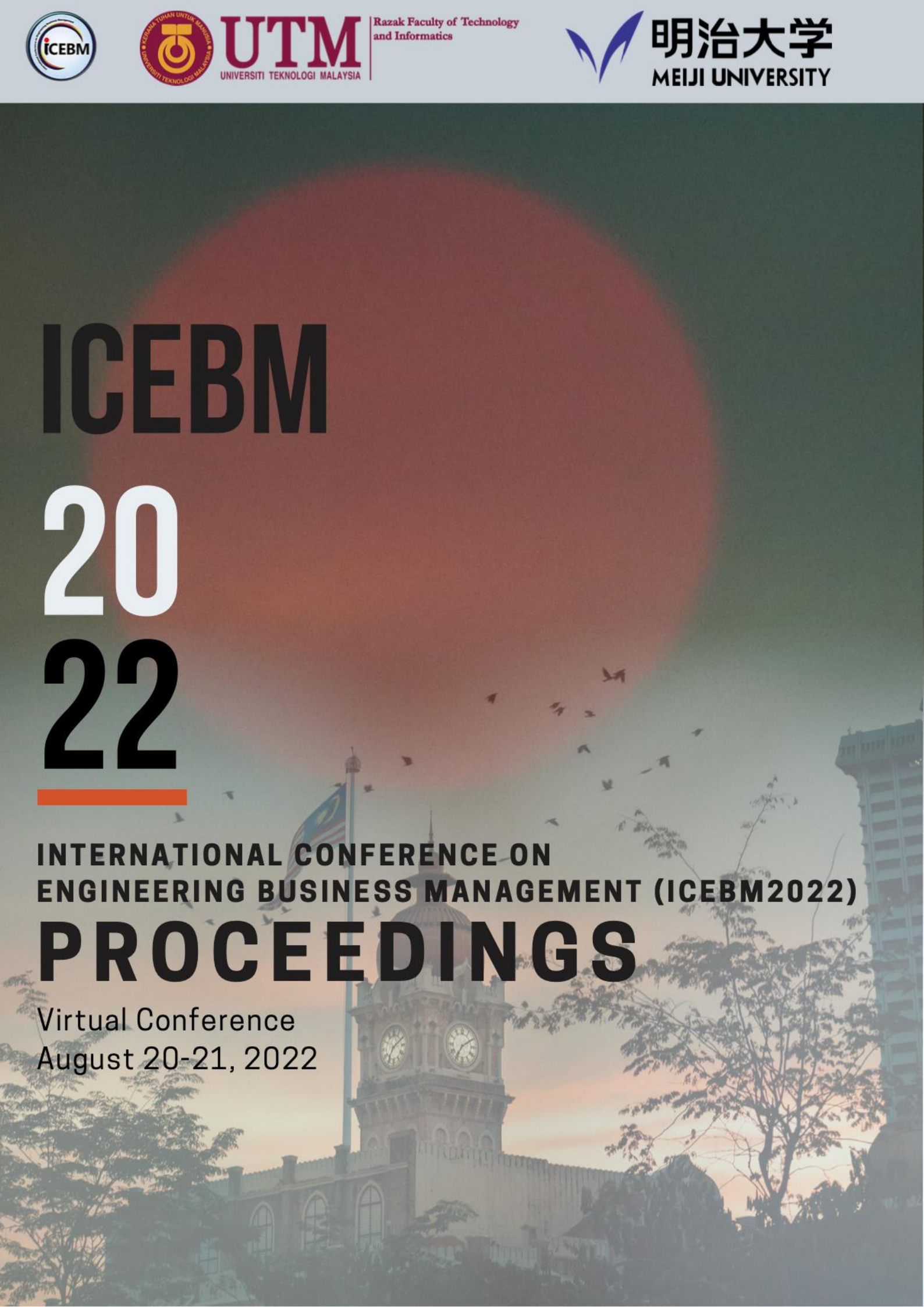
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About International Conference on Engineering Business Management (ICEBM)

International Conference on Engineering Business Management (ICEBM) is the product of the Double Master Program (DMP) established between Universiti Teknologi Malaysia and Meiji University in 2010. The first ICEBM was successfully held at Equatorial Hotel, Melaka in September 2012 with participation of researchers from both Japan and Malaysia in the area of engineering business management. It has paved the way until now, the eleventh ICEBM was successfully hosted virtually by Razak Faculty of Technology and Informatics, UTM Kuala Lumpur in August 2022. This clearly shows the strong commitment from both, Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia (UTM) and Graduate School of Business Administrative (GSBA), Meiji University in establishing long term academic collaboration that is of benefits to both institutions. The conference act as a bridge to strengthen the bond between UTM and Meiji University in many ways.

The purpose of the virtual conference is to continue sharing the knowledge and experiences in research as well as to establish academic network between the two universities. Participations are mainly from post graduate students from both institutions to encourage them to present and defend their work confidently and improve their research. This could be a platform for the participants to write high quality articles in the future. It is also a venue to expose the participants to establish networking and generate discussions for potential collaborations virtually. This conference can give opportunities for participants from both countries to communicate and learn from each other not only in terms of academic research but also the culture.

Presentation form distinguished keynote speakers certainly enlighten to the history and future trends of economic relationships between Malaysia and Japan. Articles published in the proceedings are deemed beneficial to the engineering business management research area. Some of the findings might also applicable to some of the organizations particularly in dealing with their industrial issues.

Table of Contents

Effect of Media Attention on Earnings Management in China-Based on the Moderating Effect of Internal Control

Wang Houyi[1], Maisarah Mohamed Saat[1], Wang Lijie[2]

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Abstract – *This paper discusses the relationship between media attention and earnings management, including real earnings management and accrued earnings management. According to the empirical regression results, media attention negatively affects earnings management and real earnings management, but cannot affect accrued earnings management. In addition, internal control can moderate the relationship between media attention and earnings management. When the dependent variable is changed to real earnings management, the conclusion is the same. But internal control cannot moderate the relationship between media attention and accrued earnings management. Because accrued earnings management is just the number in the financial report, real earnings management is the true earnings in the listed companies. This paper is meaningful for the external supervision method of media to Chinese listed companies.*

Keywords: Media Attention; Earnings Management; Real Earnings Management; Internal Control

1. Introduction

Earnings management is an important issue in Chinese listed companies, which has impact on the development of economics and society. Although a certain degree of earnings management permitted by law is regarded as legal behavior, excessive earnings manipulation activities will reduce the reliability of financial information (Wei, 2000; Fang & Zhang, 2016; Li & Zheng, 2018; Li & Zhang, 2021). Therefore, how to restrain the excessive and unethical earnings management behaviors of enterprises has become an important research issue.

Media is a bridge that promotes communication between the information source and the information receiver. On the other hand, media attention also influences the behaviors of earnings management. According to Information Asymmetry Theory, the degree of mastery of transaction information by both parties to a transaction is often asymmetrical, and the differences include information quantity and information quality (Qi, Yang & Tian, 2014; Yu, Sun & Pan, 2019). In an opaque information imbalance transaction, the superior party will influence the value judgment and choose the information inferior party in a variety of ways, which brings issues of "Moral Hazard" and "Adverse Selection". Under this circumstance, media is an efficient way to transfer information from the perspective of an independent third party. Media disseminates information with high efficiency, and the

public can receive the financial information disclosed by enterprises in a timely manner through the media (Ma, 2017). Therefore, media attention has the effect of external public opinion supervision on listed companies. However, in some cases, the information disseminated by the media may deviate from the actual situation, which may bring misleading information to many information recipients. Hence, media attention may not only expose unethical earnings management behaviors of enterprises, but also may become a shelter for earnings management (Reinig &Tilt, 2012).

Finally, internal control is the enterprise management process in which enterprises use organizational design and various systems to effectively prevent various financial and non-financial risks (Ashbaugh, 2008; He & Xia, 2021). Therefore, this study takes internal control as a moderating variable and considers the moderating effect of internal control on the relationship between media attention and earnings management. In this chapter, it describes the background of the study, the problem and research gap, research objectives and research questions, the scope of the study, the significance of the study, and the definition of terms.

2. Theoretic Analysis and Research Hypotheses

Effective monitor hypothesis and market pressure hypothesis are important hypotheses in this section. The effective monitor hypothesis refers to the supervision and restraint effect of media reports on earnings management. Specifically, media reported on listed companies to reduce information asymmetry and enable market participants to better understand the company’s operations, thereby restricting the company’s management and avoiding violations. Here, the media has played an active role in corporate governance. Miller's (2006) research found that the media played an external supervisory role on the capital market through objective and fair reporting of listed companies and reduced the management of accrued earnings by the company's management. Lu (2012) from the perspective of protecting market investors, research shows that due to the effectiveness of media reports, company management will reduce earnings management behaviors for personal reputation and penalties by regulatory authorities. Therefore, regarding the relationship between media attention and earnings management, this study proposes Hypothesis 1:

H1: Media attention affects earnings management.
H1a: Media attention affects real earnings management.
H1b: Media attention affects accrued earnings management.

Through the bridge of internal control, media attention can help reduce corporate fraud and violations of laws and regulations, improve corporate management efficiency and investment efficiency, and reduce the volatility of corporate performance (Zeng, Liu & Zhang, 2016). Media supervision significantly affects the issuance of audit opinions, and this influence is achieved through the moderating effect of internal control. The more company receives continuous attention and reports from the media, the easier it is for the outside

world to know the true level of the company's internal control. This will cause executives to pay attention to internal control and make improvements, and auditors will tend to issue non-standard audit opinions (Zhang, Feng & Chen, 2016). Before the company's internal control has fully taken effect, media attention will affect earnings management by virtue of its own reputation mechanism. When the company's internal control has taken effect, internal control will become a natural link between media attention and earnings management. Therefore, Hypothesis 2 is proposed:

H2: Internal control moderates the relationship between media attention and earnings management.
H2a: Internal control moderates the relationship between media attention and real earnings management.
H2b: Internal control moderates the relationship between media attention and accrued earnings management.

3. Research Design

This research focuses on companies that have issued media attention and earnings management among Chinese A-Share Listed Finance Companies from 2016 to 2020. Because data before 2016 is incomplete and difficult to find. At the same time, referring to the classic literature and based on the robustness of the research conclusions, this study screened the total sample as follows: (1) exclude the samples of financial and insurance firms; (2) eliminate ST and *ST firms; (3) eliminate the samples with the missing data in the model. There are 1311 firm-year observations remaining in the sample of this study. The data of the media attention is from Baidu News Index. The data of the internal control are from the DIB database. The financial data are mainly from the CSMAR database.

In this study, simple linear regression is applied to do analysed. Firstly, simple regression models are established to test hypothesis 1, 1a, 1b, 2, 2a, 2b. Secondly, according to the level of internal control, data will be divided into different groups, then do regression to different group to see the different level of significance.

In order to test hypothesis 1, the model 1 is established as:

$$EM_{i,t} = \alpha_0 + \alpha_1 Media_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Lev_{i,t} + \alpha_4 Roa_{i,t} + \alpha_5 Growth_{i,t} + \alpha_6 Big4 + \alpha_7 \Sigma YEAR + \alpha_8 \Sigma \mathrm{IND} + \varepsilon_{i,t} \quad (1)$$

In order to test hypothesis 1a, the model 2 is established as:

$$REM_{i,t} = \alpha_0 + \alpha_1 Media_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Lev_{i,t} + \alpha_4 Roa_{i,t} + \alpha_5 Growth_{i,t} + \alpha_6 Big4 + \alpha_7 \Sigma YEAR + \alpha_8 \Sigma IND + \varepsilon_{i,t} \quad (2)$$

In order to test hypothesis 1b, the model 3 is established as:

$$AEM_{i,t} = \alpha_0 + \alpha_1 Media_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Lev_{i,t} + \alpha_4 Roa_{i,t} + \alpha_5 Growth_{i,t} + \alpha_6 Big4 + \alpha_7 \Sigma YEAR + \alpha_8 \Sigma \mathrm{IND} + \varepsilon_{i,t} \quad (3)$$

In order to test hypotheses 2, 2a and 2b, this study use grouping method. According to the different level, all data are divided into two group: low-level internal control group and high-level internal group. The score of internal control is from 0 to 1000, and the scores higher than 650 are in the high-level group, the rest are in the low-level group (Yan, Zhao, Zhao & Lin (2017). Then do the linear regression to different groups and see the different significant level of different group.

4. Empirical Results and Analysis

4.1 Descriptive Statistic of Variables

Descriptive analysis explains the socio-demographics characteristic of the sample (Wen & Ye, 2014), which contains mean, median, minimum, maximum and standard deviation. Before performing regression analysis, this study firstly performed descriptive statistical analysis on all variables involved in the modelling, so as to gain some understanding of the basic characteristics of the variables, so as to lay the foundation for the subsequent regression analysis. This table shows descriptive statistics (i.e., Mean and S.D.) of the main variables.

	N	Missing Values	Mean	Median	Min	Max	Standard Deviation
REM	1311	0	-0.005	-0.033	-0.551	0.949	0.179
AEM	1311	0	0.031	0.016	-0.252	0.569	0.092
EM	1311	0	0.013	-0.019	-0.483	0.523	0.222
MEDIA	1311	0	0.209	0.1	0.001	0.844	1.469
ROA	1311	0	0.042	0.037	-0.039	0.118	0.081
LEV	1311	0	0.616	0.655	0.237	0.888	0.188
SIZE	1311	0	23.945	23.78	22.345	25.367	1.244
GROWTH	1311	0	0.148	0.101	-0.421	1.483	0.264
BIG4	1311	0	0.32	0	0	1	0.475

As is shown in this table, the standard deviation of all variables in this paper are very small, which means these data are good for research.

4.2 Regression Results of Hypothesis 1, 1a and 1b

The results of regression are as follows:

Regression Table 2- Earnings Management and Media Attention.

	Model (1) EM	Model (2) REM	Model (3) AEM
MEDIA(IV)	-0.016***	-0.013***	-0.003
	(-2.737)	(-2.911)	(-1.040)
SIZE	-0.012*	-0.015***	0.002
	(-1.895)	(-2.821)	(0.767)
LEV	0.168***	0.213***	-0.045**
	(3.927)	(6.304)	(-2.435)
ROA	-0.148*	-0.212***	0.064*
	(-1.763)	(-3.211)	(1.795)
GROWTH	-0.011	-0.011	0.001
	(-0.447)	(-0.603)	(0.067)
BIG4	-0.024*	-0.035***	0.011*
	(-1.769)	(-3.300)	(1.946)
_cons	0.230	0.256**	-0.026
	(1.542)	(2.178)	(-0.408)
Year	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Mean VIF	1.55	1.55	1.55
F	12.20***	26.98***	2.97
Prob > F	0.0000	0.0000	0.0069
N	1311	1311	1311

**** p<0.01, ** p<0.05, * p<0.1*

For model 1, the coefficient of media attention is -0.016, indicating that there is negative relationship between media attention and earnings management. The t value is -2.737 and P>|t|=0.000, which means this regression model passes t test. F value of model 4 is 12.20 and Prob>F=0.0000, meaning that the significant level is at 99% level and regression model 4 passes F test. The pass of t test and F test both means that the linear relationship of the model is significant. In these models, year and industry are controlled. In model 1, mean VIF is 1.55<10, which means that there is no multicollinearity. Hence, the conclusion is that media attention has negative influence on earnings management. Hypothesis 1 "Media attention affects earnings management" is verified.

As for model 2, when the dependent variable is real earning management, similarly, the coefficient of media attention is negative (-0.013), and model 2 also passes t test and F test. P value is smaller than 0.01, meaning that the significant level is at 99%. Worthy of particular note is that all control variables except growth are all significant at 99% level, meaning that model 2 is the best fitted regression model in this study. Therefore, hypothesis 1a (Media attention affects real earnings management) can be verified well.

In terms of model 3, the dependent variable is accrued earnings management, the coefficient of media attention is still negative, but the t value is -1.040 and P>|t|=0.298, which means that it is not significant at all. F value is 2.97 and Prob>F=0.0069, indicating that this regression model 3 fails to pass the F test. Although some coefficients of control variables are significant, the coefficient of independent variable (media attention) is not significant, so this regression is not significant at all. Hence, hypothesis 1b cannot be verified. Connected with the outcome of correlation tables, there is no relationship between accrued earnings management and media attention.

4.3 Regression Results of Hypothesis 2, 2a and 2b

Next step is to test the moderating effect of internal control:

Regression Table 4- IC between EM and MEDIA.

	Low-Level IC EM	High-Level IC EM	Low-Level IC REM	High-Level IC REM	Low-Level IC AEM	High-Level IC AEM
MEDIA(IV)	-0.006	-0.019***	-0.008	-0.014***	0.003	-0.004
	(-0.543)	(-2.747)	(-1.129)	(-2.620)	(0.490)	(-1.598)
SIZE	-0.014	-0.012	-0.020**	-0.013**	0.006	0.001
	(-1.118)	(-1.561)	(-2.269)	(-2.111)	(0.935)	(0.345)
LEV	0.217***	0.152***	0.280***	0.196***	-0.063	-0.044**
	(2.674)	(3.020)	(4.851)	(4.843)	(-1.465)	(-2.192)
ROA	-0.030	-0.138	-0.100	-0.247***	0.070	0.109**
	(-0.197)	(-1.299)	(-0.919)	(-2.885)	(0.861)	(2.557)
GROWTH	-0.004	-0.015	-0.004	-0.018	0.000	0.003
	(-0.079)	(-0.538)	(-0.119)	(-0.818)	(0.011)	(0.300)
BIG4	0.048*	-0.046***	0.021	-0.051***	0.027**	0.005
	(1.857)	(-2.880)	(1.135)	(-3.960)	(1.974)	(0.766)
_cons	0.209	0.240	0.319	0.245*	-0.109	-0.005
	(0.747)	(1.350)	(1.597)	(1.715)	(-0.734)	(-0.074)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Mean VIF	1.45	1.43	1.46	1.37	1.44	1.43
F	14.16	15.48	26.97	41.95	4.50	4.00
Prob > F	0.0000	0.0000	0.0000	0.0000	0.0002	0.0006
N	654	657	654	657	654	657

**** p<0.01, ** p<0.05, * p<0.1*

The VIF values are all less than 10 in these models, indicating that there is no multicollinearity. When the dependent variable is earnings management, the coefficient of

media attention is -0.019 in the high-level IC group. The t value is -2.747 and P>|t|=0.000, meaning that this regression is significant at 99% level. However, the coefficient of media attention is not significant in low-level internal control group, which means internal control can moderates the relationship between media attention and earnings management. Hence, hypothesis 2 is verified eventually.

When the dependent variable is changed to real earnings management, the result is similar. The coefficient of media attention is -0.014 in the high-level IC group, which indicates that media attention negatively corelated with real earnings management. The t value of coefficient is -2.620 and P>|t|=0.000, which means that it is significant at 99% level. The coefficient of media attention is more significant in high-level group than that in low-level group. Therefore, hypothesis 2a can be verified finally.

The result is different to the dependent variable of accrued earnings management. As is shown in the above table, the coefficients of media attention and accrued earnings management are both not significant in low and high level group. So hypothesis 2b cannot be verified.

5. Robustness Tests

In order to ensure the reliability of the above research conclusions, the following robustness tests are carried out in this study. Variables substitution method are applied to test the robustness of the relationship between independent variables and dependent variable. For independent variables, this study uses Media Attention Index from Chinese Securities Newspaper to replace Baidu News Index. For dependent variable, this study uses Extended Jones Model to replace Modified Jones Model to calculate earnings management. If the regression outcomes are still significant, these hypotheses will be verified eventually. EM1, REM1 and AEM1 are calculated by Extended Jones Model.

Regression Table.

	Model (1) EM1	Model (2) REM1	Model (3) AEM1
MEDIA1	-0.037***	-0.052***	-0.005
	(-2.682)	(-4.251)	(-0.726)
SIZE	-0.016***	-0.013***	-0.008***
	(-6.617)	(-6.223)	(-6.481)
LEV	0.062***	0.011	0.041***
	(3.710)	(0.788)	(5.057)
ROA	0.376***	0.429***	0.060***
	(10.925)	(14.578)	(3.609)
GROWTH	0.058***	0.044***	0.038***
	(6.010)	(5.436)	(8.138)
BIG4	0.010**	0.006*	0.007***
	(2.292)	(1.802)	(3.518)
_cons	0.448***	0.377***	0.206***
	(8.627)	(8.411)	(8.295)
Mean VIF	1.31	1.31	1.33
F	44.52	60.97	30.04
Prob > F	0.0000	0.0000	0.0000
N	1311	1311	1311

**** p<0.01, ** p<0.05, * p<0.1*

As for model 1, the coefficient of MEDIA1 is -0.037 and significant at 99% level. It is worth to mention that all control variables are all significant at 99% level in model 1. At the same time, t value is -2.682 and P>|t|=0.000, indicating that hypothesis 1 is verified well. In the model 2, for the relationship between real earnings management and media attention, the coefficient of MEDIA1 is -0.052, and F value is 60.97 and Prob>F=0.0000, which means that model 2 passes F test. Hence, hypothesis 1a is verified finally. When it comes to model 3, it is still not significant at all for the relationship between accrued earnings management and media attention. So the hypothesis 1b cannot be verified finally.

6. Conclusion

In this paper, the relationship between media attention and earnings management is discussed. Media attention negatively affects earnings management and real earnings management but cannot affect accrued earnings management. Internal control can moderate the relationship between media attention and earnings management, and the coefficient of media attention is more significant in high-level internal control group. The result of real earnings management is similar to earnings management. But internal control cannot moderate the relationship between media attention and accrued earnings management.

This paper makes listed companies pay attention to external supervision of media attention, which is conducive to actively guiding and regulating the operation and management of the media. Media disseminates information with high speed and can play a very vital role in external supervision of corporate governance. This research is conducive to correction of identification and dissemination of various types of information by the media and makes the government aware of the need to regulate media attention and promote the healthy and sustainable operation of the capital market.

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Influence of Sewage Treatment Plant Effluent Loading to River Basin During Movement Control Order

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Abstract – *Environment quality is essential aspects of life on earth, any changes in the quality have a significant impact on human beings. Although the unprecedented Movement Control Order (MCO) due to COVID-19 pandemic posed some adverse effects on the environment, but there are also some benefits on the environment. One of the significant positive effects by the MCO is that the environment had rejuvenated during this period, especially significant water quality improvement. Many reports worldwide, including Malaysia, had reported that the environment including water quality had shown some improvement. The review also shows that there are not many studies on the effect of water quality during the pandemic, probably because Malaysia is still under the MCO period. This study investigates the influence of sewerage treatment effluent loading from the Kuala Lumpur sewerage catchment to the Klang River basin within the Kuala Lumpur City Centre. The individual STP's BOD and SS average effluent discharge loading of the year 2020 analyzed against the study River's BOD and SS average self loading of the year 2020. The STP and River loading were analyzed to investigate the fraction of STP effluent discharge loading against River loading in the study river basin during MCO.*

Keywords: MCO, Environment; Rejuvenate, Wastewater; Loading

1. Introduction

The world had been gripped over the years 2020 and 2021 by a Pandemic that was identified as a new Coronavirus Disease 2019 (COVID-19) [1]. About 3 billion people are affected by MCO or lockdown globally (World Health Organization, 2020). The earliest COVID-19 cases detected in Malaysia is on January 25, 2020 [2]. However, since then, the number of cases is increasing, even though there was some reduction from July to September 2020. As a result, the situation becomes out of control again from April to July 2021 even though the Malaysian government had taken several control measures [3]. The Malaysian government had enforced the Movement control order (MCO) to control the COVID-19 outbreak from contagious. The five enforcement levels of MCO are Movement Control Order (MCO), Conditional Movement Control Order (CMCO), Recovery Movement Control Order (RMCO), and Enhanced Movement Control Order (EMCO) [2].

One of the biggest questions during this pandemic is 'does the COVID-19 pandemic contribute adverse or positive effects to the environment?'. During the hive of the Pandemic,

the increased use of COVID- 19 preventive equipment such as face masks, hand gloves, and others had created another unpleasant impact [4]. In addition, the used PPE had a vast amount of new waste, and its haphazard disposal has negative impacts on the environment. Besides many adverse effects, many have reported that the pandemic has positively contributed to the environment during the MCO period [5]. In addition, the movement reduction of billions people in public places during the MCO has positively impacted the environment. One of the significant improvements observed is that the pollution has reduced tremendously with enhanced the water resource quality. The Figure 1 illustrates the positive aspect reduced human activity in the environment, and the negative consequences of reduced human activities.

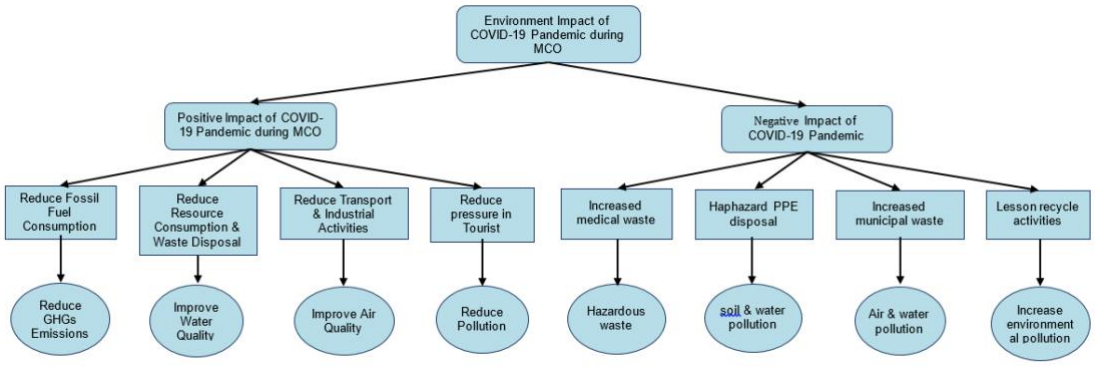

Figure 1. The positive impact of COVID-19 pandemic during MCO in Malaysia.

In this paper review effects of STP effluent loading discharge in river basin during the MCO.

2. Water Quality

Poor river water quality will severely affect the water supply to the communities. The polluted rivers have caused pollutions, floods, and water shortage to the community. Before COVID-19, water pollution is one of the biggest headaches for many countries, especially developing countries. There are many studies suggested that the sewage effluent discharge is one of the main pollution point source to the river resources [6][7][8]. Although the sewage treatment plant's effluent discharge complies with its statutory requirement under Department of Environment's (DOE) 2009 Environmental Quality Sewage Regulation (EQSR), but its overall loading capacity toward river's carrying capacity is alleged to be substantial to river's carrying capacity [9]. River constitute natural self-carrying loading, and shoulders various loading source that flown into the river in a mixed developed area. Figure 2 and Figure 3 illustrate main five focused type of pollution sources identified [10], manufacturing industries, agricultural-based industries, sewage treatment plants, pig farming and wet markets. The sewage pollution loading identified as the biggest loading contributor among the five focused type pollution loading with 54% and 34% for BOD and SS respectively.

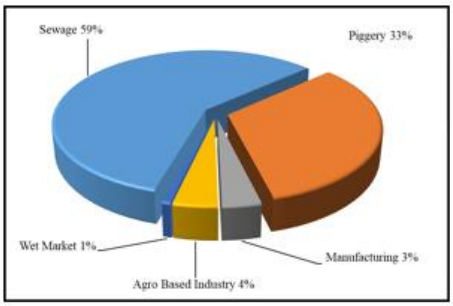

Figure 2. BOD pollution load 2020

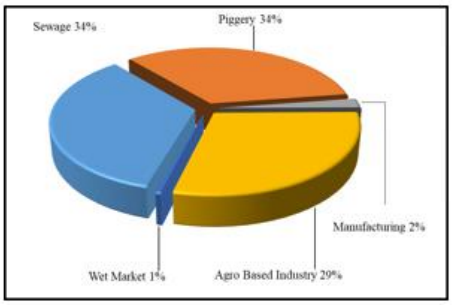

Figure 3. SS pollution load 2020

Table 1 illustrates the studies on water quality during pandemic COVID-19 in Malaysia. Improvement in water quality during the MCO and pollution loading onto river.

Table 1. Studies on water quality during COVID-19 pandemic in Malaysia.

Study	Key Results	Reference
Rivers of Klang, Penang, Putrajaya Lake for Water quality index (WQI)	Increase in Putrajaya Lake WQI from 24 % to 94 % (Class 1 river).	Najah et al., 2021
Water quality index (WQI)	Rivers were clearer during MCO: Sg. Btg Sadong, Sg. Kuantan, Sg. Pahang, Sg. Johor, Sg. Besut, Sg. Kim Kim, Sg. Gombak, Sg. Klang, Sg. Melaka, Sg. Gisir etc.	Lee Goi et al., 2020
Water quality index (WQI)	Improvement in WQI in 29 water monitoring statons (28 % WQI improved). Rivers showing improved water quality are Sg. Batang Sadong, Sg. Besut, Sg. Kelantan, Sg. Linggi, Sg. Johor, Sg. Muar etc.	Wan Ahmad and Ali, 2020
Sungai Melaka visibility	The visibility is 'greener' and cleaner. The water can be visible at several locations and drastic reduction in rubbish in the river.	The Star, 2020
Sungai Pinang visibility	Water has been noticeably clearer and cleaner.	The Strait Times, 2020
Environmental quality report 2016	Estimated pollution load from sewage sources for BOD loading is 49% and SS loading is 38%	DOE 2016
Environmental quality report 2017	Estimated pollution load from sewage sources for BOD loading is 49% and SS loading is 39%	DOE2017
Environmental quality report 2018	Estimated pollution load from sewage sources for BOD loading is 37% and SS loading is 36%	DOE2018
Environmental quality report 2019	Estimated pollution load from sewage sources for BOD loading is 51% and SS loading is 29%	DOE, 2019
Environmental quality report 2020	Estimated pollution load from sewage sources for BOD loading is 59% and SS loading is 34%	DOE, 2020
State of River Klang River 2015	The biggest pollution source estimated about 80% from sewage and STP effluent discharge.	SOR Klang River, 2015

3. Materials and Methods

The main river that spread across the Federal Territory of Kuala Lumpur (FTKL) is Klang River basin. The study only covers main river and tributary river origin till exit point of Klang River from FTKL to Selangor state at southwestern limit FTKL border. The main rivers and its main tributaries rivers that spread in study area identified. The tracing of tributary river origin not limited within the FTKL boundary but across the boundary into part of Selangor. The river flow data sought, and the selected river point sampled for river water quality analysis. The STPs located within river basin from its origin identified as well in parts of Selangor till exit point of study area identified and segregated based its River and tributary basin. The STP's average effluent discharge capacity and effluent discharge quality for year 2020 extracted for analysis. All STPs within the catchment basin, invariable of its process type and size is included to capture actual discharge capacity conditions. The flow volume capacity and water quality analysis data for both river and STP effluent discharge, analysed for River self-loading and cumulative STP effluent discharge loading. This study concentrate on Biological Oxygen Demand (BOD) and Suspended Solid (SS) water quality parameter for loading evaluation. The examined loading data further analysed for STP effluent loading fraction against the river self-loading.

4. Results and Discussions

There are total of 316 STPs identified within the study area. Total cumulative STP effluent discharge flow in Klang River per day is 914,055.32m3/day. The total STP effluent quality discharge loading is 10,231.40kg/day BOD and 14,738,015.56kg/day SS. The total average river flow self-capacity per day is 9,521,015m3/day with self-carrying loading 57,126.09kg/day BOD and 190,420.31kg/day. This constitute, total fraction of STP effluent discharge loading against the river self-carrying loading is 18% for BOD and 8% for SS. Table 2 illustrates that total 316 STP loading in the River is 18% for BOD and 8% for SS.

Table 2. Summary STP effluent loading onto River.

Branch	Main River	No STPs	STP Loading			River Loading			% of STP Loading on to River	
			Cumulative flow m3/day	BOD Kg/day	SS Kg/day	Flow measurement (m3/day)	BOD Kg/day	SS Kg/day	BOD	SS
9	Klang	316	914,055.32	10,231.49	14,738.12	9,521,015.56	57,126.09	190,420.31	18%	8%

5. Conclusion

The study concludes that STPs effluent discharge loading to the river basin constitute of 18% BOD loading and 8% SS loading. The Klang River basin results, of which constitute mixed development with residential, commercial, industrial and others can be taken as benchmark for mature area. For an all-inclusive river basin management, a comprehensive and thorough study suggested to be conducted to investigate the actual source of the balance loading of 82% BOD and 92% SS loading in the river.

