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The Project Managers and Relation with I.R 4.0(Industrial Revolution 4.0) Tools to Overcome and Solution to the Problem of Delay for Malaysian Construction Project

Pengurus Project serta Kaitan dengan Peralatan I.R 4.0 (Industri Revolusi 4.0) bagi Melalui dan Penyelesaian kepada Permasalahan Kelewatan dalam Projek Pembinaan di Malaysia

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[I.R 4.0; Construction Management; Project Management; Management]

ABSTRACT

In this Industrial Revolution 4.0 (I.R 4.0) era, the participation of government bodies like Public Work Department (PWD/JKR), Construction Industrial Development Board (CIDB), professional body Contractor Service Center (PKK), along with independent body like Board of Engineers (BOE), Board of Architect (BOA), Board of Quantity Surveyor (BQSM), as well as private consultants and contractors, is primarily crucial in solving and finding possible solutions on how to mitigate problems that occur in construction projects. This research will cover the subtopic of the detection of difficulties in construction projects, which is directly related to the main subject of delay. The research focus as qualitative mixed-method and 150 respondents were chosen randomly from construction industry background and due to pandemic Covid-19 restriction, only 43 of them responded to participate for semi-structured interview and a google form questionnaire. The responses are from Klang's Valley

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construction industry. The google form was distributed by email using Likert scale with level 1-4 and validation of data by SPSS software is employed in this research's. The semi-structured interview were conducted via tele-conversation and transcripted where later transferred to Nvivo software for validation. Lack on communication is the major findings The contribution of I.R.4.0 to government bodies, private sector and education are about time saving on communication and fast action on mitigating the problems for construction industry. For future research, the suggestion for the observation and grounded theory to be conducted for more depth information.

Kata Kunci:
[I.R 4.0; Pengurusan Pembinaan; Pengurusan Projek; Pengurusan]

ABSTRAK

Di dalam era Revolusi 4.0 (I.R 4.0) ini, penglibatan badan-badan kerajaan seperti Jabatan Kerja Raya (JKR/PWD), Lembaga Pembangunan Industri Pembinaan (CIDB), badan profesional seperti Pusat Khidmat Kontraktor (PKK), badan bebas seperti Lembaga Kejuruteraan (BOE), Lembaga Arkitek (BOA), Lembaga Juruukur Bahan Malaysia (BQSM), bersama dengan para perunding swasta dan para kontraktor, sangat penting dalam dapatan kebarangkalian menyelesaikan atau mengurangkan masalah yang muncul dalam projek pembinaan. Kajiselidik ini akan merangkumi tajuk kecil mengenai pengesanan kepayahan di dalam projek pembinaan. Di mana secara langsung terkait kepada tajuk utama mengenai kelewatan. Kajian ini menumpukan kualitatif kaedah campuran di mana seramai 150 orang telah dipilih secara rawak dari kalangan yang latarbelakang dalam bidang pembinaan ini. Oleh kerana kekangan Covid-19, hanya 43 orang sahaja yang mengambil bahagian untuk temuduga separuh struktur serta soal-selidik melaui borang google. Yang mengambil bahagian adalah dari sebahagian industri pembinaan di Lembah Klang. Borang soal-selidik diedarkan melalui emel dengan kaedah skala Likert dari tahap 1-4 dan pengesahan data oleh perisian SPSS digunakan untuk kajiselidik ini. Soal-selidik separuh struktur ini dijalankan melalui telefon dan diterjemah dimana sesudah itu di analisis melalui perisian Nvivo untuk pengesahan. Sumbangan I.R 4.0 kepada badan kerajaan, sektor swasta dan bidang pengajian adalah mengenai penjimatan masa dalam berkomunikasi dan tindakan pantas dalam usaha mengurangkan masalah pada industri pembinaan. Bagi kajiselidik di masa hadapan, dicadangkan agar kerja pemerhatian dan teori asas dijalankan untuk mendapatkan maklumat yang lebih mendalam.

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INTRODUCTION

The GDP value in construction industry is small compared to other industries; however, the construction industry has a domino impact on other industries. Hence, it is a vital business and is regarded as a major contributor to the nation's economy (Herman, 2016). Organisation Strategic Plan 2021-2025 (PSO 2021-2025) which was conducted by Malaysian Public Work Ministry (PWM, 2021) is a continuous plan from the previous strategic plan which was enacted for year 2016 until 2020. The government bodies such as CIDB, Public Works Department (PWD), Contractor Service Centre (PKK) and independent bodies such as Board of Engineers (BOE), Board of Architect (BOA) and Board of Surveyor are also related to the growth on the development of Malaysian construction industry (Kamal et al, 2012).

