intercultural competence, somehow. For instance, since the classes became online, it has limited the interaction among classmates and lecturers and tied it up with the limitation of time and place. And limited socializing with friends, university mates and national students, due to the social distance system and the lockdown rules that Malaysia and other governments are implementing, which reduce the interaction and the cultural exchange. On the other hand, covid-19 pandemic has an effect on emotional and mental health where international students who are still staying in Malaysia whether due to some reasons or whether they are stuck due to the closure of air traffic, that prevented them from returning to their home countries and families. Thus, it leads to lack of emotional support and has a negative impact on mental health.

III. RESEARCH METHODOLOGY

3.1 Research design

This research applies qualitative method design which is designed to give a detailed description of a particular program, experience or setting (Mertens, 2014). On the other hand, a case study approach of a qualitative method will be conducted in this research through in-depth interviews. Case study is a methodology requiring a detailed analysis of a particular event, or an incident, of the phenomenon being studied. A case could be focused on any number of analytical units: an individual, a group of persons, or perhaps an incident (McDuffie & Scruggs, 2008).

Moreover; the reason for the specific interview questions that were chosen for this research is because the majority of them were used and improvised in previous post-graduate level of studies. More quotations were added under supervision.

3.2 Procedures of data gathering

This research is going to adapt the primary method of data collection using in-depth interviews. In- depth interviews are beneficial when the aim is to find detailed and deliberate information about an individual's thoughts and behavior patterns or simply planning to explore new issues more deeply (Boyce & Neale, 2006). The main criteria of choosing this approach is that it helps in attaining more deliberate and comprehensive data compared to other methods like surveys while at the same offering a more comfortable engagement (Boyce & Neale, 2006). The data for this study is collected through in-depth interviews. These interviews were conducted through one to one interview, where 8 international students from the International University of Malaya-Wales, are interviewed one by one. The minimum interview in length lasted 32 minutes, while the longest interview in length lasted around 1 hour and 50 minutes. Each interviewee is from a different faculty and academic year. All of the participants are approached individually through social media platforms such as; Whatsapp, Instagram and Telegram. Right after all the 8 interviewees agreed to be part of the interview, online meetings were scheduled through Zoom. The interview questions were sent to the interviewees beforehand so it will allow them to prepare some answers.

IV. DATA ANALYSIS

4.1 Results

This paper involves in-depth input from 8 international students, from different countries and continents (Asia, Africa and Europe). All interviewees are students at The International University of Malaya-Wales (IUMW) from 2 main faculties which are; Faculty of Arts and Science, and International Business School.

International Competence

Question 1: What things did you find difficult to understand and adapt to in Malaysian culture?

According to the participants' input; adapting to the Malaysian food, weather, and language were the major issues that international students had to understand and get adapted to. On the other hand interacting with the local community and befriending them was another struggle that was faced by the international students.

Question 2: How long did it take you to comprehend Malaysian culture?

According to the interviewees' feedback; most of the international student find it easy to adapt to the Malaysian culture that they adapted pretty quickly, others consider the Malaysian culture and norms is a continuous learning process that they learn new things every time, while others the mentioned that it took them around 6 months to 1 year to normalize themselves to the environment, context, and lifestyle of Malaysia.

Question 3: What are things in Malaysian culture that you could achieve through intercultural competence or couldn't? mention some.

According to the students' input on this; some international students are very interactive and comfortable with the Malaysian culture, while others are not familiar with the absent of the minor interactions that happens usually among the public, the assumption that local community make towards foreigners, and the communication style, such as the word "lah" which is considered a slang. In addition, some international students are not familiar with the Malaysian heavy breakfast like rice or eating with using the hands.

