PROJECT COMMUNICATION ASPECTS ON CONSTRUCTION PERFORMANCE: INVESTIGATING CONTRACTORS' PERSPECTIVE

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A project report submitted in partial fulfilment of the requirements for the award of Bachelor of Science (Honours) Quantity Surveying

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DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

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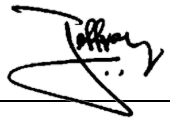
Signature : 

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ABSTARCT

The construction sector is plagued by ineffective communication management resulting in time and cost overruns. It has been discovered that over 70% of contractors' time is spent on communication with other stakeholders. Contracting parties as one of the major construction practitioners are underexplored to enhance project performance. Therefore, it is imperative to look at contractors' perspectives on project communication. This research ascertains the significance of effective communication, factors of communication that contribute to poor performance and practical strategies to improve communication effectiveness in construction projects. First, research questions and objectives were identified based on a comprehensive review of existing literature. A total of 120 valid responses were received from contracting parties through quantitative research methodology conducted in the Klang Valley region, with a response rate of 38.10%. The data collected were further evaluated through reliability analysis, descriptive statistics and inferential statistics. The three most critical needs of effective communication were revealed as "reduce conflict", "better collaboration between parties" and "good problem solving". Also, "lack of effective communication techniques", "frequent changes to contract", "lack of mutual respect and trust", "slow information flow", and "unethical behaviour" have been categorised as the top five negative factors of communication that impact project performance. As the top three recommended measures were revealed as "understand client's needs", "use effective communication channel", and "maintain integrity and trust". The research's findings also revealed the significant discrepancies in respondents' perceptions regarding the reasons and potential measures for communication effectiveness. A strong correlation was found by using Spearman's correlations test between the "lack of mutual respect and trust" and "ability to maintain integrity and trust". Five principal dimensions were identified, comprising (1) unique nature of construction industry; (2) supportive communication management; (3) communication's knowledge; (4) organisational gap and technological viewpoint; and (5) organisational culture. In short, this research's findings able to improve the construction industry's performance by allowing contracting parties to understand the importance of communication and address them with effective communication techniques.

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LIST OF SYMBOLS / ABBREVIATIONS

α	Coefficient Alpha
2D	2 Dimensional
BIM	Building Information Modelling
CIDB	Construction Industry Development Board
COVID-19	Coronavirus Disease
EDI	Electronic Data Interchange
EDMS	Electronic Data Management System
EOT	Extension of Time
GDP	Gross domestic product
ICT	Information and Communication Technology
KMO	Kaiser-Meyer-Olkin
S.D.	Standard Deviations
SPSS	Statistical Package for the Social Sciences
U.K.	United Kingdom of Great Britain and Northern Ireland.
U.S.A.	United Stated of America
UTAR	Universiti Tunku Abdul Rahman

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CHAPTER 1

INTRODUCTION

1.1 General Introduction

Chapter 1 is an outline of this research. This chapter mentions the background study and problem statement in sections 1.2 and 1.3. Followed by the goals to be achieved by undergoing this research are stated in the research aim, research question and research objective. Research methodology and research scope are also discussed and defined onward. Next, the brief abstract for the following chapter is stated in section 1.9 chapter outline. Lastly, section 1.10 outlines the summary of this chapter.

1.2 Background

Maqsoom, et al. (2018, p.769) stated, “The construction industry is the backbone for developing a country's economy”. No one can refute this statement as its productivity or assets are unique and vital to the nations. According to Moshood, Adeleke and Tagod (2021), the construction sector accelerates all nations' standards and quality of life with the essential socio-economic infrastructure. With the development of the latter-day civilisation, the construction industry is a firm and strong foundation (Khan, Liew and Ghazali, 2014). Hence, the construction industry has brought about an extra opportunity for investors to invest in diversified techniques and is essential for Malaysia to accomplish national socio-economic objectives. As mentioned by The World Bank (2021), from 2010 Malaysia with a good ratio of over 130% of the commerce to gross domestic product (GDP) leading Malaysia to become one of the most open economies. In addition, Malaysia is expected to grow faster than the figure mentioned as a developing country by Omar (2017). Significantly, the construction industry had contributed 4.0% to the GDP of Malaysia in the first quarter of 2021, amounting to RM31.4 million. Also, there is a positive growth of 3.7% in the first quarter of 2021 compared to the fourth quarter of 2020 in the impact of the COVID-19 pandemic (Department of Statistics Malaysia, 2021a).

Moreover, rather than saying the construction industry is a major sector of a country's economy, it is also considered one of the largest sectors to provide Malaysia's most outstanding employment opportunities (Olanrewaju, Tan and Kwan, 2017). Alaloul, et al. (2020) highlight that over 7 million people were hired in the construction industry as of July 2019, and almost 1.4 million were employed in the construction industry in 2020 (Hirschmann, 2020). By 2026, the construction industry will allow more than a hundred thousand new opportunities for nations to be employed. With the natural characteristic of complexity and risk, the construction industry increases the level of project information transfer with the primary goal of improving project delivery performance effectively (Othman, et al., 2018).

In the construction project, three major construction organisations are clients, consultants, and contractors to lead the project to the correct path of success (Ishaq, Omar and Yahya, 2019). They must communicate and work together to maximise productivity and profit for a construction project (Obonadhuze, et al., 2021). In other words, the construction project's success is only achieved when the quality and effectiveness of the contractual relationship between these parties is a success (Obonadhuze, et al., 2021; Subramaniam, et al., 2020). Besides, Ishaq, Omar and Yahya (2019) had also mentioned that the construction industry, with its complex character as the construction stakeholders, must form a temporary group together with the equally project objective and goals. However, these construction parties with different organisational cultures and professionalisms might hinder the project's success (Ishaq, Omar and Yahya, 2019). This can be due to the traditional procurement method widely adopted in the current Malaysian construction industry (Siah, 2020). In the conventional way, the construction parties form an adversarial relationship throughout the project lifecycle that would significantly affect the effective communication process smoothly and successfully. Obonadhuze, et al. (2021) further described the communication failure between the parties, leading to a terrible project delivery process. For instance, delays in the project timeline, cost overrun, building collapse, production of construction waste through re-tender work, and so forth are signs of the bad performance that lead by the lousy communication process

(Olanrewaju, Tan and Kwan, 2017).

Moreover, going on with the commencement of construction, the main contractor is the one to control and perform the schedule (Obonadhuze, et al., 2021). He is liable for oversight of the project in terms of parameters, money and time day-to-day (Ishaq, Omar and Yahya, 2019). Besides, he also needs to be a middle person between client and consultant with a suitable communication manner so project information exchange achieves the desired outcomes (Ishaq, Omar and Yahya, 2019). Apart from that, sub-contractorss and suppliers also perform the contractual relationship with the main contractor, and these parties have the responsibility to communicate with the main contractor efficiently and effectively. When lots of defective work happened on the construction site can be due to the parties' professionalism and the misunderstanding between contractor and sub-contractor; therefore, the poor construction performance ranking is shown at the construction site due to poor communication management (Othman, et al., 2018). Hence, the main contractor must adopt and perform effective communication management at the construction site to reduce and prevent the unwanted effect of poor communication at the construction site.

Communication skill is vital to the achievement of effective communication (Othman, et al., 2018). There are pros and cons of effective communication in the construction industry. However, nowadays, the Malaysian construction industry is still in the view with ineffective communication practices, reflected in plenty of reported cases of schedule overruns, poor quality and sustainability, and cost overruns (Olanrewaju, Tan and Kwan, 2017). Because of the issue found in the Malaysian construction industry, this research is therefore conducted to investigate the factor impact on poor performance and recommend measures to solve the problems.

1.3 Problem Statement

Multi-disciplinary in the construction industry has been widely criticised for achieving the success of a project delivery process (Ishaq, Omar and Yahya, 2019). Such professional parties hand different professional skills and ideas to lead the project successfully and in the best condition for the end-user.

However, poor communication usually happens between these parties (Olanrewaju, Tan and Kwan, 2017). Othman, et al. (2018) stated that effective communication is the button to success. Better communication leads to better project collaboration, while poor communication leads to failure of a project. Therefore, effective communication should be widely propagated and understood by all of the professional parties involved (Mavuso and Agumba, 2016). Aulich (2013) further mentioned and proved the key components are communication and consultation for the project's success. In this era, many communication tools have been developed for communication have happened efficiently and effectively, especially during the coronavirus pandemic. A simple announcement can be made by a phone call or message application by the contractor to site workers, but is it effective and efficient? Antonio and Senol (2012) also mentioned that a simple tool-box meeting every morning is also probable to have efficient and effective communication as it involves body language and face-to-face questions and answering.

It is worth noting that despite the parties understanding the need for effective communication, is everyone performing in an optimum manner for the project objective, which is the project's success? The answer is no. A previous study conducted by Othman, et al. in 2018 found 30 causes of poor communication in the project, while 41 reasons also had been found and studied by (Rahman and Gamil, 2017). Both of the research stated that the language barrier is one of the causes of poor communication. Workers or professionals are involved in a single project in many different religions or countries in the global construction industry. Still, the language used doesn't centralise the information exchanged and leads to a misunderstanding effect. In Othman, et al. (2018) study, jargons wording is mentioned. The jargons wording can be easily understood and transferred to the receivers, but some do not fully understand the true meaning of that phrase, including jargon wording. Therefore, indeed lead to the destructive effects of misunderstanding to work. Furthermore, project delay, cost overrun, accident, dispute and so on are articulated in the research by Othman, et al. (2018) and Gamil and Rahman (2017) as the impact of poor communication in the project delivery process.

Besides, in the Malaysian construction industry, most construction

projects are still adopting traditional procurement methods (Shehu, et al., 2014). However, the traditional approach would create unavoidable and excessive variation orders throughout the construction project (Abas, et al., 2015). The separation of design and project execution in the traditional way would impact the quality of the project directly as the traditional way prohibit the interflow relationship among project stakeholders. The traditional way obstructs effective communication between the consultants' and the construction team, resulting in low cost, time, and quality performance. As mentioned by Nawi, Baluch and Bahauddin (2014), poor communication, misunderstanding and low construction performance were because of the fragmentation trait of the construction sector. Moreover, Yap, Low and Wang (2017) mentioned that the design changes are one of the communication problems between the construction parties in Malaysian construction projects.

Many researchers have carried out the research on communication management based on all construction practitioners’ perspective such as study by Olanrewaju, Tan and Kwan (2017) on root causes and solutions, Gamil and Rahman (2017) on cause and effect and communication barriers by Valitherm (2014). But, there are limited studies on the contractors' perspectives on project communication management towards the construction performance. This creates a significant gap whereby the contractors' views haven't been paid attention to properly increasing productivity and performance. As the contractor firm is the only organisation to produce the paperwork into an physically touch building, they can be said to be the key to the construction project's success. Therefore, this research aims to study the communication aspects on construction performance to identify the contractors' awareness in communication management and effective strategy to enhance effective communication. Consequently, it is intelligible to research communication management at construction sites based on contractors' perspectives. As mentioned, they are the key person to enhance the likelihood of project success and allow the increases' of productivity in construction compared to other industries.

1.4 Research Aim

The main purpose of this study is to investigate contractors' perspectives on project communication aspects in the Malaysian construction industry by evaluating needs, factors of communication and exploring recommended measures to enhance communication effectiveness, which could improve project performance.

1.5 Research Questions

In this research, the research questions raised as follows:

1. Why is good communication significant in the delivery of construction projects?
2. What are the factors of communication that contribute to bad performance?
3. How to enhance communication effectiveness in the management of construction projects?

