

AWARENESS AND READINESS OF 5G TECHNOLOGY IMPLEMENTATION
IN CONSTRUCTION INDUSTRY

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ABSTRACT

Technological advancement and rapid economic growth have created a wide range of advanced technologies all over the time. The borderless world that used to be just described as impossible, has now become the heart and soul of the nation's driving force in various fields. Lately, issues related to 5G have often been mentioned. Its impacts were so drastic that it tends to give result of advantage and disadvantage. Today, construction industry was trying to implement the technology of 5G in construction process. Thus, this study was conducted to identify either construction player's aware or ready to absorb the new technology. The methodologies used in this study are by using literature review and distribution of questionnaires. Data has been collected from all construction player's that involved with the JKR Perak projects in 2019. Results of the study will show the level of awareness, readiness and advance knowledge among the construction players. The study will also provide information about the implication of using 5G technology to create big changes in reality of construction industry. Data from the study shows that the level of awareness and readiness of construction players towards new technology, especially 5G technology, is still unsatisfactory. This is driven by the factor of utilizing experts in operating 5G technology which will cost a lot of money on managing a project. Data on recent technological advances also shows that construction players are still adopting conventional technology and it is difficult to accept new changes in management and construction systems. Hopefully, the findings from this study will allow the construction players to move through the new advanced technology, thus affect the progress and increase safety in construction sites. It is also expected to provide effective suggestions on the application of 5G technology to the construction sector thus accelerate the process of managing and implementing projects without any physical weaknesses such as communication problems among construction player's and delays in the construction process.

ABSTRAK

Kemajuan teknologi dan pertumbuhan ekonomi pesat telah mencipta pelbagai teknologi canggih sepanjang masa. Dunia tanpa sempadan yang dulunya digambarkan sebagai sesuatu yang mustahil, kini telah menjadi hati dan jiwa penggerak negara dalam pelbagai bidang. Akhir-akhir ini, isu yang berkaitan dengan 5G sering disebut. Impaknya sangat drastik sehingga ia memberi kesan kelebihan dan kelemahan. Hari ini, industri pembinaan cuba melaksanakan teknologi 5G dalam proses pembinaan. Oleh itu, kajian ini dijalankan untuk mengenalpasti sama ada pemain pembinaan sedia atau tidak bagi menyerap teknologi baru. Metodologi yang digunakan dalam kajian ini adalah dengan menggunakan kajian literatur dan edaran borang soal selidik. Data telah dikumpulkan dari pelbagai pemain pembinaan yang terlibat dengan projek-projek JKR Perak pada tahun 2019. Keputusan kajian ini akan menunjukkan tahap kesedaran, kesediaan dan kemajuan pengetahuan di kalangan pemain pembinaan. Kajian ini juga akan memberikan maklumat mengenai implikasi menggunakan teknologi 5G untuk mewujudkan perubahan besar dalam realiti industri pembinaan. Data daripada kajian menunjukkan bahawa tahap kesedaran dan kesediaan pemain pembinaan terhadap teknologi baru terutama teknologi 5G masih tidak memuaskan. Ini didorong oleh faktor penggunaan tenaga pakar dalam mengendalikan teknologi 5G yang mana akan menelan belanja yang besar dalam menguruskan sesebuah projek. Data terhadap kemajuan pengetahuan teknologi terkini juga menunjukkan bahawa pemain-pemain pembinaan masih menggunakan teknologi konvensional dan agak sukar bagi menerima perubahan baru dalam sistem pengurusan dan pembinaan. Diharapkan penemuan dari kajian ini akan membolehkan pemain pembinaan bergerak melalui teknologi canggih baru yang akan memberi kesan kepada kemajuan dan meningkatkan keselamatan di tapak pembinaan. Ia juga dijangka memberikan cadangan yang berkesan mengenai penerapan teknologi 5G kepada sektor pembinaan dengan itu mempercepatkan proses mengurus dan melaksanakan projek-projek tanpa sebarang kelemahan fizikal seperti masalah komunikasi di kalangan pemain pembinaan dan kelewatan dalam proses pembinaan.