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A Mini Review of Wheel Defects Detection in Mass Rapid Transit

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Abstract – *In most developed and developing countries, Mass Rapid Transit (MRT) is built to reduce the traffic congestion in the cities. The movement of MRT caused the train wheel sets to wear and tear due to the friction contact between the wheels and the rail. The change in the train speed can cause the change of wheel profile and it leads to the safety issues in railway operation. Train wheel sets must be inspected regularly for early detection of defects and the wear and tear record of the train wheel set is very importance for the utilization of wheel sets lifetime and the safety of the commuter. The objective of this paper is to review the previous literature reviews on the methodology used in detecting wheel defects. This paper also reviews on the type of wheel defects and early wheel defects detection and discussed the challenges and the limitation faced in developing wheel defects detection system and the implication of wheel defects to the railway industry. After reviewing the previous literature reviews, this paper found that research paradigm for wheel defects detection has been shifted from computer vision and sensory system to machine learning technique. Wheel defects detection in previous studies are less focusing in detecting wheel profile defect which is the benchmark indication used in railways industry in detecting wheel defects.*

Keywords: Wheel defects; wheel profile; computer vision; machine learning; Mass Rapid Transit (MRT)

1. Introduction

Mass Rapid Transit (MRT) is being implemented in most developed and developing nations to solve traffic congestion issue in major cities. Nowadays MRTs are run in very high-speed and heavy-load and it became a contribute factor to wheel defects in day-to-day operation [1]. The speed, safety and stability of running trains are all affected by the degree of wheel wear and surface abrasion [1]. Train wheels are usually subjected to wear and tear due to friction contact between the wheels and the rail [2]. The change in the train speed can cause the change of wheel profile and it leads to the safety issues in railway operation [2]. All above mentioned factors have an impact on the smooth operation of railway trains and commuter comfort [1]. Wheels are subject to various defects, which have an impact on their smooth rolling [3]. Eccentricities, discrete defects, periodic non-roundness, non-periodic, non-roundness, corrugation, roughness, flat, spalling, and shelling are examples of wheel defects [3].Train wheel sets must be inspected regularly for early detection of defects and the wear and tear record of the train wheel set is very importance for the utilization of wheelsets [4]. Early detection of severe wheel defects on train is critical for preventing damage to railway infrastructure and providing train operators with early information on maintenance activity [5, 6]. It can also prevent further degradation of the wheels [5]. As a

result, it is essential that train wheels be maintained on a periodic and targeted basis as a cost-effective way to minimize damages [5].

2. Wheel defects detection

In previous studies there are few approaches to measure the train wheel profile. Wheel diameter measurements method in railways is classified into two: when the train is static and the measurement sensor is portable (known as static measurement in railways) and when the measurement sensor is fixed and the train is moving (known as dynamic measurement) [7]. There are numerous methods for measuring the diameters of train wheels dynamically [7]. These approaches, as well as others for measuring dynamical diameters, are based on structured light machine-vision methods [7].

In recent studies, several machine learning (ML) techniques are used to detect more complicated wheel defects. Gabriel Krummenacher et al. using Support Vector Machine (SVM) and Convolutional Neural Network (CNN) technique to detect the defective wheels such as flat spot, non-roundness and shelling (Krummenacher, Ong, Koller, Kobayashi, & Buhmann, 2017). A Bayesian machine learning approach also been used to detect defective wheels such as wheel flats, wheel shells and polygonization via track side online monitoring and showed a positive performance [8]. Guo et al. proposed using SVM technique to classify the defective wheel tread images using histogram [9].

3. Industry implication on wheel defects

An inspection of hundreds of MRT wheelsets in daily maintenance activity involves the use of appropriate device to inspect several MRT wheelsets installed underneath MRTs [10]. These inspections should map the position of cracks and defects on the wheel's surface, below the wheel surface (sub-surface), wheel flange, and wheel disk. [10]. Several approaches for this purpose have lately been established [10]. In order to remove the defects, maintenance schedule for wheels such as wheels re-profiling and wheels replacement are required [11]. Traditionally, reprofiling was a form of corrective maintenance technique in which work began after a failure due to a lack of available data and a relatively low degree of maintenance technology [12]. Therefore, an adequate wheels maintenance activity not only will enhance railway safety level but also minimise the maintenance fees due to wear and tear of flange thickness and flange height [11].

4. Discussion

There are several challenges researcher faced when using camera in wheel defects detection. A high image acquisition critical for ensuring high measurement accuracy. [4]. The relative locations of the charge-coupled device (CCD) camera, laser light source and wheel detecting sensors are very significance in obtaining a high image acquisition quality [4]. The image quality is direct proportional to image resolution [4]. However, high image quality will cost more and required more memory capacity [4].

A huge quantity of training data was required in previous artificial neural networks to achieve high performance [9]. However, in other circumstances, gathering such a large number of samples is quite difficult [9]. Because wheel defects problems are uncommon, it is very important in the wheel defects inspection system [9]. There has been limited investigation into the measuring of wheel rim thickness by using soft measurement methods[13]. The combination of machine vison and ML technique are used to address most wheel defects detections issues [9].

5. Conclusion

Most previous studies are focusing on one wheel defect detection in developing each protype. In developing new protype for detecting wheel defects is no longer relevant for the railway industry nowadays. Beside costing, it is very difficult for the industry to engage researcher to develop own wheel defects system. Secondly, industry itself already has the reliable equipment and system in place for them to performs wheel defects detection. Thirdly, the industry needs to spend time, manpower and safety for developing, testing, calibrating and commissioning newly developed system.

In order to align with the current railway industry needs, the future research direction should be more focusing in develop model, algorithm and decision support system which can associate with the existing industry system.

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Effectiveness of Innovation by successors in Small and Medium sized Enterprises

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Abstract – *The purpose of this research is to certify the effectiveness of innovation by new successors for small and medium sized enterprises. Innovating in SMEs are needed for increasing productivity in Japan because about 99.7% of companies are these companies. To certify it, qualitative analysis with interviews, and questionnaires toward people who succeeded to the business and experienced innovation. As the first step, theories of innovation by Schumpeter and Kirzner were reviewed. Both of theirs said that "innovation is not limited to technological one with special scientific things." However, the Japanese government and people had misunderstood for a while before the 2010s. It is needed to change the image of innovation and give entrepreneurs incentives to start. SMEs have advantages and disadvantages to innovating by themselves. They have higher incentives to do new things and the leaders can easily change the organization's actions, compared with large companies. On the other hand, leaders with so long experience in the same company cannot consider their own business objectively. And limited resource in SMEs makes loked-in specific strategy. To solve disadvantages and to increase productivity, new successors have high advantages to practice innovation with new perspectives as entrepreneurs like a second start-up.*

Keywords: Innovation; Small and medium sized enterprises (SMEs); Successors; Entrepreneurship

1. Introduction

It is said that Japan is facing a serious problem with productivity and continuity. According to the report from Japan Productivity Center [2021], Japanese productivity per hour was $49.5; it is 23rd out of 38 OECD companies. Japanese productivity per person was $78,655; it is 28th out of 38 companies. For Japan, these ranks are the worst in the past. And it will be worse without any solution because its market is shrinking and the population is decreasing, unfortunately. One of the keys to solving this problem is the innovation of *SMEs*. It is because that 99.7% of companies in Japan are *SMEs*. More than 50% of whole added values are from them; therefore, improvement in the management of *SMEs* makes the Japanese economic better. To increase productivity, many researchers focus on "innovation". In business study, innovation is a source for growing up. Peter Drucker [1955] said, "Because it is its purpose to create a customer, any business enterprise has two—and only these two—basic functions: marketing and innovation. They are the entrepreneurial functions."

This research reviews the basic idea of innovation and discusses the importance of innovation for new successors of *SMEs*. Research about innovation tends to focus on the

function of the entrepreneur for the company, however, I would like to focus on successors' long-term growth through their challenges.

2. Materials and Methods

2.1 Materials

For this research, interviews, and questionnaire toward people who succeeded to a business and experienced trying innovation. It needs information about their type of business, age, the objective effect of innovation, process and operation, cost, and so on. In addition, successors can be categorized into three types; a successor who takes over a business from a family, who worked as a vice president for a long time, or who buys the enterprise by M&A.

It is also needed to get data about effect and innovation from a macroeconomic perspective.

2.2 Methods

The effectiveness of innovation by new successors will be verified by qualitative research with results of interviews, and questionnaires from successors of SMEs in Japan. Common points of successful examples will be revealed; for example, their ways of thinking, situation, and business resources. Data from the government and some Chambers of Commerce is used to support verifying.

3. Results and Discussions

3.1 What is "innovation"

Two researchers are well known because of their theories about innovation and entrepreneurship; Schumpeter and Kirzner.

Joseph Alois Schumpeter theorized innovation for the first time. He introduced a concept of innovation into economics to explain the circular flow of the economy, challenging traditional economics. He explained that creative destruction by innovation makes the economy change and grow up. Schumpeter defined producing as the combination of some things and powers. When a company makes a combination in new ways, this is innovation. Innovation gives disproportion to the whole economy. A new combination includes 5 concepts as follows.

1. New property.
2. New process to produce
3. New marketer
4. New supply source of raw materials or semi-manufactured goods

5. New organization

Israel Meir Kirzner argued that innovation is done through the daily activities of entrepreneurs. He focused on the "alertness" of entrepreneurs; they find opportunities to make profits in changing markets.

Both two economists thought that innovation makes economic growth and innovation is carried out by entrepreneurs. However, there are big two differences. Firstly, Schumpeter argued that innovation causes creative destruction; on the other hand, Kirzner said that people try innovating to follow the changes in the market. Secondly, innovation is thought of as a "heroic" thing by Schumpeter, whereas Kirzner thought that it is possible to make innovation from the daily discovery of entrepreneurs. innovation mentioned by Schumpeter is radical innovation, while innovation mentioned by Kirzner is incremental innovation.

3.2 Misunderstanding of Innovation in Japan

Especially, technological innovation has been researched for a long time by many researchers. Many researchers have studied innovation from various perspectives; for example, in economic study, business study, and sociology; some researchers study how to manage innovation, and other researchers study the process of innovation. According to Takei [2019], innovation was misunderstood for a long time in Japan. In 1954, when the concept of innovation was introduced to Japan, the government translated innovation as "technological innovation". People limited the concept of innovation for technology until the 2010s. It is because manufacturing industries took the lead in growth with improvement thanks to the improvement of their technologies.

3.3 Innovation for SMEs

Ways to execute innovation depend on each business model, scale, and ideal for managers. Innovation does not need radical technological change or new thing that changes the whole society completely. Takahashi [2010] said that compared with large enterprises, *SMEs* tend to have more insensitive. In large enterprises, people are used to working in routine and do not want to change. In addition, a decision by a manager can be accepted easily in a small organization.

On the other hand, there are some difficulties with innovation in small enterprises. Firstly, managers cannot have a sense of their crisis. The period to be in charge tends to be longer than in large enterprises. According to a White Paper on Small and Medium Enterprises in Japan [2018], about 35% of the managers have experienced over 20 years as a leader. Secondly, according to Takahashi [2010], small enterprises fall into the rock-in effect; When the corporate resources are enduring, specific for strategies, an enterprise holds on to an existing strategy. Especially, small enterprises have limited resources and tend to focus too much.

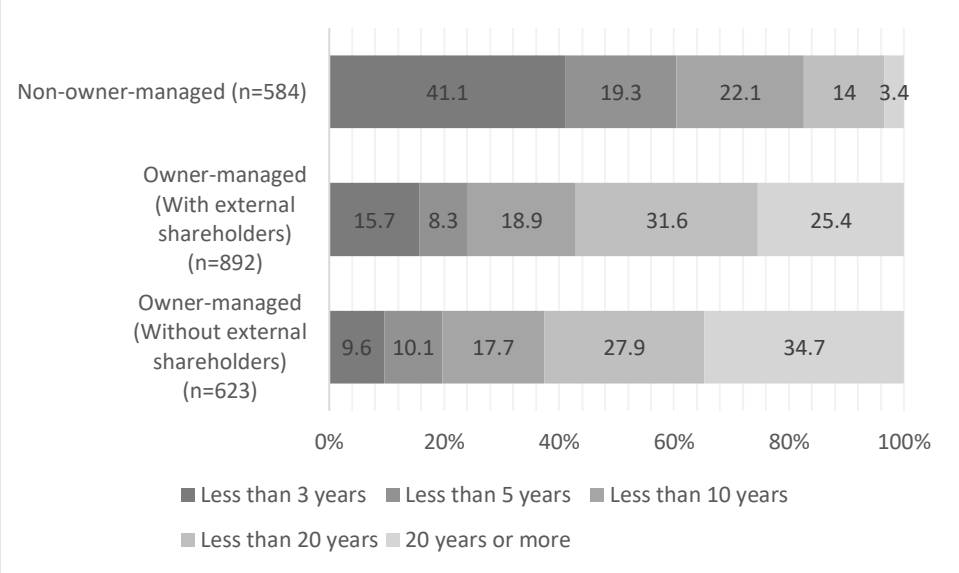

Figure 1. Term of appointment of managers (by form of ownership). Source: White Paper on Small and Medium Enterprises in Japan [2018]

3.4 Innovation and Succession of a Business

Many founders are facing the necessity to find the next managers right now. They built enterprises during the high economic growth period in the 1960s and 1970s. In this situation, the next managers can be key for innovation; because they can analyze their own business more objectively and give new learning opportunities to the company. In addition, the experience of trying to innovate gives confidence as a leader to them.

Successors can try to start the innovation process without special and specific knowledge and experience about technology. As Schumpeter expressed, innovation is not needed to connect technical things. Furthermore, as Kirzner said, entrepreneurs try to find some opportunities to innovate in daily life. Successors can be like a founder who starts their own business as a second start-up, and not only keeps business operation. Especially, in the case of small-and-medium enterprises, ownership and management are not separated; thus, managers can get ideals for their own business. In a presentation, a few cases where new successors succeeded in innovation are taken up.

4. Conclusion

Innovation by new successors can be effective for *SMEs* in Japan that are facing a period of generational change. New managers can recognize weak points of their enterprises and consider new combinations of resources with their knowledge and experiences from outside. The innovation process is not limited to “technology”.

This research will certify this thesis with qualitative analysis. It is needed to review prior research about innovation and entrepreneurship so that entrepreneurship of successors is revealed.

Acknowledgement

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The Moderating Effect of Team Psychological Safety on the Relation between MCS and Kaizen Activities

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Abstract – *Team psychological safety (Edmondson, 1999) has attracted attention in the field of organizational learning. The purpose of this study is to test quantitatively the moderating effect of team psychological safety on the relation between MCS, made with the budgetary control system and Hoshin management system, and Kaizen activities. Selecting a luxury hotel-chain company as a research site, we examine the effect by multiple regression analysis, based on the questionnaire data to front-line employees and find out that team psychological safety has a positive moderating effect on the Kaizen activities through the MCS.*

Keywords: Management control system; budgetary control system; Hoshin management system; Kaizen activities; Team psychological safety

1. Introduction

Management Control Systems (MCS) are formal information-based procedures and protocols which are used to change patterns of behavior of organizational members [1]. MCS with financial performance measurements is not enough to switch the organizational members' behavior [2] and the usage of hybrid MCS with both financial and non-financial measurements is proposed [3].

Japanese firms use the hybrid system consisting of a budgetary control system and Hoshin management system which is a control system using non-financial indicators. The procedures of the hybrid system are following: First, the budgetary control system sets budgets to units. Next, by using the Hoshin management system front-line employees are encouraged to determine Hoshin that demonstrate what Kaizen activities have to be executed in order to achieve the unit budget, and also set measures and target figures to accomplish by Kaizen activities through discussion among them. Finally, feedbacked the difference between the target and actual figures, the employees modify the Kaizen activities [4].

To the front-line employees, the feedback could notify two types of business process failure: individual errors and business process problems. Business process problems are important in learning from failures because the problems precede the individual errors [5]. Studies of learning from failure have indicated that a lack of team psychological safety prevents learning from failure [6]. Team psychological safety is defined as "a shared belief

that the team is safe for interpersonal risk taking" [7]. Learning from failure is prevented if team members feel that the other team members take a negative attitude when they speak up or point out in discussions to clarify the causes of the team' s business process problems. Team psychological safety would be necessary so that the employees can take full advantage of the business process failure and improve their business process. This is the research question of this paper.

However, there have been no Q1-level quantitative studies in MCS research that adopt the concept of team psychological safety. Thus, the purpose of this study is to quantitatively test the moderating effect of unit psychological safety on the relationship in which the hybrid system promotes employees' Kaizen activities.

2. Hypothesis

The budgetary control and Hoshin management are used in connection with each other [4].

In previous studies, it has been shown that incremental control is used in Hoshin management to achieve the unit's budgetary objectives as allocated in budgetary control, and it promotes Kaizen [8]. The incremental management in Hoshin management indicates that there are problems in the present situation and gives signals that they should fix their behavior. In addition, da Silveira et al. (2018) point out the importance of discussion in Hoshin management.

If the psychological safety of the unit is low, however, there is interpersonal risk to speak up and raise points in discussions in the hybrid systems [7], and the employees' Kaizen activities are prevented. If unit psychological safety is high, on the other hand, the employees' Kaizen activities encouraged by the hybrid system are more promoted. In summary, the hypothesis is as follows:

H1: The employees’ perceived unit psychological safety is higher; the employees' Kaizen activities are prompted more by the hybrid system.

3. Materials and Methods

Company A in the hotel industry was selected as the research site. We analysed the data from an employee satisfaction survey conducted in Company A in December 2021. The number of valid responses was 5,164.

Using IBM SPSS Statistics 28. Over, the exploratory factor analysis was conducted with the maximum likelihood method and promax rotation. As a result of the analysis, three factors were extracted. Three questions for budget control and four questions for Hoshin management were combined into one factor, and we named this factor as the MCS

"fulfilment". The descriptive statistics and results of the exploratory factor analysis for each question item are as follows (Table 1).

Table 1. Descriptive Statistics and Result of the Exploratory Factor Analysis

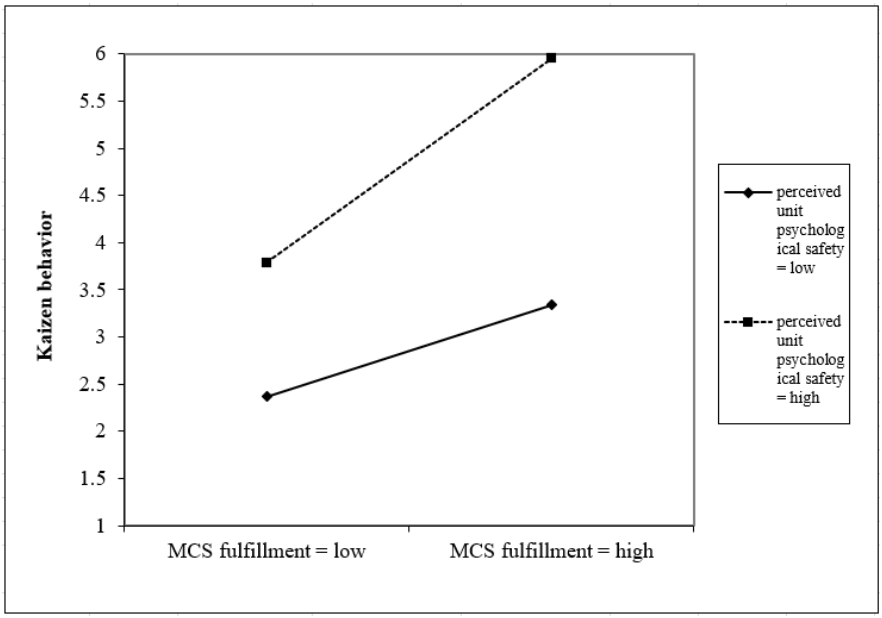
			Factor		
			1	2	3
MCS fulfillment（Cronbach's α=.929)	**Mean**	**S.D.**			
1. Does your unit have clear tasks and deadlines?	3.72	1.07	**0.909**	-0.031	-0.051
2. Can anyone quickly check the progress of the unit's objectives when needed?	3.67	1.067	**0.887**	-0.007	-0.034
3. Does your supervisor give you accurate instructions based on the achievement of the unit's objectives?	3.75	1.075	**0.871**	0.033	-0.048
4. Are your opinions reflected in Hoshin and its measures?	3.51	1.055	**0.859**	-0.009	0.005
5. Do they(you) have opportunities to know how their work relates to sales targets and expense budgets?	3.58	1.102	**0.76**	-0.023	0.024
6. Do you think the(your) department(team) is very conscious of the need to achieve the budget?	3.69	1.099	**0.74**	-0.025	-0.015
7. Are you aware that your work has a significant impact on the achievement of the budget?	3.82	1.007	**0.607**	0.013	0.168
perceived unit psychological safety（Cronbach's α=.911)	**Mean**	**S.D.**			
8. Are you able to talk freely with the members you work with?	4.01	0.971	-0.108	**1.009**	-0.009
9. Is it easy to communicate with the members you work with?	4.03	0.974	-0.052	**0.976**	-0.03
10. Do you think the people you work with understand your ideas?	3.6	1.005	0.268	**0.547**	0.066
11. In your department(team), do you feel confortable to express new opinions and ideas?	3.81	1.068	0.342	**0.465**	0.044
12. Do the unit members behave for the benefit of the whole unit, rather than only for their own benefit?	3.76	1.031	0.411	**0.441**	-0.033
Kaizen activities（Cronbach's α=.858)	**Mean**	**S.D.**			
13. How is your work performance?(Work Efficiency)	3.53	0.978	-0.084	-0.016	**0.896**
14. How is your work performance?(Accuracy of work / Accuracy of operation)	3.65	0.89	-0.014	-0.008	**0.849**
15. How is your work performance?(Commitment to Work Improvement)	3.66	0.882	0.119	0.021	**0.711**
			1	2	3
		1	-	.687**	.354**
		2		-	.390**
		3			-
			**p<0.01		

4. Results and Discussions

Table 2. Result of Hierarchical Multiple Regression Analysis

Dependent variable：activities			
	Model 1	Model 2	Model 3
Entry Classification	-0.061 **	-0.096 ***	-0.095 ***
Employment status	-0.046 **	-0.067 ***	-0.065 ***
Length of service	0.117 ***	0.092 ***	0.091 ***
Joined as a first choice	-0.132 ***	-0.057 ***	-0.055 ***
Age	0.094 ***	0.096 ***	0.101 ***
Sex	0.027 n.s.	-0.002 n.s.	-0.011 n.s.
MCS fulfillment		0.185 ***	0.184 ***
PPS		0.273 ***	0.299 ***
MCS fulfillment×PPS			0.090 ***
Adjusted R^2	0.057 ***	0.227 ***	0.235 ***
ΔR^2	—	0.171 ***	0.008 ***

Figure 2. Result of Single Slope Test



Using IBM SPSS Statistics 28.0ver, multiple regression analysis was conducted. The results are shown in Table 2. The results of the analysis are as follows.

The main effects of MCS fulfilment and perceived unit psychological safety for Kaizen are positive and significant （MCS fulfilment：β=.184，p<0.001；perceived unit psychological safety：β=.299，p<0.001）. The interaction between MCS fulfilment and unit perceived psychological safety indicated positive significant results for Kaizen (β=.090, p<0.001). From the result of the single slope test, when both MCS fulfilment and perceived psychological safety is higher, Kaizen is promoted most. Therefore, H1 was adopted.

As a result, it was indicated that employees' Kaizen is more encouraged by budget and Hoshin management when employees' perceived unit psychological safety is higher.

4. Conclusion

The purpose of this study was to quantitatively test the moderating effect of unit psychological safety on the relation in which the hybrid system promotes employees' Kaizen activities. In MCS research, there have been no quantitative studies that adopt the concept of team psychological safety. The significance of this research is that it has provided a new perspective on MCS research.

The limitation of this study is that it was a survey just in one company. In future studies, it is necessary to verify the universality of the results by examining organizations in other industries and business categories.

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The Mediating Effect of Learning on the Relation between Belief System and Job Improvement Behaviour

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Abstract – *Management control system studies have pointed out the effectiveness of not only budgetary control systems but also belief system, which communicate formally to provide organizational core values and purpose to all employees. However, there is little evidence on the process by which belief system motivate job improvement behaviour for frontline employees. The purpose of this study is to quantitatively verify the mediating process that belief system and budgetary control system motivate job improvement behaviour through learning of frontline employees in the hotel industry. The result of the analysis clarified that each belief system and budgetary control system promote frontline employee's job improvement behaviour through learning.*

Keywords: Belief system, Budgetary control system, Learning, Job improvement behaviour

1. Introduction

The previous management control system (MCS) research has proposed that the budgetary control system is a main system which motivates employees to progress toward pre-set budget targets. In response to the increasing uncertainty and risk, however, operational managers and employees (hereinafter called frontline employees) are required to constantly improve their new ways of doing their jobs. In order to deal with this situation, in recent MCS research, "belief system" has been attracting attention as a control system having different traits from the budgetary control system [1].

A belief system communicates core values and direction for the organization to all employees in order to inspire and motivate employees to engage in spontaneous and responsive behaviour [2]. While the budgetary control system is a system that encourages the achievement of short-term budget goals, the belief system is a system that encourages innovative actions that realize long-term organizational values.

Although many MCS studies show effects of the belief system, there are few studies which provide empirical evidence on the understanding of the mechanism between belief system and job improvement behaviour [3].

To solve the above problem, this study aims to examine the process by which the belief system and budgetary control system promote frontline employee's job improvement behaviour, using data from a survey of frontline employees in a luxury hotel.

I focus on the variable of "learning" as a mediator. Learning is defined as "an ongoing process of learning and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected results of actions" [4]. Learning is an important variable for encouraging employees to take spontaneous and creative behaviour [5]. The belief system, which formalizes to facilitate learning [2], may promote job improvement behaviour through learning.

2. Hypothesis

2.1 The Moderating of Learning on Belief system and Job Improvement Behaviour

A belief system inspires employees to explore by communicating the core values and purpose of organization. The use of belief system provides a criteria for judgement to determine what is important information to learn for frontline employees [6]. It is presumed that learning mediates the relationship between belief system and job improvement behaviour. To test this relationship, I propose the following hypotheses:

H1: The use of belief system is positively related to frontline employees' job improvement behavior through learning.

2.2 The Moderating of Learning on Budgetary control system and Job Improvement Behaviour

A budgetary control system communicates pre-set budget targets in advance and monitors progress towards those targets. The use of a budgetary control system sets the budget targets while listening to the opinions and ideas of frontline employees and provides frontline employees with clarity about what should be achieved [7]. It motivates employees to learn the way that improves efficiency within targets provided [8]. It is presumed that learning mediates the relationship between the budgetary control system and job improvement behaviour. To test this relationship, I propose the following hypotheses:

H2: The use of budgetary control system is positively related to frontline employees' job improvement behaviour through learning.

3. Research site and Data

I use data from frontline employees in Hotel Company A, which operates many luxury hotels. The reason for selecting the hotel company is that frontline employees are required to constantly improve their job in order to tailor customers to responsive and flexible services. Data was collected in November 2019 through a structured Likert scale survey. The number of valid respondents was 1,108. Table 1 shows descriptive statistics for variables. All Cronbach α coefficients exceed the common threshold of 0.70.

Table 1. Descriptive statistics for each variable.

Variables	Items	Mean	S.D.	α
Belief system	Does your supervisor give you instructions based on the management philosophy?	3.87	1.08	.884
	Does your supervisor explain the contents of management philosophy in their own words in an easy-to-understand manner?	3.80	1.07	
Budgetary control system	Can your supervisor explain the target sales and expenses in an easy-to-understand manner?	3.82	1.11	.923
	Can your supervisor explain how their tasks relates to sales and expenses?	3.63	1.10	
	Can your supervisor point out the causes and issues of the difference between the budget target and the actual results in an easy-to-understand manner?	3.60	1.10	
Learning	Are all departments coordinating and cooperating to flexibly respond to customer needs and demands?	3.49	1.05	.817
	Is your department able to exchange ideas to gain a new perspective on your work?	3.62	1.03	
	Do you think your department is making improvement proposals that exceed your expectations?	3.46	0.95	
Job improvement behavior	Are you reviewing your work process in order to reduce Muri (such as being unable to meet customer requests due to time and personnel constraints)?	3.58	1.02	.915
	Are you reviewing your work process to reduce Muda (such as overtime hours, paperwork that does not lead to customer satisfaction)?	3.63	1.04	
	Are you reviewing your work process to reduce Mura (such as changes in service quality during busy and off-season)?	3.64	1.02	

4. Results and Discussions

First, I conduct a confirmatory factor analysis (CFA) to confirm the model fit. The results of CFA[1] are χ^2=127.496, p<0.01, df=38, GFI=0.980, CFI=0.991, RMSEA=0.046, which show acceptable model fit. All of the values are a good fit, with acceptable levels of above .90 (for the GFI, CFI) and under .80 (for the RMSEA).

Next, I use a structural equation model (SEM) to test these hypotheses using IBM AMOS 28.0. The model abstract is χ 2=182.702 , df=66 , GFI=0.979 , CFI=0.989 RMSEA=0.040. The results of SEM are that belief system and budgetary control system, respectively, are significantly positive and also learning is related to job improvement behaviour (see Figure 1).

In addition, I perform an indirect effect test using a bootstrapping method (resample size=5000). The results show that the indirect effect of belief system on job improvement behaviour through learning is significant and positive, with the range of lower and upper limits of 95% bias-corrected confidence intervals for the estimate excluding zero (β=0.3579, a=0.000, 95%BCLL=0.3104, 95%BCUL=0.4063). Also, the indirect effect of budgetary control system on job improvement behaviour through learning is significant and positive (β=0.3682, a=0.000, 95%BCLL=0.3199, 95%BCUL=0.4180).

[1] As indicators of model fit, I used the chi-square, goodness-of-fit index (GFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA).

These results provide evidence that learning completely mediates the relation between not only budgetary control system, but also belief system and job improvement behaviour.

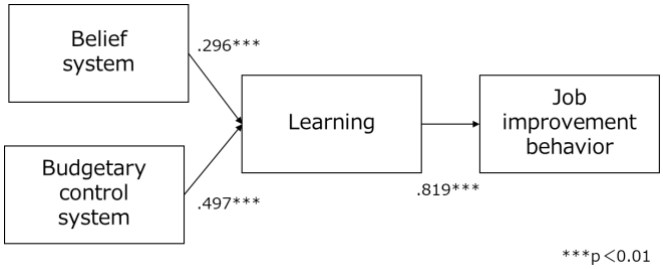

Figure 1. Results of SEM.

4. Conclusion

This study shows that the belief system and budgetary control system are associated with job improvement behaviour through learning of frontline employees. The contribution of the paper is to extend the knowledge of the belief system. Future studies should investigate the result of the mechanism, given a synergistic effect between the belief system and budgetary control system. Also, this study suggests the need for future research to examine other potential mediators.

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Factors Influencing Stock Market Participation Intentions Among Millennial Naval Officers of The Royal Malaysian Navy

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Abstract - *Stock market participation is an essential topic related to the level of financial literacy. This is because a high level of financial literacy is more likely to involve in stock market investment, which needs a good conceptual understanding of financial management, risk management, return of investment and money compounding. Millennials are the main workforce contributors to economic growth in Malaysia, while there is still low involvement in the stock market among them (stock market participation puzzle). This study integrated behavioural factors in the Theory of Planned Behaviour (TPB) and financial literacy toward stock market participation intentions. Therefore, this study aims to understand the relationship of behavioural factors with the presence of financial literacy as adding factor. This study quantitively analyzed the conceptual framework using Statistical Package for Social Sciences (SPSS) among 308 respondents from millennial naval officers of the Royal Malaysian Navy (RMN). The results show that attitudes, subjective norms, perceived behavioural control and financial literacy are significantly related to stock market participation intentions. This study will provide a more likely bridge the gap between the stock investors and non-investors regarding their beliefs toward stock market investment.*

Keywords: Stock market participation; Theory of Planned Behaviour; Financial literacy; Millennial

1. Introduction

The stock market is one of the instruments in equity investments that involve a large amount of money from financial institutions and retail investors. The stock market is significantly important for developing countries as the centre of the capital market and portrays the country's economic performance in the eyes of foreign investors [1].Millennials are the primary workforce contributing to Malaysia's gross domestic product (GDP) compared to Generation X and baby boomers [2]. The essential of stockmarket investment is reflected by the actions taken by the Malaysian government to attract more people to participate in Malaysia's stock market due to little returns offered by conventional saving instruments [3]. The stock market participation puzzleis crucial to be explored because low stock market participation can be translated as low wealth accumulation and purchasing power [4]. Stock participation among millennials is far less than Generation X in terms of central depository system (CDS) account holders and traded volume in Bursa Malaysia [5]. At the same time, relatively, there is sparse literature put non-investors as the subject in stock market participation studies [6]. Adil, Singh [7] suggested adopting the theory of planned behaviour (TPB) as the suitable theory to determine the relationship between the

factors of attitudes, subjective norms, and perceived behavioural control towards stock market participation. An additional factor which is financial literacy, can be added to TPB. Financial literacy is important as the key factor when people are considering any financial activities [8]. This work focuses on identifying the factors that influence stock market participation intentions and analysing the level of financial literacy between stock investors and non-investors toward stock market participation intentions. Finally, this work also proposing whether there is a significant difference between perspectives of stocks investors and non-investors toward stock market participation intentions among millennial naval officers of the RMN.