1.6 Research Objectives

So that to accomplish the research aim and research question, objectives are set as follows:

1. To identify the need for effective communication in the construction project delivery.
2. To investigate the factors of communication that influence construction performance.
3. To recommend measures to enhance communication effectiveness in the management of construction projects.

1.7 Research Methodology

Research methodology provides research credibility and results that are statistically accurate. A quantitative research methodology is employed to achieve this research's research aim and objectives. Three hundred fifteen sets of internet-based questionnaires were distributed to collect accurate, quantifiable data through the targeted respondent groups. Moreover, 120 valid

responses were received from the questionnaire survey, with a responses rate of 38.10%. There were 6 data analysis tests adopted in this study which are Cronbach's Alpha reliability test, Shapiro-Wilk test, mean test, Mann-Whitney U test, Spearman correlation test and factor analysis. These approaches were used to highlight the key communication needs, critical factors of communication and recommend measures to ensure communication effectiveness in Malaysia construction industry.

1.8 Research Scope

This study focused on the contractor's awareness of communication management at the construction site. It is also essential to find out the factors of communication that impact performance and practical strategies to enhance effective communication. This research study is limited to those Grade 1 to Grade 7 lisenced contractor's organisation including both main contractors and sub-contractors based in Klang Valley, Malaysia. The questionnaire surveys are carried out only for professional and experienced contracting parties in the project delivering process in Malaysia.

1.9 Chapter Outline

The research is designed to have five chapters. The chapter is outlined as follows:

1.9.1 Chapter 1: Introduction

Chapter 1 is an essential chapter where it is the framework for the whole research and provides the readers with a straightforward form of the research purpose and concept. The background of the Malaysian construction industry and communication management are first discussed. The problem statement section expresses the gap between the existing study and the current communication issues. This chapter has also identified and outlined the research aim, questions, objectives, and scope.

1.9.2 Chapter 2: Literature Review

Chapter 2 discusses the relation of this research to the published research study and the significant gap in this topic. In this chapter, two literature methods were adopted. First, the primary literature sources include articles, conference papers, journals, and government publications, whereas the secondary literature sources consist of textbooks and newspapers. Moreover, in the first section, effective communication was defined as good communication management in the construction industry. Next, the factors of communication at the construction site that impact construction performances were well-discussed. Lastly, this chapter revealed the potential solutions to enhance effective communication at the construction site.

1.9.3 Chapter 3: Methodology

The research methodology introduction and selection were discussed in this chapter. A systematic quantitative research methodology is used in this research. Questionnaire survey act as the research instrument was carried out through internet-based rather than paper-based or face-to-face. Three hundred and fifteen (315) sets of the questionnaire with pre-defined questions were distributed to the targeted respondents (main contractor and sub-contractors) through email, LinkedIn and WhatsApp. Six (6) statistical tests are proposed and listed under the data analysis section.

1.9.4 Chapter 4: Results and Discussion

Chapter 4 is where the data collected from the questionnaire submitted by targeted respondents were discussed and analysed using different statistical analysis tests. Data collected is presented in a structured manner in the form of bar chart and table form. The findings of this research were compared with the literature reviewed in Chapter 2. Lastly, the results obtained were used to check the achievement of the research purpose.

1.9.5 Chapter 5: Conclusion

This is the last chapter of this research. Chapter 5 purposely outlines a comprehensive summary of the overall research to the research aim, questions

and objectives. In this particular chapter, this study's limitations have also been revealed, followed by the recommendations and ideas based on contractors' perspectives are highlighted for the future researcher to improve their quality in this similar research area.

1.10 Summary of Chapter

In conclusion, this chapter has presented the background study of the research area and reviewed the significant gap with the existing research paper. After reviewing the gap and leading the research more deeply, the research aim, questions, and objectives are proposed. Moreover, the research methodology and scope are explained with the method used and the targeted respondents to collect the most accurate data for further analysis. Lastly, the outline of the chapter for this research was established so that to ensure the research area will not jump out from the framework and in a proper manner to present the data collected and achievement of the primary purpose of this research study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter studies and reviews relevant literature on communication management regarding construction performance based on local and international research. The definition and basic concept of communication management during the project delivery are discussed in section 2.2. Then, a further detailed discussion is outlined in section 2.3 to provide a rigid understanding for the readers regarding the contractor's perspective. Based on the previous literature, the communication management needs at the construction site have been summarised under section 2.4. The factors of communication that influent the contractor's performance at the construction site were further explored and discussed in section 2.5 and followed with the potential strategies to reduce the poor performance that arise due to the poor communication management during the construction process at a minimum.

2.2 Definition of Communication

It is critical to gain an early understanding of the principle of communication in order to highlight the growth of communication management in the construction industry. A transmission or exchange of information from one person to another is the meaning of communication shown in the Oxford English Dictionary. However, it might not perfectly express the actual wording and meaning of communication and may lead to the misunderstanding with other terms such as “collaboration”, “coordination and especially the “conversation” (Syed, 2015). The communication process is not only a transfer of information between the parties, but it should have the commonly meaningful information that is being transferred between the parties.

The origin of “Communication” has been developed from the Latin language “*Communis and communicare*” (Nepal, 2021). “*Communis*” is a verb with the meaning of share or communality while “*Communicare*” is a noun that is the action to make common (Nepal, 2021). Thus, "communication" is a

process of sharing information and knowledge that is truly transmitted in the same and typical manner. According to Earnest (2013), the step of exchanging information and well-understanding between speaker and receiver is the definition of communication. Besides, Velentzas and Broni (2014) also mentioned that communication is a natural social interaction whereby the communicating parties can interact with others freely. The complete cycle for the communication involves the sender organising or coding the message that wants to transfer, whereby the noise might interrupt in between the message transfer. The noise can be minimised with the communication medium or channel selected that takes place. The last step is where the receiver successfully receives the message and interprets it with the feedback that reverts to the sender. Figure 2.1 shows the illustration that communication takes place in a complete cycle.

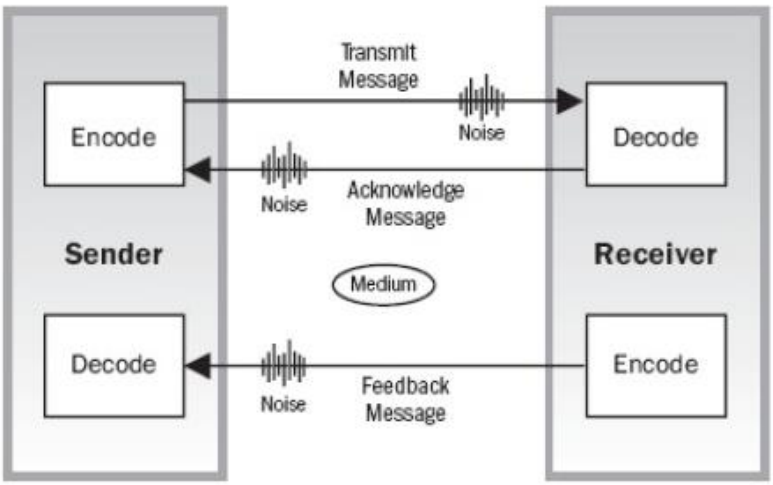

Figure 2.1: Communication Model.

Source: Project Management Institute, 2017.

Communication comes in many forms and there are verbal, non-verbal, written and visual communication. Velentzas and Broni (2014) asserted that communication could take place anywhere and anytime in life, like writing emails, meeting with colleagues, and presenting proposals or reports, which happened around day-to-day, minute-to-minute. Therefore, the communication process is not necessary to be fixed or scheduled.

In general, verbal communication is the most common type carried out in daily life. It is through the information transfer by speaking or sign language (Prabavathi and Nagasubramani, 2018). Verbal communication is classified into formal and informal communication (Velentzas and Broni, 2014). Formal communication is where conducted thru the pre-determined channel. Most of the presentations, meeting with clients and phone call discussions are formal communication with the outcomes of adequate performance of job duties (Prabavathi and Nagasubramani, 2018). The efficiency of verbal communication is vital for project success. This is because non-verbal and written communication can allow for better and more efficient verbal communication in projects such as construction projects. In comparison, informal communication is more towards chit-chatting with a friend at a café or in a room.

Furthermore, nonverbal communication involves using body language and hand posture instead of speaking to communicate (Prabavathi and Nagasubramani, 2018). This form of communication is more toward understanding the receiver's feelings when listening to speakers in a presentation (Velentzas and Broni, 2014). For example, "closed" and "opened" body language is the most obvious to understand the thoughts of receivers. Like "closed" body language will being presented with crossed arms can be reflected that the receiver might not be interested or disagree with the information stated in the presentation.

Moreover, visual communication often comes with verbal communication, the photos, sketching of the idea, the graph is attached to act as a supportive way to let the receiver understand clearly the information being transferred (Velentzas and Broni, 2014). Not every receiver will have the same idea or "picture" in mind when information is transferred. Therefore, is it beneficial to include visual communication in the verbal communication for the receiver to consume ideas and information (Velentzas and Broni, 2014). In addition, written communication is a self-explanatory form. It is thru writing down the information on a paper, email, and chatbox in every social media software (Prabavathi and Nagasubramani, 2018). Reference of meetings or discussions can be done by applying the help of written communication.

However, this form of communication has an apparent weakness. The written communication does not involve a conversational tone, so the words and sentences should be simplified and clear to the purpose of communication; otherwise, the receiver might misunderstand the communication and provide useless feedback.

There is always confusion over the concept and definition for "*Communication*" with "*Conversation*". According to AskDifference (2020), most people embrace themselves and perform good communication when they can converse. Nevertheless, it is not absolutely correct because effective communication is not just simply opening your mouth and talking or sounds heard from another one. Communication is a manner of thinking before the talk. In contrast, communication involves reorganising information with the thought in a meaningful action so the receiver can provide the targeted feedback back to the speaker. Every wording and knowledge that the speaker wishes to transmit to another must be organised wisely to get an appropriate feedback action from the receiver set in our thought. Hence, the conversation can be concluded as a simple exchange of words with the main idea of sharing it with another.

2.3 Communication Management by Contractor

In the construction project delivery, communication act as the domineering in the process of control, administrating, verification, recording and documentation (Olanrewaju, Tan and Kwan, 2017). The development of project communication management will reflect the project's outcome obviously and directly, either positively or negatively. Therefore, well planning and intelligent decisions in communication management have to be prioritised in project management. This plan can maximise the advantages and reduces the risky events that develop from ineffective communication. If the ones in a front misstep, they trigger the following.

With this in mind, communication management by the contractors becomes one of the critical issues in the project's success (Helms, 2017). As Scott (2020) reported that the contractor has spent 70% of the time on communication with other stakeholders. This is because the contractor are

always the one who acts as the significant construction stakeholder in the project delivery in term to deal with the project's client, consultants team, numerous sub-contractors, suppliers, site workers, and the most important is to inline and get control of the client's requirement. Thus, the project's contractors must perform high interpersonal skills in adopting the most appropriate communication planning (Subramaniam, et al., 2020).

Besides, according to Project Management Institute (2017), project communications management consists of three essential processes: planning, managing, and controlling. These procedures must be implemented to ensure that the project's information and stakeholders' idea demands are satisfied by creating artefacts and promoting successful information sharing by implementing the tasks designed. The project's smoothness and success must be in parallel with a clear and concise communication plan (Mavuso and Agumba, 2016). Figure 2.2 demonstrates the overview of communications management processes' activities.