The industry is made up of many players including the contractors, developers, government and private agencies, management teams, engineers, architects, surveying consultants, manufacturers, material suppliers and plant hirers. The government is an important player in the industry through its agencies: The Ministry of Works, Public Work Department (PWD), Construction Industry Development Board (CIDB), Contractor Service Centre (PKK), Board of Engineers of Malaysia (BEM), the Board of Architect (LAM) and Board of Quantity Surveyors Malaysia (BQSM). All these entities have significant roles in the growth and development of Malaysian construction projects (Kamal *et al.* 2012; Tengan *et al*. 2017). Nevertheless, more hidden problems arise when the enthusiast of construction team tries to contribute to the environment. Due to the restriction on time as well as other surrounding unsupported matters, they lack awareness and this might cause critical problems (Radujkovic et al. 2017).

LITERATURE REVIEW

The sequence and evolution of revolution industry (IR) helps to highlight its developments throughout the history. The 1st IR revolved around steam machine, metal or glass building (18th Century), followed by the 2nd IR which focused on production in large scale & electricity (19th Century). Subsequently, the 3rd IR was about the invention of Information Technology (IT) as well as invention and technology related to automation (70 years later). Finally, the 4th IR concentrates more on CPS (Cyber Physical System) digitalisation and the internet 30 to 40 years after the third revolution. Therefore, it can be concluded that IR 4.0 is the compilation of technology that will be able to give positive impacts for the construction industry. The following is the brief explanation about Industrial Revolution.

Industrial Revolution 4.0 which was introduced in German by Schwab (2016) received strong support from the German government. It was expected to boost the German industrialism and collaborate with recent technology. I.R 4.0 is the latest industrial advance compared to previous industrials such as industrials I.R 1.0 until I.R 3.0 (Schwab, 2016). This research aimed to recommend the advances made in IR 4.0 and their benefits to the construction industry. IR 4.0 is powered by the advancement and implementation of other technologies that support performance. The research also clearly shows that the industry encompasses more than utilising these technologies, producing and promoting them. IR 4.0 also has a few effects for the construction project, particularly in technologies. I.R 4.0 have begun to advance gradually

all these years and become the standard in the use of high technology tools in design and construction. Some of the tools of I.R 4.0 which contribute to construction projects are Cloud Storage, BIM (building information modelling), AutoCAD, WhatsApp, Telegram, MS Office, MS Project, Smartphone, Drone (UAV - unmanned aerial vehicle), automatic sensor, smart robotic machinery, etc.

I.R 4.0 has already penetrated the construction industry, and it is the perfect time to make it wider (Alaloul et.al, 2018). Embracing and adapting to the new and high-tech technology of I.R 4.0 will benefit the Malaysian construction industry (Tajudin, 2017). Numerous research have proven that I.R 4.0 contributes to the supply chain of the construction industry (Tjahjono, 2017). In essence, I.R 4.0 is very important to the construction project because the advance technology will benefit the construction management in mitigating the problem in delay and preventing from cost and time overrun which have been a problem all this while with the traditional method practised for a decade in the Malaysia's construction industry (Alaloul et al, 2018; Lau et al, 2019).

DELAY FACTORS IN CONSTRUCTION INDUSTRY

Delay is more about time, cost, scope of work, material delivery, benefits, work-flow, resources, stakeholder or organisation which create problems during construction and are often difficult to resolve (Mossalam, 2018). In addition, the delay can also arise from unskilled foreign and local workers, improper implementation of the technology and low quality enforcement on practical works (Kamal et al, 2012). Before commencing on any work at a construction site, respective project teams should study the problem that might occur during the work progress (Szymański, 2017). Both construction team and the stakeholder should be aware and compromise for the success of the project (Sakal, 2005; Riemann et al, 2014). Besides, big construction projects have their problem to take care of (Sambasivan et al, 2007).

Delay is one of the major issues in construction project which causes unpredicted impacts. It is a common situation when a project gets stranded due to some issues that occur during construction period. Delay, in general, is divided into two categories which are non-excusable delays and excusable delays (Hamzah et al, 2011), as quoted in Omran et al, (2015).

Complicated designs in project also contribute to the cause of delay. This, as a result, drags the contractor on negotiation and discussion with the stakeholder and consultants to meet the designs as per the specifications prepared by consultants at the earlier stage. According to Hamzah et al. (2011), Sweis (2013) and Omran et al. (2015), this process will take a longer time as the designs need to be changed during the construction period due to lack of material supply or machinery that do not meet the design requirement as well as shortage of skilled labours to work on the special design according to the specialist's requirement.