1.2 Conceptual Framework

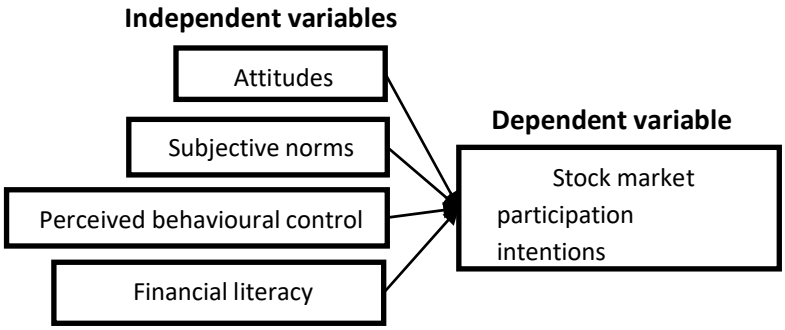

Figure 1. Conceptual Framework.

Attitudes (AT) refer to how people think and feel when expressing their opinionson various things, such as whether something is favourable or unfavourable [9]. The researchers believe that an investor's mindset may impact their decision to participatein the stock market Individuals' attitudes significantly influence stock market participation [10]. Subjective norms (SN) is a term used to describe the perceived effect that important individuals have on the intentions and actions of a person [9]. According to [11], it was discovered that there was a positive relationship between subjective norms and the intention to invest in the stock market. Ajzen [9] stated thatperceived behavioural control (PBC) refers to an individual's estimation of how easy or difficult it is to carry out the behaviour that is of interest to them. Past studies by Gopi and Ramayah [12] and Lin [13] were conducted in various situations, and these studies have shown that perceived behavioural control is significant towards stock market participation. Financial literacy (FL) is the collection of information, skills, andattitudes of persons who need to ensure their financial security for the current and future [14]. People with a low level of financial literacy are statistically less likely to engage in financial activities such as investing in the stock market and buying and selling shares [15].

2. Materials and Methods

The primary data needed for this study is the data collected from the survey by questionnaire as a quantitative study approach. Statistical Package for Social Sciences(SPSS) is a program used in this study for data management and analysis.

3. Results and Discussions

3.1 Reliability Test

A pilot study was conducted among 33 respondents to analyze the Cronbach's Alpha. Cronbach's Alpha for all variables lies between 0.63 and 0.87.

3.2 Descriptive Analysis

Table 1. Demographic profile.

Item	Range/Classification	Frequency	Percentage (%)
Gender	Male	259	84.1
	Female	49	15.9
Age	26 to 42 years old	308	100
Education level	Bachelor's degree	215	69.8
	Master degree	93	30.2
Marital Status	Married	291	94.5
	Single	17	5.5
Stock market participation status	Investor	291	94.5
	Non-investor	17	5.5

3.3 Multiple Regression Analysis

Results show regression analysis between dependent variables, which are stock market participation intentions (ItSMP), and the independent variables, which are attitudes (AT), subjective norms (SN), perceived behavioural control (PBC) and financial literacy (FL). It can be deduced that the independent variables of this study explain 51.8 percent of the variance in stock market participation intentions. The F=83.47 is obtained with the significance value of p=0.00 and lower than 0.05. Hence,the regression model is believed to be appropriate for study. The coefficient obtained shows that AT, SN, PBC and FL are significant toward stock market participation intentions with the values of p are 0.00 (less than 0.05). Hence, the first research objective is achieved.

3.4 T-test Analysis

Data were analysed by using an independent-sample T-test analysis to compare FLfor stock investors and non-investors. There are significant differences in the scores ofstock investors (M=4.73, SD=0.38), which are higher than non-investors (M=4.08, SD=0.65) with t(306)=6.05, p=0.00 with F=19.04.

Further, the difference of perspectives between stock investors' and non-investors perceptions towards stock market participation intentions was obtained by the same approach. There are significant differences with t(306)=4.71, p=0.00 and F=16.57 withthe scores of stock investors (M=4.50, SD=0.44) being higher than non-investors (M=3.89, SD=0.78). It can be deduced that stock investors have higher intentions toward stock market participation than non-investors. It can be assumed that stock investors have higher

intention toward stock market participation due to higher financial literacy compared with non-investors.

4. Conclusion

This work found that the positive AT, good SN, high PBC and prominent FL towards stock market participation will increase the possibility for individuals to be involved instock market investment. The presence of prominent FL helps to provide a very good fundamental of investment decision-making and increase the belief towards stock market investment. FL could be evolved through the education system mostly in the curriculum for the university that could be in achieving financial well-being in the future.

Acknowledgement

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Explication of Motivational Mechanisms of Management Control Systems, applying the Theory of Planned Behaviour

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Abstract – *The purpose of this study is to examine whether the Theory of Planned Behaviour (TPB) can explain employee motivation mechanisms in management control systems (MCS) research. Specifically, TPB was applied to analyze the motivation mechanisms of the budgetary control system and the Hoshin management system. Data were from a quantitative questionnaire survey of front-line employees at a Japanese luxury hotel chain company. We conducted a covariance structural analysis to test our hypotheses. We found quantitative differences in motivational mechanisms by which budgetary control system and the Hoshin management system.*

Keywords: Management control systems; Theory of planned behavior； Attitude toward behavior; Subjective norm；Perceived behavioral control

1. Introduction

TPB is a theory that emerged as a development of the Theory of Reasoned Action [2]. The Theory of Reasoned Action has two variables, attitude, and subjective norm. Attitude is the perception of significance for the behavior [1]. Subjective norm is the perception of pressure from the surroundings to perform the behavior. Referring to this theory, these two variables predict behavioral intention and behavior [2]. However, this theory has a problem that could only explain limiting behavior there were no factors that inhibited the execution of the behavior and one could execute (control) the behavior if he or she has an intention to do so[1]. That is, the Theory of Reasoned Action could not explain when a person feels significance in performing a behavior and feels pressure from others to perform that behavior, but does not perform the behavior.

To solve this problem, TPB added a new variable, perceived behavioral control (PBC), to the Theory of Reasoned Action [2]. PBC is the perception of whether people can perform the behavior. When people perceive that they can perform a behavior (i.e., they feel they have the resources, time, opportunity, ability, etc.), they will attempt to perform the behavior [2]. This addition of PBC has expanded the scope of the theory's adaptation, and TPB is frequently used in the study of human behavior [3]. Furthermore, the behavior of individuals in business organizations are situations in which the extent of one's control is limited by time, money, authority, and ability, and thus the effectiveness of TPB, including PBC, is demonstrated.

However, Groen et al. (2012) is the only paper at the Q1 level that applies TPB in MCS research. In addition, Groen et al. (2012) only conducted a qualitative survey of the effects of MCS on attitude, subjective norm, and PBC, and did not conduct a quantitative analysis. Therefore, it is necessary to conduct quantitative research including the effects of MCS on the three factors in TPB.

The purpose of this study is to quantitatively analyze whether TPB can explain the motivational mechanism of MCS. In this study, we consider MCS as a hybrid system [4] consisting of a budgetary control system, and the Hoshin management system. A budgetary control system is financial control. Hoshin management system is a non-financial control unique to Japan that has recently been attracting attention[2]. However, there is not enough research accumulation on the effect of Hoshin management systems [6]. Based on this background, we set a research question: What mechanisms by which budgetary control system and Hoshin management system affect the psychology of front-line employees and motivate them to Kaizen? To answer this research question, we apply TPB to reveal the black box of the motivational mechanism of MCS.

2. Hypothesis

In this study, the following four hypotheses were analyzed. These hypotheses are based on the prediction that the budgetary control system and Hoshin management system mediate attitude, subjective norm, and PBC, and affect the intention of Kaizen.

H1: Budgetary control system positively and significantly affect attitudes, subjective norms, and PBC.
H2: Hoshin management system will positively and significantly affect attitudes, subjective norms, and PBC.
H3: Attitude, subjective norm, and PBC positively and significantly affect the intention of Kaizen.
H4: Attitudes, subjective norms, and PBC mediate the relation between the budgetary control systems and the Hoshin management system and the intention of Kaizen.

3. Materials and Methods

3.1 Research Site

The analysis is based on questionnaire data from employee satisfaction research conducted in the fiscal year 2021. It is for the front-line employees at a luxury hotel chain company in Japan.

[2] Hoshin management system has received attention in the international literature as well as in Japan (da Silveira et al., 2018).

3.2 Data

The sample size of the data was 3710, and its characteristics are as follows. Age: 41.5% were in their ~20s, 21.5% in their 30s, 16.3% in their 40s, 11.5% in their 50s, and 9.2% in their 60s or older. Regarding years of service, 10.1% were in their first year, 12.5% in their second year, 10.2% in their third year, 19.1% in their fourth to fifth years, 23.2% in their sixth to tenth years, 13.8% in their 11th to 15th years, and 11.1% in their 16th year or more. By gender, 46% were female, 52.9% were male, 0.7% were unanswered, and 0.5% were other. Regarding the entry category, 54.2% were mid-career hires and 45.8% were new graduate hires. In addition, seven items including these characteristics of samples were used as control variables. The questionnaire items used, their means and standard deviations, and the factor loadings for each item are shown in Figure 1, and the correlation matrix is shown in Figure 2.

Table 1. Descriptive Statistics and Factor Loading.

name	questionaire	mean	S.D.	factor loading
Budgetary control sysytem	Is the information about the relationships between your operation and sales targets or expense budgetsand shared?	3.580	1.092	0.827
	Do you think the department is very conscious of the need to achieve the budget?	3.640	1.107	0.817
	Are you aware of the fact that your job performance has a significant impact on the achievement of the budget, and do you act accordingly?	3.790	1.012	0.827
Hoshin management sysytem	Has your department set clear goals for what will be accomplished by when in the current fiscal year?	3.690	1.066	0.852
	Are your voices reflected in the policies of your headquarters, divisions, and facilities, and in the measures taken to achieve them?	3.490	1.056	0.854
	Is everyone able to check the progress of the department's goals whenever they are needed?	3.650	1.055	0.864
	Does your immediate supervisor give you accurate instructions based on the status of achievement of departmental goals?	3.740	1.067	0.908
	When there are instructions or changes in work to achieve goals, are there satisfactory explanations?	3.670	1.088	0.883
Attitude	Do you have strong feelings about your current job?	3.490	1.186	0.879
	Do you feel your current job is rewarding and fulfilling?	3.570	1.160	0.907
	Are you proud of your work?	3.800	1.095	0.908
	Do you find meaning and purpose in your work?	3.750	1.064	0.879
Subjective norm	Do you have a clear understanding of what is expected of you in your job?	4.050	0.840	—
PBC	Do you have sufficient free-spending funds to improve the quality of your operations and services?	3.190	1.167	0.772
	Do you have enough free time to improve the quality of your work and services?	2.910	1.239	0.808
Intention of Kaizen	Can you persevere even if your work is not going well?	3.840	1.015	0.768
	Do you like to collect information related to your job, not only at work, in order to improve your skills and abilities?	3.670	1.076	0.760

Table 2. Correlation Matrix[23].

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Budgetary control sysytem (1)	1	0.726**	0.523**	0.488**	0.440**	0.500**	0.176**	0.126**	0.143**	-0.122**	-0.030**	-0.135**	0.209**
Hoshin management system (2)		1	0.549**	0.489**	0.532**	0.503**	0.203**	0.104**	0.087**	-0.169**	-0.072**	-0.209**	0.159**
Attitude (3)			1	0.554**	0.388**	0.742**	-0.026*	0	0.180**	-0.167**	0.176**	-0.238**	0.144**
Subjective norm (4)				1	0.313**	0.549**	0.047**	0.041**	0.157**	-0.106**	0.093**	-0.150**	0.124**
PBC (5)					1	0.342**	0.182**	0.051**	0.027*	-0.134**	-0.109**	-0.214**	0.113**
Intention of Kaizen (6)						1	0	0.027**	0.140**	-0.133**	0.136**	-0.238**	0.154**
Entry Category (7)							1	0.237**	-0.054**	-0.254**	-0.581**	0	0.008*
Type of employment (8)								1	0.056**	-0.137**	-0.412**	0.047**	0.249**
Tenure (9)									1	0.101**	0.398**	-0.046**	0.187**
Aspiration order (10)										1	0.211**	0.054**	0
Age (11)											1	-0.046**	0.075**
Effect of COVID-19 (12)												1	-0.054**
Gender (13)													1

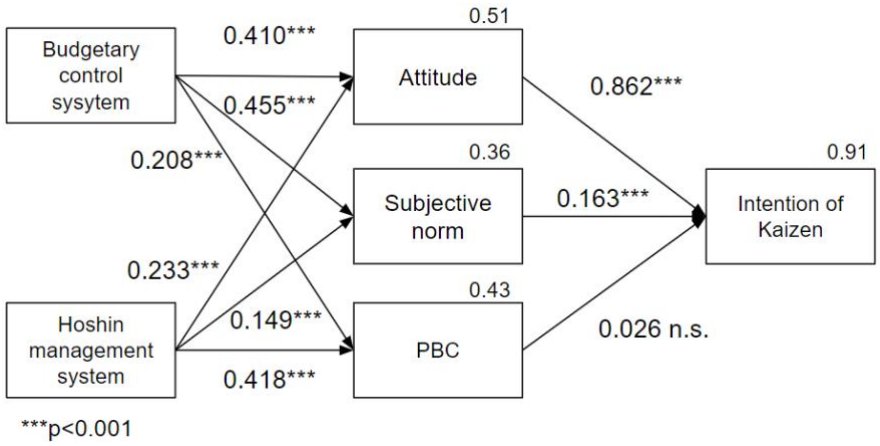
*p<0.05, ** p<0.01

4. Result and discussion

First, a confirmatory factor analysis (maximum likelihood method) was conducted using IBM Amos 28.0. The goodness of fit of the model was $\chi 2=1869.588^{***}$, df=94, AGFI=0.913, GFI=0.940, CFI=0.964, and RMSEA=0.071, indicating no problems in fitting the data.

We used Covariance structure analysis for testing the four hypotheses. Goodness-of-fit indices were $\chi 2=2830.176^{***}$, df=194, AGFI=0.904, GFI=0.938, CFI=0.955, and RMSEA=0.061. The results are shown in Table 3.

Table 3 Result of pas analysis.



Except for the path from the PBC to the Intention of Kaizen, almost all paths had a positively significant effect. Thus, H1 and H2 were supported, while H3 was partially supported.

In addition, to analyze for indirect effects of H4, we conducted a bootstrap method (resampled 5000 times). PBC was excluded from this analysis because it has no main effect on the intention of Kaizen. When the Budgetary control system was positioned as an independent variable, attitude (β=0.296, SE=0.013, p<0.05, BCLL=0.271, BCUL=0.322), subjective norm (β=0.075, SE=0.008, p<0.05, BCLL=0.059, BCUL=0.059, and BCUL=0.092) has indirect effects for intention of Kaizen. Similarly, when the Hoshin management system was positioned as an independent variable, indirect effects were obtained for both attitude (β=0.312, SE=0.013, p<0.05, BCLL=0.287, BCUL=0.339) and subjective norm (β=0.079, SE=0.008, p<0.05, BCLL=0.063, BCUL=0.095). Therefore, H4 was partially supported.

These results suggest that budgetary control systems and the Hoshin management system have different mechanisms that promote the intention of Kaizen. The budgetary control system showed high path coefficients for subjective norms and attitudes. Furthermore, these have an indirect effect on the intention of Kaizen. On the other hand, the Hoshin management system showed the highest path coefficient for PBC. However, PBC has no significance to the intention of Kaizen.

H3 and H4 were the opposite results from hypnosis because PBC does not affect the intention of Kaizen. However, this result is consistent with Ajzen (2002) and Cheung & Chan (2000). Ajzen (2002) conducted a meta-analysis on TPB intending to clarify the ambiguity of the concept of PBC. In his study, he proposed PBC should be measured by 2 aspects. One is self-efficacy indicating "dealing largely with the ease or difficulty of performing a behavior" and the second is controllability indicating "the extent to which performance is up to the

actor. In addition, Cheung & Chan (2000) found that while the aspect of self-efficacy has a significant effect on behavioral intention and behavior, the aspect of controllability has no significant effect on behavioral intention, but has a direct significant effect on behavior. Based on these studies, we reconsidered the questionnaire in this study and found that it only measured aspects of controllability such as time and expense. The aspect of self-efficacy was lacking in the questionnaire. Thus, the result that PBC was not significant for behavioral intention is consistent with Ajzen (2002) and Cheung & Chan (2000).

5. Conclusion

Conducting quantitative research including the effects of MCS on attitude, subjective norm, and PBC in TPB is a contribution to this research. We also found quantitative differences in the mechanisms by which the budgetary control system and Hoshin management system motivate employees' intention of Kaizen.

However, we found problems with the questionnaire about PBC. We need to measure aspects of self-efficacy in future research.

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A Modest Review Using Stackable Credentials for Entrepreneurial Skills in Business Diploma Programme

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Abstract – *Since entrepreneurial abilities are essential in promoting growth, generating income, and creating employment, entrepreneurship has a significant influence on a nation's economic advancement. One of the initiatives to encourage youth entrepreneurship is the Malaysia Education Blueprint 2015-2025 (Higher Education) by integrating environmental variables with the cognitive characteristics and practices of entrepreneurs to better understand their learning process as they must take responsibility of their own growth. As the use of micro-credentials in higher education may help in the decoupling of degree programs, extension of learning alternatives, and giving students access to effective tools for skill and competency recognition. The goal of this study is providing an overview to develop a dynamic and flexible stackable credentials framework that may equip business students at the diploma level with entrepreneurial competences and attitudes to compete in the market. In addition to the present Covid-19 pandemic and the impending recession, this clearly illustrates the significance of educating students and recent graduates entrepreneurship skills. Stackable entrepreneurship education may help people become more entrepreneurial, this study will engage industry professionals to participate in focus groups and surveys of students and academics.*

Keywords: Stackable Credentials; Competencies; Entrepreneurship; Lifelong Learning; Diploma.

1. Introduction

With the rise of Industry 4.0, which is changing society as quickly as it is growing, higher education has taken on a complicated, intriguing, and dialectical element; it is imperative that governments comprehend its consequences at all levels, particularly in higher education [1]. Between the years 2000 and 2010, Malaysia's HEPs/HEIs first exposed Science, Technology, Engineering, and Mathematics (STEM) students to entrepreneurship education for its financial advantages [2]. Micro-credentials (MCs) are becoming more prevalent in Malaysian Higher Education (MOHE), which is devoted to one of the primary goals of the European Commission, namely to accomplish a paradigm shift in skills and lifelong learning in order to boost the country's competitiveness and ingenuity [3]. Across all academic disciplines, there has been a significant growth in popularity and focus on students' ability to comprehend how to produce commercial or societal value from their skills and knowledge [4]. The trend of continuing education has drastically shifted recently, with stacking credentials becoming more and more popular among HEPs/HEIs and students embracing stackable credentials as a bridge to graduate-level degree programs.

This study intends to explore the key elements that diploma business courses must have while adopting a flexible stacking credentials paradigm in relation to entrepreneurial competencies, which gives insights into the expertise and knowledge that students in the business/commerce domain need and may seem to be aligned with the objectives of the business curriculum since it would both address a present demand for micro-credentials and give students with strong skills. Students should be passionate, self-assured, proactive, creative, and able to establish a business based on STEM as part of their entrepreneurship education programs. Competencies may be developed through pedagogical research, student instruction, and the development of educational programs, particularly in the area of business and commerce. This study is being undertaken to discover the ideal entrepreneurship elements that might be included to the diploma's field of business management in order to develop students' entrepreneurial competencies. However, identifying the relevant samples is important in this area. Credential stacking in the Diploma Business Program enables more flexible skill evaluation and qualification issuance in the development of entrepreneurial capabilities, as some organizations desire a rapid road to certification, especially given recent changes to Coronavirus illness (COVID-19).

2. Methodology

This study will conducted throughout Malaysian HEPs/HEIs utilising pre-existing data and statistics collected from government entities, universities, colleges, and other related academia institutions using survey instrument. A cross-sectional survey is used to collect data from a specific population at a certain point in time with closed-ended and open-ended questions which contains descriptive data for each question from responses. This study considers a wide range post-secondary learners whom has completed any tertiary education levels, and/or working adults whom has went back to school after a hiatus at work and have opted to join any Malaysian HEPs/HEIs in pursing stackable entrepreneurship education when it comes to establishing entrepreneurial capabilities, primarily at the diploma level.

The literature search was carried out for the related articles using a systematic literature review (SLR) methodology, to access the potential factors of stackable credentials in correlate with the micro-credentials. Due to the rapid advancement of digital technologies and Industry 4.0 in 21st century, HEPs/HEIs may upgrade their curricula, instruction, and even delivery methods. Students enrolled in the Diploma in Business Studies Program may earn relevant credits in a flexible manner as part of the stackable entrepreneurial education by using the "stacking credentials curriculum." It is required of business students to cultivate their entrepreneurial spirit within such a flexible and stacked curriculum.

3. Discussion

The ability of a nation to be innovative, competitive, and economically powerful has long been recognized as being strongly influenced by its entrepreneurial spirit [5]. Through training, seminars, short courses, conferences, and events, the Malaysian Ministry of Education (MOE) aims that entrepreneurship education may be defined as the systematic

formal transfer of entrepreneurial skills, which are the concepts, abilities, and mental awareness that individuals learn to establish and extend their growth-oriented enterprises [6]. Entrepreneurs are the driving force that necessitates a variety of entrepreneurial ideas and strategies to avoid or lessen the effects of the aftermath in order to succeed long-term in business, especially now that every person on Earth has been affected by the COVID-19 epidemic and the lockdowns that followed have shocked the entire world in a way that has never happened before [4, 7]. Given that education is formed by needs, education should be created to equip people with the skills necessary for lifelong learning since learning continues throughout life and gets more continuous as one's knowledge and ability develop [8]. Micro-credentials' emergence has sparked a boom in interest in "competence learning" in many areas of education, training, and professional development [9].

Despite the fact that many universities provide online certification programs, some academics have seen MC as an additional certification to a formal qualification [10]. As work and study are no longer need to be done in a straight line but rather can be spread out across a person's lifetime, it fosters lifelong learning. A stacking credential is a coordinated route of two or more occupation-specific education credentials that enables students to exchange courses and build abilities within one profession [11]. The process of developing stacking credentials is difficult because of the various constraints that have made it difficult for students to obtain the credentials they need to advance in their professions and for companies to locate the qualified employees they desire. Nations and institutions must overcome these obstacles if they are to progress in developing stacked credentials. If credentials are stackable, students will be more inclined to pursue higher education since they will have the option of employability with each award and the chance to go back for more study. Stackable credentials will also likely become more vital and advantageous in constructing higher-level, straightforward degree maps and designs, allowing progression stacks to dramatically rise in the future [12].

5. Conclusion

The study seeks to determine the concise affiliations between entrepreneurial and competency development elements in diploma-level business courses offered by MOHE, along with how it may preparing for Education 4.0 hurdles that might confront by developing an appropriate framework. This will most likely be done utilizing the stacking credentials paradigm in combination with micro-credentials; and projected to be beneficial in line with the use of Education 4.0 technologies as the use of micro-credentials in the educational system grows simultaneously.

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The Moderating Effect of Gender Diversity on Communication Through Hoshin Management

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Abstract – *There is a need for research on front-line employees in management control systems (MCS), which are systems used to align employee decision-making and behavior with organizational objectives and strategies. However, the problem is that previous MCS studies have not examined the impact of gender diversity of frontline employees on MCS. This study addressed hoshin management as MCS for frontline employees and aimed to quantitatively examine whether gender diversity moderates the impact of hoshin management on communication. The results of multiple regression analysis and simple slope analysis revealed that hoshin management in a situation of high gender diversity promoted communication to a greater extent.*

Keywords: management control systems; hoshin management; gender diversity; communication; front-line employee

1. Introduction

Management control systems (MCS) refers to a system used to align employee decisions and actions with organizational objectives and strategies [1]. In MCS research, which is a system that orients employees toward achieving organizational objectives and strategies, the need for research with frontline employees has been pointed out [2] [3]. Behind this is the problem that since Anthony (1965), who systematized MCS, limited the scope of MCS to managers, there has been little MCS research on frontline employees.

Hoshin management is an MCS used in Japanese companies to orient frontline employees toward the achievement of organizational objectives and strategies [4]. Hoshin management is a system in which frontline employees, under the supervision of a frontline manager, devise and implement measures to achieve annual policies, based on medium- and long-term goals based on strategy [5] [6].

To encourage policy making by front-line employees in Hoshin management, it is considered important to promote communication toward policy achievement by front-line employees who have various viewpoints. However, a problem in Japanese companies is that there is an atmosphere in which it is difficult for women to propose their opinions. In diversity studies, it has been pointed out that gender diversity (GD) causes conflicts of opinions and inhibits the exchange of opinions among employees [7]. However, MCS studies have not examined the impact of GD on MCS among frontline employees. What kind of impact does GD of front-line employees who participate in policy making have on the communication through Hoshin management? This is the research question of this study.

Therefore, this study takes up Hoshin management as an MCS targeting front-line employees and aims to quantitatively verify the moderating effect of gender diversity on communication by front-line employees promoted by Hoshin management.

2. Hypothesis

Hoshin management is a management technique that originated in the quality control of Japanese companies and has been attracting attention overseas in recent years. Prior research has shown from case studies that Hoshin management promotes communication among employees [8] [9].

GD is expected to have a negative moderating effect on this relationship from Hoshin management to communication. As mentioned above, GD has been demonstrated to create conflicts of opinion and inhibit the exchange of opinions among employees [7][3]. In this study, I measure GD following [7], who measures GD by the Blau index of [10]; a high GD situation is one in which the ratio of male to female employees in a department or division approaches 1:1.

Based on the above discussion, we set the following hypotheses.

H1: Gender diversity moderates the impact from hoshin management to communication. High gender diversity suppresses the positive impact of communication from hoshin management, while low gender diversity promotes the positive impact of communication from hoshin management.

3. Research Site

Company A, an operator of a chain of luxury hotels in Japan, was selected as the research site because it is important to enhance customer satisfaction through communication among front-line employees who have direct contact with customers. The company has been working to activate communication among employees in the field through Hoshin management since 2004.

The data were collected through a questionnaire survey of on-site employees working for Company A in December 2021. A five-point Likert scale was used for the question options. The number of valid respondents was 936.

First, since the data analysed in this paper were collected from a single source, Harman's single factor test was conducted to see if the problem of common method bias arose [11]. The results showed that the two-factor model had $\chi 2=226.335$, df=19, CFI=.0.972, and

[3] Nishii (2013) has 922 citations (Google Scholar, accessed 7/17/2022) and is a representative study demonstrating GD.

RMSEA=.0.108. In contrast, the goodness of fit of the one-factor model was χ2=1094.884, df=19, CFI=.0.853, and RMSEA=.0.24, indicating a higher goodness of fit than the one-factor model. Therefore, the three-factor model was adopted because this model does not have a major problem of common method bias. Table 1 shows descriptive statistics.

Table 1. Descriptive statistics.

Variables	Questions	Mean	S.D.	α
(1)hoshin management	Does your immediate supervisor give you accurate instructions based on the status of achievement of departmental goals?	3.44	1.06	0.938
	Do you receive satisfactory explanations when you receive instructions or changes in your work to achieve your departmental goals?	3.44	1.05	
	Is everyone able to check the progress of the department's goals whenever necessary?	3.38	1.06	
	Are your voices reflected in the policies of your headquarters, divisions, and facilities, and the measures taken to achieve them?	3.29	0.98	
	Has your department clearly defined what to accomplish by when in the current fiscal year?	3.46	1.03	
(2)gender diversity	-	0.41	0.14	-
(3)commnication	Do you have active discussions to achieve departmental goals?	3.34	1.10	0.934
	Do you discuss business issues and concerns?	3.48	1.11	
	Do you exchange opinions about the department's work to gain new perspectives?	3.34	1.10	

	(1)	(2)	(3)
(2)	-0.007	-	
(3)	.759**	-0.006	-

**p<0.01

4. Results

To test the hypotheses, a hierarchical multiple regression analysis was conducted using IBM SPSS Statistics 28.0. The results of the analysis are shown in Figure 2. To avoid multicollinearity, interaction terms were created by centering each independent variable.

Table 2. Results of hierarchical multiple regression analysis.

dependent valuable:communication	model1	model2	model3
joining category	0.132**	0.036	0.035
length of service	-0.08*	-0.03	-0.03
age	0.03	0.019	0.019
hoshin management		0.754**	0.751**
gender diversity		-0.003	-0.002
hoshin management*gender diversity			0.041 †
Adj.R^2	0.016	0.575	0.576
ΔR^2		0.558**	0.002 †

***p<0.001, **p<0.01, *p<0.05, † p<0.10

Notes: Standardized partial regression coefficients are listed.

The analysis revealed that the interaction between hoshin management and GD had a positive effect on communication (β=.041, p=.053). Therefore, referring to the procedure of [12], we calculated the interaction effect and tested the difference in slopes.

The results revealed that even when GD is low, communication is facilitated by hoshin management (t=16.008, p=.000), but when GD is high, communication is further facilitated by hoshin management than when GD is low (t=9.901, p=.000). Thus, "H1: Gender diversity moderates the impact from hoshin management to communication. High gender diversity suppresses the positive impact of communication from hoshin management, while low gender diversity promotes the positive impact of communication from hoshin management." was partially supported. In other words, the second part of the hypothesis, that it promotes the positive influence of communication from hoshin management when gender diversity is low, was supported, but the first part of the hypothesis, that it suppresses the positive influence of communication from hoshin management when gender diversity is high, was rejected.

5. Discussion and Conclusion

The results of the analysis partially supported the hypothesis and rejected the hypothesis that high gender diversity suppresses positive influences from hoshin management to communication.

The reason for rejecting the hypothesis may be that the implementation of hoshin management fostered the climate for inclusion, which has been the focus of recent diversity studies. The climate for inclusion refers to " the degree to which an employee perceives that he or she is an esteemed member of the work group through experiencing treatment that satisfies his or her needs for belongingness and uniqueness" [13]. In fact, the climate for inclusion has been shown to reduce the negative effects of GD [7]. Therefore, it is considered necessary to include the climate for inclusion as a variable in future analyses.

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Work-Based Learning to Improve TVET MARA Employability

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Abstract – *Work-Based Learning (WBL) is a learning method that combines two learning mediums, namely theoretical learning in educational institutions and practical applications in industry. The combination of these two learning mediums can provide exposure and relevant industry experience according to the field of study that can bridge the mismatch between the needs of the industry with the graduates especially produced by TVET MARA. Through a systematic list review (SLR), this paper aims to identify the existing WBL methods or models in TVET MARA capable of providing high impact in contributing to the marketability of TVET MARA graduates. Methods or models implemented in other public or private institutions are identified to improve the existing methods or models implemented in TVET MARA. The findings contribute to the expanding body of empirical data indicating that WBL has a favourable influence on TVET. Supporting the adoption of work-based learning (WBL) into mainstream TVET practises can be a way for policymakers, educators, and members of the public to contribute to the growth of TVET.*

Keywords: Technical and Vocational Education and Training (TVET), Work-Based Learning (WBL), employability, graduates.

1. Introduction

UNESCO Commission on Technical and Vocational Education and Training (TVET) officially approved the recommendation in 2015. The aim is based on improving the learning process to elevate TVET quality and responsiveness to labour market signals. WBL reflects a country's capacity for youth employment, the success of multi-level TVET administration, and the necessity of developing a well-rounded learning process for future employment and personal growth. Malaysia's educational system has made extensive use of WBL, including in Public and Private Universities, Polytechnics, Community Colleges, and even TVET MARA. Malaysian Qualifications Agency (MQA) has given its accreditation to the WBL methodology. Work-based learning (WBL) is a method that combines two learning mediums, namely in institutions and industry.

The TVET MARA programme aims to produce skilled psychomotor workers with the affective domains required by the industry. These graduates are expected to earn better salaries commensurate with the skills they possess.