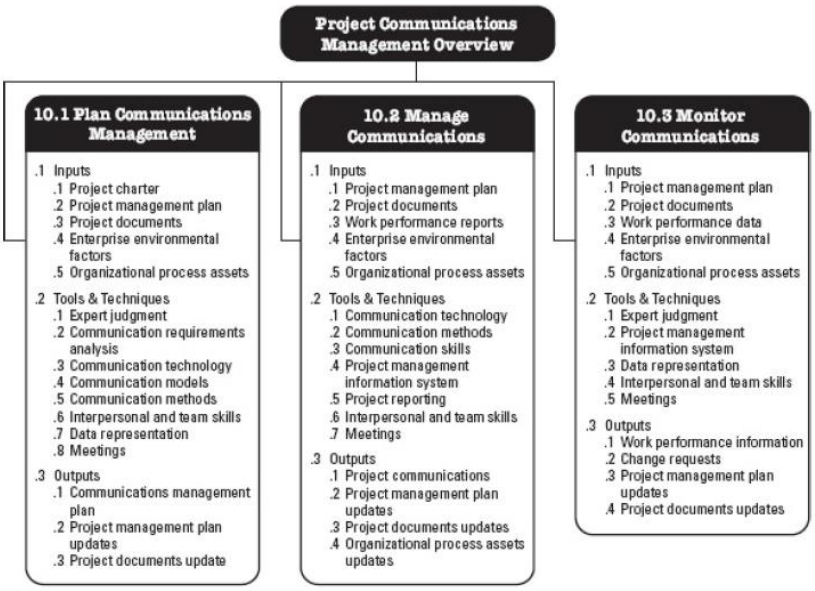

Figure 2.2: Project Communications Management Processes.

Source: Project Management Institute, 2017.

Moreover, Othman, et al. (2018) mentioned that the construction industry, with its nature complex and unique, would increase the difficulty in adopting well-planning communication management throughout the construction project. The project's complexity is because the multi-

professional parties are involved with different skills, organisational cultures and values (Othman, et al., 2018). The construction project period does not make enough for the multi-professionals from different organisations to bond up or blend into a good and smooth relationship for the project information to be transmitted accordingly. Hence, the adoption of communication management by the contractor is critical to leading the parties to be bound together so as to achieve success.

However, Subramaniam, et al. (2020) also further described effective communication in the Malaysian construction industry as being affected by a lack of adequate data channels and unreliable data exchange. Hence, contractors' communication management plan should establish appropriate and stable communication channels to make more accessible communication between construction parties. The efficiency of information refers to the speed of information flow. Only the appropriate and timely sending and receiving of information can allow project goals as a consequence. According to Khanyile, Musonda and Agumba (2019), the rate of information flow is one of the keys in communications management with a direct relationship to project outcomes.

As mentioned above, the construction project's delivery consists of multi-professional parties bonded together in a solid contractual relationship to perform their professionalism area. The sub-contractorss and suppliers are usually formed up temporary and work on the same project objective leading to the project's success. Indeed, although the sub-contractorss will only be involved in the later stage of construction progress, but the communications management measures of every party should be included in the planning stage (Subramaniam, et al., 2020). Whenever the contractor commences at the construction site, the communication management plan should be well prepared before managing and monitoring the progress (Subramaniam, et al., 2020). The project performance only can be improved when the project information is well transferred and communicated between the constructing parties, resulting in quality, cost, time and achievability. Thus, the Malaysian construction sector's inefficient communication process results in low sustainability, such as project delays, low quality of construction work and

poor safety management on construction sites (Olanrewaju, Tan and Kwan, 2017).

2.4 Needs of Communication

Although past research highlighted the benefit, the construction performance is still hit down by poor communication. However, due to the complex and unique nature of the construction project, ineffective communication has become the root of the poor performance at the construction site (Olanrewaju, Tan and Kwan, 2017). A low percentage of contracting parties has been found in the proper communication management adoption during the construction project delivery (Obonadhuze, et al., 2021). Thus, effective communication during the project's delivery is needed to achieve favourable construction performance in terms of cost, time, quality and safety.

2.4.1 Better Collaboration between Parties

The construction industry can be reflected as diversifying professionals who work together to deliver infrastructure and facilities for targeted end-users (Obonadhuze, et al., 2021). Collaboration is a meaningful way to bring these professionals together in project delivery. Goh, et al. (2014) has declared that collaboration is vital for communication between the construction stakeholders to communicate in a specific channel and precise information is being transferred. Also, Wu, et al. (2017) further highlighted that the solid multi-disciplinary partnerships with effective communication in the China construction projects had obtained a better construction performance. Communication is the basis for collaboration and cooperation to grow (Goh, et al., 2014). The parties involved include the client, consultant team, contractors, suppliers, nominated sub-contractors, and even project specialists. Obonadhuze, et al. (2021) mentioned that the stakeholders who hold the contractual agreement should act professionally in developing the professions with effective communication and collaboration skills until the project succeeds. Effective collaboration between the multi-professionals is vital whereby the parties have performed a two-way communication to exchange information and share opinions when issues are found (Obonadhuze, et al.,

2021; Mavuso and Aagumba, 2016). Subramaniam, et al. (2020) disclosed that communication has allowed the construction site parties to integrate and monitor scheduled activities on a project site.

Communication management is essential for the stakeholders to exchange information, whereby working together at all the construction stages could result in a higher yield of project success (Akinradewo and Oojo, 2019; Mavuso and Agumba, 2016; Subramaniam, et al., 2020). The multidisciplinary parties have to allow sharing of project information at all stages of the project for realising the ultimate goals (Ishaq, Omar and Yahya, 2019; Yap, et al., 2017). As Ishaq, Omar and Yahya (2019) mentioned the client and contractor significantly affect the project goal when they have better communication with better collaboration throughout the project life-cycle. Although in the traditional method, the contractor does not involve in the preconstruction period, the sharing of project information should also be done to all parties, whether they are involved or not (Ishaq, Omar and Yahya, 2019). Thus, better collaboration can be achieved as the project information is well-transferred between parties without discrepancy and conflict.

2.4.2 High-Quality Project Outcome

Othman, et al. (2018) asserted the need for effective communication in a construction project because it is tied up with the quality of the project outcome. In the construction industry, the accuracy and reliability of the project information are built on the effectiveness of information transfer and how the parties allocate the project information in the correct manner (Akinradewo and Ojo, 2019). The parties can produce high-quality construction by stimulating and managing the project information relevant to the project quality-related issue (Ishaq, Omar and Yahya, 2019). In Sweden, Ishaq, Omar and Yahya (2019) reported that the construction industry with its complex and unique characteristics, can consume lots of effort from the construction team and need to achieve the project goals. Therefore, the communication between the construction team lies a significant role in the project teams can have mutual trust and morale to work together for the client and end-user goals. Moreover, the project's quality can be established on

effective communication among the site workers (Olanrewaju, Tan and Kwan, 2017; Subramaniam, et al., 2020).

Moreover, Wu, et al. (2017) further highlighted that better communication allows the construction stakeholders to complete their tasks with high-quality performance and low chances of re-construction. Musa, Omar and Ishaq (2018) reported that one of the benefits of Building Information Modelling (BIM) as an advanced communication tool could allow the construction activities to be completed in high performance, high quality, on time and on budget. This is because the construction parties can foresee the problems in each of the progress scheduled by the contractor and resolve them at the earlier stage with the client's satisfaction with quality (Musa, Omar and Ishaq, 2018).

2.4.3 Good Problem Solving

Communication management planning acts as the first step to developing a proper methodology and planning for project communications activity focused on each stakeholder's information demands, organisational assets, and project requirements (Project Management Institute, 2017). Effective communication in the diversity of professionals allows the parties to have the opportunity to receive, discuss and feedback on the matter found during construction (Akinradewo and Ojo, 2019). Hence, allow the more reliable information used for them to solve the problem that arises (Subramaniam, et al., 2020). In addition, the problem-solving step needs to include different professional parties because the expert information and knowledge that can help to have a better outcome solution (Olanrewaju, Tan and Kwan, 2017).

Also, further declared by Goh, et al. (2014), the construction stakeholders with the project information could communicate effectively as the frequency, attribute, scope and information transmission are correct and symmetrical among the project parties. As further mentioned by Yap, et al. (2018), regular site meetings as one of the solutions to effective communication management are essential in the problem-solving procedure. During the site meetings, the project contractor and site workers communicate in the same channel to examine problematic areas, comment on quality

concerns, evaluate mock-ups, and so on could generate a suitable solution for the respective issue found. In Japan, the construction industry has proved this by attributing effective communication to the parties' problem solving, especially between contractor and sub-contractor (Ishaq, Omar and Yahya, 2019). Moreover, BIM allows the parties to have more visual ideas on the construction project even though the project has not commenced at the construction site with a better solution outcome to overcome the foreseen issue (Musa, Omar and Ishaq, 2018).

2.4.4 Better Control on Client Budget

Without suspicion, the project contractor act as the major party in the effective communication to enhance better control of the client's budget (Goh, et al., 2014). Delivery of project within client budget is prior to client's satisfaction (Subramaniam, et al., 2020). Effective communication in a construction project can allow for better construction performance, with up to 80% of the project completed on the client budget (Olanrewaju, Tan and Kwan, 2017). In fact, communication act as the bridge to link the construction parties together and strengthen the connection between them for the project goals to be achieved within project cost (Akinradewo and Ojo, 2019). Effective communication can promote better planning and scheduling by the contractor for the working program of construction works (Berenger and Justus, 2016; Olanrewaju, Tan and Kwan, 2017). In Taiwan construction industry has found out that the project time can impact the project cost; hence, well-planned activities can ensure the client's budget (Yap, et al., 2018). The contractor with adequate information can adopt proper planning and scheduling of schedule that can guide the project's client with better financial planning and enhance the material and labour availability when required (Olanrewaju, Tan and Kwan, 2017). Besides, information for ordering and payment supplies can be well-coordinated by the different parties through effective communication. Somehow, the ordering and payment of materials often arise with the cost overrun with the lousy information transfer between the different construction parties (Olanrewaju, Tan and Kwan, 2017). Wu, et al. (2017) mentioned that past studies proved that BIM acts as a communication tool that can promote

effective communication with accurate and reliable data being transferred. Moreover, BIM can reduce the cost of the building and its targeted functionality with more extraordinary building design and enhance sustainability (Musa, Omar and Ishaq, 2018).

2.4.5 Better Long-term Relationship

Obonadhuse, et al. (2021) asserted that a successful construction project relies on the client-contractor, contractor-sub-contractors and multi-professional parties' relationship quality. The term relationship between the contracted parties depends on the degree of closeness and smoothness of project information transmission during the project's delivery. As Ishaq, Omar and Yahya (2019) mentioned, effective communication with sharing, collating, integrating and collaborating of information allows the relationship between the parties, especially the client and contractor, to be prolonged and structured. Indeed, the communication management would allow mutual trust between parties to be firmed as the project is ongoing and reflected in the long-term relationship. Olanrewaju, Tan and Kwan (2017) affirmed that effective communication can improve the relationship between construction parties in the long term. Besides, Ishaq, Omar and Yahya (2019) also discussed in their study that interpersonal relationships are developed with personal communication skills. Then, effective communication is vital for the multi-disciplinary team to manage their expectations, misconceptions, and misgivings. Thus, a strong relationship between the construction parties could be achieved through effective communication strategies in a complex and heavy construction project (Ishaq, Omar and Yahya, 2019).

