

Effectiveness of Information and Communication Technology (ICT) Tools used during Covid-19 Pandemic for Malaysian Construction Projects

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Abstract: Building Information Modelling (BIM) has been helpful in project teams to obey the Covid-19 rules and physical distancing via online virtual meetings [1]. Complex information technologies such as AutoCAD, Esteem, Building Information Modeling (BIM), Revit, Tekla are often being used to improve efficiency, minimize risk, reduce costs, manage data, and develop new processes for construction. During Covid-19 pandemic, Malaysian construction site faces many challenges such as unable to communicate face-to-face due to the Standard Operational Protocol (SOP) set by Malaysian government caused difficulties communicating with all workers smoothly. Poor communication on the construction sites is the misunderstanding between superiors and workers, misinterpreting instructions, and poor communication skills among workers. This study aims to discover the effectiveness of Information and Communication Technology (ICT) tools used during Covid-19 pandemic on the delivery of information communication among the construction team in Malaysia. The data is collected using questionnaires survey all over Malaysia. Total of 62 responses has successfully collected for this study. The collected data are analyzed using SPSS software to produce and finalize final data. The result shows that 59.7% of the respondents mostly used AutoCAD and shows 50% of respondents respond to the challenges of the Covid-19 crisis through Building Information Modeling (BIM). The findings of the study revealed 43.5% of respondent agreed that ICT tools is very effective. The study able to benefits construction workers and manager by using ICT tools to improve communication problem during this pandemic.

Keywords: Construction, Covid-19 Pandemic, Information and Communication Technology (ICT) tools

1. Introduction

Construction industry is important for developing country economic investment. Construction plays an important role in economic development [2]. Designing, planning, altering, repairing and maintaining the construction industry, demolishing a building to meet needs and providing user safety. Good communication should develop from the preliminary stage, design stage, construction stage, and hand-over stage. Coronavirus disease 2019, or known as Covid-19, has caused human suffering, unstable economy, billions of lives to upset people around the world. Moreover, this pandemic has affected economic, environmental, human health, social domains and forced people to live in new everyday lives by adopting the presentation of this disease.

Communication is a process involving exchanging information, news, knowledge, and instructions through the internet, face-to-face interaction or any platform that can connect two or more people [1]. Effective communication is that the receiver can understand the information intended by the sender. Starting from the design and planning stage, construction stage, hand-over stage and maintenance stage, ideas and information such as drawing specifications, letters, instruction manuals, pictures and Standard Operational Protocols need to be discussed, stored, and communicated. Currently, the Malaysian construction sector is experiencing high delays, overruns, low quality, health and safety issues, pollution, and sustainability issues resulting from ineffective communication practices [3]. Previous study revealed that 74% of the issues encountered during the project were because of insufficient communication [4]. A Covid-19 cluster involving an engineering firm detected in Kuching, Sarawak announced by the Ministry of Health Department [5]. According to [6] from New Straits Times, this cluster involving 16 family members and 16 colleagues because of having close contact with the positive victim. Another cluster found in Puteh Lama Construction site on 27th November 2020.

This study aims to identify the most useful and effective Information and Communication Technology (ICT) tools used during Covid-19 pandemic in Malaysia. The study able to benefits both government and private construction practitioner by using ICT tools to improve communication problem during this pandemic.

2. Literature Review

Construction sector is a major contributor to the country's economic growth, according to experts. Some argue that it required to spend more attention to its construction sector [3]. Construction is an important sector that contributes significantly to a country's economic growth. Many countries are facing a recession and economic decline. Work-from-home (WFH) models have moved to accommodate and run businesses services from home. The industry worldwide is limited, and there are few companies working remotely. The construction industry has shut down as a significant growth engine of the economy. Material availability, which influenced the construction industry, is now facing a shortage due to the Covid-19 pandemic. Construction industry in Malaysia has to comply with all the Standard Operational Procedure (SOP) during disease outbreak. Contractors and consultants who wish to operate during outbreak must follow SOPs issued by Construction Industry Development Board (CIDB), National Security Council Malaysia and Ministry of Health (MOH).

ICTs enable the transfer of project data to and from a building. A user can read data either from a virtual model or from a device on the site. There are 4 modes of communications where the first two modes are related to instances where the data are read-only from a project site, and the other two modes of communication are where the project data can be accessed from both model and the site, so data can be read in both situation [7]. Complex information technologies such as AutoCAD, Esteem, BIM, Revit, Tekla are being used to improve efficiency, minimize risk, reduce costs, manage data, and develop new processes for construction. Information and Communication Technology (ICT) tools are approved increasingly in the construction industry. ICTs enable the transfer of project data to and from a building.

Communication between and within single demand and supply side parties is key to the construction industry. The ability to communicate heads the success criteria [8]. The effectiveness of communication depends on reaching others through written or spoken when working is a big organization. The ability to communicate is the most critical skill that an individual should possess.