2. Materials and Methods

Known as a systematic review, this study's meta-analysis technique includes specific and precise methods for identifying, screening, and eligibility and included the individual research and overall evidence, but it excludes the findings of all studies studied as a whole.

2.1 Literature Review

Work-Based Learning (WBL) is a type of Contextual Teaching and Learning (CTL) that incorporates work-related activities within the learning materials. With WBL, teaching and learning may be made more effective by enhancing students' abilities in the workplace [1]. In addition, WBL combines the learning process with real-world job operations. In most OECD countries, vocationally-oriented programmes are now also designed to prepare students for further study at the tertiary level [2]. Table 1 presents the use of WBL within school-based vocational programmes in countries that responded to OECD questionnaires.

Table 1. WBL in certain school-based vocational programmes [3].

Country	Mandatory	Programme
Sweden	Yes	Required 15 weeks of work-based learning within a VET programme;
Finland	Yes	Mandatory work placement of at least six months during upper secondary vocational programmes (about 20% of the programme's duration);
France	Yes	At least 22 weeks of mandatory work placement for upper secondary VET students
Netherlands	Yes	Students in school-based VET programmes must spend at least 20% of their time in work placements, with an average of around 30%.
Spain	Yes	300 hours (out of a total of 18 months to 2 years)
England (UK)	Yes	A minimum of 315 hours (or 20% of the course duration) in the new T-level qualification.
Australia	No	Variable according to the jurisdictions and the institutions
Israel	No	Students can undertake workplace visits as an option.

2.2 WBL in TVET MARA

Most Technical and Vocational Education and Training (TVET) programs in Malaysia applied the development model, which applies inversely proportional principles to the percentage of theory at 60% and theoretical practice in the laboratory/workshop at 40%. According to Seagraves, et al. [4], the learning component of the Work-based learning (WBL) programme should be organised in such a manner that it is coordinated and integrated with the curriculum as well as the evaluation system. This should take place both in the classroom and in the workplace.

At TVET MARA institutions, all engineering technology programs implement 30-40% theory and 60-70% practical [5] and students are required to undergo Industrial Training in a period between 12 weeks to 26 weeks depending on the needs of the program [6]. The period set by TVET MARA meets the minimum 8 weeks of continuous training requirements stated in the WBL guidelines by the Malaysian Qualifications Agency [7].

3. Results and Discussions

Today's workplace necessitates employees with a combination of technical know-how and transferable soft skills. Furthermore, the learning process should be organised in a way that emphasises norms and skill development rather than rote memory, so that students aren't only able to get certificates. It is possible to improve one's employability by doing academic work, working, participating in industry-based training, and incorporating job-based learning. Subekti, et al. [8] found there was a significant contribution of implementing work-based learning on vocational students' employability skills.

Williams and Hausman [9] note that the concept of employability has changed across history. The topic of employability can be differentiated from jobs. It is possible to be working when not being employed. According to Hillage and Pollard [10], employability is (a) the ability to achieve initial employment, (b) the ability to retain employment and make transfers between jobs and positions within the same company to fulfil new work requirements, and (c) the ability to acquire new employment if necessary, to be self-sufficient in seeking a job if need be. In Asia, employability theory focuses mainly on the competencies a graduate must have to find jobs. Base on the Ministry of Higher Education's Graduate Tracking Study System website, graduate employability for the TVET MARA is 91.8% on 2020 and increase to 92.9% on year 2021. Apart from that, only 44.9% of graduate receive a salary above RM1,5001 in year 2020 and 46.7% in year 2021.

4. Conclusion

Based on the discussion on the result of this study, it can be concluded that the implementation of work-based learning (WBL) contributes significantly to the employability skills development of students in TVET MARA Institutions. As TVET MARA always collaborates with the industry either in developing the curriculum, updating the curriculum and other teaching and learning activities, as well as implementing industrial training, TVET

MARA is felt to be on the right track in implementing WBL. Therefore, it is possible to draw the conclusion that the implementation of WBL as a learning model may be employed in the development of employability skills among graduates of vocational programmes especially TVET MARA graduates.

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Need Analysis of TVET Excellence Centre with Industrial-based Recognition Factors for Electrical Diploma Courses at TVETMARA Institutions

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Abstract – *In model construction research, needs analysis must be done to ensure that the products meet the consumer's needs. Therefore, this research was conducted to determine the development needs of the Framework of TVET Excellence Centre with Industrial-based Recognition for Electrical Diploma Courses at TVETMARA Institutions. A needs analysis is carried out on 120 instructors of TVETMARA institutions by sampling to develop a framework that meets their user needs. The questionnaire consists of six constructs relating to the level of consent to the constructs of development of the Framework of TVET Excellence Centre with Industrial-based Recognition for Electrical Diploma Courses at TVETMARA Institutions. The Statistics Package for Social Sciences (SPSS) software version 26.0 was used to analyse the data using descriptive statistics. The findings showed that the level of consent for the Framework Design construct was moderate at 2.76 (SD=0.79). The study results will be used to plan and develop the framework in the next phase.*

Keywords: Construction Research; Need Analysis; TVET Excellence Centre

1. Introduction

The quality of higher education students has been a hot topic in recent years, whether among academics, professionals, industry, or the general public. One of the top reasons for this discussion is that graduates from higher education institutions have a harder time finding work after graduation. As we all know, education is a milestone to ensure the success of the development of a country. Therefore, to realise these aspirations, the Malaysian education system must follow its model and progress to achieve a fully developed country status. The definition of a developed country is advanced in terms of material and spiritual development, including human behaviour [1].

Unemployment has been a major concern worldwide, especially as the world moves toward the Fourth Industrial Revolution. Its employability determines a state's economic growth rate [2]. Unemployment is distressing for graduates because it impacts many aspects of their personal lives, particularly those who took out student debt. According to statistics, the graduate unemployment rate has risen in the last decade as the number of graduates entering the labour force has increased [3]. Some industries did not recognise the qualifications of TVET graduates. Therefore, this could result in issues with unemployment among TVET graduates [4]. Cheong & KH Lee (2016) stated that employers believed that

TVET students lacked academic intelligence. The students agreed that the skills they learned in class did not comply with their work skills [6].

1.1 Needs Analysis in Framework Development

The need for the development of this study is to meet the needs of analysis to identify the components to develop the Framework of TVET Excellence Center with Industrial-based Recognition for Electrical Diploma Courses at TVETMARA Institutions. Needs analysis studies are part of the Design and Developmental Research (DDR) process. It has become one of the most important research approaches in Instructional Design and Technology (IDT) [7]. Richey and Klein [7] define DDR (DDR hereafter) as the systematic study of the design, development and evaluation processes to establish an empirical basis that can enhance the creation of instructional and non-instructional products and tools as new or enhanced models that can govern their development. The analysis phase in the study is collecting information in the context and environment to be studied [8]. In order to complete this study, needs analysis entails understanding the TVETMARA ecosystem and the strategic factors required to ensure that TVETMARA institutions and the graduates of TVETMARA meet the needs of the industry. The TVETMARA ecosystem and strategic factors must be supported by two primary entities: instructors and industry experts who mutually assist one another. Therefore, needs analysis research is essential for identifying the proper outcome to ensure that existing problems can be addressed to produce graduates that fulfil the need of the industry.

1.2 Research Objective

This study was carried out based on a needs analysis to collect data for developing the Framework of TVET Excellence Centre with Industrial-based Recognition for Electrical Diploma Courses at TVETMARA Institution. Needs analysis is performed to identify framework needs before the model is developed and evaluated in the next phase. This study aims to identify strategic factors in developing a framework for TVET Excellence Centre with Industrial-Based Recognition for Electrical Diploma Courses at TVETMARA Institution.

2. Methods

This study employs a cross-sectional survey method for needs analysis in developing a Framework for TVET Excellence Centre with Industrial-Based Recognition for Electrical Diploma Courses at TVETMARA Institution. A five-point Likert scale was used in each instrument from the range of strongly disagree with the value of 1 to strongly agree with the value of 5. The translation process employs the back-to-back translation method [9]. Next, two experts in the field of TVET reviewed the questionnaire items. The study sample consisted of 140 instructors from fifteen TVETMARA institutions in Malaysia. Sample selection is purposive sampling.

A pilot study was conducted to test the reliability of the instruments used in the actual study and to assure their consistency and accuracy. Reliability refers to the consistency or

stability of a study's measures [10][11]. The reliability of the items in the instrument was determined based on Cronbach Alpha values obtained from statistical analysis conducted using IBM statistical software version 26.0. An alpha value above 0.80 is an excellent and acceptable coefficient [12].

Next, the data obtained were analysed through descriptive statistics. The descriptive statistics used were frequency, percentage, mean and standard deviation.

3. Results and Discussions

3.1 Respondent Demographics

One hundred forty instructors completed the questionnaire from fifteen TVETMARA institutions in Malaysia. Gender, academic qualification, energy commission competency certificate, employer, experiences, and certificate or diploma programme teaching are examples of demographic information. The distribution of respondents is based on gender, as in Table 1. Male respondents are 123 (87.9%), and female respondents are 17 (12.1%).

Table 1. Number of respondents by gender.

Gender	Frequency	Percent
Male	123	87.9
Female	17	12.1
Total	**140**	**100**

Table 2 shows the main construct of the framework. The results of data analysis in Table 4 found that construct A is "Quality Assurance" (M= 2.46, SD=0.70), B is "Industrial Training" (M= 2.49, SD=0.77), C is "Certification from an Authorized Body" (M= 4.15, SD=0.48), D is "Industry Involvement" (M= 2.50, SD=0.83), E is "Financial Subsidies" (M= 2.59, SD=0.88), F is "Stakeholder Opportunities" (M= 2.59, SD=0.88), G is "Work-Based Apprenticeship" (M= 2.59, SD=0.88) and H is "Soft skills" (M= 2.71, SD=0.87).

Table 2. Main Construct of the framework.

Construct	Mean, M	Standard Deviation, SD	Interpretation
Quality Assurance	2.46	0.70	Moderate
Industrial Training	2.49	0.77	Moderate
Certification from an Authorized Body	4.15	0.48	High
Industry Involvement	2.50	0.83	Moderate
Financial Subsidies	2.59	0.88	Moderate
Stakeholder Opportunities	2.59	0.88	Moderate
Work-Based Apprenticeship	2.59	0.88	Moderate
Soft skills	2.71	0.87	Moderate

4. Conclusion

The results show that overall there is a need for developing a Framework for TVET Excellence Centre with Industrial-Based Recognition for Electrical Diploma Courses at TVETMARA Institution because the mean score is still at a moderate level. Furthermore, almost all of the constructs that make up the study are at a moderate level. This indicates a need to develop a Framework of TVET Excellence Centre with Industrial-Based Recognition for Electrical Diploma Courses at TVETMARA Institution.

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Strategic Management for Emotional Health of Field Workforce in Physical Infrastructure Maintenance During the Covid-19 Pandemic

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Abstract – *Physical infrastructure maintenance (PIM) is becoming vital at Universiti Kebangsaan Malaysia (Kuala Lumpur Campus) (UKMKL), since most buildings are 48 years old. In addition, it offers healthcare to the public. However, on the widespread coronavirus disease 2019 (COVID-19), all sectors of economy have been impacted by stringent rules and limitation of movements. Complicated procedures and fear about exposure to the virus has led to the negative emotions among FW. Therefore, the aim of the paper to develop a strategic management for emotional health of FW in PIM during the COVID-19 pandemic. A qualitative study was chosen and five-step research methodology was developed. The challenges and factors that impact the emotional health of FW were analyse through literature. Further, strategies in managing the emotional impact among FW in PIM during the COVID-19 were proposed. Mental health and safety of the FW are more difficult than ever before because to the need for everyone to adjust to new ways of working. The results of this study will greatly benefit leaders in understanding the challenges of COVID-19 among FW thus be able to provide safety conditions to protect FW and support them both mentally and physically during the pandemic.*

Keywords: strategic management; maintenance; mental; emotion; COVID-19

1. Introduction

Physical infrastructure maintenance (PIM) has grown increasingly important in Universiti Kebangsaan Malaysia (Kuala Lumpur Campus) (UKMKL), as most buildings have reached 48 years old. In addition, it offers clinical facilities such as the Dentistry Clinic, Optometry Clinic, and Physiotherapy Clinic to the general public as part of an endeavour to create their own incomes.

However, on the widespread coronavirus disease 2019 (COVID-19) starting December 2019. Malaysia was placed under lockdown, also known as a Movement Control Order (MCO), on Mar 18, 2020. COVID-19 was officially labelled as a pandemic by the World Health Organization (WHO) on Mar 11, 2020 [1].

All sectors of the economy have been adversely affected by increased limitations on movement. One of the key tactics for stopping the spread of the pandemic has been proved to be social isolation; therefore, activities such as attending school, working, and shopping

have moved to a virtual world. The PIM, for example, is an important social practise that cannot be carried out online [2], [3].

During the COVID-19 outbreak, it is critical that we gain a better understanding of the mental health of field workers (FW) in the PIM. The impacts of coronavirus disease 2019 (COVID-19) on mental health and well-being are expected to be significant and long-lasting, extending beyond individuals immediately afflicted by the virus[4], [5].

Although public health interventions are vital for protecting physical health, a better understanding of the mental health of the FW must also be gained. The information is necessary to guarantee that individuals impacted receive the necessary assistance and to enable us to be better prepared for a potential second wave of the pandemic and for future lockdown or MCO [2], [6].

There is a significant amount of literature regarding the impact of COVID-19 on FW in the construction industry, but there are very few studies examining the impact of the pandemic on the mental health of FW in the PIM industry, particularly PIM in ageing buildings and those associated with public universities with clinical facilities. The aim of this study is to identify the challenges and causes that have an emotional impact on the FW in PIM industry pertinently in the public university, namely UKMKL, as well as approaches to manage the emotions strategically.

2. Materials and Methods

2.1 Research Process

A qualitative study was chosen due to the novel and untested nature of the research subject, as well as time constraints and changes for FW in PIM due to contract renewal. Although, in general, it is based on ideas and impressions drawn from the literature review, in addition to integrating the underlying features of the individual experience of daily life. A five-step research methodology was developed to meet the study's objectives, and a schematic road map of the research process is presented in Figure 1.

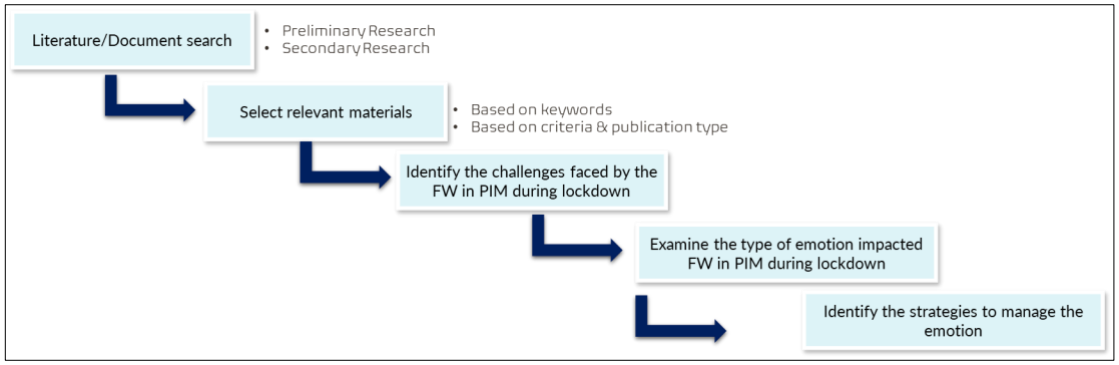

Figure 1. Research Process.

2.2 Research Site

The study will be conducted at Universiti Kebangsaan Malaysia, Kuala Lumpur Campus which cover three different locations viz. Jalan Raja Muda, Kuala Lumpur, Jalan Temerloh, Kuala Lumpur and UKM Tanjung Karang, Selangor. Additionally, the study will concentrate on the PIM on the UKMKL, particularly during the lockdown period, and the possible strategic management of the emotional health will be based on the new laws and policies made by the government and university.

3. Results and Discussions

3.1 Relationship between challenges & strategies VS productivity & Workforce

As shown in Figure 2, FW tend to become unproductive because of FW need to take care of the family members' need, managing different workloads, isolation, lack of equipment, too many procedures, technology is not user friendly, while the shortage of manpower because of Isolation, FW's concern of being exposed to virus, individual factor, financial constraint, organizational preparedness to counter the disease.

Therefore, by implementing the viable strategies which include improve the job site safety, i.e., practicing social distancing measures, restricting the number of people on job sites, floor/field markings, modify policies and practices, educate FW, help in coping with the technology, leader being vulnerable, user-friendly technology through Whatsapp (social apps), FW are more confident to come to the campus and being productive throughout the process during the PIM. Whilst, effective communication, positive thinking and social support, online therapy, survey, leader opens the door for FW to feel comfortable talking about mental health challenges of their own, modelling healthy behaviours, cultivating a culture of connectedness through check-ins can help FW performing their PIM more efficiently and reducing the effects of negative emotions.

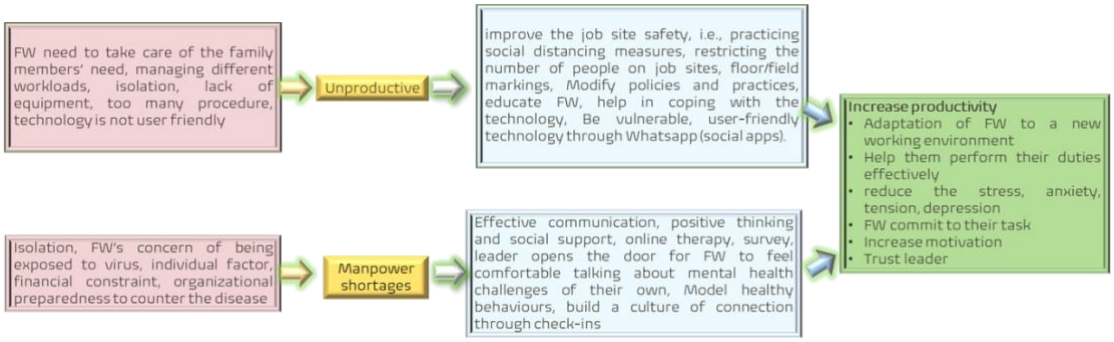

Figure 1. Relationship between challenges, emotional and strategies.

4. Conclusion

The COVID-19 pandemic has made it very evident how vital it is to protect the physical and mental health of FW in PIM during the COVID-19 pandemic. Mental health and safety of

the FW are more difficult than ever before because to the need for everyone to adjust to new ways of working. The results of this study will greatly benefit leaders by helping them understand more fully the challenges of COVID-19 among FW so that they can provide safety conditions to protect their workers and support them both mentally and physically. The information is necessary to guarantee that individuals impacted receive the necessary assistance and to enable us to be better prepared for a potential second wave of the pandemic and for future lockdown. Consequently, the purpose of this work was to identify the challenges given by COVID- 19 on the negative emotion of the FW, as well as the management solutions to alleviate these challenges. Future research is required to better comprehend the influence of COVID-19 on the emotional health of office workforce during a COVID-19 pandemic.

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Effective Commercialization Process at the Research Institutions in Malaysia

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Abstract –*The advancement of science and technology nowadays has brought all the public and private universities as well as other research institutions all around the world to the rapid evolution of product and technology innovation. Malaysia itself only exhibits a few success cases but its intellectual property creation and commercialization efforts are still low. Commercialization of the technology and product from lab to market is crucial for the economic growth and human life. Considering this importance, it is essential to obtain the effective process of commercialization for research institutions in Malaysia. The study was conducted by the interview of six respondents from different research institutions in Malaysia with diversified experience and background in research, innovation and commercialization. The data was collected and analysed to obtain the unique or effective process of commercialization at the research institutions in Malaysia. The findings were presented and discussed for further understanding. The effective processes of commercialization are expected to be disseminated among the researchers in Malaysia for successful commercialization of technology and product.*

Keywords: Commercialization framework, commercialization process; innovation process; research commercialization; technology commercialization; lab to market; research and innovation.

1. Introduction

In recent years there is a change of technology around the world. People are competing to develop and adopt new technologies such as artificial intelligence, internet of things (IoT), big data, biotechnology and many more. Due to the rapid development in these technologies, there is competition not only in industries but also in research institutions to transfer the technology successfully from lab to the market [1, 2]. As commercialization is one of the important aspects to bring technology or product into the marketplace, there is a need for an effective process to be developed and implemented throughout the journey [3]. This is evident in most of the established companies which apply total commercialization process at all levels and treating the commercialization as top priority [4, 5]. They set goals, develop skill, and get top management involved in the process to speed up the actions and decisions. These companies are willing to change their way of business just to get in-line with competitors [6]. Due to the importance of the technology commercialization, research institutions are rapidly evolved in the research, innovation and commercialization arena to meet the demands [7]. This study aims to identify the unique and effective process of commercialization at the research institutions in Malaysia. The effective processes are

expected to be disseminated not only to all researchers in Malaysia but also around the world.

2. Materials and Methods

The aim of the study is to obtain the effective process of commercialization at the research institutions in Malaysia. Hence, a set of open-ended questions have been developed based on the research objectives. The study was qualitative research by using interview method. The interview was conducted with six respondents from different research institutions and various background such as science, technology and agriculture. The study was a semi-structured interview and used the same set of questions prepared for 6 respondents from Universiti Teknologi Malaysia Innovation and Commercialization Centre (UTM ICC), Universiti Teknologi Petronas (UTP) Technology Transfer & Commercialization Office (TTO), Naturel Kiss (UTM spin-off, Malaysia Agriculture Research & Development Institute (MARDI), Malaysian Institute of Microelectronic Systems (MIMOS) and Standard and Industrial Research Institute of Malaysia (SIRIM). The interviews were conducted by face to face and online using Google Meet. The interview session lasted around 2 hours for each respondent. The data collection was documented and analyzed after the meeting.

3. Results and Discussions

The proposed commercialization processes as obtained from the research study are shown as in Figure 1.

Figure 1. Proposed Effective Processes of Commercialization.

The proposed effective processes for commercialization are grooming, initiate the real problem faced by industries or stakeholder, personal branding, industrial partner, product branding, market validation and digital platform.

4. Conclusion

The proposed effective processes were based on the experienced and expertise of the respondents in the research, innovation, and commercialization. The proposed effective processes found in the study are grooming, initiate the real problem faced by industries or stakeholders, personal branding, industrial partner, market validation and digital platform. All the effective processes proposed in the study have a strong justification where it benefits the current and future research and innovation work. It is expected for the effective processes to be as a reference to all researchers not only in Malaysia but also around the world.

Since the study is focusing on the commercialization at the research institutions in Malaysia only, the recipient may require more data from private companies. Hence, future researchers may focus on the commercialization process at companies or industries in Malaysia. They may combine the data found in this study for better results.

Acknowledgement

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Business Sustainability Conceptual Framework for Construction Company

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Abstract – *Throughout the decades, the construction industry was suffered for its business sustainability, mainly due to its poor productivity across the industry. This can be improved through implementing of Technology Management the innovative ways, which consists of BIM, block-chain technology and e-procurement. Throughout the stages of Design, Procure, Execution, and Commissioning, as well as applications on the existing building for the ease of building maintenance. This paper aims to emphasize on the external and internal factors that influence the business transformation towards Technology Management, and its advantages for business sustainability.*

Keywords: Knowledge; Innovation; Productivity; Sustainability; Management

1. Introduction

Construction works play vital role in daily life; it is a routine process to provide habitat for human beings, as well as increase living quality through improve of building quality. It is known for its complexity and large scale; also, poor productivity compared to manufacturing industry. Therefore, further research on sustainability and productivity improvement for construction company should be propagated. Construction companies that without proper guidelines, and solely depend on the owners' decision are struggling to survive sustain their business in today's business environment, which eventually will be closing down, due to the inactivity in the industry or killed by project's profitability.

2. Methodology

This study will be carried through systematic literature review that firstly, to identify causes of construction business failure; then followed with identification of construction business successful factors. at the later part, based on the collected data through literature review, a conceptual framework will be proposed to improve construction company sustainability.

3. Results and Discussions

3.1 Construction Business Failure Factors

A business or company is categorized as failed, if the given realized rate of return for the invested capital, is continually and significantly much lower than the prevailing rates as

compared to the similar investments. Alternately, the insufficient business turnover to cover daily overall business cost, or the average amount of Return on Investment much lower than the company's cost of capital. It is believed that failure of a company, was not solely depend on single factor but instead, a consequence of complex operating process, which involves but not limit to managerial actions and decisions David *et al* [1]. Generally, it can be categorised into two main factors that are environmental-dependent and response-dependent factors. As shown in the Figure 1. The vertical axis represented by environmental that split into internal and external environmental, which respectively means issues that under or beyond management control; however, the horizontal axis represented by response that further split into administrative responses, for the short-term operational activities. The strategic responses for the long-term business planning for the company.

ENVIRONMENTAL	External: Issues beyond Management Control	• Business Issues	• Macroeconomic Issues
	Internal: Issues under Management Control	• Budgetary Issues • Human and Organizational Issues	• Market Adaptation Issues
		Administrative (Systems and Procedures)	Strategic (Long Terms Planning)
		RESPONSE	

Figure 1. Matrix Distribution of Failure Factors (Adapted from David *et al*, 2000).

3.2 Construction Business Success Factors

Critical Success Factors (CSFs) are a set of organizational best practises that improve rate of succession upon implemented, being in the area of project itself or on overall company performance. CSFs for the construction business that generally categorised into five groups, they are human resource-related factors, procurement-related factors, contractor-related factors, design-related factors, management process-related factors Ofori *et at* [2]. Which then further derived into the ten most recognized CSFs, as shown in Table 1.

Table 1. Ten Critical Success Factors for Construction Company (Adapted from [2]).

Rank	Critical Success Factor
1	Leadership and vision
2	Project management
3	Human factors management
4	Process management
5	Knowledge management
6	Customer service
7	Cooperation relationship management
8	Quality management
9	Strategy management
10	Technology and Innovation management

3.3 Conceptual Frameworks for Construction Business Sustainability

The proposed conceptual framework is the result of researcher's findings or a tentative conclusion. The ideas of concepts appeared that based on literature review where the proven result still insufficient. Conceptual framework is the synthesized outcomes of all the interconnected concepts, and these concepts is interlocked with one another to serve as a strong foundation of the study hypothesis. Therefore, the workout being called as framework that supports some arguments that initiate some other productive debates. Standard QMS system mentioned that processes are a group of interacting and interrelated activities that depends on inputs to generate the intended outcomes. Both inputs and outputs can be tangible or intangible. The inputs for this study include the identification of business failure factors for construction company, then followed with the assessment of CSFs for construction company, via literature review from previous research works. The process approach as per shown in Figure 2 that consists of Inputs, Activities, then finally the Outputs.

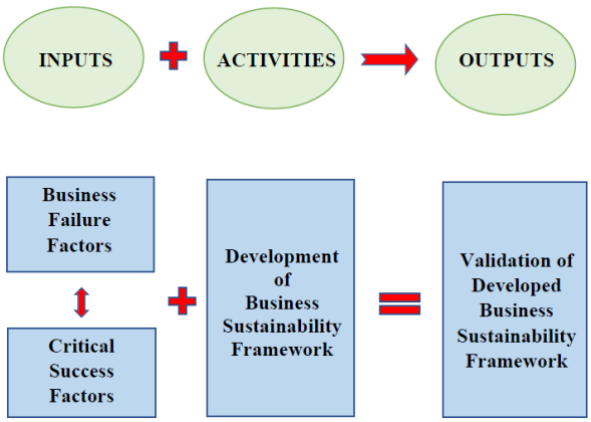

Figure 2. Proposed Conceptual Frameworks.

4. Conclusion

The proposed conceptual framework consists of "inputs" that are all being identified through literature review; the "activities" is the core function to develop a customize framework to suit each individual construction company, to improve individual's sustainability in construction industry. Lastly, would be the "output" where the developed framework to be validated.

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Identifying Accident Factors in Developing a Systematic Guideline on Occupational Safety and Health Management

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Abstract – The purpose of this study is to propose a guideline to improve the quality of safety management in the workplace thereby consistently able to be decreasing industrial accidents. It focuses to SME (Small and Medium Industry) organizations that don't have ISO certification due to certain constraints such as resources to have ISO certification. This study focuses on food manufacturing industries on palm oil based. The basic PDCA (Plan-Do-Check-Action) principle was developed as a basis for this study. It uses quantitative methods on accident statistics for 5 years as key data to conduct a study. Factors that because accidents are thoroughly analysed for each incident. These data are categorized according to the 5 elements and the Human factor as the focus. However, it still analysed along with other direct factors consisting of Machines, Methods, Equipment-Tool-Materials and Workplace-Structural Environment. Then, that human factor was developed into factors related to age, work experience, working time, and gender and so on. Cross-examination to be carried out on existing safety management such as workplace inspection information, hazard observation and assessment program to identify deficiencies and weaknesses. Finally, appropriate guidelines will be proposed to improve safety management in workplace.

Keywords: A guideline to improve the quality of safety management, Plan-Do-Check-Action principal Human factor assessment

1. Introduction

Industrial development in Malaysia began as early as the late 1800s. Various ordinances were introduced and in 1967, the Malaysian government introduced the Factories and Machinery Act to deal with issues related to occupational safety and health. It was further strengthened in 1994 when the government introduced Occupational Safety and Health. This research is looking at the implementation of Occupational Safety and Health in the palm oil-based food manufacturing industry. This study was conducted at a margarine and cooking oil packaging factory in Pasir Gudang Johor. This factory is a small and medium (SME) industry where management focuses more on increasing productivity and matters related to it including certification like ISO22000, HACCP, GMP and HALAL. The implementation of Occupational Safety and Health at the workplace is more about fulfilling legal requirements. So, from time to time the implementation is seen as difficult to reduce the number of accidents consistently. Due to the constraint of the time and sources, the study will focus on the human contribution factor but will not leave out other factors that also contribute to accidents.

2. Materials and Methods

Initially, the accidents record (raw data) will be analysed to identify the root cause and underlying cause. The data involved in relationship was (but not limited to) unsafe condition (machinery, material, tool, equipment, substance, and environments), method implementation, human action/ behaviour, and human demographics (gender, designation level, age, work experience, gender, educational level, local workers/ foreign workers). Latent factors become catalysts if combined with suitable workplace environmental conditions and result in the occurrence of accidents. Understanding and researching accidents is the best method to ensure safety in the workplace [1].

Next, a review of the current implementation will be made. it will involve information from location inspections / hazard observations, review assessments and safety programs that have been implemented. Cross -examination will find meeting points (intersection) and identify weaknesses or shortcomings that exist. Once weaknesses are identified, improvements will be made to those weaknesses.

PDCA (Plan-Do-Check-Act) uses a High-Level Structure methodology where each element has specific activities and programs to implement. These activities and programs are organized systematically so that no activities and programs are left behind [2]. High level structure is able to increase the effectiveness of program implementation and quality OSH Management in the workplace [3]

Using Descriptive Statistic assessment to obtain graphs, charts, modes, mean, median, variance, range and standard deviation, correlation coefficients. Scatter Plot and Kruskal Wallis H test [4] also are used. Rules related to statistical analysis will be use Correlation Test Table by Chua'2014 to analysis the correlation between data [5]. In addition, Normality test is also conducted to determine the distribution of data whether normally distributed ($p > 0.05$) or not to use Parametric data analysis or non-parametric data analysis and the use of Pearson Correlation or Spearman's rho methods and so on. Assessment analysis was made using SPSS analysis system. This identification method is used to find relationship based on independent variables and dependent variables [6].

3. Results and Discussions

3.1 Accident data

From 41 accident cases recorded, we obtain demographic data (age, experience, gender, citizenship, education level), Human behaviour (unsafe act) and unsafe condition (condition of machine, substance or material, work environment, media). The combination of these conditions and factors is the cause of accidents at work area. As stated before, we will focus on human-related contributing factors [7]. From the above information, 2 types of factors related to human beings are demographic factor and human behaviour factor (Unsafe act) [8].

Table 1. Demographic data.