2.4.6 Better Project Time Control

The adoption of effective communication in the construction industry would enable projects execute five times faster than not doing so (Olanrewaju, Tan and Kwan, 2017). With the adoption of well-planned communication management and communication effectively, the construction project can be completed on time-specific in the contract document without any delay, reducing the chances to incur liquidated damages to the project's contactor

(Olanrewaju, Tan and Kwan, 2017). The progress of construction activities execution smoothly and correctly as effective communication is involved in transferring project information. In light of this, material delivery progress, design issue, and affirmed working schedule are well-prepared with effective communication management due to the low chances of project delay (Gamil and Rahman, 2017). Project completion on time is one of the criteria for end-user satisfaction whereby is reflected in the successfulness of the construction project (Akinradewo and Ojo, 2019). Subramaniam, et al. (2020) further mentioned that effective communication could have better collaboration between the construction parties and better problem-solving skills. Therefore, it can fasten the construction progress with lesser interruption if unnecessary issues arise and reduce the project completion time. Plenty of project information from each construction party that communicates to the contractor can allow the contractor to prepare the most efficient work programme and reduce the chance of delay in the project (Akinradewo and Ojo, 2019).

2.4.7 Enhance Labour Productivity

Effective communication is pressing in a construction project (Olanrewaju, Tan and Kwan, 2017). Workers' productivity significantly impacts working efficiency in the construction industry if it emerges between the client and contractor (Ishaq, Omar and Yahya, 2019). Then, effective communication shows a positive relationship with the working efficiency of the parties. The Kingdom of Saudi Arabia's construction industry has found that communication management significantly impacts labour productivity (Ishaq, Omar and Yahya, 2019). Better means of information transfer and analysing between the parties can improve the project's productivity (Ishaq, Omar and Yahya, 2019). Because effective communication promotes the involvement of the two-way communication skill and affects parties' satisfaction with activities and work productivity.

Moreover, the productivity is enhanced with the adoption of communication management throughout the construction project with the changing of parties' perspectives, negative thinking, and unethical moral value, strengthening the workforce from each party (Mavuso and Agumba, 2016).

Well-coordinated information transmission and transfer between parties show positive productivity. The material is delivered on-site with the specification required and on time and low chance of error in the rework and delay (Olanrewaju, Tan and Kwan, 2017). Poor resources management at construction and poor works completion would not assist the firm and structured communication management (Mavuso and Agumba, 2016). Furthermore, as Ishaq, Omar and Yahya (2019) declared, effective communication can prevent the withdrawal of the construction parties from the project and hence would not affect productivity.

2.4.8 Reduce Conflict

As described by Wu, et al. (2017), conflicts a common occurrence found among the multi-professionals because of the divergent view of the parties to the project goals. Effective communication among the construction parties leads to an oblivion procedure of conflict during the construction project (Ishaq, Omar and Yahya, 2019). In addition, when the parties communicate effectively, mutual trust and open communication are carried out between the parties throughout the construction project in enhancement. Besides, the construction parties would not misunderstand each other's perspectives to facilitate teamwork between them (Wu, et al., 2017). Design error and worker demotivation do not occur when good communication between the consultant and contractor teams is adopted (Ishaq, Omar and Yahya, 2019). In a procurement construction project, the sharing and managing of the project information are communicated and transferred to others efficiently and effectively (Ishaq, Omar and Yahya, 2019). If the conflict happens, the client may lose up to 5% of the project cost for resolving the conflict (Wu, et al., 2017). Conflict in construction projects usually happens between different organisations as the difference in culture and lack of trust. Effective communication is a bridge between different organisations and the exchange of project information and reinforces the dependency on each other to achieve the joint project goals (Akinradewo and Ojo, 2019).

2.4.9 Enhance Safety Performance

The construction site has been classified as a risky and dangerous environment with a high chance of accidents and injuries (Skeepers and Mbohwa, 2015). The construction industry covers a wide range of activities starting from the piling to installation work. As mentioned by Skeepers and Mbohwa (2015), communication strategically enhances the construction industry's safety performance. Having said that, the construction sector’s application of information and communication technology (ICT) could be enhanced and improved as the base for safety performance (Musa, Omar and Ishaq, 2018). As the BIM is one of the most effective communication tools adopted in the current construction industry with the benefit of improving the safety throughout the construction project. Effective communication through BIM adoption would allow the construction parties to foresee the safety issue in visualisation at the design stage (Musa, Omar and Ishaq, 2018). BIM take the priority in the ICT that can be used by the construction parties to adopt a safety leadership (Skeepers and Mbohwa, 2015).

2.4.10 Manage Change

The changing of communication tools can enhance project information transfer throughout different parties and projects. The effective communication can drive the change of communication tools from the traditional become ICT. Berenger and Jutus (2016) declared in the traditional procurement project that the traditional communication tools such as face-to-face and 2D paperwork are prior to the transfer of information. Widespread ICT adopted in the construction industry is BIM. Hatem, Naji and Alkreem (2018) highlighted that BIM as the communication tool has a more remarkable performance in communication management with the best solution for the construction project network.

Table 2.1: Literature Map for Needs of Effective Communication in Construction Project.

Ref	Needs	Gamil and Rahman (2017)	Othman, et al. (2018)	Mavuso and Agumba (2016)	Ishaq, Omar and Yahya (2019)	Olanrewaju, Tan and Kwan (2017)	Subramaniam, et al. (2020)	Obonadhuze, et al. (2021)	Goh, et al. (2014)	Berenger and Justus (2016)	Yap, et al. (2018)	Wu, et al. (2017)	Akinradewo and Ojo (2019)	Musa, Omar and Ishaq (2018)	Hatem, Naji and Alkreem (2018)	Yap, et al. (2017)	Skeepers and Mbohwa (2015)	Total
N1	Better collaboration between parties			√	√		√	√	√	√		√	√			√		9
N2	High quality project outcome		√		√	√	√					√	√	√				7
N3	Good problem solving				√	√	√				√	√	√	√				7
N4	Better control on client budget					√	√		√	√			√	√				6
N5	Better project time control	√				√	√				√		√					5
N6	Better long-term relationship				√	√	√											3
N7	Enhance labour productivity			√	√	√												3
N8	Reduce conflict				√							√	√					3
N9	Enhance safety performance													√			√	2
N10	Manage change									√					√			2

2.5 Factors of Communication

The construction performance can be examined from different perspectives, such as quality, costing, timing and safety. A successful construction with high performance should have a high-quality product outcome with minor defect works, completed in time, within the client's budget and with minimum risk to happen the construction accidents. However, the construction performance is challenging due to the poor communication at the construction site. A variety of factors may obstruct communication and hinder overall comprehension and interpretation of project information. The factors communication that lead to low performance at the construction site are addressed in the following section.

2.5.1 Adversarial Culture

Luong and Watanabe (2017) mentioned that culture is one of the critical success factors because a wide range of project stakeholders are involved throughout the entire construction process. The construction communication becomes more complex as project stakeholders' involvement increases (Olanrewaju, Tan and Kwan, 2017). Each of them will act differently on their behaviours and attitudes toward different cultures in terms of religion, educational level and professionalism in the construction activities (Emuze and James, 2013; Mavuso and Agumba, 2016). Also mentioned by Antonio and Senol (2012), effective communication becomes problematic to be adopted as project culture becomes complex due to the complex communication environment (Othman, et al., 2018). Moreover, adversarial culture forms an unnoticeable barrier to collaboration (Hosseini, et al., 2016; Memon, et al., 2015). The Norwegian construction industry reported a decline in productivity and performance due to the construction project's adversarial culture (Hosseini, et al., 2016; Memon, et al., 2015).

Significantly, the culture of the main contractors of a specific construction project would play a vital role in project outcomes (Luong and Watanabe, 2017). The study by Luong and Watanabe (2017) believed that interpersonal communication problems would arise due to cultural differences disregarding the project objective. When the different cultural parties bond together, tension could arise knowingly or unknowingly among other parties

because the construction parties are not used to dealing with each other before (Othman, et al., 2018).

2.5.2 Complexity of Construction Project

The construction industry is a complex trade with multi-professional stakeholders working together with the same goals to achieve the project success in temporary mode until the project's end (Olanrewaju, Tan and Kwan, 2017; Othman, et al., 2018; Subramaniam, et al., 2020; Wu, et al., 2017). The multi-professionals stakeholders with weak relationships form the barrier to the transmission of information (Othman, et al., 2018). Indeed, in the external environment, different professional stakeholders come from different organisations, which increases the complexity for them to interact and exchange professional information (Ebenezer, 2019). On the other hand, the internal environment of the same organisation's team is quite complex because they form up as a team for a different construction project (Ebenezer, 2019). The unique characteristic of the construction industry creates a complex communication environment and process. As a matter of fact, the poor communications process happens with complexity in the construction industry worldwide (Obonadhuze, et al., 2021; Subramaniam, et al., 2020).

Besides, according to Gamil and Rahman (2017), negative factors of communication lead to poor performance in the construction industry. Consequently, the delay has happened in the form of lagging in information transfer in the complex project. Ochieng and Price (2010) further disclosed that the chances for the project's failure arise when the cultural complexity in the construction project is found, and the impact of those issues arise. Hence, the complexity of construction projects is a significant factor that might continuously impact the project performance and catch the construction stakeholders off guard.

2.5.3 Language Barrier

Mandarin, English, and Malay are the common languages used in the Malaysian construction industry's documentation, communication, and agreement. However, the Malaysian construction sites are full of site workers

from Bangladesh and Nepal who do not speak the common language used fluently (Valitherm, 2014). This situation has acted as an obstacle for the contractor or sub-contractor to transfer the project information and progress for site workers to perform the works smoothly (Ishaq, Omar and Yahya, 2019; Obonadhuze, et al., 2021; Subramaniam, et al., 2020). The language spoken by them cannot be easily interpreted and understood by the site workers. Hence, Valitherm (2014) stated that safety and quality issues would arise when site workers' language is not interpreted well. On the contrary, language barriers to implementing adequate work safety on construction sites (Harikrishnan and Manoharan, 2016). No more than that, the language used between site workers can also lead to the work not being done in the correct manner (Olanrewaju, Tan and Kwan, 2017).

Moreover, Othman, et al. (2018) indicated that Jargon's application in the communication process could lead to misunderstanding of the information transferred. Although the contractor or sub-contractor understood the meaning of Jargon in their sentences, they have forgotten that the site workers are not professionals like them, and site workers will misinterpret the meaning and carry out the work that is wrong in manner. Subsequently, this results in low quality of work and the re-construction process need to be conducted after inspection.

2.5.4 Slow Information Flow

Emuze and James (2013) mentioned that the construction project is being classified into different phases to suit the respective construction activities to be commenced in the realisation of the construction project. The well-performed activities are bridged to the communication process with smooth information flows (Emuze and James, 2013). The slow information flow can enlarge the gaps between the actual end-product in terms of performance and the client’s expectation (Cheung, et al., 2013). In addition, the flow of information is the brilliant middleman in the construction project because construction projects require highly trust among stakeholders to achieve good project performance relationships (Cheung, et al., 2013; Ishaq, Omar and Yahya, 2019). Therefore, the slow information flow would likely have a lousy

project performance, such as unsatisfied quality, overrun in project time and cost (Cheung, et al., 2013). Lack of speedy flow of information, the project stakeholders, cannot have a better economic decision when problems arise throughout the construction activities. The respective shareholder has to bear a high risk of delaying time and costly activities (Cheung, et al., 2013; Mavuso and Agumba, 2016).