Therefore, there are several themes that were occurred through discussing intercultural competence, such as;

- 1) Language barrier: The language spoken in Malaysia is Malay, which is considered to be the biggest challenge faced according to international students. "The primary form of communication and language is Malay. Most of the things here were in Malay, so I had to get used to them and figure out alternatives. I always keep my phone with me to google things I don't understand instantly" -Jazib (Pakistan/Emirates).
- 2) Different cultural background: The dominant religion in Malaysia is Islam, and shaking hands

between men and women is not encouraged in Muslim societies. "As a new person I meet you, we're greeting each other, and we shake our hands. Now, for instance, coming to Malaysia I found that shaking the hands of the opposite gender is an issue. But back home it's basically nothing" -Victor (Nigeria).

3) Different values: To some cultures insisting on sharing food with guests is a form of hospitality. But, in Malaysian culture, some may not have the same belief or value. "In our culture, when guests come to our home., we serve them, we serve everything. We believe that guests will be shy. That's why we force them to eat and tell them to not be shy. But in Malaysia it's totally different; they don't force you to eat or drink something, more relaxed" -Aynur (Xinjiang, China).

Social Support

Question 1: Where do you seek/get social support from?

According to interviewees' input on the sources of social support; all the international students seek social support from other international friends who are close to them, their family members, and people from the same community as them.

Question 2: Do you feel that people you have met in Malaysia, understand your perceptions and culture? According to interviewees; most international students feel that their perceptions and culture are not completely understood by locals or people they met in Malaysia; however, some internationals make efforts to explain to the people around them about their culture

Question 3: Have you experienced times of loneliness related to your different cultural background and to what extent?

According to the input received from participants; all international students experience feelings of loneliness especially when they are the minority in a group in which most of the members are Malay- language speakers, when they can't find communicate with their native language most of the time, when their perceptions are being misunderstood or when the don't find others who share same interest as them.

Question 4: Does anyone here help you to deal with these challenges and hardships, such as your local peers, family support, or any international officers in your university?

According to the inputs received from students on this question, international students receive help through hardships they face from their friends and family members as well as their university "IUWM". However; to some internationals; the university wasn't very helpful towards their issues.

Therefore, there are several themes that were occurred through discussing social support, such as;

1) Emotional barrier: The research "The Role of Social Support for International Students' Adjustment" discussed that support sources including

academic peer groups, student support services and friends help to reduce stress and assist international students in their psychological adaptation (Brisset, Safdar, Lewis, & Sabatier, 2010; Sümer, Poyrazli, & Grahame, 2007), and enhance academic performance (Rienties et al., 2012). Without addressing their stressors, international students may eventually develop physiological, emotional and psychological health issues (Hamamura & Laird, 2014) that would affect their learning, engagement (Suárez-Orozco, Onaga, & de Lardemelle, 2010), and cademic and social competence (Duru & Poyrazli, 2007). "Biggest challenge is managing the emotions, Being far from your parents and here like I've been two years far away from my parents, my friends, so you have to put your emotions aside sometimes you feel you're not welcomed here especially in governmental sectors" -Hamed (Yemen).

2020 Experience and Covid 19

Question 1: Tell me more about your study experience of 2020? How can you describe your 2020 and cultural experience? The good and bad.

According to interviewees' responses on 2020 study experience; it was very tough for the international students to keep up with the online classes since it was demanding sometimes, or shorter than it supposed to be, or not efficient and informative enough especially when it comes to practical subjects such as math, in addition it was lacking the study environment where students were struggling with studying from home. However; international students were aware of the fact that it saved more time, and it suited students whose study field related to computer science. On the other hand, the 2020 cultural experience was almost absent due to the fact that the physical interactions were extremely limited, students were stuck at home and educational institutions were closed.

Question 2: What is the most difficult part about it?

According to the responses received by the interviewees; on what they think it was the most difficult in 2020, All international students agree that the quarantine, restrictions of movement and travel, outdoor activities, online learning as well as the tough financial conditions were the most difficult part in 2020, due to the obstacles they created to make it more challenging and troublesome.

Question 3: What experiences in this country have made you feel good and valued?

According to the interviewees' input; international students feel values when they get appreciated, welcomed, treated kindly and respectfully by the local community. they feel valued when they contribute to their environment and have a positive impact. They feel good and valued when they experience new activities that expand their knowledge and skills, when they are given the space to express and share their cultures with the Malaysian local community.