Group demographic	Detail	f	%	Group demographic	Detail	f	%
Gender	Male	39	95.1	Education level	Unable specified	12	29.3
	Female	2	4.9		Secondary school	26	63.4
Citizens	Local worker	29	70.7		Diploma & certificate	2	4.9
	Foreign worker	12	29.3		Bachelor degree & above	1	2.4
Level/ Designation	Non-Executive	37	90.2	Age of employees	≤ 35 years old	21	51.2
	Executive	4	9.8		35 – 50 years old	9	22
Work experience	< 10 years	28	68.3		≥ 50 years old	11	26.8
	10 -20 years	3	7.3	Employment status	Own employee	37	90.2
	> 20 years	10	24.4		Others	4	9.8

3.2 Correlation analysis

Further analysis related to Correlation Coefficients has been performed. It looks at the extent to which 2 variables move in alignment with each other. This analysis identifies whether it is moving in the same direction (positive) or moving in a different direction (negative). Correlation Coefficients will record readings between '0' to '1' where '0' is 'No Correlation' and '1' is 'Very Strong' correlation. These Correlation Coefficients are applied to 'Gender', 'Citizen', 'Designation', Education level', 'Age of employee', 'Experience at incident area', 'Employment 'and 'Human Behaviour'.

Evaluation of the strength of the relationship between variables through correlation coefficients will use the Chua 2014 table. This table states that '0' means no correlation, '± 0.1 to ± 0.3' has 'Very Weak' correlations, '± 0.31 to ± 0.5' indicates 'Weak' correlations, Readings between '± 0.51 to ± 0.7' are 'Moderate' correlations, '± 0.71 to ± 0.9' are 'Strong' correlations and readings of '± 0.91 to ± 1.0' are 'Very Strong' correlations.

Data research using Scatter Plot of correlation has been done. From the raw data (41 cases), it is found that the correlation between 'Experience at accident area' with 'Age of employee' can be carried out. From the analysis conducted the R^2 Linear reading displays 0.569. This shows that there are positive correlations between the two variables, but it is just a 'Moderate' relationship. 30 cases out of 41 cases were found had a Human Behaviour factor (Unsafe act). From the Scatter Plot found that the R^2 Linear reading 0.482 with positive correlation between age and experience. Although R^2 displays the readings are not very significant but there is no denying the relationship between Experience and Age of employee.

Table 2. Correlation test table (Chua 2014).

Correlation Coefficient, r	Correlation strength, relationship	Colour reference
±0.91 to ± 1.0	Very strong	
±0.71 to ± 0.9	Strong	
±0.51 to ± 0.7	Moderate	
±0.31 to ± 0.5	Weak	
±0.1 to ± 0.3	Very weak	
0	No correlation	

Table 3. Correlation table.

Spearman's rho (Nonparametric correlation)		Gender	Citizen	Designation	Education	Age	Experience	Employment	Human Behaviour
N		41	41	41	41	41	41	41	41
Gender	Correlation coefficient	1	-0.146	-0.074	0.089	-0.287	-0.153	0.371	0.244
	Sig. (2-tailed)		0.363	0.644	0.582	0.069	0.339	0.017	0.124
Citizen	Correlation coefficient		1	-0.212	-0.911	-0.317	-0.390	-0.181	0.198
	Sig. (2-tailed)			0.184	0	0.043	0.012	0.258	0.215
Designation	Correlation coefficient			1	0.257	0.236	0.160	-0.092	0.079
	Sig. (2-tailed)				0.105	0.137	0.318	0.566	0.625
Education	Correlation coefficient				1	0.199	0.274	0.110	-0.139
	Sig. (2-tailed)					0.212	0.083	0.494	0.386
Age	Correlation coefficient					1	0.691	0.040	-0.211
	Sig. (2-tailed)						0	0.806	0.186
Experience	Correlation coefficient						1	-0.234	-0.271
	Sig. (2-tailed)							0.142	0.087
Employment	Correlation coefficient							1	-0.09
	Sig. (2-tailed)								0.577
Human behaviour	Correlation coefficient								1
	Sig. (2-tailed)								

3.3 High Level Structure, Legal Requirement, and Current OSH Program

High Level Structure based on PDCA (Plan-Do-Check-Act), OSH legal requirement in Malaysia related to food manufacturing industry and current OSH Program is analysed to identify its relationship with this industry in this study. The 'intersection'/ overlapping point between them becomes part of the guideline that will be used.

4. Conclusion

From the analysis conducted, it was found that each factor contributed to the accident that occurred. Although the results of the study show that the relationship is not too strong, the relationship between the factors still exists. The limited amount of data is likely to provide less robust relationship results. If the quantity of raw data is more, we are sure that the relationship will be clearer and stronger. Therefore, OSH management at the workplace needs to be implemented systematically. The guideline displayed below can be used as a basic guide for the implementation of OSH Management in the workplace by consider every factor that contributes to accidents.

Table 4. OSH management guideline.

	PLAN			DO			CHECK	ACT
	• Documentation, Initial assessment, stated the scope. • Committee, meeting, discussion, site organization • Assessment, HIRARC, JHA, Register and summary • Training, dissemination of information, communication			• Onsite implementation, maintaining, servicing, production, process flow, Emergency response			• Inspection, monitoring, analysis, Assessment, Investigation, program review	• Corrective action, preventive action, continual improvement
Legal Requirement	**Activities**							
OSHA Act 1994 **FMA Act 1967**	Documentation - legal requirement, policy, procedure, checklist, SDS, equipment certificate, drawing and record	Training, Awareness & Competency - Legal Awareness,	Information & Communication - Meeting, toolbox, induction, poster, signage, newsletter, email.	Condition - Surface, layout, site surrounding, arrangement, clean, tidy, walkway, 1st Aid equipment, fencing, covering	Servicing, repairing & maintaining	Emergency Preparedness & Contingency	Audit, Assessment, Monitoring, Site Inspection, Investigation & Review	Improvement - Implementation finding, Human Surveillance & Continual program
	Data Analysis - 'Human Factor'							

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Evaluating Handheld Laser Scanner for Crime Scene Analysis

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Abstract – *Forensics, also referred to as crime scene analysis, is a field of science that aids juries, prosecutors, and judges in assessing the tangible proof in a criminal case. It is important for finding and convicting criminals. The conventional approach to crime scene analysis requires more work and increases the likelihood of error. In this thesis, the use of a handheld laser scanner for crime scene documentation has been praised for its convenience and mobility in terms of data collection. In spite of this, the effectiveness of the Handheld Laser Scanner has been the focus of this research, specifically whether the level of data gathered is sufficient for further crime scene analysis. For comparison, a benchmark was scanned by a Leica RTC360 in this research study using the Leica BLK2GO handheld laser scanner. The Handheld Laser Scanner's data reliability and intensity have been found to be insufficient for crime scene analysis with small pieces of evidence, like bullets and typical trajectory rods due to the performance of the instrument, resulting the data is polluted with noise. When it comes to objects or crime scenes that do not require extreme precision, such as crime scene modelling, handheld laser scanners are suitable for the purposes. Despite the instrument's high mobility, analyzing a crime scene requires a higher point cloud intensity when collecting data for better analysis purposes.*

Keywords: Crime Scene Analysis, Forensics, Handheld Laser Scanner, LiDAR, Performance

1. Introduction

Since Antistius autopsied Julius Caesar in 44 B.C., CSI has been used. Using modern forensics, we can discover why and how a crime was committed. This evidence can bolster witness testimony at trial. DSLR (Digital Single Lens Reflex) cameras are used to take crime scene photos [1]. With the image presented, little can be done, and human error may overlook some data. Traditional crime scenes take too long and have too many officers, which can contaminate evidence on the crime scene. Due to technology, land surveyors (sometimes called geomatics) could do more. With a laser scanner, it may be feasible to quickly inspect a crime scene without contaminating it. Due to the one-person rule, fewer people may be at the scene. Faro Zone 3D can analyse the laser scanner's point cloud data for crime scene investigation. Laser scanners can scan millions of point clouds to construct a crime scene model fast. Laser scanners offers non-contact way of collecting data of the crime scene.

Figure 1. On the left, hand sketched diagram of crime scene and on the right, laser scanning data.

This effort will assist advance and strengthen the time-consuming, contaminated, and conventional technique of crime scene investigation approach. The large number of non-essential individual's risks contaminating the scene and influencing the investigation's results. This study may also lead to a 3D portrayal of the location. The website's material is simpler to understand because to the 3D model's exact depiction. Using the 3D model's dynamic components, investigators may zoom and rotate areas.

2. Materials and Methods

For this evaluation to be carried out, a mock crime scene is constructed duplicating a real crime scene. Preparation for measurement analysis such as bullet is cut out from a copper and brass rod closely to actual measurement measured using Vernier calliper. For bullet trajectory analysis, a metal skewers will be use to replicate bullet trajectory rod. The rod will act as a trajectory rod which will help for further bullet trajectory analysis. Conventional measurement made for comparison purposes using protector. The readings will then be recorded for analysis purposes on later stage.

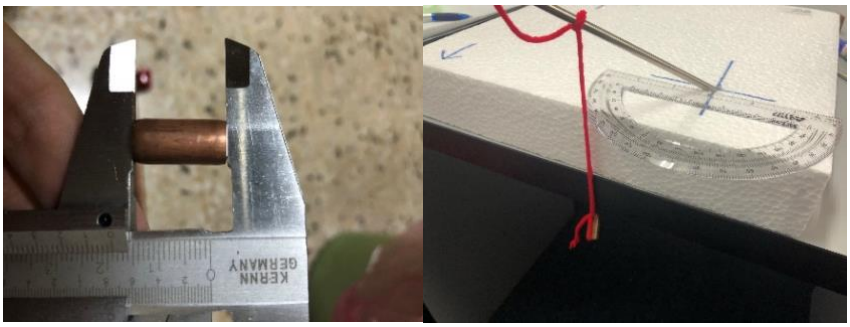

Figure 2. Measurement of mock bullet cartridge (left) and bullet trajectory analysis (right).

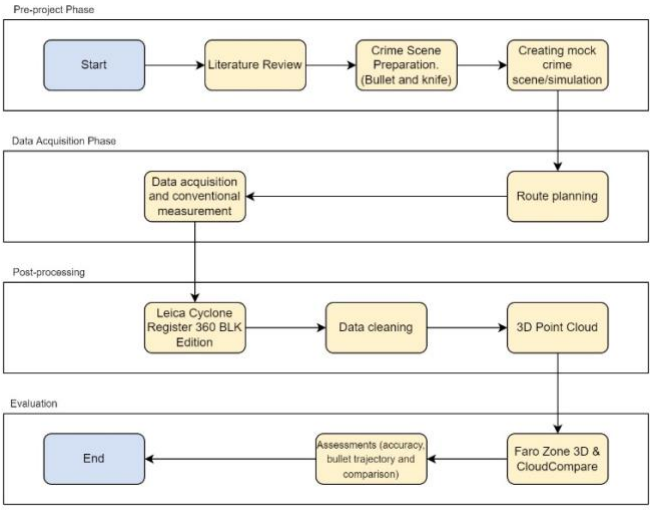

Figure 3. Workflow of the research process.

Figure 3 shows four study steps. The pre-project phase focuses on preliminary research, instrument preparation, and crime scene preparation. During the data acquisition phase, traditional measurements and laser scanning data are collected. During post-processing, raw data is converted to readable point cloud data and cleaned to remove unwanted points so software can process it more easily. In the final stage, called evaluation, the cleaned point cloud is used for analyses and evaluations.

3. Results and Discussions

To conduct the analysis for the evaluation purposes, the Faro Zone 3D is used for bullet trajectory analysis whereas CloudCompare is used for measurement purposes. Both BLK2GO Handheld Laser Scanner data and Leica RTC360 data is being evaluated the same way and will be compared to one and another. The measurement will also be compared with conventional measurement method of using Vernier calliper and protector. The measurement differences between conventional method and TC360 has shown a maximum difference of 2.8 millimetre whereas the bullet trajectory analysis has shown a similarity of over 90% resemblance.

For BLK2GO Handheld Laser Scanner, small object measurement, in this case a bullet cartridge cannot be measured due to the performance of the instrument, thus the analysis is not feasible. Bullet trajectory analysis is still possible for certain samples. It has shown that the similarity of over 90%, but not all trajectory rods is analysed due to noise related issue that is affected by the performance of the instrument. This can be seen in figure 4 below.

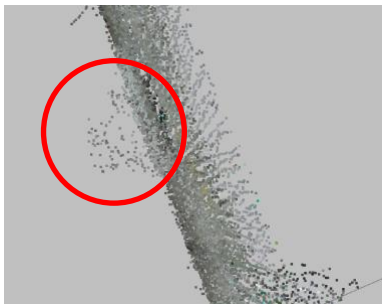

Figure 4. The noise scanned using handheld laser scanner on bullet trajectory 4 and 5.

4. Conclusion

The study has shown that performance of the instrument is important when conducting a crime scene analysis. For handheld laser scanner, the performance capability is not suitable for high precision analysis but is suitable for crime scene mapping purposes. To further improve the quality of data, a multiple scan is required and combining the data for higher density of point cloud to carry out analysis.

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Obstacle on Hazard and Operability During Simultaneous Production and Drilling at Oil and Gas Platform

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Abstract – Hazard *and operability (HAZOP) analysis have a well-deserved hazard identification methodology for systematically evaluating process hazards. The technique is widely known and used in the oil and gas industries. In many countries performing a HAZOP has become a legal requirement for new or modified plants. A HAZOP exercise is a systematic and highly structured study with a critical approach to examining the process and engineering intentions of the design. While practicing HAZOP, following best practices is not simple, and many challenges must be made to complete the HAZOP task. Most troublesome occurs when an independent leader leads the HAZOP from an external company. HAZOP leader has to follow the client's requirements, which frequently does not always correspond to best practices. HAZOP is seen as an obeying tool rather than a methodology to ensure a safe, reliable, and well-designed plant. As a result of this compliance, it is a high possibility that the intention is to reduce liabilities. Additionally, the client tends to reduce the HAZOP study scope to safety and environmental concerns only and exclude operability and reliability issues. In this trend of increasing financially, these problems are expected to increase as project costs come under increased pressure and the scope of many projects is reduced. This paper discusses several common issues that occur during HAZOPs for SIPROD mode.*

Keywords: Hazard and Operability; Hazard and Effect Management Process; Health, Safety and Environment Management System; Process Hazard Analysis; Simultaneous Production and Drilling

1. Introduction

Hazard and Operability (HAZOP) is the application of a formal systematic critical examination to the process and engineering intentions of new or modified facilities to assess the hazard potential or mal-operation of individual equipment items and the consequential effects on the facility. The technique systematically stimulates the imagination of designers, engineers, and operators to identify the potential hazards in a new design or modification work. The latest technologies in designing a complex platform will lead to a systematic method to identify the hazard. The term HAZOP is known as process hazard study and is popular among people as a tool for hazard studies. However, following its best practice is not always straightforward in the actual practice of HAZOP, and many challenges must be made to complete the HAZOP task. During simultaneous operations, risks and probability of failure are substantially higher than in non-simultaneous activities because of increased personnel. More personnel are concentrated in the same area, and jobs are carried out which require interaction and coordination with each other, the value of the assets involved

may be higher, the line of command may be more complex, non-routine activity, and the entire operation is exposed to the combined probability of failure of each activity. Sometimes, HAZOP is not the best option when the design is reviewed, while different techniques are seen as more appropriate to implement. This can lead to HAZOP being performed at the wrong project stage, leading to repetition later.

2. Materials and Method

HAZOP study represents one of the methods available to be applied in the Hazard Identification phase of HEMP, which is the methodology employed to achieve demonstrably the HSE objectives managed by the HSEMS, as shown in Figure 1. The HAZOP study team consists of multi-disciplinary personnel because the brainstorming methodology relies on the team's broad experience to identify potential hazards and operability problems.

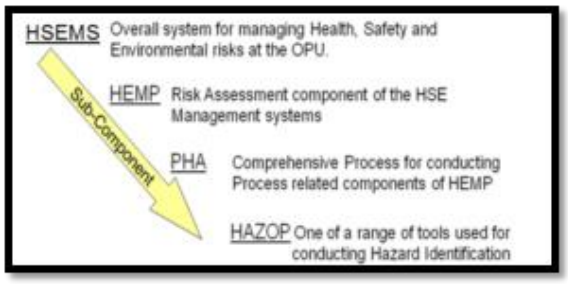

Figure 1. HSEMS relations with HAZOP.

The following sequential steps can summarize the HAZOP procedure:

Step 1 : Determine the selection of the node sizes and the route through the systems;
Step 2 : Define the node and its design intent (Parameters such as pressure, temperature, flow rate, and level);
Step 3 : Select parameter and deviation relevant to the nodes, mode of operation, and HAZOP study technique applied;
Step 4 : Identify all possible causes of a node guided by the parameter and deviation selected;
Step 5 : Assess credible consequences of each cause by assuming there is no safeguard in place; Step 6: Identify existing safeguards;
Step 7 : Propose recommendations when the existing safeguarding system is not adequate to protect the system.

3. Results and Discussion

The HAZOP approach for SIPROD mode is shown in Figure 2. In general, the scope package to be covered during the HAZOP session for SIPROD is the preparation package, rig-up package, and rig-down package. The following are common problems that occur during HAZOPs for SIPROD mode.

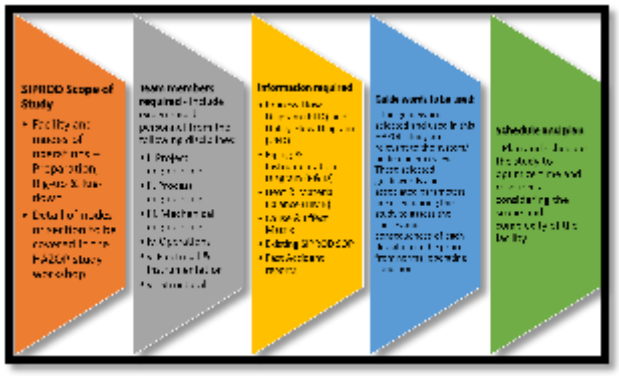

Figure 2. HAZOP approach in SIPROD mode.

The difference in HAZOP for Parallel Equipment

Technically, HAZOP is a valid methodology when dealing with repeating designs. One piece of equipment reviews its hazard and findings and then captures them to the other. The HAZOP will become an issue when the same equipment under the vendor package is installed on different SIPROD platforms. This problem requires examining the discrepancy made in previous HAZOP case studies. It is a common mistake when the HAZOP session only highlights the hardware changes, for instance, materials used during construction or design pressure/temperature, without considering all crucial process conditions in the SIPROD plant to which the equipment connects.

Insufficient Information Available

Practically, before performing HAZOP, a firm SIPROD P&ID should be available that reflects actual field conditions accommodated with all supporting documentation such as P&ID, Cause & Effect Matrix, Heat & Material Balance, Process Flow Diagram, and SIPROD SOP as shown in Figure 3.

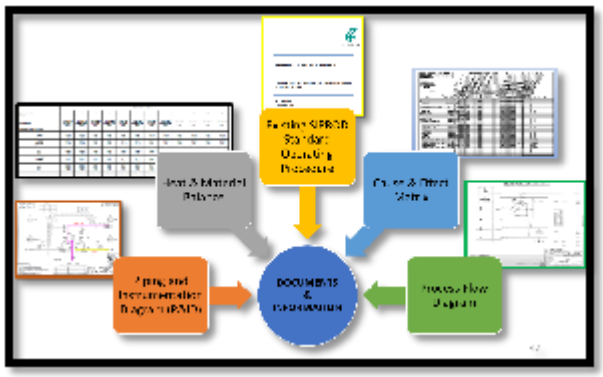

Figure 3. HAZOP Supporting Documents.

During the current practice of HAZOP, the date for its session will be set up on a fixed deadline, while engineering design causing a problem will delay. The typical reason for this unexpected problem is due to the tendency to perform HAZOP too early in the SIPROD

project stage of development, while other studies, such as HAZID, shall be more appropriate. The HAZOP leader is responsible for handling such a situation to achieve the information made available within the stipulated time. During a project lifecycle, different types of HAZOP studies are applied at different stages during the project, as demonstrated in Figure 4. In this context, the term flexibility is the quality of provided information. In addition, the best practice is to proceed with HAZOP based on the assumption that some information can be confirmed later.

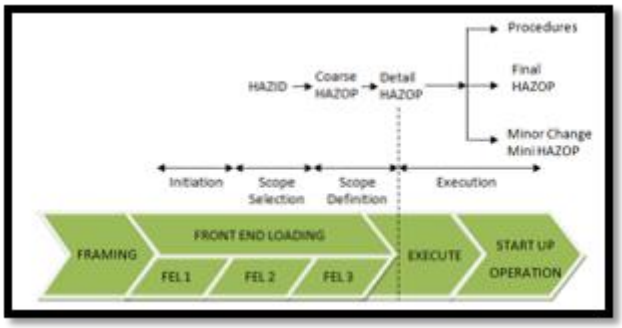

Figure 4. Sequence of HAZOP Studies throughout a Project Lifecycle.

Insufficient Time

HAZOP leader, by experience, shall be able to estimate the time requirement by reviewing the SIPROD document to ensure an agreement on the project schedule with the client's project manager and demonstrate it in HAZOP Terms of Reference. Due to insufficient time allocated in the schedule, certain crucial areas in SIPROD tend to be left out from the HAZOP review, and this will affect the quality of HAZOP and impact several implications, which will result in the whole HAZOP session being redone. HAZOP progress is expected to be overrun by progress. Hence, the HAZOP leader must discuss with the client's project manager soon to agree on the schedule arrangement.

4. Conclusion

Hazard and Operability studies (HAZOP) can be seen as an indicator for systematically evaluating and identifying process hazards. Therefore, to produce a good quality HAZOP, the HAZOP team leader and its team member shall impose sufficient experience and knowledge of respective areas and discipline both in the theoretical and practical application of the design and operation of the SIPROD platform.

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This study was financially supported by the Universiti Teknologi Malaysia (UTM) Fundamental Research Grant (Q.K130000.3856.22H17), the Ministry of Higher Education (MOHE) under the Fundamental Research Grant Scheme (FRGS) (grant number: FRGS/1/2019/TK03/UTM/02/14 (R.K130000.7856.5F205)), Razak Faculty of Technology and

Informatics (UTM), Universiti Teknologi Malaysia (UTM); for all the support towards making this study a success.

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Fatigue Analysis of Crack Growth on Sukhoi Su-30MKM Horizontal Stabilizer Lug

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Abstract – *The critical aircraft structure is the load-bearing members are a vital component for any aircraft. The effect of fatigue loading, operating conditions, and environmental degradation has caused the structural integrity of the airframe to be assessed for its airworthiness requirement. Using the fatigue design concept of Safe Life, the RMAF adopts the fatigue life assessment and crack growth prediction to monitoring its critical components' structural integrity. Various methods were used, and for this analysis, the Crack Growth Prediction method was used to determine the crack growth behavior and its ultimate failure point in case of any crack occurrences. The horizontal stabilizer lug was chosen since it has the highest possibility of fatigue failure. The analytical methods discussed are Crack Growth Analysis and Low Cycle Fatigue. For the numerical method, NX Nastran was used to simulate crack growth. The result from the crack growth analysis was validated with the numerical result. The conclusion is that, based on the fatigue life cycle, the structure condition is not affected by severe damage, and its failure is approximately around 1 million cycles, and the crack growth location on the bottom of the lug is the critical location. The research outcome will be on the extension of the structure life of the lug.*

Keywords: Sukhoi Su-30MKM, horizontal stabilizer lug; crack growth analysis; fatigue analysis; ZENCRACK

1. Introduction

The Sukhoi Su-30MKM aircraft horizontal stabilizer comprises spars, stringers, ribs, and skin. The structural elements of aircraft wing spars and stringers experience cyclic loading during the flight cycle from take-off to landing [1]. The loading creates stress concentration at the counter-sunk rivets from crack nucleation sites. When the stress intensity factor exceeds the threshold value, corrosion pits become fatigue crack growth. Fatigue is based upon repetitive loading below the yield stress, leading to premature failure [2] [3].

In the early days of aircraft fatigue studies, the safe life approach was used to ensure the integrity of airframe structures from fatigue failure. In this approach, the mean fatigue life of the structure was estimated and then divided by a scatter factor to give a safe operating life (safe life). The safe life must ensure that the cumulative probability of failure is less than 1 in 1000 over the safe operation life [4] [5]. The structural integrity of the stabilizer lug is determined by its fatigue life and crack growth analysis. This approach

allowed the structure to remain in service until a planned inspection procedure detected fatigue cracks before they reached a dangerous extent and that the structure must have sufficient residual strength to provide safety until cracks are detected from routine inspections [6] [7].

Fracture mechanics-based fatigue approaches may be used to model fatigue crack propagation from an initial size to the final dimensions responsible for the fracture of the component. This approach may be used to complement the local strain-life approaches, modeling the crack propagation from the initial crack to the critical dimensions leading to component collapse [8] [9] [10]. Fracture mechanics-based fatigue approaches may be further extended to simulate the global fatigue life of components, using the Equivalent Initial Flaw Size (EIFS) concept based on cyclic J-integral. The material is assumed to include defects acting like initial flaws. Therefore, the component's fatigue life is assumed as the number of cycles required to propagate these initial defects until critical dimensions [11] [12].

2. Study Methodology

2.1 Fatigue Analysis

The horizontal stabilizer includes two panels with each panel rotated around the pivot rigidly attached to two points of the fuselage frame No.45. For Finite Element Analysis (F.E.A.) and fatigue analysis, the horizontal stabilizer lug structure has been chosen among the critical locations due to its function as an attachment between the horizontal stabilizer and the rear fuselage [13] [14]. Figure 1 shows the location of the horizontal stabilizer lug.

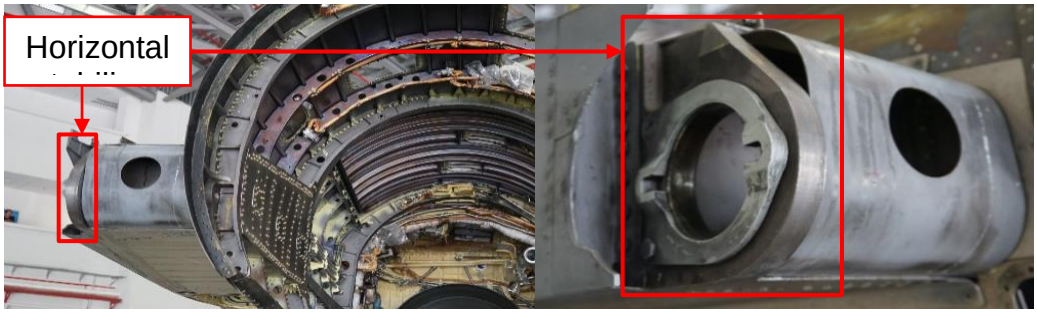

Figure 1. Location of the horizontal stabilizer lug.

The fatigue life calculation of Su-30MKM was performed on the horizontal stabilizer lug joint structure. The structure is made by using the material Al7075-T6 (Aluminum alloy). Fatigue life calculation used in Unigraphics (N.X.) requires the spectrum loading (g-loading), Material properties, fatigue characteristics, S-N or E-N formulation, and the component to be analyzed. The component should have actual physical geometry, which has been analyzed to obtain its displacement, stress, and strain result. This is usually performed using static linear analysis, but other solutions can be used if needed.

Ten years of history (2008 – 2017) of flights obtained from the ARM-TSV have been used to represent future usage analysis [15]. A safe life approach or crack initiation method was assumed, which uses E-N (Strain life) formulation. Furthermore, the Low Cycle Fatigue (L.C.F.) approach was adopted because the Loading profile is the g-acceleration data.

2.2 Crack Growth Analysis

Pre-processing of C.G.A. analysis starts by obtaining the CAD model and mesh models. Two types of input data were used for the analysis: the material data and the loading data. The material data was used for finite element and crack growth analysis, while the loading data was used during fatigue crack growth analysis. Below are the CAD and mesh model images, as shown in Figure 2.

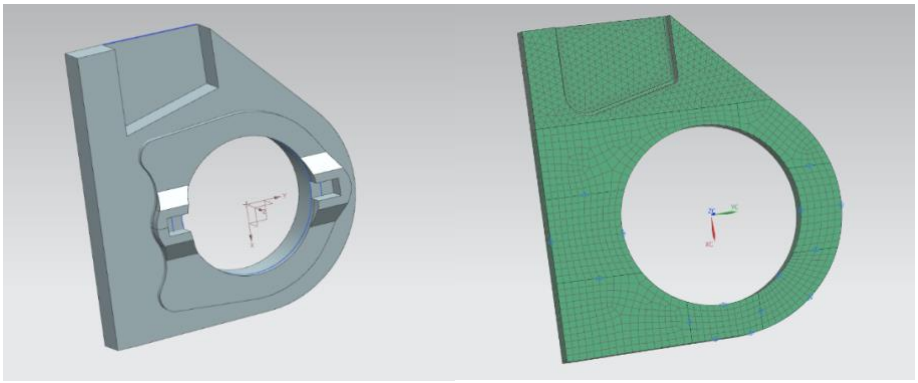

Figure 2. CAD and Mesh Model.

C.G.A. was then conducted using ZENCRACK on the transferred model to obtain crack behavior, critical crack length, and cracked part lifespan. Two cracks were initiated on the horizontal stabilizer lug part structure. The crack model compares the differences in the behavior of the crack during analysis.

3. Results and Discussions

3.1 Critical Crack Length

Table 1 shows the result value for each initiated found crack model based on the S.H.M. history profile as the fatigue multiplier.

Table 1. Summary of the result.

No	Crack Type	Properties	Value
1.	Top crack	Critical crack length	Crack retardation.
		Crack part full cycle.	1325009229 cycles of A.C.M. sortie.
2.	Bar Crack	Critical crack length	17.01 mm
		Crack part lifespan.	108294671 cycles of A.C.M. sortie.

3.2 Fatigue Damage

For fatigue damage, total fatigue from 2008 until 2019 is 1.069e-11. Fatigue damage value shows the accumulative damage in the structure due to the application of cyclic loadings for all the years combined. The structure will fail due to fatigue when the fatigue damage value equals one. The fatigue damage result is shown in Figure 3.

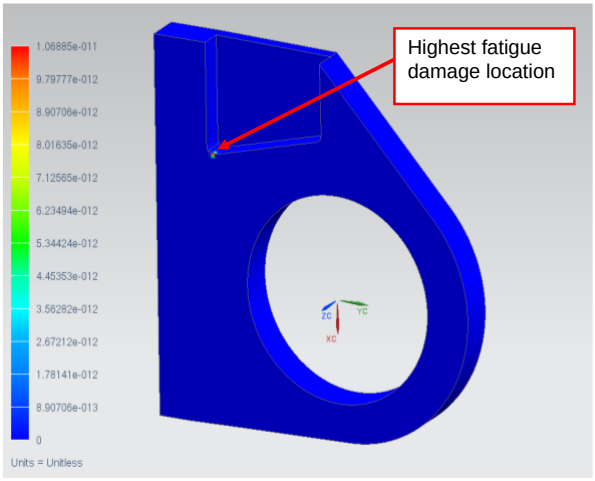

Figure 3. Fatigue Damage Result.

4. Conclusion

The fatigue life cycle is the value that predicts how many times the structure can withstand being subjected to the same loading profile input and same stress history. Fatigue analysis for the horizontal stabilizer component shows that the minimum cycles to failure for the fatigue life cycle is 9.356x1010 cycles. In this fatigue analysis, one cycle was equal to the loading profile from 2008 until 2019. Due to the design structure and the loading applied on the horizontal stabilizer lug part, the crack growth for the bottom crack will reach its critical stage while the top-initiated crack shows signs of crack retardation. Thus, the final crack growth location on the bottom of the horizontal stabilizer lug structure part has been selected as a critical crack length. The critical crack length point will be translated as the limiting value for the crack part lifespan.

Acknowledgment

This study was financially supported by the Universiti Teknologi Malaysia (UTM) Fundamental Research Grant (Q.K130000.3856.22H17), the Ministry of Higher Education (MOHE) under the Fundamental Research Grant Scheme (FRGS) (grant number: FRGS/1/2019/TK03/UTM/02/14 (R.K130000.7856.5F205)), Razak Faculty of Technology and Informatics (UTM), Universiti Teknologi Malaysia (UTM), the Royal Malaysian Air Force (RMAF) Subang and CAIDMARK Sdn. Bhd., thank you for all the support towards making this study a success.

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An Integrated Operational Excellence and Performance Measurement Tool for Organization Self-Assessment

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Abstract – *Competitive environments and priorities change over time, and effective enterprise management always depends on the effective measurement of performance and results. A sound performance measurement and evaluation system is the first condition to establish, implement, and achieve operational excellence. The development of the performance measurement and reporting process is one of the subfactors of the Improvement dimension. A complete self-assessment tool for Operational Excellence in the aviation industry is currently unavailable. Thus, this study focuses on the development of a complete OE self-assessment tool. Using a matrix to evaluate and compare existing self-assessment tools in terms of dimensions, assessed scoring criteria, and usability, a complete self-assessment tool is developed based on combining existing assessment tools and the normalized weights derived from AHP analysis. Additionally, Organizations should assess their current maturity of operational excellence implementation. To satisfy these two conditions, the proposed self-assessment tool used in this study suggests the integration of the EFQM excellence model scoring and the normalized weights derived from AHP analysis to determine the level of maturity in each organization. The scoring matrix is issued by allocating a percentage score to each sub-factor, including each matrix element. And then, by using a scoring record, the percentage of scores given to the sub-criteria are combined to obtain an overall score.*

Keywords: Operational Excellence; Critical Success Factors (CSFs); Self-Assessment; aviation industry; Scoring Matrix.