2.5.5 Unclear Objective

Challenges for project success link the construction activities to the project objectives (Mavuso and Agumba, 2016). In early construction, the client is the leading person who speaks and sets the whole construction project objective and all the project stakeholders. The unclear objective refers to the project stakeholders having a lack of idea of the specific goals that are aimed to be achieved (Othman, et al., 2018). Besides, according to Cheung, et al. (2013), when an unclear objective occurs in construction progress, the project information exchange process is considered improper. The change in project objective is unable to be understood by the project stakeholders. The information transmitted is deemed abnormal to perform the correct construction activities in progress (Cheung, et al., 2013; Othman, et al., 2018). Therefore, changing the project's objective would resulting the contractor having to make changes to the working programme. This is because the fuzzy objective set would be the same as the unclear working scope mentioned by the client and would lead to dragging activities to another (Harikrishnan and Manoharan, 2016). Hence, the project will be delayed and overran in the budget due to the low construction productivity.

2.5.6 Lack of effective communication technique

According to Sambasivan and Yau (2007), the contractor acts as the major party related to the construction performance, especially when the project is completed on time and within budget. Construction progress and project information should be transferred effectively between various parties (Subramaniam, et al., 2020). Othman, et al. (2018) and Obonadhuze, et al. (2021) stated that although the communication was carried out at the

construction site between various parties, the outcomes of the communication process were not practical due to the timing and quality of the communication process is low. "One's ability falls short of one's wishes" every construction party desires to have an excellent and smooth project, but ineffective communication techniques will only bring negative performance in construction (Obonadhuze, et al., 2021; Othman, et al., 2018).

The questionnaire result of Gamil and Rahman (2017) was highly studied and proven by the previous research as the result of poor construction performance when ineffective communication occurred during the construction stage. Besides, the ineffective communication technique such as the communicating parties did not pay attention, does not give appropriate feedback and will express the performance either directly or indirectly (Ishaq, Omar and Yahya, 2019). The misinterpretation of information would result in a low quality of communication whereby the receiver cannot understand and perform the work accurately (Ishaq, Omar and Yahya, 2019; Olanrewaju, Tan and Kwan, 2017). This would lead to a problem posed at the construction site by site workers to the project's failure because of significant defects in work or low quality of project outcome.

2.5.7 Lack of Communication Management Plan

Mavuso and Agumba (2016) indicated that the catalyst for the development of the construction project management is communication management; without this, the construction project will not have maximum productivity outcome for every construction project (Ishaq, Omar and Yahya, 2019). Clear and direct communication plan preview how the communication affects the project flow (Mavuso and Agumba, 2016). The construction industry can be classified as a prominent business process that involves multiple stakeholders with different professionals working together in a temporary mode until the construction project ends (Subramaniam, et al., 2020). All the transfer of project information and interpretation has occurred between these various professional parties through a favourable communication management plan (Subramaniam, et al., 2020). Obonadhuze, et al. (2021) mentioned that contractors play a vital role in communication management. As a contractor needs to communicate

thru internally and externally when the commencement of the project at a construction site. By adopting communication management, the collaboration is increased to deliver the best outcome for the project's needs. Favourable communication management leads to the project's success as all parties involved understand and perform the work well (Obonadhuze, et al., 2021; Subramaniam, et al., 2020;).

In Nigeria, research by Tipili, Ojeba and Muhammad (2014) found that the major cause of the failure of the project was due to the ineffective communication management throughout the whole project lifecycle, especially the client's budget will overrun. In other words, poor communication management is a sign of an unsuccessful project outcome because the information transfer between the parties is unsuccessful and incomplete to produce the desired quality, on time and within the budget (Othman, et al., 2018). In different procurement methods of the construction project, the contractor will show the different levels of involvement. Nevertheless, the communication management plan should be developed from the start until the end of the project as the information is exchanged in all the construction stages (Obonadhuze, et al., 2021; Subramaniam, et al., 2020).

2.5.8 Improper Communication Time Management

Cheung, et al. (2013) mentioned that the timely project information would benefit the construction performance; otherwise, it would affect the activity's progress. The construction team needs to receive the information as per the construction activities from the person who supervises them, usually the contractor (Harikrishnan and Manoharan, 2016). Communication allows the information to be communicated correctly to achieve the desired outcome (Mavuso and Agumba, 2016). The information transferred and received in the correct timeline would maximise the project outcome. However, it is frequently to have an issue of message overload whereby the receiver, usually the site workers receive too much of the project pieces of information simultaneously, and the message cannot be interpreted and understood by site workers (Yakubu, et al., 2015).

2.5.9 Frequent Changes to Contract

Change in project contract is due to the poor communication between the project stakeholders, resulting in lousy construction performance (Gamil and Rahman, 2017). Design change considers one of the changes made to the project contract after the project has been awarded to the successful contractor from a competitive bid (Abdul, Wang and Yap, 2017). In fact, the working method, procedure and material involved would change as the design change. Therefore, the frequent change of project contract would result in project delay and overrun in the budget due to the change in working method and material used (Ibbs, 2012). As Abdul, Wang and Yap (2017) mentioned, design change often occurs between poor communication between client and architect for project objective and the client's want. This would result in about five (5) to eight (8) percent of the contract cost arising and elongating the contract period. This communication factor affected the main contractor, whereby the construction progress was unstable and re-work might be incurred (Abdul, Wang and Yap, 2017; Olanrewaju, Tan and Kwan, 2017).

2.5.10 Lack of Mutual Respect and Trust

Othman, et al. (2018) described trust as built on the hierarchy of honesty. In a multi-professionals construction project, trust is essential to affect the outcome of the project. In the construction project, all of the construction team, such as architects, engineers, contractors, sub-contractors, suppliers, and many more, are mutually working together with the same goal, which is to achieve the high productivity of the construction project. These various parties form up within the project timeframe, and they might not know each other well before the official contractual document.

Furthermore, research results from Ishaq, Omar and Yahya (2019) prove that the trust between the main parties, client and contractor, can boost the level of success of the project as they can communicate effectively for the information to be transferred from one party to another. Moreover, the questions and conflicts are reduced as trust is formed (Ishaq, Omar and Yahya, 2019). In turn, the failure of the construction project is majorly due to the lack of trust between the client and contractors. As more and more arguments and

conflicts occurred during the communication (Ishaq, Omar and Yahya, 2019). In the international project, multi-professionals can increase the mistrust as different cultures and backgrounds are brought into a construction project, increasing the difficulty of achieving the high productivity of construction performance. Trust should be involved in every communication process, especially in team meetings (Subramaniam, et al., 2020). The decision making is to select the best option in the form of performance for construction, which will affect the cost and quality of the chosen material or method. Besides, Ishaq, Omar and Yahya (2019) mentioned that the communication failure between two parties is because of the unwillingness to associate and trust each other in order to achieve the project goals.

2.5.11 Unethical Behaviour

According to Olanrewaju, Tan and Kwan (2017), unethical behaviour is one of the harmful consequences when project stakeholders do not perform effective communication and have been proved through the research study by Gamil and Rahman (2017). In a specific case mentioned by Antonio and Senol (2012), the ethical behaviour of the main contractor and client might have a favourable or negative impact on the successful completion of a project. The construction site involves project engineers, contractors, and site workers, either skilled or non-skilled. They should be motivated and treated equally no matter their work performed and how much they get paid (Antonio and Senol, 2012). Each project stakeholder has its own code of ethics frame from their professions (Kumar, 2011).

The client-related factor mostly happens in the Malaysian construction industry, such as paying completed work to contractors (Sambasivan and Yau, 2007). Although the contract document signed between client and contractor had stated the maximum period for the client to pay for the contractor. Nevertheless, the client will act unethically to drag the payment for the contractor and give out some unreliable comments on the claimed money. Hence, the payment dragging would force a slowdown in progress as the contractoring parties has not had enough cash flow for the onward activities (Sambasivan and Yau, 2007).

Moreover, the stakeholder with unethical behaviour would transfer the project information in an unreliable channel or medium and project information that is totally incorrect. (Antonio and Senol, 2012; Othman, et al., 2018). The unethical behaviour among the project stakeholders would also unintentionally lead to the safety issue among site workers (Skeepers and Mbohwa, 2015).

2.5.12 Lack of Support for Advanced Technology

According to Mavuso and Agumba (2016), effective communication can be achieved internally or externally using appropriate communication technologies. The lack of advanced technologies in the communication process will affect an isolated and excluded from global economic activity (Mavuso and Agumba, 2016). Moreover, Obonadhuze, et al. (2021) described the exclusion of the needed support for advanced communication technology adoption by the contractor as can impact how managerial functions are discharged. The transmission of project information can be continuous if the involvement of advanced technology can be achieved (Othman, et al., 2018). A high degree of vital information transfer through advanced technology can maintain the construction performance in terms of reduction in cost, wasted time, and minimising the risk of accidence.

Continuity used of the old communication technologies is the barrier to high performance in construction projects because of the ineffective communication between the multi-professional parties (Obonadhuze, et al., 2021). In Iraq, Hatem, Naji and Alkreem (2018) prove that the percentage result of computational-mediate-communication has a higher percentage than traditional communication (face-to-face) in the productivity of construction progress. The advanced communication technologies reduce the wasted time and expenses when problems arise in the construction phase (Hatem, Naji and Alkreem, 2018).

The construction industry acts as a labour-intensive industry, but the involvement of advanced communication technology has been delayed compared to the manufacturing industry (Ebenezer, 2019). Old and weak

communication might not afford to translate and totally transfer the information as the whole construction project generated entirely of data.

2.5.13 Different Level of Education

According to the research by Gamil and Rahman (2017), Obonadhuze, et al. (2021) and Subramaniam, et al. (2020), this factor have been proven by them as the matter will impact the project outcome. The level of education in incompatible creates a provoked communication environment to be carried out smoothly and successfully (Othman, et al., 2018). Additionally, the involvement of essential stakeholders such as engineers, contractors, and site workers is the vital parties that always carry out the communication process for the project progress to continue going on. Nevertheless, the educational gap between them is obviously seen (Othman, et al., 2018). Usually, the engineer and contractor act as the educational parties to communicate with the uneducational site workers. However, the site workers without technical training and experience cannot understand the process or essential information for the construction works to be performed. Although the sentence and language have been simplified by the higher educational parties to the lower educational parties, it might still not be absorbed and analysed by the lower educational parties, site workers. Hence, Othman, et al. (2018) stated the performance would be reduced as these issues cannot be overcome throughout the construction project.

According to Olanrewaju, Tan and Kwan (2017), the site workers can also learn some technical information that would increase the performance and productivity of construction projects but is not thru the elevated platform. No one among the site workers can ensure that they had learned the correct knowledge from the informal platform, and they maybe will mistakenly think it was correct and use it in the subsequence construction progress (Olanrewaju, Tan and Kwan, 2017).

2.5.14 Poor Communication Skills

Communication skills are interpersonal skills that significantly affect the success rate of the construction project (Ishaq, Omar and Yahya, 2019;

Mavuso and Agumba, 2016). Especially for international construction projects, contractors must have strong communication skills to lead the project's success (Obonadhuze, et al., 2021). Poor communication skills have been recorded as the third most frequent causative factor in the construction industry (Gamil and Rahman, 2017). According to Mavuso and Agumba (2016), communication medium and communication skills are essential in construction performance. With powerful and advanced communication medium but poor communication skills, the information also cannot be fully transferred to the receiver. Mavuso and Agumba (2016) mentioned that Garen argued that the communicator with poor communication skills might question himself or ignore the feedback completely. The poor communication skills of the sender are that the original meanings and original goals cannot be achieved. At the same time, the receiver is unable to revert the feedback in coordinated sentences well in the communication process (Mavuso and Agumba, 2016).

According to Olanrewaju, Tan and Kwan (2017), poor communication skills are often found in the site workers, and the foreign site workers hold a large percentage at the construction site. However, the site workers with poor communication skills are unable to produce high-quality construction works that complete on time and within the client's budget. The performance can only be increased based on the productivity of site workers.