V. LIMITATION

- 1- Due to the Covid19 pandemic; all interviews were conducted virtually via Zoom from behind a screen which limited the body language and non-verbal communication.
- 2- Finding contact with first-year international students was limited due to the fact that campuses are closed and classes moved from physical to online.
- 3- The sample size for this research is eight international students which is considered quite small.

VI. DISCUSSION

This research was conducted in the Covid19 pandemic era which created a lot of difficulties and challenges to get solid interviews and find international students to gather data from since the majority of them went back to their home countries due to online learning. Thus, all interviews were conducted online which created more barriers such as technical issues and absence of physical and face to face interactions. The author would recommend to conduct this research physically face to face because the author believes that body language is very important in communicating with other students as it helps to avoid misunderstanding and provide a deeper comprehension to details and explanation given by the interviewees. It will also help save time by avoiding technical problems.

VII. CONCLUSION

Due to the improvement of certain factors, such as globalization and technology, the notion of intercultural competence has grown in significance in recent years leading to a much focus on it especially in higher education. Malaysia has a rich history in the educational system, a variety of choices when it comes to higher educational institutions whether they are public or private institutions which attract international students and make Malaysia a targeted destination. Besides what mentioned, studying abroad has its challenges that international students face specifically; studying in Malaysia. Therefore; cultural competency can be viewed as a person's capability to understand other cultures, and to be intelligent to interconnect effortlessly with individuals from those cultures. Additionally, social support is a major need for international students, especially those who are far from their home country and family members. Moreover, positive communication among international and local students is viewed to improve social gratification and social support (Hendrickson, Rosen & Aune, 2011).

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Attitude and Challenges Towards The Use of Social Mobile Apps Among Empty-Nest Seniors

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Abstract— The use of social mobile apps among the elderly is becoming an apparent growth. This phenomenon is mostly contributed by the empty-nest seniors in China to battle loneliness. Despite various types of apps were developed for the 'silver hair' societies to help them stay connected, the analysis of usability and challenges faced by the elderly remain insufficient to meet the needs. This preliminary study sets out to examine the attitude and ways to manage difficulties encountered by the empty-nest elderlies in China towards the use of social mobile apps. Through purposive sampling, survey was conducted in April 2021 among 102 Chinese seniors age between 60 to 75. Study shows that majority of elderlies claimed to have good control over screen time (45.1%). 66% of seniors are more connected with friends instead of family members (34%) and by maintaining their presence, they most preferred leaving comments and giving thumb up on their friends' social posts (86%). Study also discovers that when seniors faced difficulties such as password lost, security problems and stress over cyber fraud, 50% will seek help from family members. However, half of the elderlies will eventually turn to their friends after not receiving help from family (25%) while 14% prefer to learn to solve the problems by themselves. This study suggests that user experience design is deemed critical to better support the positive attitude of using social mobile apps among the empty-nest seniors.

Keywords—empty-nest seniors, social mobile apps, UX design, usability challenges, designing for elderly

I. INTRODUCTION

As the second largest global economy, China currently houses the world's largest population of 1.4 billion (19.13% of the world population) who are highly active internet users. Among the total population, the silver hair user is accounted for 16.9% which means one in every six internet users is senior citizen. The recent statistic report on the Internet Development in China predicted that by 2050, there will be an increase of 400 million of frequent users of internet aged more than 65 years old (26.9% of the total population), and 150 million more with the aged of 80 years and above [1]. Such growing phenomenon is associated to empty nester issues faced by the elderly as a coping mechanism to battle loneliness, seeking for social support and affective responses from people [2].

This situation was quickly picked up by mobile application (apps) developers shifting their product focusing on the senior users and a large variety of mobile apps are rapidly developed. However, the design of mobile apps has put less consideration of how the elderly will use the mobile apps. Recent study revealed that more than 50% of Chinese seniors are facing difficulties using mobile apps with majority of them highlighting their poor eyesight as a prime factor. There were at least 30% of seniors have no idea how to use the functions offer in the apps and 20% were having

difficulty understanding the words and emoticon use by young people (figure 1). The data further stressed that when social mobile apps claimed to be senior centric, yet the needs and prominent demands required by the senior users are obviously lacking. Hence, there is a persistent need to examine the user experience (UX) design which is key to enable users to reach their pragmatic and hedonic goals [3].