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LIST OF ABBREVIATIONS

4G	-	4 Generation
5G	-	5 Generation
CIDB	-	Construction Industry Development Board
JKR	-	Jabatan Kerja Raya
SPSS	-	Statistical Package for Social Science
RII	-	Relative Importance Index

CHAPTER 1

INTRODUCTION

1.1 Preface

The development of technology today is undeniable. Consumer needs and technological advances put a positive pressure on the creation of sophisticated technology tools and equipments, especially in the field of telecommunications. If in the past, the sophistication of digital technology was just chatting and sending short messages, now everything was drastically changing to drive through to the borderless world. Today, all information sharing required data, image and video communication to form communication. Communication has become a necessity in construction management and this is possible because of the convergence of several services such as voice, data, images and videos. Quoted from a reference source Jeyachandran (2012), it stated that the efficiency and effectiveness of a construction organization is driven by the quality of effective communication, either in verbal or written by the construction team and stakeholders involved in a project. The demand for technological progress in communication technologies shows an ever-increasing trend.

Communications and technology have been a driving force behind organizational performance through stimulation and standardization of a smooth and effective communication among the members of particular organization as well as inter-organizational collaborations (Adriaanse et al. 2010). Technological advancements have been progressing significantly faster in other industries but the construction industry has lagged behind many industries in terms of usage, acceptance and adopting new technologies (Peansupap; 2012). An effective adoption of technology in construction organizations is hinged on an appropriate alignment of

the people, process and the technology itself. In fact, attention to people, process and technology is the fundamental criteria to successful adoption of new technology in organizations (Konrad, 1996). A construction organization is set-up where people, process and technology are interrelated and any technological adoption needs to be effectively managed for the initiative to be efficient.

Technologies utilization ratio in the construction industry is relatively low. This industry is characterized by low productivity, time and cost overruns in projects due to inefficient management process, poor communication and low process automation. Cost, time and quality are well known as the important elements and major concerns in construction management. Selection of construction technology may play a role in improving the cost, time and quality for one construction project.

According to Bowen and Cattell (2002), client is concern with cost, time and quality in the construction industry (Bowen and Cattell, 2002). It is very hard to optimize these three different parameters by project manager. Contractor may lose their profit or even go bankrupt if they failed to manage these parameters properly. Construction technology and communications is important in the construction industry.

Communications are defined as the process in which information is encoded and imparted by a sender to a receiver via channel or medium (Perumal et al. 2011). It is a process for exchanging information such as words, voice and diagram. To have an effective communicator, construction players must be aware and know the barriers to the communications process. By applying the effective communication, it will results reduce of cost and time, as well as improve quality of work significantly. According to Mahadik (2015), cost is the expenses on labour, material, equipment, financing, services.

As a part of steps to achieve successful communication and technology, mobile networks show the big impact in the construction industry. The evolution of mobile networks from 2G to 4G has been mainly driven by the supporting

applications, whose requirements defined the features of the network in terms of procedures (e.g, authentication, signalling, connection establishment) and functionalities (e.g., mobility management, anchoring, data forwarding, path computation. Coverage for 2G networks (now covering 90% of worldwide usage) which is designed only for voice networks, 3G network coverage (currently covers 65% of the world's population) for voice and data networks, and the latest 4G network coverage (since 2012) provides an unlimited internet broadband experience worldwide.

Cellular network capabilities have been significantly enhanced through the existence of 4G networks which can provide Internet access that can be used by mobile devices. Since 2012, long-term evolution (LTE) for 4G network connectivity, has made 4G the fastest and most consistent network compared to other competing technologies such as BLE, WiMax, ZigBee, Sigfox, LoRa and others. Currently, 5G shows that next generation networks which is expected to solve challenges that facing by 4G networks, such as more complicated communication, device computational capabilities, and intelligences, etc., to match the needs in smart environments, industry 4.0.