1. Introduction

The development of performance measurement and reporting process is one of the subfactors of the Improvement dimension. As part of their desire to succeed and grow, organizations are concerned about whether they are on the right track towards excellence and how their performance can be assessed (Oakland, 2001). Additionally, Organizations should assess their current maturity of operational excellence implementation. Maturity means knowledge, use, effective deployment, and concrete positive results from a company's operational excellence implementation (Garza-Reyes, Rocha-Lona, and Kumar, 2015).

A complete self-assessment tool for Operational Excellence (OE) in the aviation industry is currently unavailable. Thus, this study focuses on developing a complete OE self-assessment tool. Using a matrix to evaluate and compare existing self-assessment tools in

terms of dimensions, assessed scoring criteria, and usability, a complete self-assessment tool is then developed based on the combination of existing assessment tools and the normalized weights derived from AHP analysis.

Most assessment tools are designed for large organizations and barely consider the needs of medium-sized enterprises (Jaeger, Matyas, and Sihn, 2014). Due to limited time and monetary resources, e.g., high efforts for preparation and execution, smaller organizations especially encounter problems applying the current assessment methodologies. Consequently, the need for a simplified and user-optimized assessment version is clear (Rusjan, 2005). Therefore, a reliable self-assessment tool for organizational performance should measure what it is supposed to measure, and it should be able to measure them correctly (K. Pun and Lau, 2003).

In order to satisfy these two conditions, the proposed self-assessment tool used in this study suggests the integration of scoring of the EFQM excellence model and the normalized weights derived from AHP analysis to determine the level of maturity in each organization. (Putri and Yusof, 2011) used the AHP analysis to identify and calculate an organization's total score. The EFQM scoring system provides a well-founded basis for self-assessment to assist organizations in striving toward business excellence. The EFQM model, Europe's answer to the American Malcom Baldrige Award and the Japanese Deming Price, is widely accepted by academics and industry. However, applying the EFQM ratings, especially regarding Operations Excellence, presents many substantial challenges for enterprises (EFQM, 2012).

This article presents the development of complete Operational Excellence (OE) self-assessment tools using a scoring matrix. The second section of this article discusses the materials and methods used to develop the self-assessment scoring index. The third section of this paper discusses the development of the Operational Excellence Self-Assessment tool. The last section presents the summary of this article.

2. Materials and Methods

The various employed methods to get conceptual background from the literature review on operational excellence and performance improvement, an overview of operational excellence in different industries, review of the different operational excellence frameworks implemented globally, analysis of developed critical factors, barriers affecting implementation, and performance improvements, such as content analysis, related print media, academic and trade journals, official reports analysis and web search engine.

Online academic databases relating to performance improvement and operational excellence approaches, including Web of Science (WoS) and ProQuest Direct (PQD), were utilized. In this phase, content analysis was carried out to identify and summarize critical success factors affecting the effective implementation of operational excellence philosophy and the study of operational excellence approaches based on extant literature in this area.

The literature was further analyzed, assessed, and presented in a matrix format which showed the conceptual framework for operational excellence.

The Delphi methodology was employed in this research to collect practical information and data to obtain an expert judgment from the consulted experts. Thus, experts from different fields in Sudan were selected. Additionally, the final phase involved deploying the AHP approach in Delphi round 3 to rank the critical success factors for achieving operational excellence by organizations in the Sudanese aviation industry. A set of AHP-related questionnaires was used during interview activities to construct the AHP model. The main outcome of Delphi Round 3 is to calculate the importance weight of criteria and sub-criteria.

3. Results and Discussions

The Operational Excellence Self-Assessment Scoring Matrix (OEM_2021_v1.0) was developed to assess the effectiveness/maturity of operational excellence in the Sudanese aviation industry. A scoring matrix is a standard tool that contains a set of checklist-type questionnaires for self-assessment and benchmarking (K.-F. Pun, 2002). Organizations in the Sudanese aviation industry may use the Operational Excellence Self-Assessment Scoring Matrix (OEM_2021_v1.0) as a starting point or use them when reviewing their progress and deciding on the appropriate action plans. Many research participants stressed the theme of making the self-assessment process relevant to an organization by the authors (McCarthy, Greatbanks, and Yang, 2002). By continuously adding to the document and keeping it relevant, organizations will demonstrate that they are applying the principles of assessment and review to their self-assessment approach.

The Operational Excellence Self-Assessment Scoring Matrix (OEM_2021_v1.0) is developed using Microsoft Excel software to efficiently enable organizations in the Sudanese aviation industry to carry out the self-assessment process. Figure 2 shows the Scoring Summary sheet, which includes the rating of each criterion and the assigned scores.

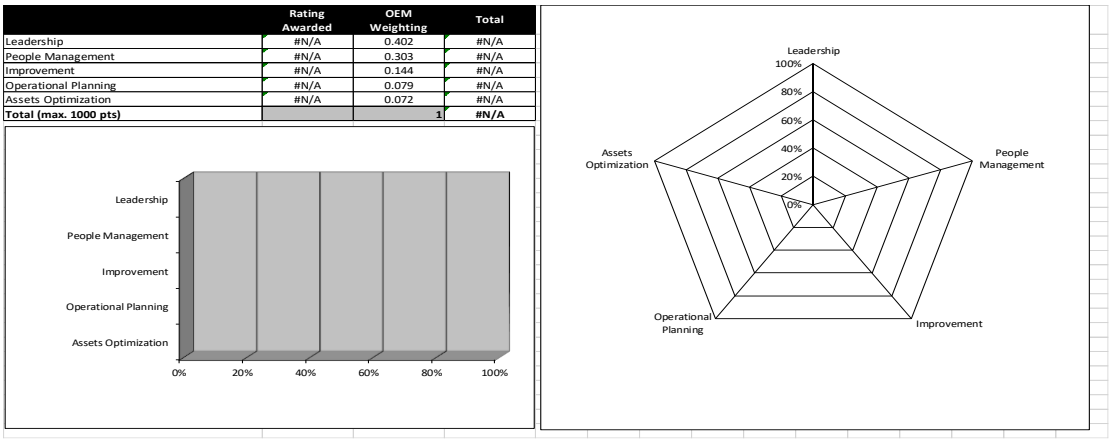

Figure 2. Scoring Summary sheet.

This calculation shows the self-assessment results against the targeted results (K.-F. Pun, 2002). The scoring matrix allocated a percentage score to each sub-factor by including each element of the matrix for each sub-factor. And then, by using a scoring record, the percentage of scores given to the sub-criteria are combined to obtain an overall score.

In summary, assessment and review seek to establish whether the operational excellence practices are regularly reviewed, whether the organization seeks to learn how the operational excellence might be better carried out and whether improvements have been made. This process would enable the organization to demonstrate the description of approach deployment, a focus on stakeholder needs, a well-defined process, links with other approaches, and support for policy and strategy. It shows that the organization acts upon the raised Areas for improvement and that it learns from other organizations and makes improvements.

4. Conclusion

Operational excellence is critical as it assures organizations' efficiency and effectiveness. One of the significant components of the operational excellence framework is a self-assessment tool to analyze the effectiveness/maturity of operational excellence in the Sudanese aviation industry. The development of performance measurement and reporting process is one of the subfactors of the Improvement dimension. Additionally, Organizations should assess their current maturity of operational excellence implementation. Based on the above discussion, it was evident that the Maturity Level classification index is needed to evaluate the maturity level regarding the implementation of operational excellence by the organizations in the Sudanese aviation industry.

Acknowledgement

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New First Level Resolution by Employing Robotic Process Automation

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Abstract – *Service quality refers to the gap between the customer's expectations of the service and the perception of the service received. Customer's satisfaction with services in both technical and functional quality are considered the most important factor leading toward competitiveness and success of business world today. This is where the Service Operation Centre is the centralized contact point when the customers encounter any issues, or customer experience any after-sales-service issues. Therefore, the new first level resolution system is very crucial to ensure Restoration Cycle Time for each incident is within the target duration to restore the service. Hence, this paper came out with the objectives of identifying the system used by the telecommunication Service Operation Centre for first level resolution process, evaluating the inefficiency of the current first level resolution system and proposing new first level resolution system by employing robotic process automation. The research method will be based on the literature and document review.*

Keywords: Service Operation Centre, Service Quality, Telecommunication, Robotic Process Automation

1. Introduction

An excellent service quality assurance would lead to subsequent buying behaviour. Ideally the loyal customer with high customer satisfaction level will think thoroughly before they decided to churn or turn away to another telecommunication service providers (Tas et al., 2019). The significant determinant for corporate profitability and, eventually, survival is achieving customer satisfaction. (Tas et al., 2019) states that the concept of "customer service" becomes important to organisations and the ability to identify and select quality service-oriented employees becomes critical for an organisation's success. In this regard, in order to ensure continual support from its customer, it is crucial for Service Operation Centre (SOC) to know the perception of its customers on their service quality. Plus, providing the services that is beyond customer expectation is always be an ultimate goal of any service operation regardless of the sectors. This paper therefore sets out to identify system used by the telecommunication SOC for first level resolution process, evaluating the inefficiency of the existing system and propose new first level resolution system by employing robotic process automation.

2. Literature Review

2.1 Service Operation Centre (SOC)

Telecommunication SOC, which acts as the operational hub, and ideally bridges organizational internal stakeholders and customer through the correlation of network information into a meaningful interpretation of service quality. In order to support the customer centricity aspiration, SOC Centre collaborates with the internal stakeholders to provide comprehensive and regular update to customers especially during the fault restoration process. This will ensure the customers are satisfied with SOC's excellent support, have strong confidence with the telecommunication services and consequently will retain the service for a longer period as well as continue to subscribe new product with this telecommunication service provider.

The term SOC varies for each company. In this study, the SOC considered as service desk or help desk. According to Cassandra et al., (2019), the service desk played a critical role in customer service as they are the representative of the whole company when interacting with customers. For these reasons alone, the service desk should have a strong iron clad management. The management of service desk requires, a part of the standard maintenance of the system or services, applying the definition and description of the services that the company offers to its customers, discovery of their shrouded value and reasons of why they use the provided services. Ultimately, these services will need a constant improvement and administration at all levels of management (Hamranová et al., 2020). This is precisely why SOC is playing a major role in companies strategizing in achieving company's objectives.

A knowledge based is very essential for a service desk where they might encounter repeated issues or enquiries. Many companies attempt to build a service desk system to support the quality service. There are reports showing that 70 % of the customer's satisfaction is not about the service itself but because of the customer's service efficiency when they were facing any incidents (Cassandra et al., 2019). Knowledge based can also be considered as a database that stores past interactions between customers and companies. Many big companies that have high vision for their future growth is putting a lot of efforts in improving their customer support management. One of the main reasons for this is the increasing of purchase of services that support their business (Jäntti & Cater-Steel, 2017). Thus, it is becoming increasingly important on how service desk handles the first level resolution.

2.2 Inefficiency of the existing system used by telecommunication Service Operation Centre

SOC proven to be very much valuable aspects for a company in handling both internal stakeholders and external customers. Strategically speaking, the SOC system that used by this telecommunication company is one example where the company failed to optimize the

usage of this SOC and will slowly drag the whole operation down. In this example, the systems created separately to contain specific information. To update the Customer Portal, the user needs to sign in twice to retrieve different information. The whole process is really limiting the productivity as most users will spend more time in this cycle instead of updating the Customer Portal faster. The users are stuck in this whole process will spend more time retrieving data are really wasting human resources.

Apart from that, manual repetitive tasks increasing the chance of human error. For a telecommunication company that have hundreds if not thousands of users, the number of issues reported daily surely will not be in a small number. Thus, the personnel must be handling a lot of incidents daily are prone to make some mistakes in the processing. Lastly, the systems themselves may have problems. The systems may sometimes load slowly thus increasing more than 10 minutes needed to spend in for an incident. As the systems was used regularly, they need to be maintained regularly also. The company may needs to prioritize in upgrading the server hardware that contain the systems to ensure the process running smoothly. It is also a good strategy to improve the software themselves so the whole process will take less time and can be done more efficiently.

2.3 New First Level Resolution System by employing Robotic Process Automation

Bhatnagar (2016) concurred that innovation is a core competency for a service industry. In his opinion, service innovation is steered by the organization's capacity to creatively use the advantages of technological advances, relationship networks and new knowledge. This goal has required the service providers to improve innovation competence, which is an important role in shaping and developing the service innovations (Bhatnagar, 2016). Subsequently, there has been a rising attentiveness in specific area of automation that is, robotic process automation. This robotics technology is referring to software agents acting as human agents in system interaction. Robotic process automation is a system that process-aware (Syed et al., 2019). They also agreed that robotic process automation is a new technology consisting software agents called 'bots' that imitate the path taken by a human agent through a selection of computer systems when performing a range of tasks in a business process. It is important to note that the tasks that it executes are generally rule-based, well-structured and repetitive. The paper that has supported by Zhang and Liu (2018) who stated that robotic process automation is a software robotic tool that helps automate the routine tasks. It has been agreed by researchers to be an effective and innovative way to cut cost and perform tasks efficiently.

Robotic process automation did not change the foundation of the IT system itself and improvise the existing manual process with the automated plan (Huang & Vasarhelyi, 2019). It is widely used in almost every industry in the market. According to Santos et al. (2019) most of the tasks performed by robot are filling forms, monitoring events, performing checks, logging into specific programs, sending emails and extracting data. The study of robotic process automation system is capable of working in a complex environment that focuses on recurring topics especially for human. The robot interaction field represents the

starting point for advanced research and technological transfer taking account of interface and human (Laudante et al., 2020).

3. Discussion

Knowledge base in the service desk role is to act as a library that stores the issues or enquiry that have arisen previously. According to Cassandra et al. (2019), many companies have started to develop an intelligence help desk to cater the first level resolution before proceeding to pass the issue to the second level. The system will be based on a knowledge based, automatically tries to locate solution patterns, previous issues from past customers. This has been a great help in the first level resolution for the service desk.

Leal et al. (2017) points out that the system is able to use a semantic technique to extract the troubleshooting knowledge in their research which focusing on how semantic web and artificial intelligent technologies to be utilized in first level resolution from the point of view of the context indexer. This proves that by using a solid knowledge based, the first level troubleshooting or resolution can be handled by the artificial intelligent system. It is also one of the strategies in the service desk field in the assurance of following the standard procedures. The cognitive automation was acknowledged to be able to assist the company in figuring out the future demand for the service based on the past and current usage pattern and establishing a plan for the service portfolio accordingly (Krishnan & Ravindran, 2017).

According to Jäntti & Cater-Steel (2017), there have been an increasing volumes of service desk request that propels the service providers to be more proactive instead of wrestling to solve the issue that was reported to them. Service operation should be able to anticipate the needs of the end users and respond efficiently and effectively to them directly. These proactive methods such as preventive actions, trend analysis, and major issues reviews is very important in improvising the first level resolution. Even with the advancement of technology, it is still challenging to provide efficient and effective customer service that meets all the requirements. Instead of requesting help of a customer support, the intelligent service desk will offer a wide range of strategic possible solution or alternatives for customer's problem (Leal et al., 2017). The outcome of these automatic searching and filtering also tends to be more consistent and able to handle the uncertainty situation better.

Retrieved from (Telecommunication Company Internal Document, 2019), implementation of robotic process automation as the new first level resolution system in a telecommunication service operation SOC, the process only took 1 minute to be completed. The robot scope will be doing the same process as the normal user would do to publish the data in the Customer Portal but with 50% reduced in the time needed usually. This new system will increase the productivity of the workers as they no longer needed to spend more time in getting and publishing the data manually. Subsequently, the workload of the users can be directed to more productive tasks rather than spending time in the systems looking for data. As the process was automated, the chances of errors happening due to manual

data handling also will be eliminated. The robot will not likely to return with wrong data if all the parameters passed correctly from the beginning.

4. Conclusion

This paper able to identify the system used by the telecommunication SOC for first level resolution process, then evaluating the inefficiency of the current first level resolution system and new first level resolution system by employing robotic process automation. Other than robotic process automation in first level resolution by telecommunication SOC, there are also many other possible factors that may have improve the service quality assurance in telecommunication service provider in Malaysia. The question of whether service quality should be measured as the difference between customers' perceptions and expectations, or whether some alternative approach is more appropriate remains part of an extensive debate in service quality literature.

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Confined Space Bowtie Risk Assessment Framework for Sewerage Construction Project

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Abstract – *This paper aims to investigate the issues related to safe working in confined spaces at the sewerage treatment plant construction project in Hulu Langat district and to provide a solution by proposing a substantial approach to mitigating risk during confined space entry due to an ineffective risk assessment and poor compliance by project management. The methods used were site visit observation and survey, followed by an analysis of the selected risk assessment method. The site visit to the sewerage treatment plant project investigated the compliance of confined space risk assessment documents to established requirements such as OSHA 1994, FMA 1967, ICOP 2010, HIRARC Guidelines 2008, Quebec Regulation 2015, ISO 31010, HSE UK, and BCGA UK. The selected risk assessment method was analyzed with Bowtie Risk Assessment by referring to the preventive approach concept or barrier analysis. Next, additional information relevant to risk assessment from journals was included. Evaluation of Bowtie Risk Assessment was conducted through a focus group discussion (FGD), which plays an essential role in developing the Bowtie risk assessment graphical framework. The proposed Bowtie Risk Assessment graphical framework provides a sewerage treatment plant construction project with a holistic technique for preventing confined space accidents. It also provides a safe work system, manages hazards and risks effectively, promotes good leadership practice, improves company reputation, and significantly reduces accident costs. The framework is also useful as a reference model to other industry players.*

Keywords: Confined Space, Bowtie, Risk Assessment, Fatality Accident, Industrial Code of Practice 2010

1. Introduction

Malaysia is one of the countries that focus on industrial sectors such as manufacturing, construction, oil & gas, agriculture, and services. The industrial development initiatives implied that substantial numbers of equipment and recent technology increased the type of activities or worked to be carried out, leading to a different working environment that created multiple hazards, such as confined space. Several local and international requirements such as Legislation, Standard, and Guidelines are identified and explicitly explained on their contribution elements to risk assessment and confined space entry requirements. Furthermore, key contributing factors toward confined space accidents are identified by referring to a confined space accident, as shown in Figure 1.

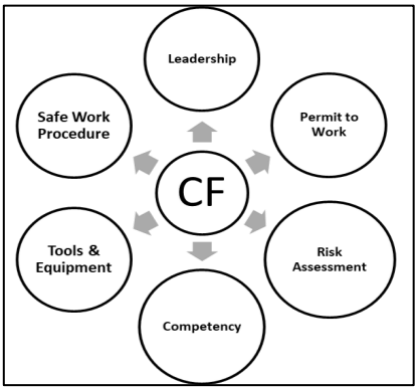

Figure 1. Contributing Factors Towards Confined Space Accident.

Statistics of confined space accident in Malaysia has been obtained from the Department of Occupational Safety and Health Malaysia website, as depicted in Figure 2.

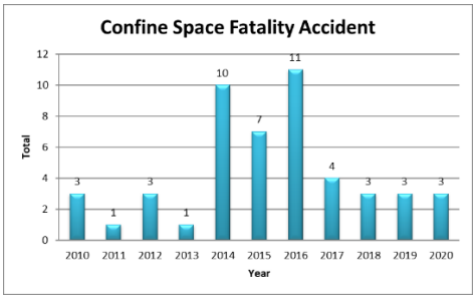

Figure 2. Confined Space Accident Statistics.

A study conducted by a previous researcher specifically aimed at confined space works is gathered to relate to the issues faced during confined space entry. A study about the requirements to identify all hazards prior to entering confined space by familiarizing the threats according to job types and confined space category. Hazards like Biological, physical, chemical, and health are the most common category contributing to the risky work environment [1]. A recommendation related to improvising the Permit to Work (PTW) system for confined space contributes much to incidents nowadays. In their study, the existing PTW required a proper review and proposed a comprehensive type of PTW [4]. Additionally, a study on risk assessment [5], atmospheric testing [13], leadership [7], the configuration of confined space [4], emergency response [12], and ventilation [11] are contributing to the development of an inclusive risk assessment.

2. Materials and Methods

Several methods have been used to obtain sufficient input and information prior to finalizing the inclusive risk assessment for confined space entry as below:

a. Risk Assessment Tools Compliance - Site visit conducted at the project site to assess compliance of risk assessment application against the legislation, Standard, and Guidelines requirements.

b. Risk Assessment Tools Method - Several risk assessment types were selected and assessed on their application in the industry, specifically for confined space entry. Examples of tools are Checklist, Risk Scale, Risk Calculation, Questionnaire & Risk Matrix, Risk Estimation, Ishikawa, Flexible Risk Assessment, Bowtie Risk Analysis, Proportional Risk Assessment, Three Step CJSA, and Risk Assessment Model.

c. Confined Space Safety Management - The issues while working in a confined space are Depth, Physical Condition, Work Environment, Presence of Toxic Gases, Noise, Duration, and Numbers of Entrant. The project's confined space reports are assessed for compliance with local [3] and international requirements [8],[9],[14].

d. Risk Assessment Tools Analysis - Ten types of Risk Assessment tools will be further analyzed qualitatively. The analysis is conducted using two approaches: the first is against Industrial Practices & Application (IP), and the second is the Barrier Analysis approach (BA). An IP analysis method is measured through five parameters: the purpose of the application, specific functions, the scope of application, availability in Standards, Legislation or guidelines, and relevance to the project.

e. *Focus Group Discussion* - The establishment of Focus Group Discussion evaluates, develops, and validates the research process outputs and data and finalizes the developed Risk Assessment tools for confined space.

3. Results and Discussions

The study outcomes have successfully produced a comprehensive type of Risk Assessment. The study process strictly refers to the methods that have been organized. Confined space risk assessment tools compliance conducted has provided a detailed configuration and types of confined space as well as inclusive compliance against local and international requirements according to the shared project reports. The Risk Assessment Tools method provides inputs on each assessment tool's application in the industry, whether partially, entirely, or not relevant as a confined space application. The confined space safety management provided a real-time challenge faced at the project site in managing it safely where the details of issues of confined space are obtained such depth, physical condition, work environment, presence of toxic gases, noise, duration, and numbers of the entrant which useful during development of risk assessment framework. The risk assessment tools analysis gave a detailed output qualitatively on selected risk assessment tools against Industrial Practices & Application and Barrier Analysis, where the results will display the most relevant risk assessment tools for confined space. The Focus Group Discussion was carried out, and a team was formed to finalise all the inputs from the methods applied. This process will involve a selected project team member and a Bowtie specialist in evaluating, developing, and validating the Confined Space Bowtie Risk Assessment Framework.

4. Conclusion

The significant contribution toward implementing a Confined Space Bowtie Risk Assessment are reduction of confined space accidents, leadership enhancement, culture development, improved safe work system, and prioritized personnel competency. Future works are suggested to extend the area of Bowtie Risk Assessment and advance the risk assessment using Bowtie, such as adding Escalation Factor and Bowtie Chaining.

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Risk Management Framework: A Review for Boiler Operations In Malaysia

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Abstract – *Numerous activities performed in boiler operations are complex; these operations are hazardous and risky and can cause accidents. This study aims to develop and propose risk management frameworks for working in a hazardous working environment at the boiler plant in Malaysia to prevent and control accidents and implement adequate safety and health management. Next, to analyze the risk factors and hazards for boiler operations based on the nature of work at the boilers in Malaysia using several methods, which are Bowtie Risk Assessment, Hazard and Operability Study (HAZOP), Fault Tree Analysis (FTA), Failure Mode and Effect Analysis (FMEA). The result showed that the rate based on hazard sources in the boiler division has Extreme Risk levels (8%), High Risk (14%), Moderate Risk (35%), and Low Risk (43%). Risk assessment based on the type of hazard in the boiler division has risk levels ranging from high to the lowest score is the danger of Mechanical (25%), Electrical hazard (10%), chemical hazards (6%), and physical hazards (59%). The developed risk management framework with enhanced risk assessment techniques may solve the integration of sustainability aspects in boiler operations safety and risk management.*

Keywords: Risk Assessment, Bowtie Risk Assessment, Hazard and Operability Study (HAZOP), Fault Tree Analysis (FTA), Failure Mode and Effect Analysis (FMEA).

1. Introduction

Steam is used in practically every industry, and it is generally recognized that steam generators and heat recovery boilers are critical to power and process plants [1]. The boiler is among the essential equipment in power plants, as it converts biofuelinto energy. This includes the shipping industry, which is the most extensive in the world [2]. The boiler is made to work under challenging conditions, such as high temperatures, high pressures, and a potentially dangerous atmosphere. On the other hand, prolonged exposure to those circumstances causes the boiler to fail and lose itsstrength. Power plants are forced to shut down because of the failures. As a result, weneed a robust safety policy and system to reduce the chance of failure, particularly formore sensitive components, such as the boiler [1][2]. Due to the dangerous workplaces that boiler operation constitutes, the companies need to ensure safe working conditions through systematic and regular hazard identification and risk assessment. Safety procedures and regulations need to be followed by the management as well as the workers. Many business enterprises have proven that good safety management leads to increased productivity and power plant work [3].

The boilers are widely used for heating applications. The Fire-tube boiler is as simple as its construction. In a fire tube boiler, the fuel is burnt inside a furnace [4]. The hot gases produced in the furnace then pass through the fire tubes. The fire tubesare immersed in water inside the main vessel of the boiler [5]. As the hot gases are passed through these tubes, the heat energy of the gasses is transferred to the watersurrounding them. As a result, steam is generated in the water and naturally comes up and is stored in the water in the same vessel as the fire tube boiler. This steam is then removed from the steam outlet for the required purpose. The water is fed into the boiler through the feed water inlet [7]. As the steam and water are stored in the same vessel, it is quite challenging to produce very high-pressure steam. In a fire tubeboiler, the main boiler vessel is under pressure, so if this vessel is burst, there will be a possibility of a major accident due to this explosion [6].

Recently, several studies suggested that there are need for risk management frameworks in boiler operation activities [5][6][7][8][9][10]. No specific risk assessment frameworks in Malaysia have been developed for boiler operations [11]. Unlike other developed countries and other high-risk industries that have established specific risk assessment frameworks and techniques, Malaysia practices a general risk management framework, which refers to hazard identification, risk assessment, and risk control (HIRARC) guidelines, 2008 and standards such as OHSAS 18001- Occupational Health and Safety Management standards, Factory and Machinery Act 1967. These pose challenges to Malaysia's boiler operators [12][13].

2. Materials and Methods

In this study, the HIRARC method was applied as the primary analysis tool to assess the risk factors of boiler operations. However, the framework has been improved to suit the boiler operation suitability. The Malaysian HIRARC 2008 guidelineprovides a guideline for simple operation activities [14]. The guideline has a framework that uses a qualitative risk matrix assessment and a simple risk rating calculation and categorizes risks into three levels, not considering the existing controlmeasures. These limitations lead to a challenging implementation of risk managementin boiler operations [15]. This study is to analyze the risk factors and hazards for boileroperations based on the nature of work at the boilers in Malaysia using several methods, which are Bowtie Risk Assessment, Hazard, and Operability Study (HAZOP), Fault Tree Analysis (FTA), Failure Mode and Effect Analysis (FMEA). An improvement of the risk management framework was developed with the identification of risk factors in boiler operations [14]. Besides that, an enhancement was proposed with anintroduction of risk frequency into risk rating calculation, risk criteria parameters for risk likelihood and severity, new risk matrix dimension and instruments to evaluate the existing control measure factor, and new risk categories with five levels [15]

3. Results and Discussions

Data collection on the identification and assessment of risks analyzed by HIRARC evaluated and found a better solution to determine and control hazards in theworkplace

so that the workplace is safe. The result showed the sources of the dangersare charcoal dust, sparks, heat radiation, falls, pinched, charcoal sprinkle, noise, high electric pressure, explosion, fire, hot material, exposure to chemicals, inhaling chemicals, steam, leaks in drum steam, hot water, excess gas pressure, and embers. Risk assessment based on the type of hazard in the boiler division has risk levels ranging from high to the lowest score is the danger of Mechanical (25%), Electrical hazard (10%), chemical hazards (6%), and physical hazards (59%). The rate based on hazard sources in the boiler division has Extreme Risk levels (8%), High Risk (14%), Moderate Risk (35%), and Low Risk (43%).

The HAZOP application pointed out critical points of the system. For the first Knot,it was evident that the identified deviation concerns the low water flow (guide word:less). Moreover, for the second Knot, pressure (steam), the deviation is linked to the pressure of low steam (guide word: less) of steam pressure. Therefore, the correctiveactions are (i) implementation of an operating manual for the boiler, (ii) pipingpreventive maintenance, (iii) operators' training, and (iv) implementation of an alarm(Andon) system for low water levels.

The FMEA revealed that boiler tubes, shells, mud door gaskets, steam feed water pumps, and safety valves are critical components of the boiler system.From the identification of 52 components in the boiler using the FMEA method, it was found that two components were included in the high-risk category, and the attemperator and feed water pump components are included in the high-risk category. So that the attemperator and feed water pump components are the top events that will be identified by the Bow tie method.

At a high level of risk, a minimum of 1 high-effectiveness barrier and 1 medium-effectiveness barrier are required for each threat and one barrier for each consequence. So from the identification results on the attemperator using the bow tiemethod, it can be seen that the existing barrier on each threat is considered insufficient because it only has 1 low effectiveness barrier, which is indicated by a redmark. Therefore, it is necessary to add a barrier with a high level of effectiveness barrier, such as installing a thermocouple, installing an overheat trip, and installing a filter on the attemperator. The results of the identification of the feed water pump using the bow tie method, the barrier in threat 1 is actually sufficient, but in the field,there is still frequent damage to the pipe header, so it is recommended to add a barrierin the form of choosing the proper pipe specifications. The barrier in threat 2 is considered insufficient because it only has 1 low-effectiveness barrier, which is indicated by a red mark. Therefore, it is necessary to add a barrier with a high level ofeffectiveness, such as installing vibration dampers and installing strainers.

4. Conclusion

The main contribution of this research is the development of risk management frameworks for boiler operations with enhanced risk assessment methods to improvethe risk management framework. The risk management framework was proposed with an

introduction of risk frequency into risk rating calculations, risk criteria parameters for risk likelihood and risk severity, new risk matrix dimensions and instruments to evaluate the existing control measure factors, and new risk categories with five levels which provide more details and a sustainable risk assessment method. This facilitates applying risk management to solve the sustainability of boiler operations' occupational safety and health concerns. The developed risk management framework with enhanced risk assessment techniques may solve the integration of sustainability aspects in boiler operations safety and risk management. Further research could expand the scope of the study to other boiler operations in other countries and cover the whole boiler operations.

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Solar Renewable Energy: A Systematic Review of Sensitivity Analysis Practices

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Abstract – *Sensitivity analysis provides information on the relative importance of model input parameters and assumptions. It is distinct from uncertainty analysis, which addresses the question, 'How uncertain is the prediction?' Uncertainty analysis needs to map what a model does when selected input assumptions and parameters are left free to vary over their range of existence, and this is equally true of a sensitivity analysis. Despite this, many uncertainties and sensitivity analyses still explore the input space moving along one-dimensional corridors, leaving space for the most unexplored input factors. An extensive systematic literature review shows that many highly cited papers fail the elementary requirement to explore the space of the input factors properly. While discipline-dependent, the results point to a worrying lack of standards and recognized good practices. The ending stated a few possible reasons for this problem and suggested some guidelines for the proper use of the methods.*

Keywords: Uncertainty analysis; sensitivity analysis; solar renewable analysis; extensive systematic literature review

1. Introduction

Mathematical models have become increasingly prominent tools in decision-making processes in broad applications. Driven by increasing computing power, coupled with the abundance of available data, models have become more complex, aiming to include ever more processes at an ever-higher resolution. However, this increased complexity requires much more information to be specified as the model inputs, which is not well-known. Therefore, it is essential to understand these uncertainties' impact on the model output if the model is to be used effectively and responsibly in any decision-making process. *Sensitivity analysis* (SA) and *uncertainty analysis* (UA) are two main tools for exploring such models' uncertainty.