2.5.15 Impropriate Communication Channels

As mentioned by Subramaniam, et al. (2020), impropriate communication channels resulted in low performance in the construction industry. In the impropriate communication channels, unreliable data is being transferred, and the desirable feedback cannot be well transmitted and interpreted by the sender (Subramaniam, et al., 2020). The team meeting discussion is the central problematic communication channel that leads to the low productivity construction project as the factors of communication have happened (Subramaniam, et al., 2020). Furthermore, the impropriate communication channels can produce full of a conundrum. Once and for all, the communication process is affected and negatively affects outcomes (Kjanyile, et al., 2019; Othman, et al., 2018). From the project initiation, all of the

shareholders should produce an agreed channel as the absence of satisficed medium can denote the failure in information transfer and arrival (Othman, et al., 2018).

According to Obonadhuze, et al. (2021), the impropriate channel can be presented with noise and a lousy communication medium. When noise is interrupted thru the message transfer, the original meaning from both parties can be twisted and lead to low quality in transmission and weak feedback.

2.5.16 Stressful Working Environment

Lack of concentration and low physical responses signify the high working stress at the construction site (Olanrewaju, Tan and Kwan, 2017). The assigned site workers with overloading work activities would result in high stress and affect their productivity as they cannot interpret and work out the information passed to them effectively. On the contrary, the construction site workers with high working pressure are due to the untimely information that was informed to them. They have to work overtime just as requested by the client or main contractor to complete the project on time (Yakubu, et al., 2015). Bridge back, overtime and lack of resting time on the site workers would increase the working stress by about 50% said to Olanrewaju, Tan and Kwan (2017). The low productivity and low performance are the results of the working pressure of on-site workers (Olanrewaju, Tan and Kwan, 2017). The chance of having a mistake in the construction activities did increase that, caused by work pressure and stress, hence the mistake resulting in low-quality outcomes (Othman, et al., 2018).

2.5.17 Poor Feedback

Othman, et al. (2018) described feedback in a communication process as an act of response whereby the message has been sent to the receiver, and the receiver reverts the required information to the sender. Without feedback in the communication process, it should be classified as an incomplete communication cycle. Poor feedback can also translate into the failure of the communication process between both parties.

Usually, poor feedback is found in the ineffective communication process in the construction project (Obonadhuze, et al., 2021). The poor feedback has the characteristic of low quality and bad timing. Quality of information directly relates to the performance in construction projects (Obonadhuze, et al., 2021). Whereby low quality of information and low performance are recognised throughout the project lifecycle. When the communication is urgent with the required feedback information, the timing and quality of feedback from the receiver are vital for the effective communication process to carry out (Othman, et al., 2018).

2.5.18 Inaccessibility of Information

The construction project is unique and involves plenty of information that is widely spread among those project stakeholders such as clients, consultants, contractors and labours (Gamil and Rahman, 2017). None of them can work independently to perform the whole construction work (Harikrishnan and Manoharan, 2016). However, design revision tends to increase project stakeholders' requests for the latest information regarding specifications, drawings updated with client's needs, and guidelines. As Khahro and Ali (2014) mentioned, the lack of accessibility information could lead to a conflict among the parties. They cannot perform the construction activities with accurate and reliable data from other major construction parties. According to Harikrishnan and Manoharan (2016), this issue happened in Asia more frequently compared to America and Europe. This trend reflects that the proper accessibility of information has become a factor for various stakeholders to perform well in construction projects (Harikrishnan and Manoharan, 2016).

2.5.19 Knowledge Hoarding

Su (2020) described knowledge hoarding as the knowledgeable person willing or non-willing to share the information and knowledge they own with others in the future. In China, the Chinese culture would much prefer to keep rather than share. Hence, the project information cannot be widely spread to all construction stakeholders (Wu, et al., 2017). However, it is not easy and non-practically to have an extensive knowledge hoarding person in a specific

construction project (Yap and Toh, 2019). This is consistent with the research by Wei and Miraglia (2017) in the U.K. only in a collaborative manner of the construction project the problem of knowledge hoarding can be mitigated (Yap and Toh, 2019). Effective share of the knowledge gained would enhance the better performance of construction activities and reduce construction costs as the project time can be shortened (Su, 2020).

2.5.20 Lack of Open Communication

Lack of open communication resulted from Ishaq, Omar and Yahya (2019) as the poor communication between client and contractor and agreed by the respondents through the questionnaire. The lack of open communication indirectly forms a barrier for two parties to communicate well (Ishaq, Omar and Yahya, 2019). The reason for this statement from Ishaq, Omar and Yahya (2019) was supported by Konrad, as both parties cannot express their view on the issue or problem from the construction site, hence affecting the interaction and communication by both parties. The communication parties did not open widely to show their prior view and comment whenever they intended to improve the performance of construction works.

Table 2.2: Literature Map for Factors of Communication that Impact on Construction Performance.

Ref	Factors of Communication	Gamil and Rahman (2017)	Othman, et al. (2018)	Mavuso and Agumba (2016)	Valitherm (2014)	Ishaq, Omar and Yahya (2019)	Olanrewaju, Tan and Kwan (2017)	Subramaniam et al. (2020)	Obonadhuze, et al. (2021)	Sambasivan and Yau (2007)	Kjanyile, et al. (2019)	Ebenezer (2019)	Wu, et al. (2017)	Ochieng and Price (2010)	Harikrishnan and Manoharan (2016)	Khahro and Ali, (2014)	Cheung, et al. (2013)	Emuze and James (2013)	Yakubu, et al. (2015)	Abdul, Wang and Yap (2017)	Antonio and Senol (2012)	Ibbs (2012)	Hosseini, et al. (2016)	Memon, et al (2015)	Total
F1	Adversarial culture	√	√	√		√	√	√	√	√	√		√	√				√			√		√	√	15
F2	Complexity of project	√	√			√	√	√	√			√	√				√	√	√	√					12
F3	Language barrier	√	√		√	√	√	√	√						√	√		√	√		√				12
F4	Slow information flow	√		√		√		√	√		√	√	√				√	√							10
F5	Unclear objective	√	√			√		√	√			√	√		√										8
F6	Lack of effective communication technique	√	√			√	√	√	√	√										√					8
F7	Lack of communication management plan	√	√	√		√		√	√		√						√								8
F8	Improper communication time management	√	√	√			√		√		√				√		√								8
F9	Frequent changes to contract	√					√		√	√		√	√							√		√			8
F10	Lack of mutual respect and trust	√	√	√		√		√							√				√						7

Table 2.2: Literature Map for Factors of Communication that Impact on Construction Performance (Cont'd).

Ref	Factors of Communication	Gamil and Rahman (2017)	Othman, et al. (2018)	Mavuso and Agumba (2016)	Ishaq, Omar and Yahya (2019)	Olanrewaju, Tan and Kwan (2017)	Subramaniam, et al. (2020)	Obonadhuze, et al. (2021)	Kjanyile, et al. (2019)	Ebenezer (2019)	Wu, et al. (2017)	Ochieng and Price (2010)	Hatem, Naji and Alkreem (2018)	Harikrishnan and Manoharan (2016)	Khahro and Ali (2014)	Cheung, et al. (2013)	Emuze and James (2013)	Su (2020)	Yakubu, et al. (2015)	Antonio and Senol (2012)	Skeepers and Mbohwa (2015)	Kumar (2011)	Yap and Toh (2019)	Wei and Miraglia (2017)	Total
F11	Unethical behaviour	√	√			√	√													√	√	√			7
F12	Lack of support of Advanced Technology	√	√	√			√	√		√			√												7
F13	Different level of education	√	√			√	√	√									√			√					7
F14	Poor communication skills	√		√	√	√		√												√					6
F15	Impropriate communication channel	√	√				√	√	√					√											6
F16	Stressful working environment		√			√		√		√	√								√						6
F17	Poor feedback		√					√							√				√						4
F18	Inaccessibility of information	√					√							√	√										4
F19	Knowledge hoarding																	√					√	√	3
F20	Lack of open communication				√											√									2

2.6 Effective Strategies for Effective Communication

As the effect of communication factors rises in the Malaysian construction industry nowadays, practical strategies must be adopted and implemented to address the factor of communication that impacts the performance in the Malaysian construction industry. The potential strategies that enhance effective communication at the Malaysian construction site are addressed in the following section.

2.6.1 Adoption of ICT

Kwofie, et al. (2020) asserted that ICT tools are better communication tools in the construction industry in the future. In fact, from the feasibility, planning, design, construction, and even the completion throughout the project, the transmission of information is an essential factor for achieving the project's goal. Drawing has been recognised as a weak communication tool in the current construction industry as its impact on cost, time and quality performance (Akinradewo and Ojo, 2019). The ICT tools allow the improvement communication process that benefits all stages and phases of the project (Ishaq, Omar and Yahya, 2019; Premdilip and Uma, 2020; Yang, Ahuja and Shankan, 2007). The use of ICT, such as the "Electronic Data Interchange" (EDI) or "Electronic Data Management System" (EDMS), creates a shared database for project information transfer among construction stakeholders (Moshood, Adeleke and Tagod, 2021). Adopting EDI and EDMS could facilitate high communication and collaboration in the construction industry. The data stored and transmitted using these ICT platforms can reduce the administrative cost and time lag between data transfers and the information blunder (Moshood, Adeleke and Tagod, 2021). The adoption of ICT at the construction site would allow the contractor to communicate the scheduled work programme to the site workers in an effective manner, hence, improving the overall productivity (Yang, Ahuja and Shankan, 2007). The project information can be stored under this ICT in the correct order, which will enhance the construction parties to commence the construction activities without misunderstanding or overlooking the latest version of the drawing or specification (Moshood, Adeleke and Tagod, 2021).

2.6.2 Adoption of BIM Technology

Goh, et al. (2014) mentioned Malaysian construction industry still implemented the traditional paper-based prior in the communication due to the lagging of technology adoption nowadays. BIM is represented as a vital and explored platform for the project information to be exchanged (Goh, et al., 2014; Kwofie, et al., 2020). Moshood, Adeleke and Tagod (2021) declared that BIM could act as an advanced tool for the analysis of building information from various parties toward the project goals. Moreover, the BIM allow the decision-making to be carried out with the maximisation of the project quality because of the centralised information collection in the construction project (Goh, et al., 2014; Moshood, Adeleke and Tagod, 2021). Furthermore, Moshood, Adeleke and Tagod (2021) further highlighted that the information flow between the parties appears streamlined, so all the project information can be communicated effectively and efficiently. The problem-solving process is enhanced with BIM as the streamlined data characteristic (Hatem, Naji and Alkreem, 2018; Musa, et al., 2018). BIM can maintain the collaboration between all construction parties till the project end (Moshood, Adeleke and Tagod, 2021). As BIM is an intelligent and parametric digital representation for information analysis, enhancing effective communication during the project's delivery (Goh, et al., 2014).

2.6.3 Partnering

Partnering is increasingly accepted and adopted in the construction industry globally (Hosseini, et al., 2018). The partnering allows for the reduction of inconsistent project objectives and a reduction in the chance to have a conflict (Hosseini, et al., 2018). Hasugseth, et al. (2014) and Nevstad, et al. (2018) further mentioned that the client and contractor in a partnering relationship would allow initiating of two-way communication and open communication. Hosseini, et al. (2018) also asserted that partnering in construction projects allows the parties to communicate effectively with their expert communication skills and two-way communication channels. To gauge effective communication, the collaboration tools in partnering allow the communication

process to be carried out correctly and smoothly, such as conflict-solving methods, workshops, and team-building (Hosseini, et al., 2018).