Before initiating a technological transformation, the construction players need to examine their organizational attributes i.e. level of 'readiness for change' prevailing within the organization such as employees' motivation. According to Holt et al (2007), readiness for change is a comprehensive attitude which reflects the extent to which an organization is inclined to accept and adopt a technological change.

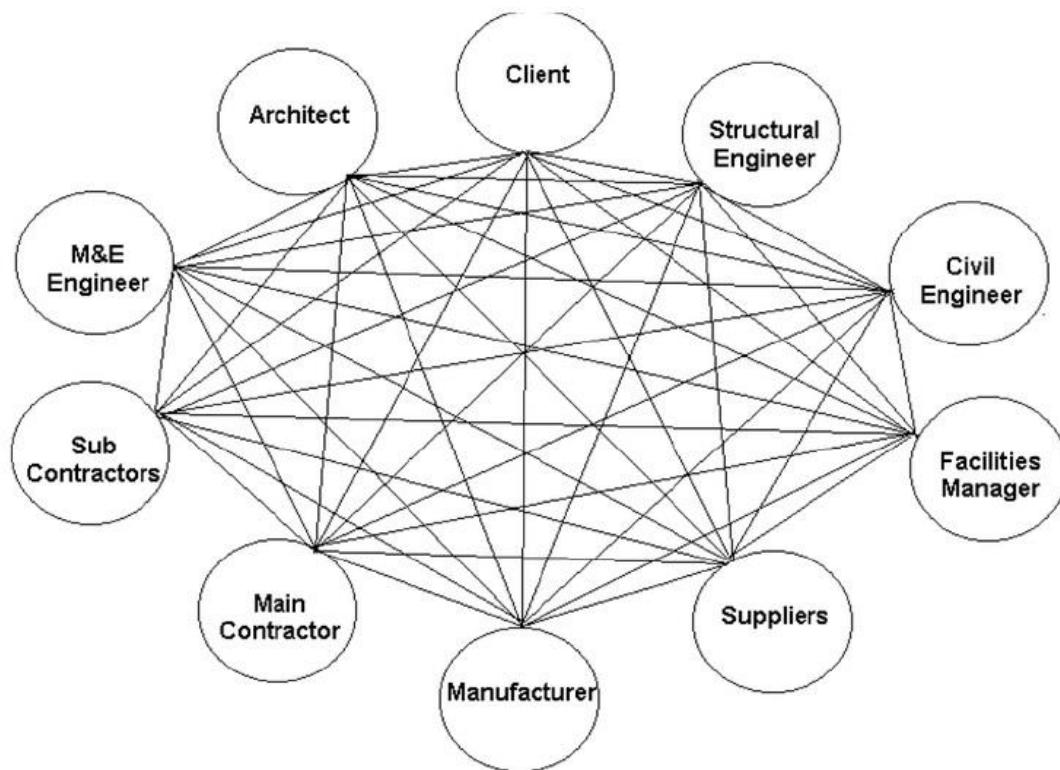


Figure 1.1 The Chaotic Intercorrelation among Stakeholders in the Construction Project (Ruikar et al, 2003)

1G	2G	3G	4G	5G
1981	1992	2001	2010	2020(?)
2 Kbps	64 Kbps	2 Mbps	100 Mbps	10 Gbps
Basic voice service using analog protocols	Designed primarily for voice using the digital standards (GSM/CDMA)	First mobile broadband utilizing IP protocols (WCDMA / CDMA2000)	True mobile broadband on a unified standard (LTE)	'Tactile Internet' with service-aware devices and fiber-like speeds
				