In this research, the researchers have identified the importance of fully utilising the technology of I.R 4.0 which could mitigate the delay issue in construction projects in advance. Furthermore, it can also complete the project construction beyond the stipulated time and save overrun cost.

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Table 1: Criteria of Delay According to Authors

NO	AUTHOR	DELAY		
		NON-EXCUSEABLE	EXCUSEABLE	CON CURRENT
1	Hussein, 2014	✓	✓	✓
2	Ahmed et al., 2003		✓	
3	Alaghbari et al., 2007	✓	✓	✓
4	Assaf et al., 2006	✓	✓	✓
5	Benz, 2018	✓	✓	✓
6	Gebrehiwet et al., 2017	✓	✓	✓
7	Mossalam, 2017	✓	✓	✓
8	Mustafa et al., 2012	✓	✓	✓
9	Hamzah et al., 2011	✓	✓	✓
10	Rejment et al., 2015	✓		
11	Riemanna et al., 2014	✓	✓	✓
12	Sambasivan et al., 2006	✓	✓	✓
13	Sakal, 2005	✓	✓	✓
14	Serpella, 2015	✓	✓	✓
15	Szymanski, 2017	✓	✓	✓
16	Tumi et al., 2015	✓	✓	✓

As per table 1, according to a selective of authors, delay factors can come in 3 different criteria such as non-excusable delay, excusable delay and concurrent delay which are related to the objective of this research. The data of this research are also taken from the analyses of their journal articles.

Non-excusable Delays

Non-excusable delays are delays due to the complications or issues related to the factory, subcontractor or contractor and have nothing to do with the stakeholder's management. Subsequently, Extension of Time (E.O.T) will be given and Variation of Order (V.O) cannot be claimed. Other factors include poor financial management, lack of site management, no cooperation between contractors or sub-contractors, regular changes of construction team due to lack of performance, lack of supervision, under-estimate material stock on site, improper inspection during work in progress due to quality or double check on wrong specification as well as delay in ordering material to site (Alaghbari et al., 2007, Assaf et al., 2006, Assaf et al., 2006, Assaf et al., 2006, Benz, 2018, Gebrehiwet et al., 2017, Mossalam, 2017, Mustafa et al., 2012, Hamzah et al., 2011, Rejment et al., 2015, Riemanna et al., 2014, Sambasivan et al., 2006, Sakal, 2005, Serpella, 2015, Szymanski, 2017, Tumi et al., 2015).

Excusable Delays

Excusable delays, also known as 'force majeure' are classified into two categories namely compensable and non-compensable delays (Alaghbari et al, 2007). Compensable delays are usually caused by stakeholders and consultants either due to decision making issues or changes of design problems which are not related to contractors (Hussein, 2014; Ahmed et al., 2003; Alaghbari et al., 2007; Assaf et al., 2006, Benz; 2018; Gebrehiwet et al., 2017; Mossalam, 2017; Mustafa et al., 2012; Hamzah et al., 2011; Riemanna et al., 2014; Sambasivan et al.; 2006, Sakal, 2005; Serpella, 2015; Szymanski, 2017; and Tumi et al., 2015).

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According to Alaghbari et al. (2007), the second category of delay is also known as Non-compensable delay. 'Acts of God', is mostly due to natural disasters such as flood, volcano eruption or disasters caused by humans, for example, riots. In this case, the contractors cannot be blamed for the delay. However, the contractors will resume their work without extra charges or claim unless the latter is covered in the insurance.

i) Compensable

The delay caused by stakeholders can interrupt the contractors' works (Alaghbari, 2005), for example, the inefficiency in providing proper decisions by stakeholders or end users, when it is urgently needed by the consultants or contractors during construction period at the construction site. Another cause is financial crisis which depends on back up funding programme on project financing by banking institutions. Additionally, another delay crisis emerges when some stakeholders have no clear directions or specific conditions for the project requirement (Alaghbari et al, 2007; Hamzah et al, 2011).

ii) Non-Compensable

This delay is caused from situations not related to the stakeholders or contractors themselves but by other factors such as natural disasters that include earthquake, fire disaster, flood or changing of monsoon season, as well as issues created by humans such as strike, political issues or anything that contributes to it (Hamzah et al., 2011 ; Alaghbari et al., 2007 ; Omran et al., 2015.)