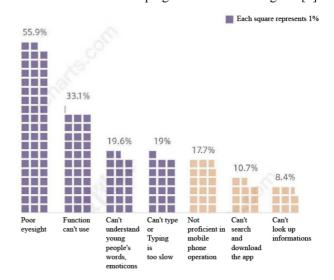


Fig. 1. Difficulties faced by China senior citizens when using mobile apps [4].

A. Statement of Problem

Data shows that social mobile apps are the most popular activities among senior citizens in China. More and more social mobile apps become senior citizens indispensable assistants, especially the empty nesters who are dealing with limited offline activities during situation such as the outbreak of covid-19 [5]. However, study shows that mobile apps designers have not had the opportunity to work closely with senior citizens which resulted in the lack of consideration for 'elderly friendly' interface design in mobile apps.

Such situation has led to many seniors struggle when using mobile apps and in some worse case scenarios, they decided to stop using the mobile apps [6]. Further report has highlighted that these seniors are losing the quality of life to socialize as interaction and engagement through mobile apps is one key determinant to help prevent or delay Alzheimer Disease (AD) and decrease symptoms of depression [7, 8].

Moreover, despite many mobile apps' main users are senior citizens, yet the special needs and features that are often required by the senior are not adapted in the UX design [9]. Zhao [10] further stressed that attention to a good UX in

the mobile apps design will better promote the desirability and usability of the platform for the seniors. This approach showcases respect and care for the distinctive users like seniors whose physical and mental health are equally as important as others [11].

This study sets out with the main objective to examine the attitude and challenges towards the use of mobile apps among empty-nest seniors in China. This study is guided by three research questions:

- 1) What are the attitudes among China senior citizens when using mobile apps?
- 2) What are the challenges encounter by China senior citizens when using mobile apps?
- 3) How do the China senior citizens tackle challenges when using mobile apps?

II. LITERATURE

A. Empty-Nest Seniors

Today's China society appears a large number of "Empty Nesters" due to the implementation of single child policy in the country. Empty-nesters is also regarded as a representative of the current China's aging population whereby children leave the parents because of work commitment or marriage, thus, the senior citizens are commonly left to live by themselves. More often than not, this arrangement has put many seniors to experience loneliness. 2018 studies show that China has nearly 250 million of population who are age 60 and above and they appear to be empty-nest seniors [12]. They often lack proper care, and many suffer apparent issues such as poor physical and mental health in China [13].

Furthermore, according to studies, the emotional changes among empty-nest seniors are increasingly obvious where they become worrying about physical diseases feeling anxiety, as well as fear of the lack of social interaction resulting in a lot of negative emotions in themselves. Self-abasement and depression are very common traits among the senior citizen groups. With the gradual growth of age and retired from work, not only they are facing more problems with the body function, they often feel they have lost their values. As a result, they became sensitive, portraying trivial temper, feeling abandoned and alienated [14]. Thus, in order to battle loneliness and feeling isolated, more and more seniors are relying on mobile phones and mobile apps to seek connection and gain happiness through interaction with others apart from their families.

B. Seniors and the Use of Mobile Apps

With the rapid escalation of mobile Internet users that reached 99.1 percent of internet users in China, the proportion of the senior citizens as internet users is comparatively increasing. There is a sharp increase of users with the age of 60 and above from 6.6 percent to 6.9 percent in 2019 and according to statistics, the number is expected to rise to 17% in the following year. The widespread trend of the users among seniors is predicted to take over a major market [15].