Figure 1.2 Evolution Era in Digital Cellular Communication Device

1.2 Background of Study

The construction site is one of the high-risk locations for fatal accidents. Negligence is one of the leading causes of serious accident on the site. Ongoing monitoring and safe work environment influence actions to reduce accidents and thus reduce construction costs. There are various difficulties affecting the safety of the workplace. These include inaccurate information flow, coordination problems in managing an administrative organization, and the delayed action on accident response. Due to the tight and confined site environment factors, many phases of construction need to be well-managed including machinery and logistics management, raw materials and solid waste management, human resource management, site security management and etc. Besides, the most important aspect of a construction organization is the loss of important records or information. This is especially when there is a changes in the organizational leadership and executives within a construction site. Information and communication technology has been a driving force behind organizational performance through stimulation and standardization of a smooth and effective communication among the members of a particular organization as well as inter-organizational collaborations (Adriaanse et al. 2010). Back to 1960's in Japan, large construction companies developed their own systems by implementing high technologies in it. This fusion of prefabrication technology, information technology, automation technology and construction technology in construction industry were emerged, and became a new innovative construction system (Yamazaki, 2004). In order to more concretely understand the engineering challenges facing 5G, and to plan to meet them, it is necessary to first identify the requirements for a 5G system. The creation of new IoT applications in the future requires new basic criteria to improve performance such as massive network connection, improved security, reliable, comprehensive wireless communications coverage, low ultra-latency rate, throughput, ultra -reliable, et al. For a large number of IoT devices, to meet this need, Long-Term Evolution (LTE) and 5G technologies are expected to provide new connections for future IoT applications. The next generation of "5G" is in its infancy, aimed at new radio access (RAT) technologies, antenna improvements, higher frequency usage, and network

redesign. Significant advancements in cellular network systems have created many types of wireless networks. The evolution of Long-Term Evolution (LTE), for example, is expected to bring about radical changes to create the next generation of technological changes, thus impact high-technology mobile device designs.

1.3 Problem Statement

Digital technology in construction industry has been one of the most important part of the construction technology and communication. It has been used as a medium to communicate, sending or transferring data and information in fastest way and also used to build advanced machinery system in construction process. Today, technological advances in sellular networks are growing rapidly due to high demand in the global marketplace. The growing impact of popularity on 5G technology is directly involved in all aspects of life including managing personal matters as well as in the operation of expert work.. However, many construction players are less gleeful about the benefits that might be expected. In theory, 5G technology puts the construction players incharge of the whole project. However, 5G technology also not exclude that were faced problem by construction players in the construction industry. One of the common problems are the awareness and readiness about the new 5G technology.

1.4 Aims and Objective

The main aim of this study is to determine the awareness and readiness of construction players in 5G technologies among the contractors and parties involved in listed project of JKR Negeri Perak in 2019. In order to achieve this aim, the following objectives outlined are: -

- a) To investigate the level of awareness among construction players on 5G technology.