Table 2: Categories of Three Main Factors of Delay (Alaghbari et al., 2007; Hamzah et al., 2011)

COMPENSABLE	NON-COMPENSABLE	CONCURRENT
Undefined goals	Poor communication	Flood
Changing scope	Insufficient team skills	Storm
No accountability	Geographical dispersed team	Hurricane
Lack of risk management	Not using proper management software	Tornado
Poor communication	Issues with a team	Fire disaster
Unrealistic expectation	Resources deprivation	Earthquake
Stakeholder indifference	Sustainability social environment & economic	Landslide
Insufficient team skills	Unpaid workers	Tsunami
Organisational process & structure	Various technology among general contractors	Volcano eruption
Retirement of age boomers	Unfavourable contract terms	Lightning strike
Lack of stakeholder engagement	Lack of financial	
Lack of financial	Lack of quality management system	
Lack of quality management system	Lack of risk management	
Geographical dispersed team	No accountability	
Issues with a team	Various technology among general contractors	
Unpaid workers	Ambiguous contingency plan	
Various types of technology used by general contractors	Various types of technology used by general contractors	
Ambiguous contingency plan		

According to the studies by Hamzah et al., (2011) and Alaghbari et al., (2007), there is a new category of delay which is termed as concurrent delay. Concurrent delay occurs when several causes of delay happen simultaneously. As a consequence, negotiation will be difficult to achieve in this situation. In short, delay in construction industry can be caused by three main types which are compensable, non-compensable and concurrent (refer to Table 2) (Hussein, 2014; Ahmed et al., 2003; Alaghbari et al., 2007; Assaf et al., 2006; Benz, 2018; Gebrehiwet et al., 2017; Mossalam, 2017; Mustafa et al., 2012; Hamzah et al., 2011; Rejment et al., 2015; Riemanna et al., 2014; Sambasivan et al., 2006; Sakal, 2005; Serpella, 2015 ; Szymanski, 2017; and Tumi et al., 2015.)

RESEARCH METHODOLOGY

The study ethic also had been considered during this study as the rule and regulation from university. The study approach used for the current study is described in this chapter. The chosen of methodology and method approach was been made due to pandemic was one of the studyer initial major challenges. Therefore, in order to solve the issues, a strong findings must be developed and also construction of survey too. To do this, a proper research approach had been described.

In order to identify issues and solution for related findings for mitigating the problem, this study included a review of the literature, questionnaire surveys (for the pilot and main study), and semi-structured interviews. The chapter explains the techniques for data gathering and analysis as well as how the approaches used were justified.

The Study Ethic

The UPM Ethical Committee has endorsed the main study with rules for studyer conducted the survey.

Informed Consent

The consent form were given to participants and acknowledged the rules of consent. Later the participants must respond to google form or semi structured interview and after that need to sign for participants to take part in this survey.

Right to Privacy

The participants allowed not to proceed the survey or ask the questions during this meeting. All the information will be kept in secret for privacy purpose.

Information Protection Issue

All the printed information from the survey stored in safer place for future reference and future study.

Language for Questionnaire and Interview

English is the main language used during survey and interview conducted to participant.

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FINDINGS AND DISCUSSION

This study adopts a qualitative mixed-method analysis for the research methodology based on a strong data collection. As for the methods of collecting data is survey. This study applied semi-structured interview and google questionnaire forms. Due to pandemic of Covid-19 restriction, where only 43 respondents participated in the study voluntarily for this survey where 35 participate in questionnaire, 7 participate as interviewee and 1 involved both survey. The responses given by them were analysed using Nvivo and SPSS software. According to Vaus (2002) from social research and Fadiya et al. (2014) from construction industry, a small number of sample is sufficient for the purpose of data collection and analysis for the variables.

The interviewee and respondents are from construction industry background such as semi-government staff (Putrajaya Holding), consultants and contractors who are involved in the same government construction project. Pugh et al. (2005) highlighted that a research is conducted to collect information about uncertainties. Similarly, Creswell (2009) stressed the importance of methodology in collecting the data which will determine the success of the research. Correspondingly, in order to get a strong data collection, this research used a mixed method data collection using semi-structured interview and google questionnaire forms with Likert scale 1-4 level.

This study attempted to describe in detail the methodological approach adopted. In order to determine the most appropriate position, careful considerations must be made based on the nature of the problem and the established research questions. Table 3 below highlights the feedback from the questionnaires.

a) Qualitative Analysis

This section discusses the qualitative data collection process that involves selected government bodies, consultants, and contractors who are working in construction projects. Nvivo 1.6 software was used for the data analysis. Based on this analysis, three themes were identified. The themes were the causes of problems, the methods used and the benefits of employing IR 4.0 tools. The semi-structured interviews were conducted via tele-conversation due to the restrictions during the Covid-19 pandemic. The interviewees were two (2) officers from Public Works Department (JKR), one (1) person from consultant firm and five (5) persons from private contractor's company (Refer to Table 3).