One definition of sensitivity analysis is "the study of how the uncertainty in the output of a model (numerical or otherwise) can be apportioned to different sources of uncertainty in the model input" (Saltelli, 2002). As such, it is very much related to – but distinct from – uncertainty analysis (UA), which, as we define it here, characterizes the uncertainty in model prediction without identifying which assumptions are primarily responsible. Ghanem et al. (2017) stated that uncertainty analysis could include a broad range of applications relating to uncertainty.

In building a model, several things must be specified, including the type and structure of the model, parameters, resolution, and calibration data (Figure 1). Each of these has an associated uncertainty and is *an assumption*. In a qualitative uncertainty analysis, we can only investigate (vary) a subset of these assumptions. We call this subset the input factors, which includes all items varied in a SA or UA, model parameters, and any other types of assumption that will be varied. In performing any uncertainty and sensitivity analysis, it is crucial to keep in mind that the uncertainty in the assumptions outside the input set will not be explored. The model results for any input factor values are called the *model output*.

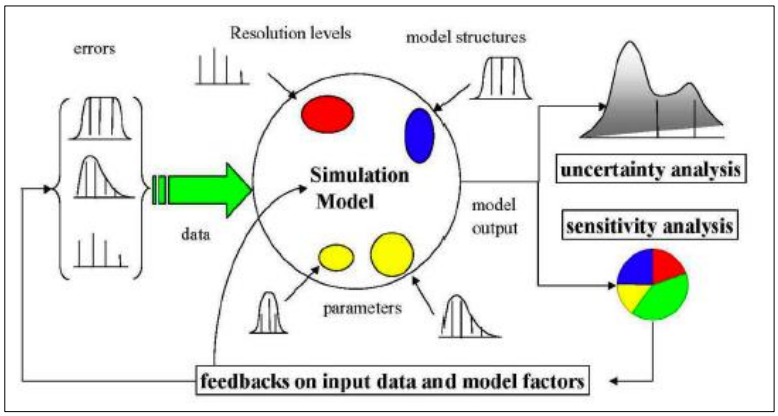

Figure 1. Idealized uncertainty and sensitivity analysis.

The UA may involve extracting summary statistics, such as the mean, median, and variance, from this distribution and possibly assigning confidence bounds to the mean. At the same time, SA is used to quantify the contributions of model inputs, or sub-groups of inputs, to the uncertainty in the model output (Eisenhower et al., 2012). Saltelli (2002) also stated that in this uncertainty setting, typical objectives are to identify which input factors contribute the most to model uncertainty ("factor prioritization") so that further information might be collected about these parameters to reduce model uncertainty or to identify factors which contribute minimally and can potentially be fixed ("factor fixing"). Sensitivity analysis can also be used to understand processes within models better, and thereby, the natural systems on which they are based (Becker et al., 2012), or as a quality assurance tool: an unexpected strong dependence of the output upon an input deemed might either illuminate the analyst on an unexpected feature of the system or reveal a conceptual or coding error.

2. Materials and Methods

In order to understand the prevalence and type of sensitivity analysis across different fields and the extent of the issues discussed in the previous section, an extensive literature review (a meta-study) was carried out. The review was based on highly cited articles focusing on sensitivity analysis. The reasoning here was that the most cited articles should represent, on average, "commonest practice" relative to that field. Therefore, by analyzing these papers, we should be able to conclude, with reasonable confidence, that the rigor of sensitivity analysis in a given field is at, or below, the level of its top-cited papers.

a. Selection procedure

The literature search was conducted on the Scopus database. In order to identify relevant papers, the following search criteria were used. First, the strings "sensitivity analysis," "model/modeling," and "uncertainty" were required to be present in the title, abstract, or keywords. This ensures the paper has a significant focus on sensitivity analysis related to mathematical models and concerns uncertainty. Second, the papers were restricted to 2012-2022 to provide a sample of recent research.

b. Review Criteria

Each paper was reviewed against a set of simple criteria, as follows.

1. Was an uncertainty analysis performed? If so, was a global or local approach used?
2. Was sensitivity analysis performed? If so, was a global or local approach used?
3. Was the paper primarily focused on the *sensitivity analysis method* or the *model* (application)?
4. Was the model used linear or nonlinear, or was it unclear?

3. Results and Discussions

OAT methods are defined as all procedures where factors are moved only one at a time, even when derivatives are computed efficiently, such as when using the adjoint method. Furthermore, some methods, such as in or in, are based on derivatives but are classified as global methods because they sample partial derivatives or incremental ratios at multiple locations in the input space. Global approaches are any movement of factors together, such as in the Design of Experiment (DoE). A Monte Carlo analysis followed by an analysis of the scatterplots of *y* versus the various input factors x_i is also classified as global (albeit qualitative), as well as approaches based on regression coefficients of *y* versus x_i, the use of Sobol's sensitivity indices – independently of how these are computed, screening methods such as the method of Morris, Monte Carlo filtering, and the additional online material for the methods met in the papers reviewed. Valuable recent reviews are (Norton, 2015) and (Pianosi et al., 2016).

One might wonder what an OAT uncertainty analysis looks like. Some papers quantify uncertainty by observing y_i^{max} and y_i^{min} for each input factor during an OAT experiment, and assign the range of uncertainty on y as [y_i^{min}, y_i^{max}], where y^{min}=$min_i(y_i^{min})$, and similarly for y_i^{max}. This ignores the additional uncertainty in *y* when more than one factor at a time is set to its maximum or minimum values.

The main distinction between method and model-focused papers is as follows.

a. Model-focused papers are defined as those which focus on a model and use sensitivity analysis as a tool to investigate uncertainty or other aspects of the model. These types of paper will often have a greater impact on the application

(which is ultimately the outcome of concern), for example in assessing the uncertainty/sensitivity of climate models or the other models used in decision-making. The primary conclusions of the paper are therefore related to the model.

b. Method-focused papers introduce sensitivity analysis methodology and use a model as a case study to demonstrate a new approach. Conclusions are therefore focused on the method's performance, and results relating to the model are of secondary interest. Typically, the authors are familiar with sensitivity analysis techniques, which allows them to propose new approaches. These papers are more likely to feature high-quality sensitivity analysis techniques.

Table 1. Percentages of reviewed papers based on focus, model linearity, uncertainty, and sensitivity analysis type.

Paper focus	Method	10 %
	Model	90 %
Model linearity	Linear	7.0 %
	Nonlinear	61 %
	Unclear	32 %
Uncertainty analysis type	One at a time	7.0 %
	Global	21 %
	Unclear/absent	72 %
Sensitivity analysis type	One at a time	34 %
	Global	41 %
	Unclear/absent	25 %

This study's result clearly shows severe methodological deficiencies in highly cited papers. There are a few reasonable reasons which could be speculated which are (Abokersh et al., 2020; Coskun et al., 2017; Espinosa et al., 2015; Groen et al., 2017; Hong et al., 2016; Luerssen et al., 2021; Mavromatidis et al., 2018; Mutel et al., 2013; Tran & Smith, 2018; Zhang et al., 2022): (1) sensitivity analysis is intrinsically attached to modeling, which itself is not a unified subject; (2) most researchers conflate the meaning of SA and UA; (3) global analysis unavoidably requires a good background in statistics to implement and to interpret results, and (4) researchers tend to emulate methods found in highly cited paper which modeling is used.

4. Conclusion

The conclusion is that a carefully performed sensitivity analysis is a crucial ingredient of a model's quality assurance and a necessary condition for any model-based analysis or inference. However, such analyses are not standard enough and often inaccurate, indicating that action is urgent regarding quality assurance procedures for mathematical models.

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Introduction of Automated Valuation Model in The Valuation Process

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Abstract – *This research paper will firstly introduce the function of a property valuation in Malaysia and relating valuations needs to the institutional investors and bank. The valuation standards and bases together with the valuer skill sets were discussed in this paper. Thereafter, this paper will be describing of the advance of technology like introduction of data and big data in Valuation, blockchain, artificial intelligence and automated valuation system (AVS), automated valuation models (AVM) and other type of potential advance technology. Furthermore, this paper will describe of the changing client expectations such as sustainability and value, long term value, valuation uncertainty and delivery time. Provided that the Automated Valuation Model have given the added value like the valuation uses in future roles, the valuation process in the future, the valuation standards, valuation approaches and basis of value and the skills of the Licensed Valuer. This research paper will be reviewing the Literature of different papers, report, insights, journals and articles. Thereby, introduction of the Automated Valuation Models to the users in the Valuation Sector in the Business industry. The conclusion of the paper will summarized the evolution of the Automated Valuation Models (AVS) from the Traditional Valuation Models.*

Keywords: Automated, Valuation, Licensed Valuer, Value and Standards

1. Introduction to the Property Valuation Sector and the Developments

The history of Public Valuation Sector known as The Valuation and Property Services Department (JPPH) established by the Ministry of Finance Malaysia had set up a Valuation Division operation in 1st June, 1957, i.e approximately 65 years ago [1]. In year 1999, the National Economic Action Committee (MTEN) in Malaysia has established the National Property Information Centre (NAPIC) to centralize the property monitoring system through a property centre under the NAPIC to monitor the growth of the property market in the country [2].

The Board of Valuers, Appraisers, Estate Agents and Property Managers in Malaysia (BOVAEAP) was established by the Ministry of Finance Malaysia in year 1981 governed by the Valuers, Appraisers, Estate Agents and Property Managers Act 1981 in Malaysia (Act 242) [3]. The function of BOVAEAP is to regulate the professional practices among the professionals held under the Act 242 in order to maintain and control the professional licensing of the professionals practicing in Malaysia. Several frameworks and the standards were provided by the BOVAEAP.

Besides the Surveyors profession were first recognized in the year of 1885, and prior to 1961 there were two professional bodies representing the Surveyors are the Institution of Surveyors Malaysia (ISM) and Institution of Land Surveyors, [4]. Both of these professional bodies appeared to be a supportive non-profitable organization to give supports to the professional practices of Valuation and Property Sectors in Malaysia and strengthen the networking system [4].

The standards, rules and acts that were recommended and introduced by the BOAVAEP are the Valuers, Appraisers, Estate Agents and Property Managers Act 1981 and rules in Malaysia (Act 242), Malaysia Valuation Standards 2019 (Red Book), Estate Agency Standard 2020 and the Property Management Standard [3]. Several continuous profession development courses and seminar were conducted by the Royal Institution of Surveyors Malaysia and books and manual publications were published by the Royal Institutions of Surveyors Malaysia [4].

The Malaysian Valuation Standards (MVS) in Malaysia were revised to 6th Edition effective from 1 January 2019 with the progressive development and inclusive of the Valuations for Submission to the Securities Commission Malaysia and Valuation of Biological Assets. The first issue of the MVS has shown the progressive development in the first edition of the Valuation of assets. The MVS recognizes the valuation principles as enunciated by the International Valuation Standards (IVS) [5]. The MVS and IVS are the standards that promote greater transparency and consistency in the professional practices of the Valuation sectors in the Locally and Internationally for the past 40 years. BOVAEAP Licensed Valuer Registration (LVR) provide the assurance that the independent quality process and assurance to the clients with high levels of standards and professionalism [6].

2. Background of the Automated Valuation Models and Automated Valuation Systems

Valuation profession is progressive developing and will be the most impactful sector that will be affected due to computer technology and the changing client expectations. There have been many different types of changes throughout the six decades in the Valuation sectors of the Private sectors and the Public Sectors because of the evolution of 4th Industry Revolution (IR) in the country of Malaysia. In the Property Market Report stated by the Penang Statement Government 4th Industrial Revolution is a revolution strategy to converge the public, manufacturing, and services sector, to gain their benefits and experiences in the 4th Industrial Revolution [7]. The 4th Industrial Revolution is the current trend of automation and data exchange especially in the manufacturing sector to create a “smart factory” using the technology advancement. This manufacturing technology in the current trend of 4th Industrial Revolutions brings the the future into the application and usage of Big Data Analytics (BDA), Cloud Computing, Internet of Things (IoT) and e-commerce [7]. In the new and fast changing environment of the advanced technology, the industrial revolutions have also changed client expectations towards the services sector in the Valuation Sectors emerging in the Automated Valuation Models and Automated Valuation System [6].

According to the statement quoted from RICS Research Team in the Articles for insights of Future of Valuation, 2017 [6]:

> *" The valuation profession is likely to face a period of significant change in coming years, in terms of how the valuation process is managed, the role of the valuer as well as the added value to clients."*

The valuation profession is very important to the property sectors and is very important to have accurate valuation [8]. The public sectors valuations are carried out for taxation and compensation purposes, Valuation in the private sectors are generally for lending purposes (retail banking and corporate customers), valuation reports are needed for the security and collateral for the loan provided [8].

There are two (2) types of challenges and issues in the valuation profession that have been discussed in the insights of Future of Valuation, these includes the technological developments and the changing client expectations. Accordingly, there were six (6) recommendations for valuers to be well equipped in the Automated Valuation Models and Systems including embrace technology, enhance the client experience, ensure independence and objectivity, beware of liability, reduce timescales and update your skill set [6].

Valuation is a skill set of process that required the understanding as both art and the science [15]. First, the valuation is a required understanding and knowledge in the theory of value to gained from the science of economics. Second, the methodologies have been determined through the methods and approaches of Valuation in Malaysia. Third, the teaching of the subject involved the rigorous application of mathematics and statistics. Fourth, the introduction of computers and application of developments in Information and Communication Technologies (ICT) to streamlines the procedures and adopt a more systematic approach to procedures in determination of value. Fifth, more and more research to be carried out in the property market research to preparing a Valuation Report and Financial Appraisals because of the requirement to determine the ownership, use, development, management, and ultimate disposal of the asset in a Valuation Reporting process [8 & 15]. In the past, Valuation is considered as an art because of the Valuation report required the preparation of the opinion of market value and must be verify by a Licensed Valuer. All opinion of market value must be supported by relevant information that required to prepare in the Valuation Report to form an opinion of Market Value in accordance to the Malaysian Valuation Standards (MVS) [5 & 8]. Therefore, A valuation is a process to determine the Market Value of the property, tangible and intangible assets [5, 6].

3. Methodologies

This research paper aims to study through the underlying process that could improve the valuation processes in the Valuation sector for consistency and transparence. Two (2) of the research objectives have been determined in this research, the first objective is to give

insight of the background of valuation, the processes, the functions, the needs and the importance of property valuation. The second objectives is to determine the types of changes that could explore and enhance into the property valuation sectors [6]. The purpose to carry out this research is to identify the issues emerging in the Valuation Sector for the technological developments and client expectations and to relate the Automated Valuation Models and System into the Malaysia context in the Valuation Sectors. The methodologies are carried out through thorough literature review and the findings determine from the main sources will be discussed in the research paper.

4. Results and Preliminary Findings

4.1 Purpose of Valuation and the Attributes in A Valuation Report

The results from the Literature Reviews shows that Valuation is a process of determining the value of a property. Valuation is reflecting the past or the current value. The value reported are the fundamental of the reporting and this is for the purpose of business decisions in the accounting purposes, financial reports purposes, tax purposes, conveyancing purposes, sales and purchase decision and support in secured the loan decision [5]. A valuation report follows the Malaysian Valuation Standards (MVS) and the International Valuation Standards (IVS) to the valuation practices to secure the trusts of the client(s). For example, the consistency in valuation approach, consistent in valuation opinions, objective, independent and transparent in the licensed valuer's approach, clarity relating to the terms of engagement like clarity in the appointment letter with clients' terms, clarity relating to the valuation basis and clarity in reporting and proper disclosure and adequate information [6].

4.2 Two (2) Types of Valuation Process

There are 2 categories of Valuation process in the past and in the future namely Traditional Valuation Models and the Automated Valuation Models (AVM)/Automated Valuation Systems (AVS) [9, 10, & 11]. Although, the Traditional Valuation Models have been in practices for more than 40 years, a systematic process was presumed to be required for Valuation reporting. However, the client has expectation in the business to be punctual in submission of the Valuation reports to the Banks and the Financial Institutions. Therefore, Automated Valuation Models (AVMs) and Automated Valuation Systems (AVS) were introduced and emerged into the Property Valuation Sectors because of the weaknesses in the Traditional Valuation Models and to aims to reduce the delays in the valuation process [12]. The Automated Valuation Systems is a technology that uses the computer system to communicate using the data, big data, blockchain, artificial intelligence and automated valuation, automated valuation models [13, 14].

The valuation process in the Traditional Valuation Models are listed in the flow chart below:-

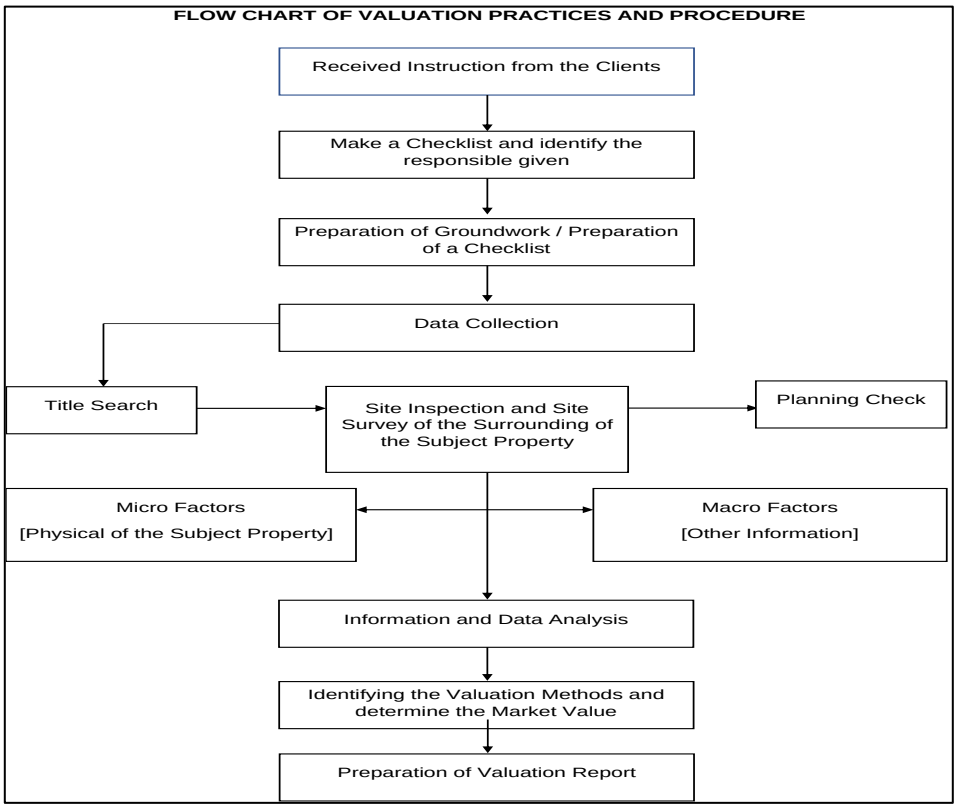

Figure 1. Summary of Valuation Process in the Local and International Context, Source: [6].

The process of Valuation inclusive of the instruction given by the customers and the Financial Institutions. This process is a process that required a systematic management of process and monitoring in order for the valuation cases to be fully executed and carry out successfully. Data management involved in the Valuation Process because collection of the properties data is important in the primary stages [8,6].

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Analysing the Project Delay Causes and Improving Quality using Multi- Project Strategies

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Abstract – *Numerous reasons for project delays from the viewpoints of the owner and the contractor have only been somewhat studied. The aim of this paper is to recognize the delays' underlying causes and provide ways to reduce them considering the progress of the project. Consequently, one hundred and six contractor-side experts and eighty-two owner-side experts in project management were the subjects of this study. The owners and contractors gave the same importance to factors like poor communications and governmental approvals in projects that were successful (had a time delay of less than 10%). Similar mitigating techniques including rigorous project monitoring, skill development training, and effective planning were advised. When projects were unsuccessful (with a time delay of more than 10%), they displayed a wide range of behaviours.*

Keywords: project management; delay project; mitigation approach; delay cause; time management

1. Introduction

Delays come in a variety of forms, and academics use their own criteria to rank and recognize them. Delays can occur for a variety of causes, which vary from project to project and are particularly special to each project. Progress in reducing the delay viamitigation or remove the delay through acceleration are actions that can or may be appropriate in certain situations, depending on the projects under consideration.
The major reason of a delay is changes. If no adjustments are made to projects, they will be completed on schedule since there will be no or little disruptions to the work. Contractors would also like to work on projects where the plans have been finished and there have been no alterations or interruptions. "In an ideal world, all construction projects would be completed on schedule, with no adjustments ordisruptions." Contrary to belief that contractors cannot wait for adjustments to beginon a project since that is where they purportedly "make their money," most contractors would want their projects to be completed without alterations." (Molner,2007).

Nevertheless, this is a utopian condition; in reality, adjustments are inherent in practically all large-scale projects owing to the fact that projects seldom begin until all drawings have been finalised and authorised. It is critical that all of the project's major stakeholders agree on how and by whom the project's modifications will be handled.This is in the best interests of the project since it benefits both the owner and the contractor. The constant strive for progress necessitates the incorporation of modifications, even if they may cause some disruption to the job.

The stage at which modifications are recommended to be incorporated is critical since

any large adjustments offered once the project is nearing complete would complex the operation, damage the timeline, and potentially create delays in completing. The alterations will raise the project's cost since failed works, modifications, and revisionswill incur costs. "Changed work complicates a project, promotes delays, and raises project costs - all of which make owners dissatisfied." (Molner, 2007) A thorough literature research is conducted for the objectives in order to assess the kinds, causes,and solutions for delay prevention and mitigation.

2. Materials and Methods

All materials and methods that have been used in the work must be stated clearly and subtitles should be used when necessary.

2.1 Research Design

The above research methodology and data processing methods have been used to improve the methodology for this research note to strengthen the timeline of the project and the existing projects.

2.2 Questionnaire Design

The five categories in Table 1 represent the delays that were identified by this study from the literature review. The questionnaire survey made advantage of these delay factors. Based on their prior experience with projects, the respondents were asked torate the significance of the reasons of delays in the questionnaire. The significance levels were assessed using five-point Likert scales: one point (less than one month), two points (about one month), three points (roughly two months), four points (roughly three months), and five points (roughly five months) (more than 3-months delay).

3. Results and Discussions

3.1 Causes of Delays in Successful Projects

Table 4 shows the causes of delay in successful power projects. In the group overall, the owner's inadequate funding or budget allocation (O7_1st Rank), the contractor's delinquent payment to suppliers or workers (C8_2nd Rank), late deliveryof materials and equipment (I6_3rd Rank), and delays in obtaining permits from authorities (I7_4th Rank) rank the highest.

In the owner group, the owner's inadequate funds or budget allocation (O7_1st Rank), late delivery of materials and equipment (I6_2nd Rank), Unskilled or inexperienced labour (I5_3rd Rank) and changes in scope (O1_4th Rank) rank as the top five.

In the contractor group, the contractor's delinquent payment to suppliers or workers

(C8_1st Rank), lowest bid tender award (O6_2nd Rank), delays in procuring materials (O5_3rd Rank), and poor communication and coordination (O3_4th Rank) rank as the top five. The owner and contractor groups ranked the top five delay factors.

Group	Number	Total		Owner		Contractor	U-test
		Mean	Rank	Mean	Rank	Mean	Rank	Sig.
Owner-related	O1	2.53	6	2.41	5	2.69	11	0.421
	O2	2.19	27	2.05	27	2.39	24	0.169
	O3	2.45	13	2.18	19	2.82	5	0.042
	O4	2.38	17	2.10	23	2.73	9	0.118
	O5	2.49	8	2.23	16	2.86	3	0.068
	O6	2.48	9	2.08	24	3.04	2	0.009
	O7	2.74	1	2.90	1	2.55	19	0.265
	O8	2.17	28	2.16	20	2.19	33	0.930
Contractor-related	C1	2.27	23	2.24	15	2.31	29	0.684
	C2	2.45	14	2.38	8	2.54	20	0.515
	C3	2.27	24	2.21	17	2.36	26	0.452
	C4	2.51	7	2.31	10	2.79	6	0.145
	C5	2.35	20	2.14	21	2.62	14	0.065
	C6	2.32	21	2.26	14	2.39	25	0.484
	C7	2.46	11	2.37	9	2.59	17	0.754
	C8	2.64	3	2.29	11	3.14	1	0.023
	C9	2.43	15	2.27	12	2.68	12	0.278
	C10	2.46	12	2.40	6	2.56	18	0.864

Group	Number	Total		Owner		Contractor		U-test
		Mean	Rank	Mean	Rank	Mean	Rank	Sig.
Design-related	D1	2.37	18	2.27	13	2.50	21	0.593
	D2	2.17	29	2.07	25	2.30	30	0.683
	D3	2.39	16	2.13	22	2.75	8	0.148
	D4	2.26	25	2.00	32	2.64	13	0.087
	D5	2.32	22	2.05	28	2.71	10	0.056
Infrastructure and socially related	I1	1.87	34	1.74	35	2.03	34	0.466
	I2	2.13	32	2.05	29	2.23	32	0.608
	I3	1.8	35	1.86	33	1.71	35	0.317
	I4	2.21	26	2.05	26	2.41	23	0.178
	I5	2.47	10	2.50	3	2.43	22	0.909
	I6	2.56	4	2.54	2	2.59	16	0.936
	I7	2.55	5	2.39	7	2.77	7	0.346
Externally related	E1	2.16	30	2.02	31	2.36	27	0.664
	E2	2.15	31	2.03	30	2.32	28	0.441
	E3	2.37	19	2.19	18	2.61	15	0.218

4. Discussion

The drivers of delays in projects and their mitigation have been the subject of several studies. However, there are still a lot of construction projects that regularly become delayed, which leads to subpar project performance, including disagreements, arbitration, litigation, and outright project cancellation. Because owners and contractors have varied responsibilities and capacities for dealing with delay management, this study attempted to gather more detailed information about each group. Additionally, the reasons of delays and their mitigation strategies might change based on the performance and difficulty of the project. As a result, this study recommended different delay reasons and mitigation techniques for successful and unsuccessful projects.

5. Conclusion

In both successful and unsuccessful power building projects, this paper analysed the reasons of delays and mitigation approaches between of contractor and the owner. This study discovered that, project progress performance had a substantial impact on the reasons of delays as well as mitigation approaches.

Acknowledgement

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Application of Micro UAV for Forensic Photogrammetry

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Abstract – *In recent years, Micro Unmanned Aerial Vehicle (UAV) has been utilized in numerous fields of activities. It is particularly useful in land-use projects where time and cost are critical to its viability. In the field of forensic science, the application of photogrammetry is crucial in the 3-Dimensional (3D) reconstruction of a crime scene where the details in distance, position and perspective are key elements of the model which provide aid to the forensic team or investigators, lawyers and insurance adjusters. Conventionally, the usage of digital camera such as Digital Single-Lens Reflex (DSLR) in forensic photogrammetry pose setbacks as the crime scene has the risk of being tempered whilst images of the site are being captured. By launching Micro UAV at a crime scene, the site is preserved whilst the evidence is being captured. This will ensure the integrity of the evidence is maintained even long after the on- scene investigation has concluded. This data is valuable since it may take months for an investigator to re-examine a scene and find a new piece of important evidence. The methodology of this study is to collect data on a simulated crime scene, particularly in a constraint area using Micro UAV and process the data using photogrammetry software which will produce a 3D model point cloud. The data will then be compared against data produced using Terrestrial Laser Scanner (TLS) as the primary comparison and Vernier Calliper (VC). The result shows that the Root Mean Square Error (RMSE) of Micro UAV against TLS is ±1.698mm. In conclusion, it is feasible to use Micro UAV for forensic photogrammetry in a constrained crime scene and produce a high-accuracy 3D model point cloud.*

Keywords: Crime Scene; Close Range Photogrammetry; Forensic; Micro UAV; 3D Model Point Cloud

1. Introduction

Pinhole cameras and film were initially used for photogrammetry in forensics. Theuse of photographs as evidence in the court system has been allowed since the early 1800s. Videotape recorders were released later in the 1950s and may be used as evidence in court. Digital cameras became an essential instrument in forensic photogrammetry when photography transitioned to the digital age. The reproductionof the scene, particularly the location, distance, and perspective of important scene elements, must be produced with high precision in order for the evidence to be accepted in court [1]. As a result, utilising a DSLR for forensic purposes pose several challenges that may compromise the validity of the inquiry, particularly for a small compact scene that is difficult to reach without tampering with the evidence. This study examines the use of Micro UAV in offering a feasible and economical approach to obtaining forensic images. The project will also evaluate how well employing MicroUAV works for gathering evidence at crime scenes, especially in restricted areas, in terms of data accuracy and convenience of usage. Compared with Terrestrial Laser

Scanning, a novel forensic photogrammetry technique, the usage of Micro UAV is expected to yield 3D model of a crime scene that is at least as good as or better than those produced by Terrestrial Laser Scanning (TLS). The comparison shall also be madewith a conventionally used manual tool which is Vernier Calliper (VC) to further assessthe accuracy of objects captured by Micro UAV and TLS.

2. Materials and Methods

Setting up a mock crime scene, finding the equipment needed for the data capture, and gathering the data itself are additional important actions that need careful planning. After the crime scene has been set up in a confined space, the Micro UAV was deployed manually by a ground pilot due to the lack of GPS in a tiny space withina building.

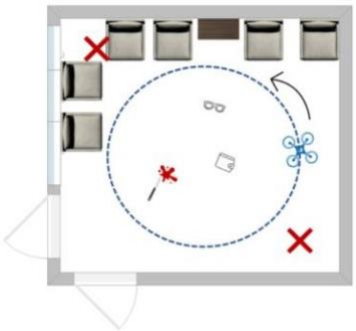
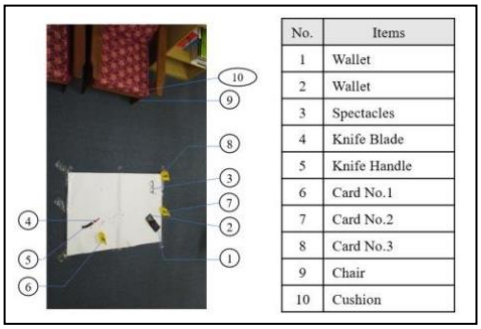


Figure 1. Approximate of overall planning data acquisition

The Micro UAV was flown in a circular pattern while photographs were captured at various angles to capture the crime scene in its entirety, whilst the location of TLS were marked 'X' as seen in figure 1. For this research, artificial targets on the crime scene are used as local reference coordinate system. For this study, the objects for accuracy measurement of data extracted from Micro UAV against TLS and VC are shown in figure 2 below.



No.	Items
1	Wallet
2	Wallet
3	Spectacles
4	Knife Blade
5	Knife Handle
6	Card No.1
7	Card No.2
8	Card No.3
9	Chair
10	Cushion

Figure 2. The distribution of objects for the measurement

The overall study procedure is shown as in figure 3, which includes the four phasesof research planning and design, data gathering, data processing, and outcomes and analysis.

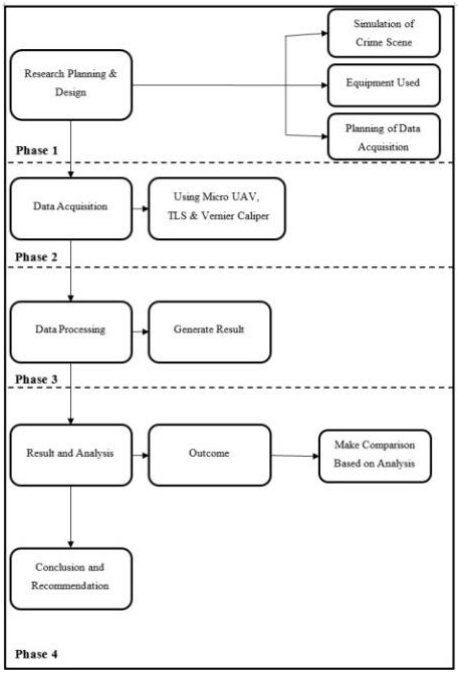


Figure 3. Research Methodology.

3. Results and Discussions

The process of images and point clouds were made using Agisoft Metashape until3D model point cloud and 3D point cloud were produced.

Figure 3. On the left is the output from Micro UAV (Figure 3A) whilst on right is the output from TLS (Figure 3B).

In figure 3B where there are gaps in data extracted from TLS as depicted in the picture in the elliptical-shaped void. This may happen due to the limitation of TLS forsetting up in close and tight compound or placement of TLS require adjustment. This causes three items i.e., spectacles, card no.1 and card no.3 cannot be seen in figure 3B.If measurements of the three undetectable items are excluded from the Root Mean Square Error (RMSE) calculation

based on the data with TLS being the benchmark, Micro UAV provides the acceptable accuracy of ±1.698mm, a difference of only ±0.265mm as compared to Vernier Calliper.