The social mobile Apps such as WhatsApp, WeChat and LINE are typically popular among the seniors in China. Most of these applications offer free messaging capabilities

and are helpful for users to connect with their friends immediately. In addition, there are many Information and Communications Technology (ICT) tools have also been developed for improving the well-being and health conditions of seniors in recent years specially to enhance the emotional well-being that foster social inclusion and facilitate communication with family and friends [16].

Significant evidence from the literature suggests that these kinds of technology interventions aimed at improving older adults' well-being and enhance their cognitive performance [17]. Research provides conclusive evidence that the use of mobile devices helps seniors with their self-realization, psyche, socializing, and self-confidence. Mobile applications also have some key benefits for senior citizens such as providing safety and security, healthcare, socializing, and entertainment; improvement of quality of life of elderly people [9].

C. Attitude and Challenges of Using Mobile Apps

With mobile phones become an important entertainment and engagement tool for the senior citizens to relieve the loneliness, report suggests that the average daily usage time of senior citizens over the age of 60 is 16.2 minutes more than the average users and those who are over the age of 40. Senior citizens seem spending as much time on the mobile internet as young people and have established a fixed online life trajectory [18]. Data further show that social platforms, video apps and information apps are the most popular platforms among senior citizens in China. In particular, video apps are the main entertainment form among senior citizens whereby the short video app is generally more popular and preferred by the elderly populations. They also have prominent demands for information apps as well as preference for different kinds of news apps to keep themself occupied [5].

Unfortunately, the elderlies are at increasing risk of being digitally marginalized due to lower tech savviness [19]. The technology barriers such as the UX remains a challenge among the elderly and at the same time apps designers are not adopting and giving consideration to ease the needs of senior citizens [9]. As the growth of age, the vision, auditory, cognitive ability, motor ability gradually declines, color recognition ability and contrast visual acuity continue to decrease. The problems in the design of mobile apps such as too small a font, too many functions that require coordination and too complex a menu structure is designed had all contributed to the levels of difficulty and as a result, seniors gradually losing confidence in using mobile apps is inevitable [20].

Furthermore, research shows that almost 100% of the elderly users had persistent problems when using mobile apps. For example, they often require more time to be familiarized with certain function in an apps [21]. Although there are several recommendations on how to tackle issue of visual, psychomotor and cognitive through UX design, many of the mobile apps that are currently offered in the market is still seemingly lacking design features to ease the usability of seniors [3]. That said, UX design is fundamental to support the needs of elderly users.

III. METHODOLOGIES

A. Sampling and Data Collection

This study employed a questionnaire survey to achieve the stated research questions. Based on the cross-sectional study approach, the data collection was conducted in a single period of time from April 2021 to end of June 2021 at main cities of Zhengzhou and Luoyang, the capital of Henan Province in China. According to the latest survey data in 2020, the province is the second city that houses the largest aging populations in the country with 13.6% of the total population who are aged 60 to 75 years old. Additionally, the city was identified as the National Smart Health Elderly Care Application Demonstration Foundation since 2017 hence is deemed suitable to carry out this research.

With a total population of 1.275 million in the province, this research utilized a sample size of 102 as a pilot study determined based on Krejic and Morgan's sample size calculation [22]. The sample size calculation was based on p = 0.05, where the probability of committing type I error is less than 5 percent or P < 0.05. In this research, senior citizens were the targeted respondents based on the selection method using purposive sampling. Such sampling was made on the basis of the similarity in their living arrangement as empty nesters and are between 60 to 75 years old. Criteria such as qualification, income and marital status were not part of the selection consideration in this study.

The survey employed an online questionnaire platform and distributed to 150 respondents. With periodic reminders and invitations, 102 surveys were eventually collected by the researchers. Participation in the survey was voluntary, and the respondents' consents were obtained prior to the start of the survey. During this process, participants were assured regarding the confidentiality of their responses.

B. Study Instrument Development

The instrument of this study consists of the survey questionnaires adapted from Research Report on the Internet Access of the Elderly in 2019 and QuestMobile 2020 Silver Economy Insights Report [5]. The questionnaires were designed to examine the use behaviour of internet among the elderly. The instruments were designed in dual languages (Mandarin and English) and the number of questions were sorted accordingly by the researchers. The questionnaires had undergone words checking and administered by a professional translator for further verification. Such a process was deemed necessary to minimise translation error.