Table 3: Participants of Semi-structured Interview

Construction Team	Participants	Response Rate Number	Interview session
Private Consultancy Firm	5	1	7/5/2021-29/5/2021
Private construction company	5	5	
Government body/GLC	5	2	
Total	15	8	

The data information for qualitative is about depth of information and studyer obtained until 8 participants which responses for this data collection after the data saturated and the total participants invited were 15 participants where only 1 from 5 participate as interviewee from

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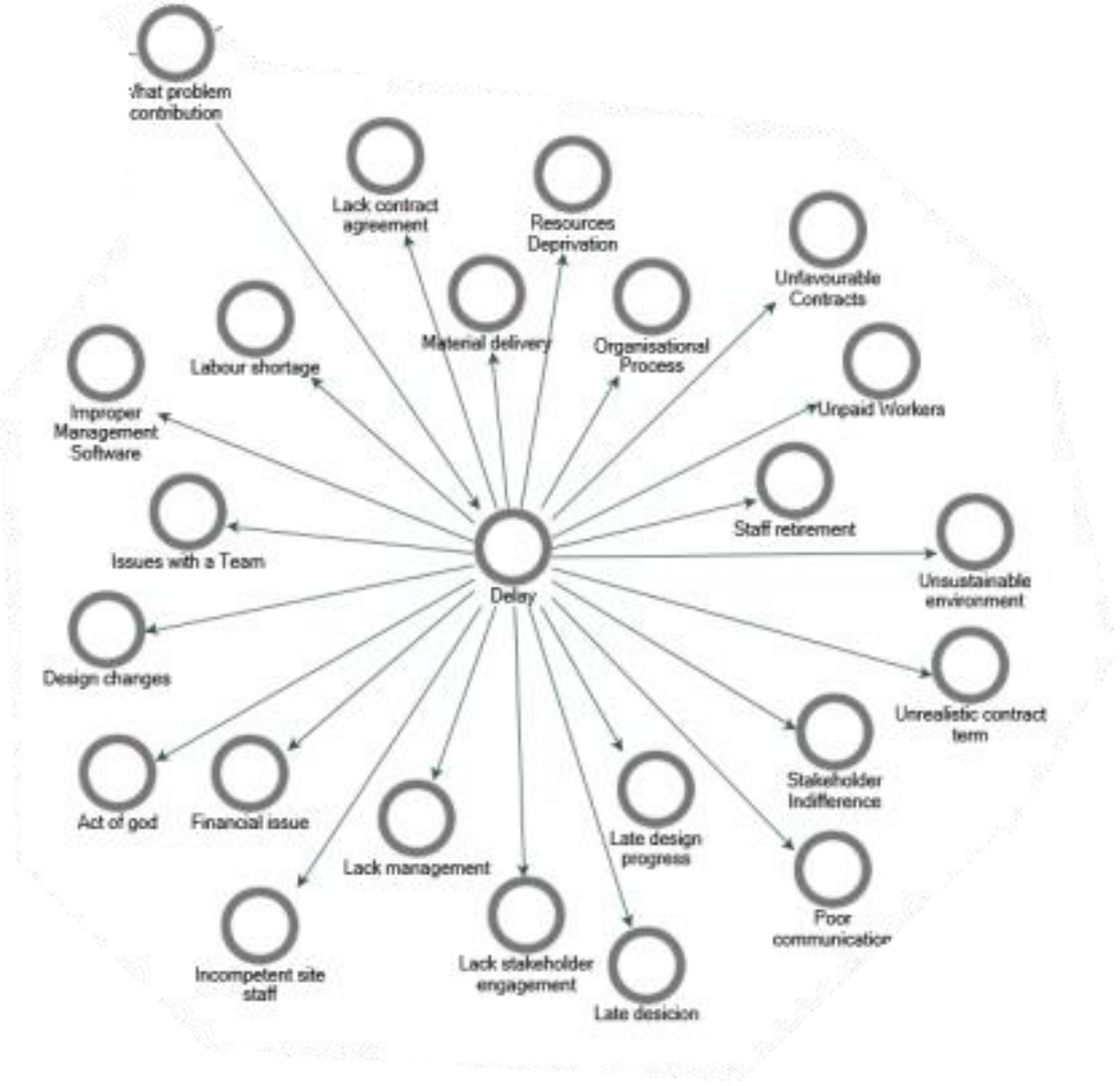
private consultancy firm, 5 of 5 responses from private construction company and 2 of 5 responses as interviewee which is total 8 responses for this interviewee session.