Moreover, mutual trust, respect, and collaboration are established in partnering, enhancing effective communication during a construction project (Hosseini, et al., 2018; Keys, Silverman and Evans, 2017). Furthermore, Woien, et al. (2016) asserted that a partnering relationship between the client, consultant, and contractor could promote better functionality in the BIM adoption, promoting a better communication process. The contractor can effectively solve the conflict and disputes at the construction site, consuming less time and incurring less cost (Woien, et al., 2016).

2.6.4 Maintain Integrity and Trust

Integrity is the expression and behaviour of a party to act professionally, although no one has been asked to do so (Kwofie, et al., 2020; Ishaq, Omar and Yahya, 2019). According to the research result from Ishaq, Omar and Yahya (2019), maintaining integrity obtained the highest result from respondents to reduce the poor communication in the construction industry. A better understanding of the information transfer between the construction parties can be achieved as honesty and trust are built on the hierarchy of integrity (Butt, Naaranoja and Savolainen, 2016). Hence, Ishaq, Omar and Yahya (2019) mentioned that achieving better communication between constructing parties is considerably obtained from maintaining integrity. The complex construction site usually will have an informal communication channel such as a face-to-face method of communication. The parties involved need to practice integrity even more than other construction parties (Kwofie, et al., 2020). The pre-condition for the integrity to be a success is that all of the communicating parties should be performed whatever he or she promises in word or text. Integrity is faithfulness to the moral and ethical behaviour of the parties (Ishaq, Omar and Yahya, 2019).

These solutions restrict professionals and should also be adopted by the construction site workers (Olanrewaju, Tan and Kwan, 2017). At the construction site, the interactions between site workers are contracted and highly focused. Better integrity between them can allow the information

transfer between site workers to be achieved with the primary purpose (Olanrewaju, Tan and Kwan, 2017).

2.6.5 Team Building

Tornerman (2015) mentioned that team building workshops allow the partnering arrangements that bond the construction parties together. As the multi-professional stakeholders can bond like a team without any misgiving and would understand each other better (Hietajarvi and Aaltonen, 2018). The team-building workshop would perform a better outcome when it is carried out in the initial phase. The project stakeholders can acquaint each other and better understand others' cultures and backgrounds. Aga, Noorderhaven and Vallejo (2016) highlighted four methods that enhance effective communication: setting a clear objective, developing closer interpersonal, adopting clear problem-solving skills, and stating clear roles and responsibilities. Trust and good relationship quality can be built through the methods adopted in team-building and every stakeholder can ensure the maximisation of the chances of project success (Jelodar, Tak and Wilkinson, 2016).

2.6.6 Use Effective Communication Channel

The communication channel is for the transmission of construction information by various construction parties (Ebeneze, 2019). When the receiver has done only understanding and feedback, the communication process must be regarded as complete. An effective communication channel is the most significant part of improving construction performance and productivity. The client and contractor should have a mutual agreement on the communication channel at the commencement of the project because it will be used until the end of the project (Ishaq, Omar and Yahya, 2019). The communication channel is able to enhance the parties' communication much more effectively because the information sent through the channel is understood well with feedback (Ishaq, Omar and Yahya, 2019). With the adoption of effective communication channels, contractors can have better interactions with the site workers and promote feedback from the site workers if they find out something wrong with the information transfer from the

contractor (Ishaq, Omar and Yahya, 2019; Kwofie, et al., 2020). Communication can be improved through effective communication channels such as walkie-talkies, phone calls and video calls (Ishaq, Omar and Yahya, 2019). Any additional change in the communication channel adoption throughout the construction project will confuse the information transfer, and the sender's feedback cannot be achieved (Ishaq, Omar and Yahya, 2019).

2.6.7 Provide Language Training

In the Malaysian construction industry, the majority of the site workers are foreigners. They have weak language communication with their supervisors, hence acting as a barrier to the enhancement of construction performance and project success (Valitherm, 2014). Research from Valitherm (2014) declared that both supervisors and site workers agreed to provide and attend the language training lessons to improve their local language skills and technique. The employer itself can do the language lessons through the external engagement of a trainer, or the Construction Industry Development Board (CIDB) provides language lessons for those site workers (Olanrewaju, Tan and Kwan, 2017). Neither which method, but the training lessons should have to conduct before the commencement of the construction project so that the site workers have the firm skills and have digested the knowledge learned during their training to be performed on the construction work as increase the construction performance (Kwofie, et al., 2020; Valitherm,2014).

2.6.8 Long-term Relationship

In the diverse relationships and complex construction industry, the relationship between the client and contractor can enhance better communication (Ishaq, Omar and Yahya, 2019). When the construction parties work together from project to project, which is a long and firm relationship, the parties can collaborate, share and transmit the project information well (Aulich, 2013; Ishaq, Omar and Yahya, 2019). In other words, effective communication had been established between them quietly (Ishaq, Omar and Yahya, 2019). Moreover, mutual trust has become the foundation for effective communication to take place because the long-term relationship has worn out

the distrust and chance for conflict to occur. Ishaq, Omar and Yahya (2019) described that both parties would act fairly and honestly throughout the project life cycle. It will ensure the improvement in the working relationship and communication (Aulich, 2013).

2.6.9 Understanding Client's Needs

The construction project is only successful when the contractor is fulfilling the client or end-user needs through the construction project. In the Nigerian construction industry, Ishaq, Omar and Yahya (2019) say that understanding the client's needs and wants can improve the communication process between client and contractor during the project on-going. In the fact that the contractors as the project builders are to build the client's desires from virtual into a physical building (Aga, Noorderhaven and Vallejo, 2016). Therefore, contractors act as vital parties to the client's needs to work out better communication and better relationships between client and contractor (Ishaq, Omar and Yahya, 2019). The client might not easily understand the construction knowledge and experience as they do not have a professional construction background when the project is carried out. Indeed, the contractor should apply his expertise in order to fulfil the client's wants and don'ts (Ishaq, Omar and Yahya, 2019).

2.6.10 Avoid Noise Communication Environment

Olanrewaju, Tan and Kwan (2017) highlighted that the construction industry and sites are complex and noisy due to the fully occupied by plants, equipment and machinery operative for the construction activities. As mentioned by Olanrewaju, Tan and Kwan (2017), a survey carried out in the UK proved that the noise during the construction is a problem that reduces the productivity of site workers. Reasons for this outcome are because the noise will impact the psychological and physical of the site workers and hence lead to poor communication (Olanrewaju, Tan and Kwan, 2017). When the site workers and the contractor can avoid having information transmission at a high level of noise environment, they can enhance the communication process effectiveness and enhance the information is well transmitted to the receiver.

Table 2.3: Literature Map for Effective Measures for Effective Communication.

Ref	Effective Measures	Butt, Naaranoja and Savolainen (2016)	Valitherm (2014)	Olanrewaju, Tan and Kwan (2017)	Ishaq, Omar and Yahya (2019)	Goh, et al. (2014)	Kwofie, et al. (2020)	Akinradewo and Ojo (2019)	Musa, et al. (2018)	Hatem, Naji and Alkreem (2018)	Moshood, Adeleke and Tagod (2021)	Yang, Ahuja and Shankan (2007)	Premdilip and Uma (2020)	Aulich (2013)	Hosseini, et al. (2018)	Tomerman (2015)	Hasugseth, et al. (2014)	Hietajarvi and Aaltonen (2018)	Aga, Noorderhaven and Vallejo (2016)	Nevstad, et al. (2018)	Woien, et al. (2016)	Keys, Silverman and Evans (2017)	Jelodar, Tak and Wilkinson (2016)	Total
S1	Adoption of ICT				√		√	√			√	√	√											6
S2	Adoption of BIM technology					√	√		√	√	√													5
S3	Partnering														√		√			√	√	√		5
S4	Maintain integrity and trust	√		√	√		√																	4
S5	Team building															√		√	√				√	4
S6	Use effective communication channel			√	√		√																	3
S7	Provide language training		√	√			√																	3
S8	Long-term relationship				√									√										2
S9	Understand client's needs				√																			2
S10	Avoid noise environment			√																				1

2.7 Summary of Chapter

In summary, this chapter defined the communication and outlined the communication management by the contractor to improve effective communication throughout the project lifecycle. Next, existing research papers' needs for effective communication, factors of communication that impact performance, and effective communication strategies were summarised in Sections 2.4, 2.5 and 2.6.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The reasons for effective communication, factors of communication and effective measures to enhance effective communication in the construction industry were studied in the previous chapter. A well-planned research approach enables the researchers to attain the objectives spelt out. In this chapter, the employed research methodology is disclosed in the following section with aspects of the research framework, sampling design, data collecting technique, research tools and method of data analysis.

3.2 Nature of Research

There are numerous varieties of research that can be grouped based on the research techniques and research's aim and objective. Figure 3.1 shows the research methods employed. The application of study, research objectives and the ways of information collection are used to categorise the studies mentioned in Figure 3.1.

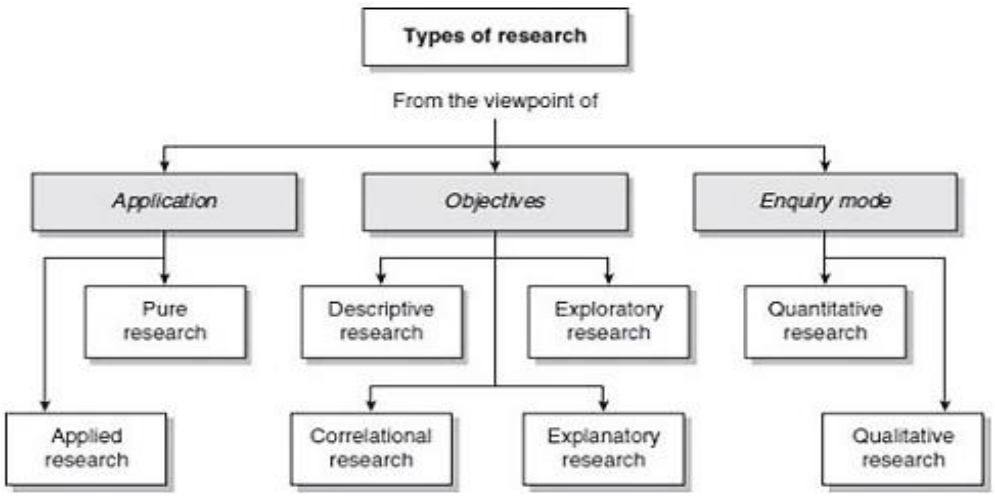

Figure 3.1: Types of Research.

Source: (Kumar, 2011).

This research is much more of an explanatory study. It aims to explore the factors of communication that impact construction industry

performance and find practical strategies for promoting effective communication in the Malaysian construction industry. The explanatory study is used when the researcher answers the “why” and “how” questions in a particular way of research (DeCarlo, 2018). In addition, the researcher has to emphasise to appraise the causes and effects of the research topic to demonstrate a clear relationship between these aspects (DeCarlo, 2018).

Moreover, the explanatory study is best used for this research because of one of the research objectives. The first research question has clearly expressed in the “why” question, which explores why good communication is significant to the construction industry.

3.3 Research Methodology

The research methodology is a technique that is followed in a methodical way to obtain the outcome of the research question and research objective (Kumar, 2011). The term methodology describes the strategy that researchers use to develop answers to several research difficulties up in a particular research area. In other words, the scope of research methodology precise the strategies for identifying, collecting, and analysing information and data for a specific study. Research methodology can be conducted in two approaches manner known as qualitative approach and quantitative approach. These two approaches somehow can be conducted parallel in a specific research study by the researcher, which is known as mixed-method research.