The survey questionnaire consisted of three sections in total. Section one encompassed basic demographic information while section two consisted of questions related to attitudes of using mobile apps among the seniors. Third section was designed to examine the obstacles encountered among the elderly when using mobile apps. The data were analysed using Statistical Package for Social Sciences (SPSS) version 25 through a univariate statistical analysis to provide a synthetic description of the basic features. Research study regard univariate analysis as part of descriptive statistics which is one common approach used in studies to enhance understanding of individual variable in a

sensible way as well as studies to examine product users [23]. In addition, it is worth noting that this study had only performed descriptive analysis because the subject studied did not intend to imply specific pattern of correlation taken on the same unit at different times.

IV. RESULTS AND DISCUSSION

A total of 102 respondents participated in the study and their socio-demographic characteristics are shown in Table 1. The sample disclosed that 48.04% were female and 51.96% were male. Among the respondents, 50% were aged between 60 – 64 followed by 65 – 69 years old (22.22%) and 27.78% were aged 70 – 75 years old group. Result shows that majority of the respondents were living only with their spouse (47.22%) while 30% still living with the spouse and children. Respondents who are single and lived with children accounted for 16.67% while 5.56% of respondents lived alone.

TABLE I. CHARATERISTIC OF RESPONDENTS PARTICIPATED IN THE STUDY

Characteristics	Frequency	Percentage
Gender		
Male	53	51.96
Female	49	48.04
Age		
60 – 64	51	50
65 – 69	23	22.22
70 – 75	28	27.78
Living Arrangements		
Only living with spouse	48	47.22
Living with spouse and children	31	30.56
Single elderly living with children	17	16.67
Living alone	6	5.56
Living Areas		
City area	99	97.22
Rural area	3	2.78

A. Attitude of Using Mobile Apss

Based on the findings, it was revealed that senior citizens have their own demands toward the use of mobile apps. Results show that the seniors use social mobile networking for the longest time, and their demand for news and information is much higher compare other younger age groups. A total of 87.25% perceived the use of social mobile apps help them relieve pressure and emotions while only 12.75% of the senior citizens disagreed (figure 2).

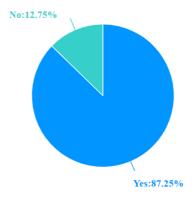


Fig. 2. Majority of the senior perceived the use of social mobile apps help them relieve tensions.

In addition, senior citizens were asked how much time they actually spent on social mobile apps each day. Results discover that 45.1% of the senior citizens used social mobile apps for less than 1 hour; 31.37% used social mobile apps for 1-2 hours; 15.69 used social mobile apps for 2-4 hours, 5.88% used social mobile apps for 4-8 hours, and only 1.96% used social mobile apps for more than 8 hours. Findings portrays an obvious good control over screen time among the elderlies on daily basis.

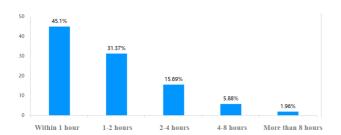


Fig. 3. Majority of seniors displayed good control over daily screen time.

In figure 4, it was found that between family and friends, more than half of the respondents are connected with their friends (65.69%) more often than with their families (34.31%). Findings in figure 5 further disclosed the preferred approaches to stay connected and maintaining presence among the elderly are by leaving comments and giving thumbs up on their friends' social postings (86.27%). Only a small number of respondents prefer to browse the social mobile apps without further interaction (13.73%).

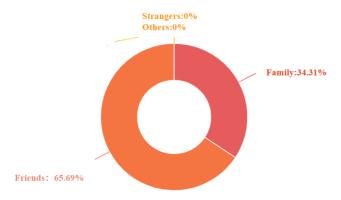


Fig. 4. Seniors are connected with friends more often than with their families.