Figure 1: Theme 1- Factors that Contribute Problem to Construction Projects



Problems in construction projects have become a normal phenomenon as they arise during construction period and have become a problem to the whole project team. These problems were caused mainly by human and nature factors. As listed in Figure 1, Theme 1 was the problems that contribute to construction projects. It was found that there are three main issues experienced in construction projects which are quality, safety and delay. Quality-related issues involve areas such as changing scope, financial issue, incompetent workmanship, insufficient team skill, inadequate monitoring, limited knowledge, organisational issue, poor communication, unsustainable social environment, staff retirement and unrealistic deadline. As for safety-related issues, there are a few sub-themes found which are incompetent staff, financial difficulties, management incompetency, poor communication, and unsustainable environment. For delay-related issue, among the sub-themes found are mother nature, design

changes, financial issues, improper management software, incompetent site staff, teamwork failure and labour shortage. Lack on contract agreement, lack on management competency, lack of stakeholder engagement, late decision making, late design process, material delivery, organisational process, poor communication, resources deprivation, staff retirement, stakeholder indifference, unfavourable contracts term, unpaid workers, unrealistic contract term and unsustainable environment are subsequent sub-themes that have been identified.

Figure 2: Theme 2- Implementing Technology to Solve Problems in Construction Projects

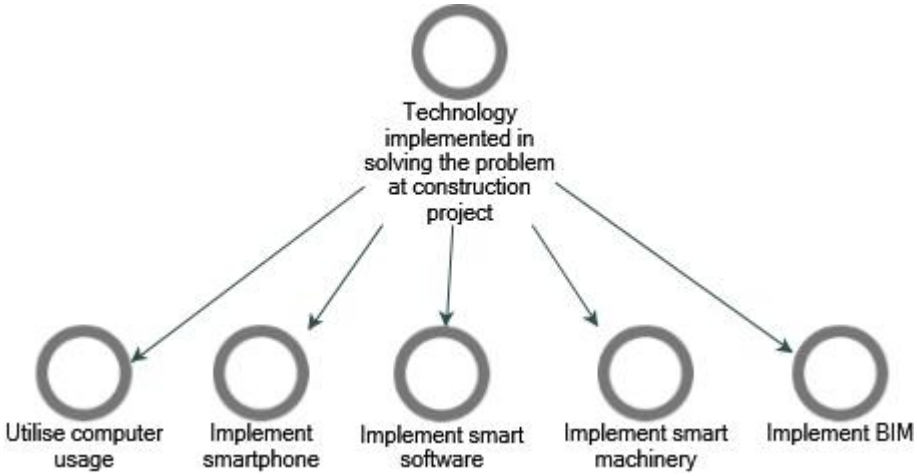


Figure 2: Theme 2 above explains about the implementation of technology in solving the problems in construction projects which represented the methods and tools from IR 4.0 that are fully utilised by construction companies in their projects to achieve their target. There are five (5) elements under the theme which include utilising computer usage, using smart-phone, smart software, smart machinery, and BIM. These elements derive from the codes which are generated through the qualitative semi-structured interviews with the respondents, and they have agreed that these five (5) elements of IR 4.0 technology can be regarded as solutions for their construction projects.

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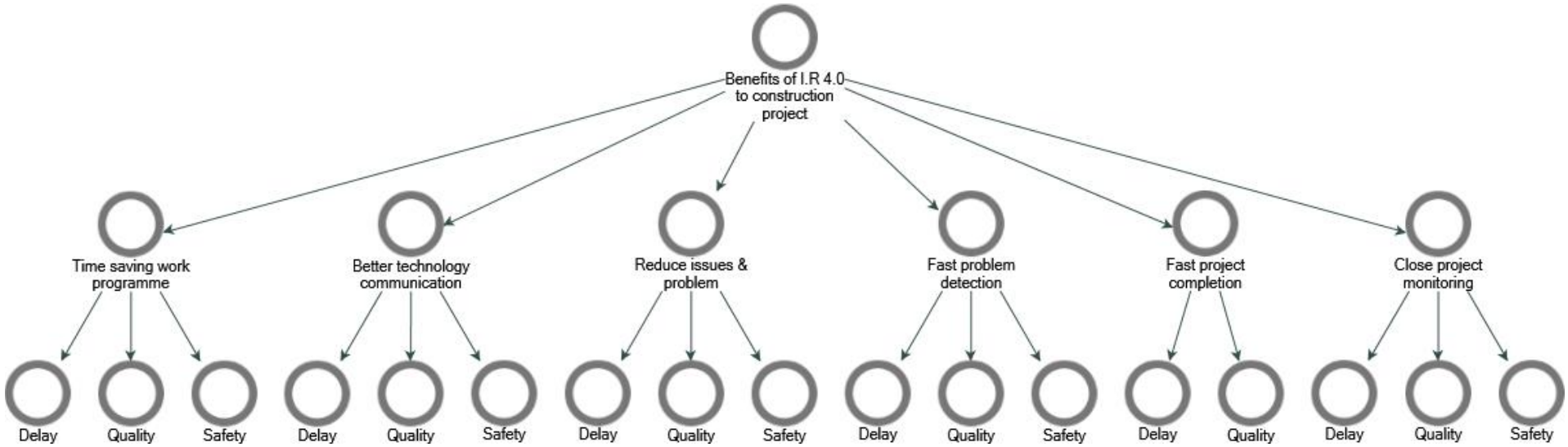
Figure 3: Theme 3- The Benefits of Using Technologies during I.R 4.0 to Mitigate Problems in Construction Projects