3. Research Methods

Research methods used in this study is through questionnaires based on random sampling method [9]. The sample size of this findings is 119 of respondents [10]. The questionnaire is distributed through internet medium such as WhatsApp, e-mail, and google form to facilitate the data collection process. After all, the data collected are analyzed by using Statistical Package for Social Science (SPSS). Lastly, the result shown if the data is reliable and valid by using Cronbach's Alpha [11].

3.1 Questionnaires

This questionnaire used consist of four (4) parts to achieve the objective of this study. Part A of the questionnaire is to identify respondent's background. Part B is to identify the Information and Communication Technology (ICT) tools used during the Covid-19 crisis. Part C is to identify the effectiveness of the Information and Communication Technology (ICT) tools used during the Covid-19 crisis and part D is to determine the most useful and effective Information and Communication Technology (ICT) tools used during the Covid-19 crisis. A cover letter outlining the questionnaires' intent and providing guideline bout how to answer the question. The questionnaire using the Likert Scale for measuring rank to assess the ICT tools used in the current industry and determine how the Information and Communication Technology (ICT) tools impact the Malaysian construction site during the pandemic. The instrument used for this section is the Likert Scale rating where it is agreement and frequency. For this study, the respondents who successfully fill out the questionnaire are 62 construction practitioners out of 150 from the target. The response rate for this study is 41.3%.

4. Results and Discussion

This chapter is all about the analysis data that has been collected from the completed survey by questionnaire as the validation for this study.

4.1 Results and Discussion

Table 1 presents the demographical data of the respondents who took part in the pilot study. Most of the companies, they attached to government-based sector. However, in this study, the contract value and group classification are not considered for further analysis because the major focus was on Information and Communication Technology (ICT) tools. Regarding their roles in the organization, most participants work as engineer. However, for the qualification, the data shows that most of the respondents obtained a bachelor's degree and have been working in construction for less than 3 years. Therefore, their responses and opinions regarding the evaluation of the relevancy for cause-and-effect factors are used for further analysis.

Table 1: Participant's demography

Category	Items	Frequency	Percentage (%)
Gender	Male	27	43.5
	Female	35	56.5
Age	18-21 years old	1	1.6
	22-25 years old	21	33.9
	26-30 years old	23	37.1

Table 4.1: Participant's demography (Continued)

Highest level of education	31-35 years old	11	17.7
	36 years old and above	6	9.7
	PhD	2	3.2
	Master	3	4.8
	Degree	35	56.5
	Post-Secondary (Matriculation, Diploma)	19	30.6
	Secondary Education (PMR, SPM)	3	4.8
	Category of organization	Government	33
	Private	29	46.8
Roles of a participant in an organization	Project Director	3	4.8
	Project Manager	1	1.6
	Construction Manager	5	8.1
	Project Engineer	5	8.1
	Engineer	23	37.1
	Site Supervisor/ Assistant Engineer	25	40.3
Years of experience	<3years	34	54.8
	3-5 years	20	32.3
	6-10 years	6	9.7
	>10 years	2	3.2

Table 2 shows the highest frequency with 37 out of 62 respondents used AutoCAD software during the pandemic happens in Malaysia. The lowest frequency was Esteem software.

Table 2: ICT Tools used in current Construction Industry

	Frequency	Percent
Revit	5	8.1
Tekla	14	22.6
AutoCAD	37	59.7
Civil 3D	3	4.8
Esteem	1	1.6
BIM	2	3.2
Total	62	100.0

Table 3 is to determine how often the respondents used ICT tools. Based on the data collected, 51.6% of the respondent choose very frequently they use AutoCAD software in their daily working life. This proves that the respondent is more familiar with AutoCAD software. Only 8.1% respondents are not using Information and Communication Technology (ICT) frequently. This proves that 5 out of 62

respondents are actually not familiar with ICT tools that has been use in Malaysian construction industry.

Table 3: Frequent level on ICT tools usage

	Frequency	Percent
Not frequently	5	8.1
Moderate	9	14.5
Frequently	16	25.8
Very Frequently	32	51.6
Total	62	100.0

Table 4 shows that the ICT tools used by respondent is easy to be used and understand. 50% of the respondent are strongly agreed that AutoCAD is a very easy tool to be used during Covid-19 crisis in Malaysian construction site. However, there are 9 out of 62 respondents chose neutral as they not sure how AutoCAD software are actually help in their engineering working life.

Table 4: ICT tools used is easy to be used and understand

	Frequency	Percent
Neutral	9	14.5
Agree	22	35.5
Strongly agree	31	50.0
Total	62	100.0

Table 5 shows that 27 out of 62 respondents mention the Information and Communication Technology (ICT) tools used which is AutoCAD is strongly effective during the pandemic in Malaysian construction site. However, 3 out of 62 respondents think that this software is ineffective when overcoming the pandemic in our country.

Table 5: Effectiveness of ICT Tools used in Industry

	Frequency	Percent
Ineffective	3	4.8
Moderate	7	11.3
Effective	25	40.3
Strongly Effective	27	43.5
Total	62	100.0

Table 6 shown that respondent faced various type of challengers such as having poor internet connection, hard to communicate with software language and unsupported computer specification. There are 33.9% of respondent having problem with software communication, 22.6% of the respondent poor internet connection in their home, 12.9% of the respondent have problem with their computer

specification and 30.6% of the respondent facing 3 of the challenges when Working from Home (WFH). This clearly shows that all the respondent is facing challengers when working from home compared working in the office.