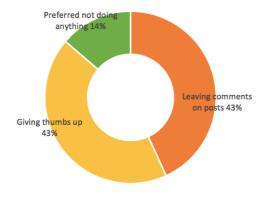


Fig. 5. Seniors are connected with friends more often than with their families

B. Challenges of Using Mobile Apss

This research further probes to better understand what challenges were encountered by the seniors. Results in figure 6 reveal that although majority of them have not experienced serious network security issues, there was a small number of respondents experienced cyber fraud (3.92%). Other than that, a total of 11.76% had experienced password lost while 14.71% of senior citizens had faced issues such as personal information disclosure.

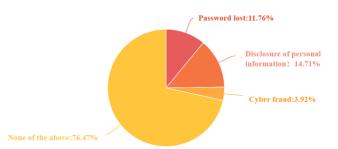


Fig. 6. Network security issues faced by seniors when using social mobile apps.

Study further discovered that when seniors faced difficulties such as password lost, security problems and stress over cyber fraud, 50% of the senior citizens will initially turn to their families for help. However, half of the elderlies will eventually turn to their friends after not receiving help from family (24.51%) while 13.73% prefer to learn to solve the problems by themselves and only a small number will seek help through online customer service (11.76%).

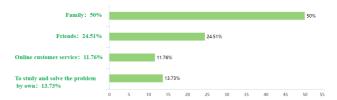


Fig. 7. Half of the senior citizens will turn to their family members for help when they have trouble using social mobile apps.

V. CONCLUSION

A total of 102 senior citizens participated in the study, 51.96% were male, 48.04% were female. 50% were from 60-64 years old group, 22.22% were from 65-69 years old group, while 27.78% were from 70-75 years old group. All of the respondents were senior citizens in China from major city of Henan provinces. The study revealed that most of the senior citizens believe that social mobile apps help them relieve pressure and enable them to express their emotions. Findings also show that the elderly have better control over screen time on a daily basis when compared to other age groups.

The empty nester seniors like to communicate with others on social mobile apps. The people that they contact most regularly are friends instead of family members. However, with a basic mark of old age, slowness of behaviour affects both body and mind that resulted in the slowness of reaction, physical and mental task performance [24]. Such slowness also reflected on the ability to solve challenges such as password lost, security problems and

cyber fraud. Study shows that the seniors would first turn to family members to seek help, however, they will eventually turn to their friends for help after not receiving assistance from families. Nevertheless, a small number of empty nesters would still prefer to solve the problem by themselves other than seeking help from customer service. On the overall findings, it is clear that senior citizens in China perceived positively towards the use of social mobile apps despite some difficulties.

A. Implications of the Study

Throughout the study, it was discovered that as China is evolving into an aging society, the number of elderly mobile apps users is rapidly rising at the same time. Despite some difficulties encountered among the seniors when using social mobile apps, this preliminary study also revealed that the platforms had enabled them to adjust their stress more properly, it helps relax their mood and allowed them to improve their happiness index. In order to better help the use of social mobile apps, the UX design is key elements to be looked into.

According to Roman Berezhnoi, designing for older adults is a significant part of the UX design [25]. Trends had indicated that there are more and more elderly users tend to use mobile apps. Yet, poor usability will badly affect the elderly more than it affects younger people. Therefore, it is important to give more considerations especially attention to features design that are more preferred and user friendly for the senior citizens.

In addition, this paper stresses one particular area. With enhancement on the mobile apps design, not only it helps to elevate the need to meet the demand of the senior citizens for mobile apps design, it will aid social emotional learning among elderlies. In another word, an improved social mobile apps will be beneficial to support the empty nesters' self-awareness, self-management, social awareness and relationship skills moving forward.

B. Limitations and Future Research

Although the study has contributed to the attitudes and challenges of elderlies' literature, there are several limitations that should be considered for future research endeavour. Firstly, with the current sample population employed in this study, it is indispensable to look into areas where senior citizens who are the minority residing in the highly commercialized cities. Secondly, as this study is based on questionnaires survey and serve as a preliminary data, future research should include interviews in order to obtain an in-depth understanding of empty nesters.

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