IR 4.0 tools and technologies have successfully mitigated the issue of delay, quality, and safety in construction project through the six (6) elements mentioned in Figure 3. The six (6) elements found are time saving work programme, better technology for communication, reduced issues and problems, fast problem detection, fast project completion, and close project monitoring. These elements have helped to mitigate problems on site for the betterment of the future.

i) Theme 1: Factors that Contribute Problem to Construction Projects

During the interview session, the interviewees were asked about the problems that occur during construction period which were delay, quality and safety. The interviewees were only asked selected questions that were relevant to their tasks or job specifications in the project.

Table 4: Problems that Contribute to Construction Projects

Factors that contribute problem to construction projects	No of source	No of references
Delay	7	92

The data on the delay issues as presented in the table 4 were taken from semi-structured interview and the review of literature from several authors which are related in construction projects. They contributed to the input of this study, and they have agreed to protect the findings and issues emerged during the construction period. In addition, the construction project staffs have also highlighted the same situation on similar issues in their working environment.

In construction projects, the role of sub-contractor is very important in supporting each other on completing a project (Bingol et al., 2017). Mother nature is another concern that is being monitored because disaster may hit a project during the construction period. Besides, financial issues and work planning are huge contribution to delay factors too as they have the domino effects (Csordas et al., 2017). Hence, communication in every aspect is the key to success. Good communication in every situation is the most important key to ensure all tasks and work flow in construction projects go smoothly.

ii) Theme 2: Implementing Technology to Solve Problems in Construction Projects

During the interview session, the interviewees were asked about the technology used to overcome problems during the construction period. The interviewees responded based on their experiences in construction projects. However, the interviewees were only asked selected questions that were relevant to their tasks or job specifications in the project.

Table 5: Implementing Technology to Solve Problems in Construction Projects

Implementing Technology to Solve Problems in Construction Projects	No of sources	No of references
Computer usage (Integration networking etc.)	8	13
Smartphone (WhatsApp, Telegram etc.)	8	44
Smart software (Excel, Ms Project, Primavera, Cloud data etc.)	7	44
Smart machinery (robotic, sensor technology etc.)	7	9
BIM (AutoCAD, 3D Max, Revit etc.)	7	24

The findings in table 5 is about the technology used to overcome issues in construction projects are divided into five categories which are implementing computer usage, smartphone, smart software, smart machinery, and BIM. Some of the codings were identified in a similar way of analysing other methods, and they are categorised accordingly as presented in the table above.

iii) Theme 3: The Benefits of using Technologies during IR 4.0 to Mitigate Problems in Construction Projects

For this interview session, the interviewees were asked about the benefits of incorporating IR 4.0 during construction period. All responses were based on the interviewees' experiences and knowledge in construction projects, refer table 6.

Table 6: How Technologies during I.R 4.0 Helps In Mitigating Problem at Construction Project

The impact of using Technologies during IR 4.0 to Mitigate Problems in Construction Projects	No of source	No of references
Close project monitoring	8	44
Fast project completion	7	91
Fast problem detection	8	40
Reduce issues & problem	8	55
Better technology communication	8	79
Time saving work programme	8	43

Six aspects of IR 4.0 benefits have been identified, and some of the coding were identified similar to this these aspects; thus, they are organised according to categories as presented in the table above. The category identified from the interviewees during the interview is used as the code for data analysis such as close project monitoring, fast project completion, fast problem detection, reduced issues and problem, better technology communication and time saving work programme.

A few interviewees agreed that technologies from the IR 4.0 such as applications, systems and software contribute the most in construction projects. They are proud to support the incorporation of IR 4.0 in construction projects to ensure that their working environment is smooth, and the project can be completed within the time given.

Willingness to utilise the implementation of IR 4.0 tools in construction projects will benefit the construction team on mitigating delay issues that occur during construction period as stated in the above statement by an interviewee.

In sum, all interviewees agreed that the implementation of IR 4.0 such as the selection of tools and applications in their working environments eases them to complete their tasks and assists them to mitigate the issues that occur such as delay, quality and safety in their working environment.