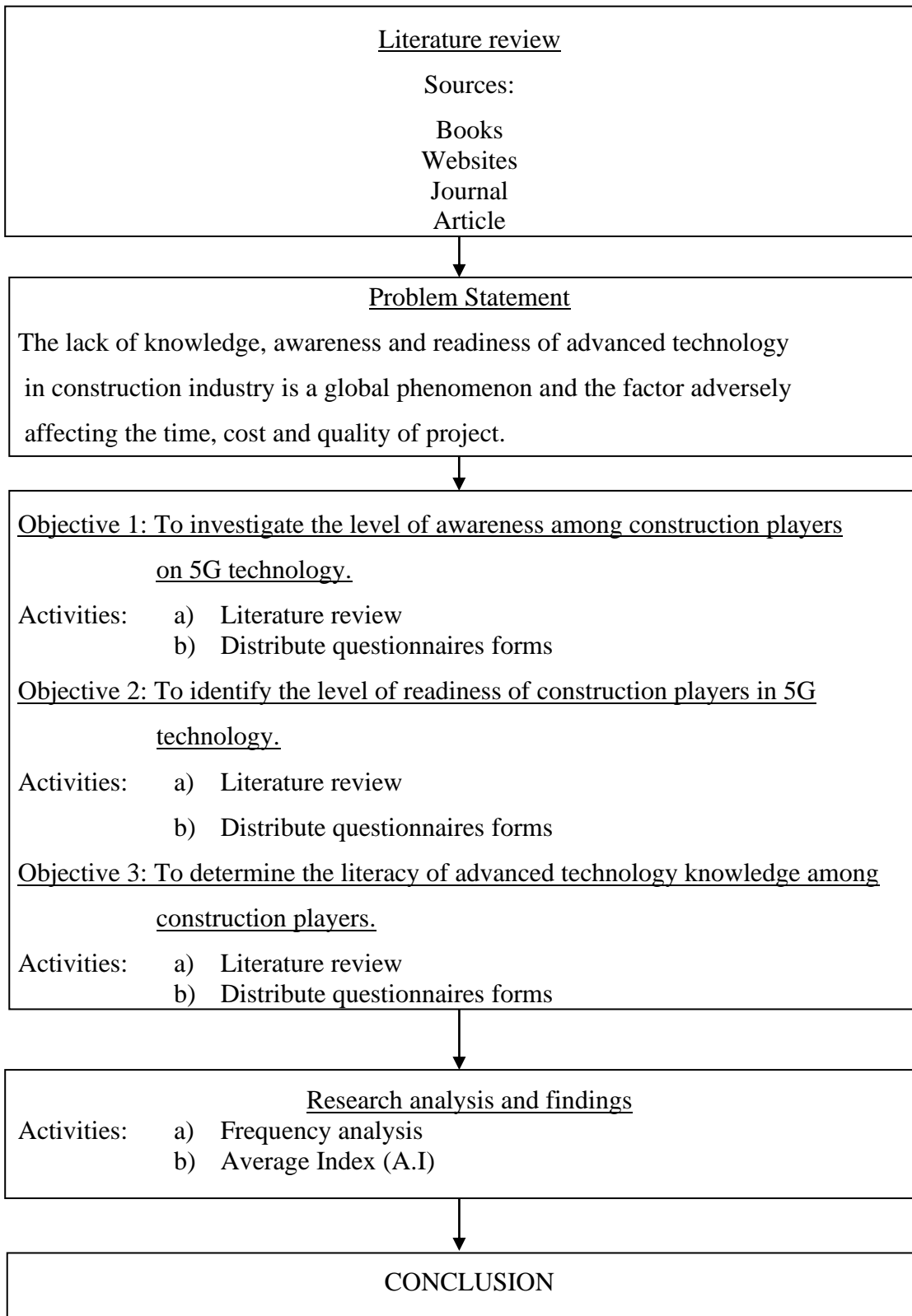
- b) To identify the level of readiness of construction players in 5G technology.
- c) To determine the literacy of advanced technology knowledge among construction players.

1.5 Limitation and Scope of Study

For the scope of this study, limitations were set to establish a focus on specific areas including narrowing the scope of topics to specific areas of the study subject. The scope of this case study can be described as below:

- a) This study is focus about 5G technology in construction industry.
- b) The respondents are registered as contractors, consultants, clients, suppliers and also construction worker's.
- c) This study consists of government and private agencies.
- d) The area of this study involves all JKR Perak project's in 2019.

1.6 Methodology



1.7 Significant of study

The primary purpose of this project is to study the awareness and readiness of construction players about the new 5G technology in construction industry. Besides that, to study the level of advanced technology knowledge among the construction players. As the research is focusing on government projects, and respondent involved is among contractor, consultant, client and other's construction players. Without proper and systematic methods, the performance of a project will be adversely affected, resulting the cost of construction going up dramatically.. So, the most important element in construction is network technology (5G) which can affect either in communication process or in technology advancement. Information collected indirectly can be used by the government sector to address problems encountered during the construction phase.

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