Table 6: Challenges by using ICT tools when responding to Covid-19 pandemic

	Frequency	Percent
Poor internet connection	14	22.6
Hard to communicate with software language	21	33.9
Unsupported computer specification	8	12.9
All of above	19	30.6
Total	62	100.0

Table 7 shows 40.3% of respondent think that current Information and Communication Technology (ICT) tools used are just good while 19 out of 62 respondents chose neutral rating for the Information and Communication Technology (ICT) tools used. This finding can conclude that most the respondents are actually satisfied with their current used ICT tools.

Table 7: Rating on current ICT tools used in Industry

	Frequency	Percent
Neutral	19	30.6
Good	25	40.3
Very good	18	29.0
Total	62	100.0

Due to Work from Home (WFH) which introduce by Malaysian government, 41.9% of the respondent choose to create virtual meeting among co-worker to ensure they understand what sender's information clearly. Meanwhile, 11.3% of them still stick to conventional method which is to have written instruction and 25.8% of them still prefer to have hard copy provided for them to refer. However, they are 21% of respondent insist to have above items to enable receive fully understand their instruction.

Table 8: Ensure receiver's understanding

	Frequency	Percent
Provide a hard copy for them to refer	16	25.8
Create virtual meeting	26	41.9
Written instruction	7	11.3

All of above	13	21.0
Total	62	100.0

Table 9 shows the data of miscommunication and misconception by using ICT tools in Malaysian construction site. 37.1% of respondents agree that AutoCAD software does not cause misunderstanding and misconception when information and data being communicate with the receiver. This proof that AutoCAD software is reliable for users. However, there are 33.9% of respondents agree that this software caused miscommunication and misconception for users, and 29% of respondents are unsure.

Table 9: Miscommunication and misconception by using ICT Tools

	Frequency	Percent
Yes	21	33.9
No	23	37.1
Maybe	18	29.0
Total	62	100.0

Table 10 shows data to determine what are the best ICT tools to overcome Covid-19 pandemic in Malaysian construction site. In this question, respondents are asked to give a recommendation on the best tools to be used during Covid-19 pandemic. 50% respondent recommend BIM or known as Building Information Modelling to be used during Covid-19 pandemic. The lowest is Revit software which only stands for 1.6%.

Table 10: Best ICT Tools used to overcome Covid-19 pandemic

	Frequency	Percent
Revit	1	1.6
Tekla	16	25.8
AutoCAD	10	16.1
Civil 3D	2	3.2
Esteem	2	3.2
BIM	31	50.0
Total	62	100.0

Respondent recommend Building Information Modelling (BIM) software to be used to overcome like-wise pandemic in construction industry. Data shows 50% of the respondent suggested that BIM to be used because of a single system that can generate data, workflows and manage documents and task better with the only project collaboration solution. BIM is used for creating and managing data during the design phase, construction phase and operations process. Besides, BIM able to integrate multi-disciplinary data to create digital representations that able to give greater visibility, better decision making and cost savings on architecture, engineering and construction (AEC) project.

5. Conclusion

In this paper, the conclusion has been made based on the determination of the most useful and effective Information and Communication Technology (ICT) tools used during the Covid-19 crisis.

5.1 To identify the Information and Communication Technology (ICT) tools used during the Covid-19 crisis

From the questionnaires, 59.7% respondents agreed that AutoCAD was the best ICT tools used to overcome covid-19 crisis and most of the respondents used this software very frequently in their every life. Besides, 50% of respondents are strongly agree that AutoCAD tools are very easy to use and understand. However, the percentage of causing misunderstanding and misconception are low between sender and receiver.

5.2 To identify the effectiveness of the Information and Communication Technology (ICT) tools during the Covid-19 crisis

Many challenges faced by respondent during using current ICT tools in construction industry such as having hard time to communicate with software language, low computer specifications and poor internet connection. These challenges happen when Malaysian are forced to Work from Home (WFH) because of the increasing positive Covid-19 cases. Therefore, the Ministry of Health (MOH) and the National Security Council Malaysia are enforcing new Standard Operation Protocol (SOP) to apply to all public and private company Malaysia. It is statically proven that the 43.5% of respondent agreed that AutoCAD is very effective used during the Covid-19 pandemic in Malaysian construction are AutoCAD.

5.3 To determine the most useful and effective Information and Communication Technology (ICT) tools used during the Covid-19 crisis.

The findings of this study are to identify the most useful and most effective Information and Communication Technology (ICT) tools in Malaysian construction industry. Data shows that 50% of respondents respond to the challenges of the Covid-19 crisis through Building Information Modeling (BIM). This study able to help to improve the communication among co-worker in construction site either for public or private construction site in Malaysia. The study able to benefits construction workers and manager by using ICT tools to improve communication problem during this pandemic.

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