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As per table 7, the date of circulating the survey questionnaire was from 4/12/2020 until 11/12 2020 and date for collecting was from 4/1/2020 until 22/1/2021. 150 respondents were chosen to participate where 60 by hand circulating and 90 by google form, but only 36 response and return back the questionnaire.

Table 7: Conveyance of Questionnaire Surveys

Construction Team	Proposed respondent Number	Response Number	Response Received %	Circulating Method (A)			Circulating Method (B)		
				By Hand	Date of Circulating	Date of Collecting	Google Form	Date of Circulating	Date of Collecting
Private Consultancy Firm	50	13	26%		4/12/2020-11/12/2020	4/1/2021-22/1/2021		4/12/2020-11/12/2020	4/1/2021-22/1/2021
Private Construction Company	50	16	32%						
Government body/GLC	50	7	14%						
Total	150	36	24%	60			90		

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b) Quantitative Analysis

This survey adopts a quantitative analysis by distributing 150 questionnaires which is created using the Likert scale from level 1-4 and under 4 different categories. Part A is about general information. Part B focuses on the factors that contribute to problems in the construction project, and part C is centred on the mitigation methods used to overcome and avoid the problems in the construction project. Lastly, part D emphasises the purpose and benefits of Industrial Revolution 4.0 tools, applications and software which were split into two sections (Section 1 - Frequency of tools and software I.R 4.0 used during the construction of the project site and Section 2 - Benefits of tools and software of I.R 4.0 used during the construction of the project at the site). The questionnaires were then distributed to selected respondents consisting of government staff, consultants and contractors who answered the questions according to their skills and field experiences, refer table 8 and 9.

Table 8: Frequency of delay (Part B)

Factors contribute to the problem (delay)	**Delay in payment to contractors**		**Delay in site possession to contractors**		**Poor coordination**	
Mean	1.89		1.97		1.67	
Std. Error of Mean	.087		.074		.080	
Std. Deviation	.523		.446		.478	
Frequency/ Percentage						
Highly agree	7	19.4	4	11.1	12	33.3
Agree	26	72.2	29	80.6	24	66.7
Disagree	3	8.4	3	8.3	0	0
Highly disagree	0		0		0	
Total	36	100	36	100	36	100

The purpose of this survey was to explore the level of the factors that contributes to the problem in the construction project. In this section, the findings from part B of the questionnaire focused on the problem contributing to the issues in construction project. There were 10 questions in this part for the respondents to answer. The respondents were asked to select the level for the factors according to the 4-point Likert scale. Upon receiving the answered questionnaires from the respondents via google form, SPSS was used to analyse the results as shown in the table 8.

Table 9: Frequency of Delay (Part C)

Mitigation methods used to overcome the problem (delay)	Improve payment approval period		Improve the work programme		Minimise the organisation bureaucracy	
Mean	1.67		1.53		1.58	
Std. Error of Mean	.105		.093		.101	
Std. Deviation	.632		.560		.604	
Frequency/ Percentage						
Very effective	15	41.7	18	50.0	17	47.2
Moderate effectiveness	18	50.0	17	47.2	17	47.2
Low effectiveness	3	8.3	1	2.8	2	5.6
Not effective	0	0	0		0	

Based on the data collection for this section (Part C), the analysis was conducted using the SPSS software in order to get the variable on the mitigation methods used to overcome the problem in construction projects. Part C consists of 9 questions. The results of the mean analysis are shown in Table 5.

Analysis of Table 8, reveals that the frequency of responses on the delay for site possession to contractors is higher (mean 1.97) compared to the frequency of delay in payment to contractors (mean 1.89). On the other hand, the frequency of delay for poor coordination secured the lowest number of frequency among the respondents (mean 1.67).

Table 9 encapsulates the analysis on frequency of response in mitigation methods used to overcome the problem under delay issues. In view of that, the method on improving payment approval period scored the highest variable (mean 1.67), followed by the method of minimising the organisation bureaucracy (mean 1.58) and lastly, the method of improving the work programme (mean 1.53).

CONCLUSION

The limitation for this study are about the restriction during the pandemic of Covid-19 where the interview session were conducted via on-line and focus for Klang Valley only and the number of participants are small.

The contribution I.R 4.0 has led the way towards mitigating the problems in the construction project. It is clear that the evaluation of building design for compliance within the virtual world and building performance in the real world, called the performance gap where the private sector and government body will benefits on saving more times for construction period and will also contribute to academic sector the exposure on current issues and technologies applies in construction industry.

For future study, to conduct more survey, observation and grounded theory for more depth in

gaining data information for better future study.

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