Table 1. Error measurements excluding undetectable items.

No.	Items	Error Measurement in (mm)	
		TLS-UAV	TLS-VC
1	Wallet	-4.428	-3.559
2	Wallet	-2.23	-3.796
3	Knife blade	-7.752	-8.54
4	Knife handle	1.458	1.413
5	Card No.2	4.25	-0.058
6	Chair	0.693	-0.559
7	Cushion	2.162	2.11
RMSE		1.698	1.423

In terms of efficacy of using Micro UAV in forensic investigation, the study found that the portability, lower cost of investment, ease of use and coupled with acceptableaccuracy of the generated 3D model point cloud will be the primary driving factors.

4. Conclusion

In conclusion, the creation of a meshed and textured 3D model from the Micro UAV image processing has the ability to provide accurate dimensional measurement with the accuracy of ±1.698mm, which is advantageous for data recording and interpretation for forensic photogrammetry, especially in confined space.

Acknowledgement

The authors highly acknowledge Universiti Teknologi Malaysia for providing a conducive learning experience, environment, and equipment to conduct this study.

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A New Maritime Life-saving Stretcher Design

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Abstract – *This study presents a new maritime life-saving stretcher design that has changed how it is opened and operated. Marine life-saving stretchers can be more comprehensive protection in the ship crash timely life of personnel. This product is not large and can be placed at any position on the ship. The product is changed to a very bright color to ensure that it can be immediately discovered anywhere. When a ship is wrecked, the crew or the passengers on board can find the product's location the first time and get out of the shipwreck in time. When danger comes, the crew or passengers can quickly find it easy to lift and use directly. They can directly press the switch buttons on both sides of the product to open the product. It is extremely easy to operate and can be used by one person. The product carries positioning, rope belts, pharmaceuticals, and shark repellents, which can be further protected after the injured person falls into the water. Waiting for the arrival of the search and rescue personnel increases the injured person's survival chance. It can reduce the search and rescue difficulty of the search and rescue personnel and provides the dawn of hope for the injured person.*

Keywords: Water life-saving; Functional design; Modularity; Lifesaving stretcher

1. Introduction

Human beings have begun to carry out water activities for nearly a thousand years, from the development of simple water fishing to today's developed waterway transportation. Water transportation has become an indispensable part of people, and accidents have become more frequent. Currently, for various reasons, Chinese ships are in danger yearly, but there are still specific problems with commonly used life-saving equipment.[1]. In recent years, the attention of various countries to disaster self-rescue products has been increasing, and the number of entries in major international design competitions on rescue is also increasing each year. In fact, after the shipwreck, it is difficult for rescuers to arrive at the scene for the first time. According to the weather conditions, accident location, accident time, and rescue speed have specific differences. We should pay more attention to the dangers and related needs encountered by the distressed in the water waiting for rescue in the case of slow rescue confusion. It can improve the probability of a successful rescue.

Domestic maritime rescue products are mainly lifebuoys, life jackets, and lifeboats. There are almost no products on sea rescue stretchers, and the following products can be found on sea rescue stretchers.

The product on the left is a domestic water rescue stretcher, but the use rate of this product is not high, and it is not easy to carry because of its large size. The product on the right is a rescue stretcher designed by designer Yu-Hsin Wu. This inflatable stretcher has many functions but is more troublesome to open, needs to be inflated, and will take time in critical moments. Based on the existing rescue stretcher, the author hopes to design a one-button start, easy-to-operate, and easy-to-carry rescue stretcher.

2. Materials and Methods

a. *Material analysis*

Most marine life-saving equipment is currently made of closed-cell foam, and sharp objects easily puncture the inflatable airbag. So it is intelligently used in water entertainment facilities and swimming pools. The life-saving equipment used in the ocean primarily uses high-density polyethylene as the shell, the polyurethane foam material as the internal buoyancy material, and the marine use of life-saving military equipment to use a single polyethylene material on the surface and inside[1]. Combined with the materials currently in use, the authors will use a single internal and external polyethylene material for this product.

b. Colour analysis

Colour analysis, a problem point when waiting for rescue is how to pay attention to rescuers faster, so the color of the lifebuoy becomes very important. According to the data, the longer the wavelength of the color, the weaker the penetration. The shorter the opposite wavelength, the stronger the penetration. The longer the wavelength, the shorter the frequency of the wave, the weaker the energy of each particle, but the stronger the diffraction ability of the wave. For life-saving equipment, the stronger the penetration of the surface color, the easier it is to attract the attention of rescuers[2]. Therefore the color of this product is orange.

c. Reflective tape material analysis

The type of reflective tape is self-adhesive with adhesive on the back that can be attached directly to the surface of the rescue stretcher that needs to be glued. The reflective tape adheres evenly along the rescue stretcher in four circles, and the width of the reflective tape is about 5 cm per revolution. Because the reflective tape should be pasted to the stretcher,

it must have good waterproofness, followed by good wear resistance, bending resistance, and temperature variation [3].

3. Results and Discussions

a. Design positioning

From the perspective of the relevant needs of the drowning person and its increase in the probability of rescue, a certain degree of improvement has been made based on the original rescue stretcher, and the design framework is divided into three modules: essential function, demand function, and easy operation function. The life-saving stretcher is an important guarantee for maintaining the lives of people in distress[4]. The primary function is to provide the necessary buoyancy for the person who falls into the water. This allows the people to float on the water's surface, waiting for treatment while avoiding more severe damage caused by soaking in the cold water. The demand function refers to the need for rescue stretchers to provide people with the required energy and related necessities within a specific floating time. Finally, there are easy-to-operate features at a glance. According to the investigation of the rescue accident, the 72 hours after the shipwreck are all golden rescue times.

Practicality: The essence of the rescue stretcher is to provide buoyancy to the injured person who has fallen into the water. It helps him ensure that the wound does not deteriorate again and maintain body temperature and physical strength to wait for rescue.

Demand: People need a certain amount of water daily to sustain themselves[5]. Injuries require simple treatment of wounds and medications, and rescue stretchers place such items in different locations. The rescue stretcher can be located simultaneously, which is convenient for quickly finding the injured and rescued.

b. Colour positioning

The use of orange-red life-saving equipment allows rescuers to find it at a distance, and according to research, sharks are very afraid of oranges, and seeing orange objects will quickly move away.

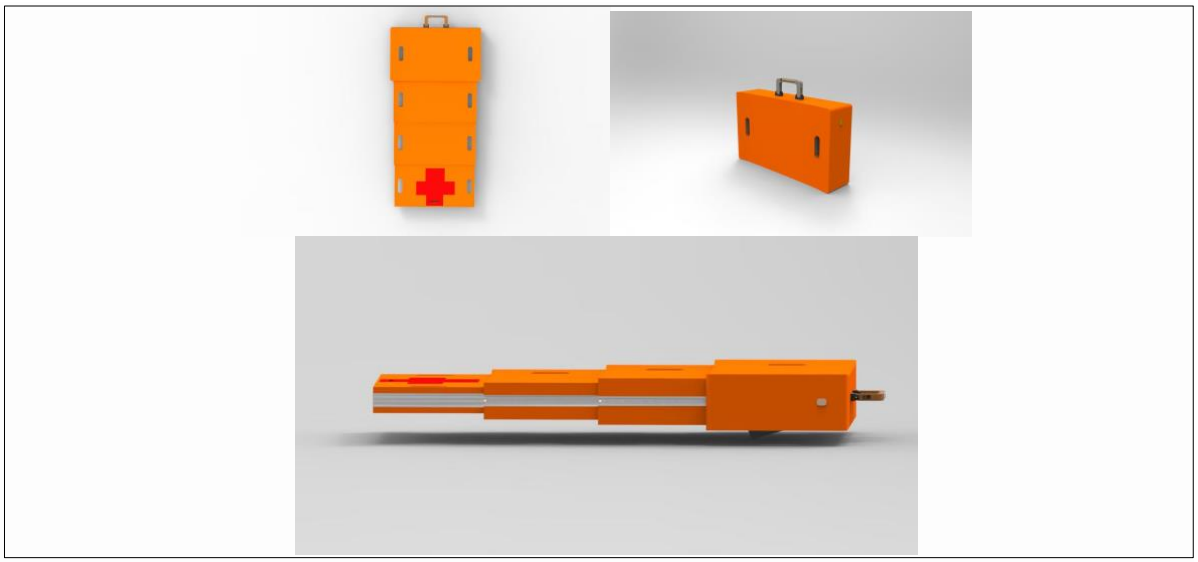
c. Material positioning

The inner and outer shells are made of polyethylene, which has good wear resistance, electrical insulation, toughness and cold resistance, and chemical stability. At the same time, it is insoluble in any organic solvent and is also resistant to corrosion of acids, alkalis and various salts.

d. Reflective tape material

Reflective tape material using a white 3M reverse light-emitting film.

e. Structural design



4. Conclusion

The main research results of this paper are as follows:

(1) This design changes the structure of the sea rescue stretcher to a one-button telescopic type
(2) The design adds essential drugs and gauze for emergency medical use. Shark repellent has been added to protect the safety of the injured.

So far, the author has only made a preliminary explanation of the opening method of the product and the modules added. The shortcomings of the paper will be further studied in the future.

Acknowledgement

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Covid-19 Tracing Application Security Enhancement Guideline for Users in Riyadh

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Abstract – *The recent outbreak of COVID-19 has taken the world by surprise, forcing lockdowns, and straining public health care systems. In response, many governments have shown great interest in smartphone contact tracing apps that help automate the difficult task of tracing all recent contacts of newly identified infected individuals. However, tracing apps have generated much discussion around their key attributes, including system architecture, data management, privacy, security, proximity estimation, and attack vulnerability which cause reducing number of installations among individuals. In this research, we provide the first comprehensive review of the Saudi tracing app TABAUD. We also present an overview of many proposed tracing app examples, some of which have been deployed countrywide, and discuss the concerns users of TABAUD have reported regarding their usage. We close by outlining potential research directions for next-generation app design, which would facilitate improved tracing and security performance, as well as wide adoption by the population at large. The research used questionnaire methodology where all Participants completed an online survey that included thoughts and concerns about the application, status of use, and questions about whether the application was being used correctly. We performed multiple descriptive and frequency analysis to clarify the association between the use of the app and sociodemographic factors and user concerns.*

Keywords: Failure Factors and Challenges Covid-19, tracing, Application, TABAUD, Concern

1. Introduction

COVID-19 was designated a pandemic by the World Health Organization (WHO) on March 11, 2020, with its consequences likely determining the growth of our civilization since many generations to follow. The ability of human civilizationto quickly and collaboratively arrive at the greatest mitigation strategies will determine the path of this evolution. till a vaccination is developed or else the virus goes away on its own [1]. Prevention and rapid detection of infected persons will be the most effective weapons in the hands of governments. Indeed, in the global battle to combatthe spreading of COVID-19, nations, government and private corporations, academics, and many others have rapidly banded together to coordinate suitable responses, as a result of the epidemic, most health and social services will be closed down, and populations border controls will be implemented across the country. Technology and digital technologies had also facilitated the provision of critical services following the introduction of certain stringent mitigation requirements. On March 3, 2020, the first case of COVID-19 in Saudi Arabia was verified. In reaction to the epidemic, Saudi Arabia, like several other nations across the globe, shut down all retail and social activities, and the Saudis Ministry of Health has deployed

numerous informatics systems to give public health information to people and the community.

To combat the spread of COVID-19, authorities in a number of nations are pressing for geographical monitoring. While digital surveillance may be the most efficient approach to stop the outbreak from spreading, the implications on privacy and security concerns should be addressed both now so as the epidemic progresses. Fear and anxiety frequently triumph over civil freedoms; yet, as previous crises have shown, regaining lost liberties may be difficult. As a result, it is important not just to accept the virus-response options afforded by technologies, but rather to assure that the right to security and privacy is protected [2].

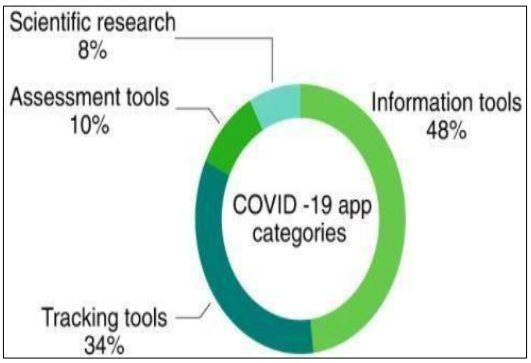

Figure 1. Distribution of COVID-19 apps from Nature Medicine [2].

Contact tracking applications obtain data from persons that have positive tests for the disease and then utilize Geolocation, Bluetooth, or wireless technologies to locate and alert those that are in close contact with any of those people. All of the information of the user is used and collected and contact tracking applications operate with the user's data either in a centralized or decentralized manner.

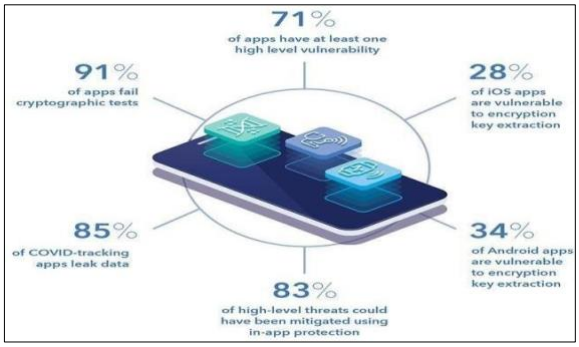

Figure 2. COVID-19 tracing app security report analyzes [3].

The forerunner in digital rights management (DRM) new tech and largest provider of software information security, has published their 2020 security report on global mHealth apps, exposing that 85 percent of medical and healthcare applications in use for monitoring the Covid-19 have all been leaking information. The document evaluated 100 publicly accessible worldwide mobile healthcare applications along a range of subjects—

incorporating COVID-19 tracking applications —to identify the most dangerous mHealth app threats [3].

As per the Ministry of Health in Saudi Arabia (TABAUD), it is among the most widely utilized application in Saudi Arabia to contain COVID-19, with much less than 5 million downloads, the Ministry of Health in Saudi Arabia has still been pressuring residents to download the app and is fining those who have not, people's concerns about security and privacy prohibit them from installing the app, which has a direct impact on the spread of the epidemic in the nation.

1.2 Decentralized Approach

This is a much more data protection method, in which the phone activities log never leaves the smartphone and only limited data is downloaded to a central database, the implementation regularly uploads codes of positive diagnosed participants, and fits them against contact records stored on the device, this a method is being used in the DP3T open protocol, and also in the Google and Apple- created “Exposure Notification” standard. The DP3T decentralized approach is used by Holland's Private Tracer.

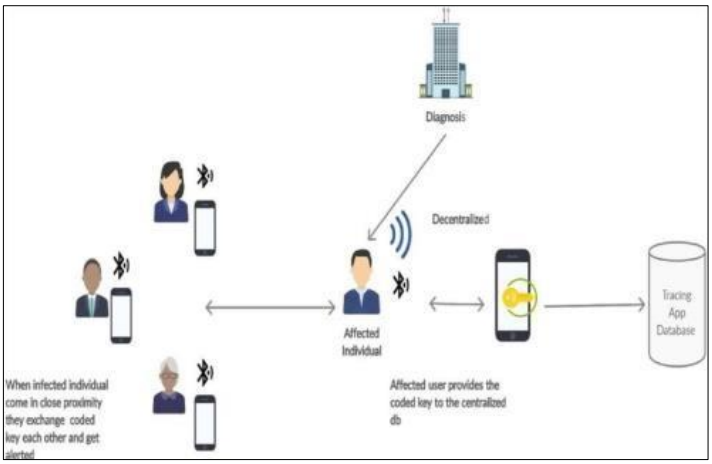

Figure 3. Decentralized Approach architecture of Covid Tracing Apps [4].

Figure 3 depicts a decentralized approach that delegated essential capabilities to the user's phones, leaving the server with little participation in the interaction tracking procedure. This method improves security and privacy by creating anonymized IDs on mobile networks and handling exposure notifications on different devices rather than a centralized server, after testing positive for Covid-19, the individual can submit their encrypted key to a central database. This is in contrast to the centralized design, in which the user's whole profile is downloaded [4].

1.3 TABAUD Application

TABAUD application is a way to notify those in contact with people infected with the

emerging corona virus, where individuals can download the application and use it to achieve the health purpose for which it was developed. The application sends camouflaged identifiers data to the smart phones used for the application, which were recorded during the period of contact with an infected person with the emerging corona virus, accompanied by data on the devices of infected people, according to the policies of the two global companies (Google and Apple), the application enables the user to obtain direct and proactive notifications if any registered infection is detected, for the purpose of requesting direct health support from the Ministry of Health (in the Kingdom of Saudi Arabia).

2. Materials and Method

The study effort is divided into three parts that investigate Covid-19 tracing applications in Saudi Arabia and seek to analyze the behavior of users in Riyadh that influences the number of applications installed. The research strategy for this research paper reflects the general approach for linking the conceptual research difficulties to the research study's aim, this also implies that the research articulates what data is necessary, what techniques will be utilized to gather and evaluate the data, and how the data will be used to answer the research question. The structure will attempt to solve the research issues stated before. This operational framework is a road map that provides consistency to the relevant question as shown in Figure 4

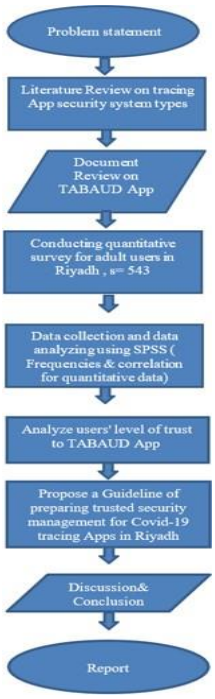

Figure 4. Operational Framework.

For this research study there are estimated about 543 samples of adult users for the tracing app TABAUD in Riyadh will be collected. to respond to questions about the key

issues drawn from the literature review, Data obtained from the questionnaire would be evaluated using a statistical software program (Statistical Packages for Social Sciences) (SPSS).

3. Results and Discussions

The results presented in Figure 1 showed that the more than half of the respondents (56%) of the respondents didn't know what security system used for TABAUD App, (42.2%) of them stated (Yes), and only (1.8%) of them stated (Maybe), where the results presented in figure 2 indicated that the majority of the respondents (70.9%) sated that Sometimes TABAUD App is an invasion of privacy, however it is necessary, (20.6%) of them stated (Never), and only (8.5%) of them stated (Always) which shows that even though majority of individuals do not understand the security system that is used they still take priority of beating the pandemic to their privacy.

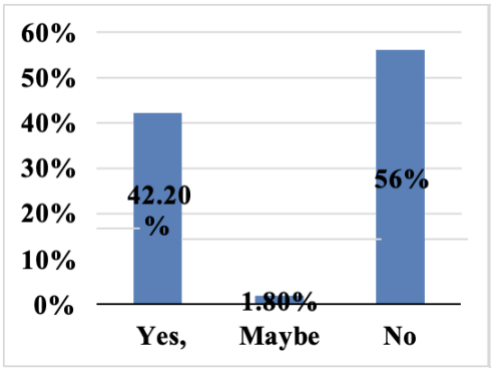

Figure 1. The answers of the respondentsabout (do you know what security system used for TABAUD App?).

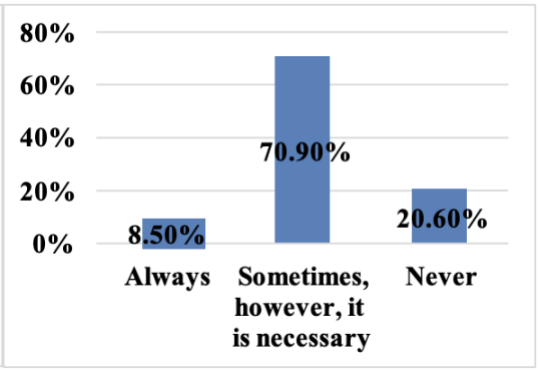

Figure 2. the answers of the respondents about (I think it is aninvasion of privacy).

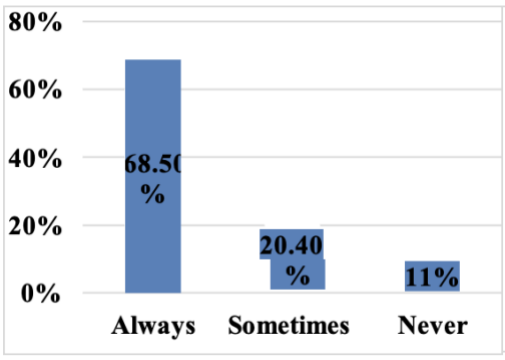

Figure 3. The answers of the respondentsabout (Security concerns about covid-19 TABAUD app).

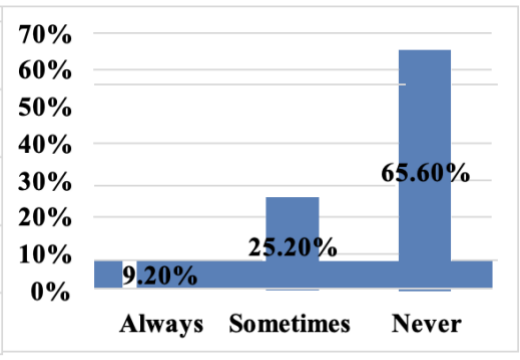

Figure 4. the answers of the respondentsabout (I don't want the government to havea ccess to my location data).

The results presented in Figure 3 reported that most of the respondents (68.5%) sated that always have security concerns about covid-19 TABAUD app, (20.4%) of them stated (Sometimes), and only (11%) of them stated (Never).where the results presented in figure 4 indicated that most of the respondents (65.6%) sated that never want the government to have access to their location data, (25.2%) of them stated (Sometimes), and only (9.2%) of them stated (Always). Which shows that users concern more about security of the than the privacy of their data specially with having high rate of trust to the government.

4. Conclusion

The study found that the users who are familiar with the security and protection program of TABAUD App often have greater confidence in the effectiveness and benefit of the application, but at the same time, they are the most fearful of the security aspects of the application and prefer that the application be centralized or controlled by the government even there is a violation of privacy from the government, but they think it is safer for them since the trust between the users and the government is somewhat high. between the users and the government is somewhat high. The study found that the users who don't have an idea about the privacy and protection program used in TABAUD App often doubt the benefit and effectiveness of the application and at the same time there are various fears in terms of the application security and privacy. However, there is an approximate consensus that privacy is not a priority, but rather the important thing is to take advantage of the application, which means the users who are not aware of the applications that they use, they also prefer the application be a centralized or government-controlled software over decentralized. The study found that most of the users think that not enough people will install TABAUD App during the pandemic because it is not effective enough for preventing the spread of the pandemic, and because security issues since it is a decentralized app.

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A Review of Threat Assessment Model for IoT Smart Home

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Abstract – *Study has shown that IoT Smart Home is one of the most dynamic fields in Information Technology environment and due to the heterogeneous character of this technology, it creates security challenges to homeowners. Because of the security flaws in IoT devices, hackers may easily take control of Threat modelling aids in the implementation of a systematic approach to dealing with the security effect. It's a continuous process that starts at the early stages of layered-defense architecture and continues throughout the security life cycle. Current threat modelling assessment focus on the organization only where threat modelling aids in the implementation of a systematic approach to dealing with the security business effect, however, little has pay attention to Smart Home. The scope of the study will be focusing on smart home appliance owners that use any of the smart home products like wearables, smart watches, smart thermostats, and smart. Research shows that why the use of smart home appliances is low, including user perception, data security and privacy constraints, a lack of installation support, insufficient maintenance and skills, a lack of understanding of user initial requirements, system integration difficulties, device and installation costs, and old housing challenges that will contribute to the failure of implementing smart home.*

Keywords: IoT Smart Home, Threat Assessment Model

1. Introduction

Smart Home technology was developed before the internet was invented. Century Homes "House of Tomorrow," a modern-looking house, was one of the fairs. Electrical doors completed the house, which was constructed of steel and glass. Emil Mathias of Jackson, Michigan, later invented the connected house system known as Push-Button Manor in 1950 [1]. Mathias created certain home equipment that can be controlled by simply pressing a button, such as closing the curtains or turning on/off the radio in the living room from the bedroom button. He also designed the radio automation system for each planned time, the burglar alarm in a certain state, and the garage door automation system. Following that, Microsoft introduced gadgets with biometric identification for house entrance, mobile location tracking, speech recognition action, smart grocery scanning, and other smart appliances in 1999, imagining a futuristic Smart Home.

Even though thousands of industries are moving forward adapting IoT into their current environment and organization, there are still some substantial challenges acknowledged by many industries before the company can fully transfer their current operations to large-scale IoT. However, it is of big importance to understand people's motivation to use Smart Home technologies and their reasons not to do so. In [2], it stated

that the adoption of Smart Home technology will be inevitable in the future if companies deal with the challenges put in front of them. As "the characteristics of the system affect how motivated users are to use the system" [3] it is crucial to understand the advantages and disadvantages of Smart Home technologies and how they are perceived by users and potential users. One of the most significant issues highlighted on creating trust to consumers in terms of data privacy and exposure to security risk.

The main reason causes of failure of the IoT Smart Home system were user perception, data security and privacy constraints, lack of installation support, inadequate maintenance and skills, minimal understanding of user initial requirement, difficulties of system integration, devices and installation costs and old housing challenges will contribute to the failure of implementing Smart Home [4]. According to Gartner reports in 2017, the exponential rise of IoT devices predicted for the next several years may increase up to 25.1 billion units in 2021 and this statement combined with proof of the risks posed by inadequate security measures, has made IoT security as hot issue [5].

2. Security and Safety Concern in IoT SmartHome

Homeowners may be concerned about how Smart Home applications could intrude on their private lives or violate their right to privacy. Regarding the same situation, it is not unsettling that a homeowner lock is integrated to the internet, making it vulnerable to hacking or being opened by an unauthorized person. People are aware that there may be privacy concerns while implementing smart homes, but they are not always aware of what information is being gathered, how it is being acquired, or why it is being collected, according to [6]. Another application issues for smart homes are the security of data and privacy [7]. The danger to the security and usage of network services as well as the use of authenticating for privacy protection, machines, and data sharing are two important security challenges that also become concern. Through the use of cyber security, in [8] has outlined the trends and difficulties of smart devices in smart homes. Despite the fact that they provide customers some features, these smart gadget also exposes users to dangers and hazards. In [9], they outlined a number of application layer security issues that result from the use of smart homes, including attacks on vulnerable software, phishing, manipulating an unpredictable setup, reconfiguring device, social engineering attacks, hacking into smart metres, attacks using malicious code, attacks on access controls, and not receiving security patches and from the other hand, security flaws affect not just the application layer but also individual applications like Smart TV [10].

3. Methodology

In order to fulfil the objective to identify the security threats in IoT Smart Home, this research paper has using UTM online databases includes JStoor, ProQuest, Emerald, Science Direct, SpringerLink, Scopus and several notable open-source databases such as Research Gates and Google Scholar to find article related to security threats in IoT smart home.

4. Results

A technique called threat modelling uses a detailed investigation of an organization's architecture to identify, categorise, classify, and rates the vulnerabilities. Table 1 shows the comparison of existing threat assessment model in IoT environment which are Attack Tree, STRIDE, PASTA and LINDDUN.

Table 1. Comparison of Threat Model.

Threat Model Traits	Threat Model			
	Attack Tree	STRIDE	PASTA	LINDDUN
Identifying and classifying assets			✓	
Identifying Users and Threat agents		✓	✓	
Establishing Trust level and user's role		✓		✓
Identifying security domains			✓	
Identifying threats	✓	✓	✓	✓
Identifying vulnerability	✓		✓	
Ranking and measuring threats	✓		✓	
Ranking and measuring vulnerabilities	✓		✓	
Identifying counter measures			✓	
Defining new assets threats or vulnerabilities	✓			

An individual may determine the risks that offer the most risk to any company by identifying and rating such threats, prioritising their mitigation with effective responses. Threat modelling aids in implementing a methodical approach to managing the security related impact to the organization [11] . As shown in the Comparison Threat Model in table 1, PASTA consist of nine characteristics and the differences where PASTA threat model covers technical specification of the asset in step number 2. It is important to include system specification since IoT involve multiple layers attack and due to the heterogenous characteristic of IoT smart home application.

5. Conclusion

This study will be of great use in the marketing area. It will help individuals and companies to understand what the security threats are concerning the use of Smart Home technology. Marketers can, based on this paper, develop marketing strategies emphasizing Smart Home devices' advantages and eliminate certain factors preventing their devices from become loophole home for hacker to perform unethical access based on the threat modeling proposed. Furthermore, they will even be able to reconsider the production process of their products by knowing what are the vulnerabilities that they might face during the initial stage

of production and change product features if necessary. Consequently, this study will provide knowledge that can help to further exploit the opportunities given in the market and to overcome the low diffusion rates of IoT technology in the Smart Home environment.

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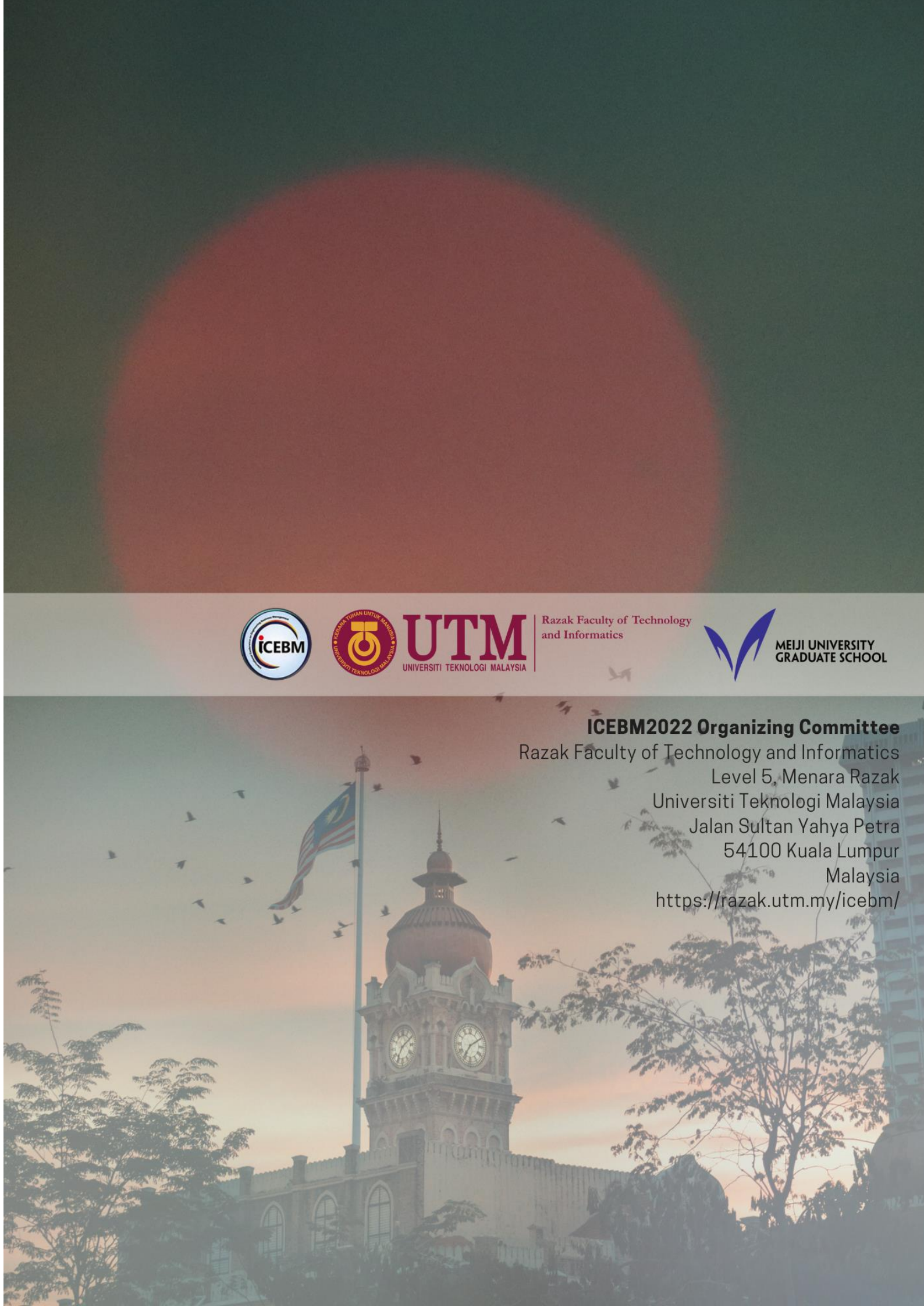

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