First of all, the qualitative approach collects the data through non-numerical ways to explore and analyse opinions, experiences, ideas, emotions, and feedback through formal interviews or discussion groups (Pajo, 2018). The qualitative approach can be further described as exploring human behaviour to obtain answers with embracing quality. Moreover, the qualitative approach generates non-structured data in texts, video records, and verbal communication words. This approach is also emphasised more by the oral depiction of meanings and experience (Boru, 2018). Therefore, this approach can produce free-ended responses from the discussion group or formal interview.

On the contrary, the quantitative approach is somehow related to the mathematical formulation of collecting data. This approach prioritises collecting data in the form of numerical data (Pajo, 2018). The data collected through the questionnaire and survey can be quantified from a large sample community (Pajo, 2018). The result collected through this approach is much more structured than the qualitative approach. Last but not least, the data collected through this approach allow for the data analysis testing and tabulated in tables, charts or graphs. While the mixed-method research methodology includes gathering, combining, analysing, and integrating quantitative and qualitative data to produce a more full and accurate knowledge of the study problems.

Furthermore, the selection of approach has to consider the nature of the study, the acquired information and the availability of resources (Kumar, Talib and Ramayah, 2012). The selected approach positively correlates to the usefulness of data collected (Sileyew, 2019).

3.3.1 Selection of Research Methodology: Quantitative Research

The quantitative approach was used in this study to achieve the research question and objective by collecting statistical data. Questionnaire surveys, correlational research, experiments and causal-comparative research are all examples of quantitative analysis. In this study, the questionnaire survey was selected with designing of closed-ended questions and distributed to the targeted population in the Klang Valley area. The targeted respondents are required to complete the form, answer all of the questions and revert to the pre-determined time frame. Data collection will not be carried out physically (face-to-face) due to the COVID-19 pandemic around the Malaysian community. The questionnaire survey is generally acknowledged as the most cost-saving and less time-consuming research method because it doesn’t necessitate conducting interviews with the targeted respondents. It also ensures the respondents’ confidentiality and allows them to go beyond their replies again.

3.4 Research Design

The research design is critical to the success of the research because it ensures that the research activities run smoothly, yielding the most accurate information and outcomes for the least amount of work, time, and effort (Kotharim, 2004). To achieve the research objectives, research design involves defining beforehand the techniques for collecting associated data and the methods for analysing and interpreting the data. Research design should be presented simply so that the reader can readily study and understand a summary of the research flow (Dominic, et al., 2017). The research process in this research was constructed and presented in Figure 3.2.

First of all, before deep research on the problem statement for this study, a topic study was conducted. This step can allow the researcher to establish realistic boundaries for this research and helps to focus concentration and discover critical areas. Also, this step allows the researcher to verify that this research is feasible to conduct. Furthermore, step 2 is to adequately and precisely describe the research problem. This step allows for a more in-depth discussion about the current construction industry communication issues. In other words, the importance of this work and the research gap were assessed and discussed. It also spells out the structure for reporting the findings, indicating what is likely to be required to perform the study and describing how it will convey this data. After determining the problem statement, the research's aim, three research questions and three research objectives were developed.

Step 3 comprises conducting a literature review after the research aim and objectives have been established. The definition and concept of contractor communication and communication management are examined, including communication models and project communications management procedures. The secondary data for this study comes from a literature review of journals, papers, and books. Furthermore, step 4 is the identification of the research framework. In order to acquire data and accomplish the research objective, an appropriate research approach is critical. Research methodology refers to the system researchers use to solve several research problems in a particular field, such as discovering, gathering, and interpreting data and information for a

specific study. In this research, the quantitative research methodology is selected.

Next, step 5 is the identification of sources of data. Before conducting surveys, a sample design is determined, including the sampling frame, sampling size, and sampling processes from groups of respondents. An adequate sampling procedure can accurately reflect populations and ensure the research's results are reliable. In this research, the non-probability sampling method is engaged and a minimum of 100 responses should be acquired from the questionnaire survey. Due to the COVID-19 pandemic, the main survey was constructed with closed-ended questions and used the Google form approach. The questionnaire was divided into four sections to collect information related to the study's objectives. Section A was prepared to collect the personal information about the targeted respondents. While Sections B, C and D correspond to each of the research objectives, and the five-point Likert scales were used in these sections.

Step 6 is data collection. The questionnaire survey is used to collect the primary data in this research. Five pre-tests were delivered to targeted respondents before the main survey to verify that the survey assigned is ideal for getting adequate and dependable data from the sample group. Furthermore, a total of 315 questionnaires are distributed to the respondents by email, LinkedIn and WhatsApp. The data analysis is carried out in step 7, which is the final phase of this research, once the data collected reach a saturation number. At this stage, six data analysis techniques are chosen and evaluated. The findings are provided in the table, chart, and diagram. In the discussion, existing research is referenced to support and justify the findings. Last but not least, this research concludes with a conclusion and recommendation. The accomplishment of the research objectives comes first. In addition, the research's constraints with solutions have been presented, followed by recommendations and ideas based on contractors' viewpoints for future researchers to enhance their quality in this same area of research.

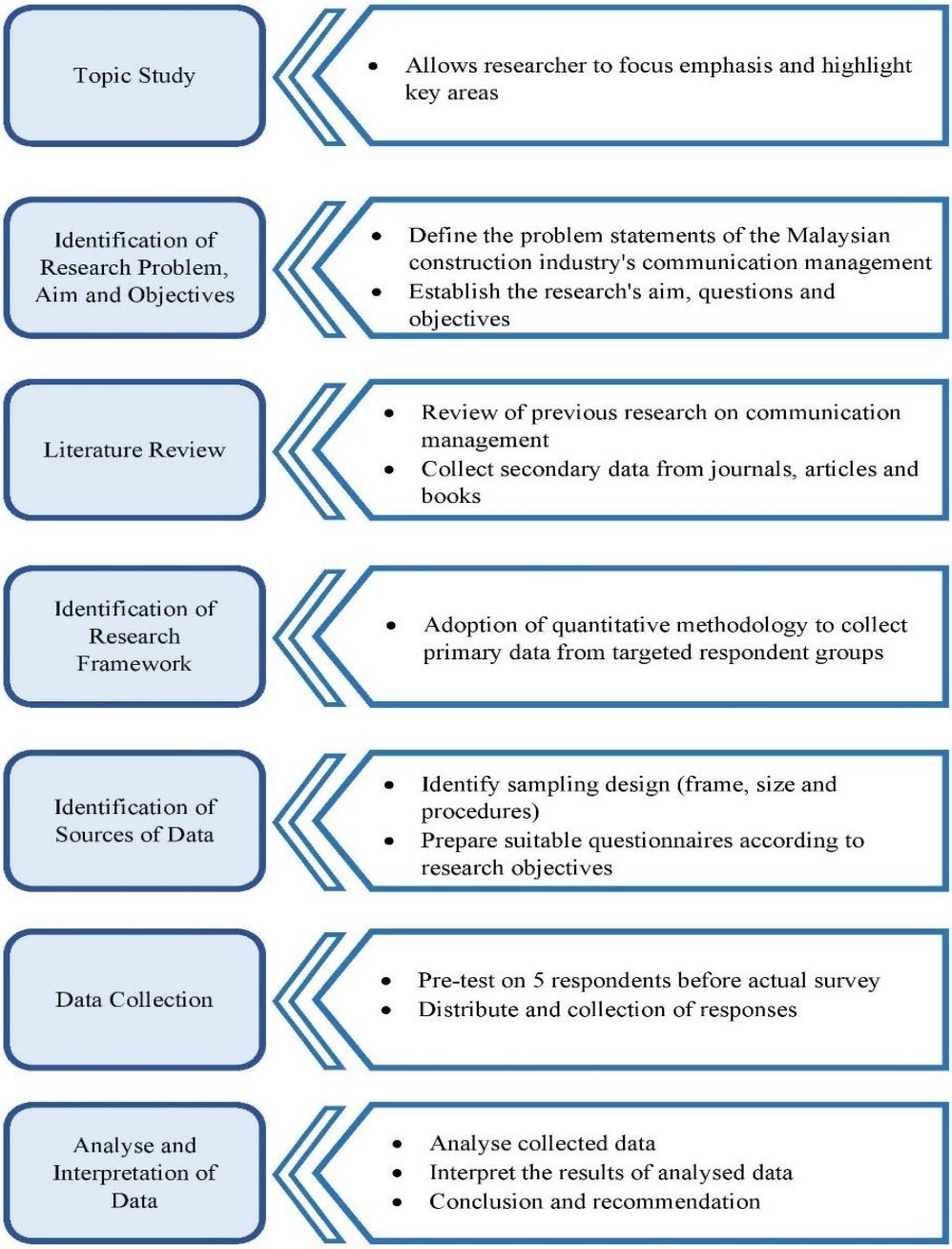

Figure 3.2: Research Design.

3.5 Sampling Design

Sampling is defined as selecting a small sample of a larger population, which can be defined as a sample (Pajo, 2018). Observing and analysing the entire population is unrealistic as the research study period is too short (Khalifa, 2020). For this reason, the idealistic can be in terms of the limited time, lack of resources provided, ethical issues and legitimate grounds (Salhin, et al., 2016). Therefore, the sampling design is a vital step for obtaining accurate data. The

sample selected should be able to perform and provide feedback on the most accurate data, reducing the risk of acquiring the worst and most inaccurate results (Pajo, 2018). The sample must be represented in the research population through the sampling design. Moreover, Kumar (2011) mentioned that the sampling design in a research study could affect the cost of the study. In other words, the sample selected is good; the cost can be minimised, onward, it will be burst on cost. The sampling design outlined and discussed the sampling method applied, sampling size, and targeted respondents in this research.

3.5.1 Sampling Method

According to Bernard (2017), sampling methods are classified into probability and non-probability sampling. First of all, probability sampling is a method for the researcher to select the sample from a large population by using the theory of probability as studied. Also, probability sampling can be defined as random sampling (Kumar, 2011). The reason is that the participants are selected in the probability method by random selection. This can be described as the sample chosen is all based on arbitrary and not to be affected by any consideration such as the researcher's preference. For this probability sampling to be used, the population targeted should share the same chance that will be selected (Kumar, 2011). The selected sample from the big population will be represented the responses in the big population. This probability sampling has provided an excellent opportunity for a good piece of a population that is precisely the population as a representative.

Furthermore, the second type is the non-probability sampling method. The selection of samples in this method is based on non-random selection and can be influenced by the researcher's opinion. This non-profitability sampling method also is defined as the non-random sampling method. This non-probability sampling method is a low rigorous method. According to Kumar (2011), this method was used when the sample could not be calculated. This non-probability sampling is rarely adopted in quantitative research methodology because the probability of the selected sample is unknown but is widely adopted in qualitative research.

In this study, the non-probability sampling method is adopted with the selection of two techniques: convenience sampling and snowball sampling. Yap, et al. (2020a) mentioned that these two sampling techniques are widely adopted in the construction management research study. In the convenience sampling techniques, the sample population is selected by the researcher as they are readily available. This means that the selected sample with the characteristic of being easy to contact (Kumar, 2011). Besides, snowball sampling is a sample selection process by a network with information sharing (Kumar, 2011). The targeted sample respondent should provide more expert experience and perspective in the construction industry. The snowball process will continue until the information reaches saturation (Kumar, 2011).

3.5.2 Sampling Size

Sampling size is a procedure to determine how big of the number of respondents included in a research study. It is vital to be confirmed to increase the accuracy of the analysis afterwards (Kibuacha, 2021). The sampling size cannot be too small; otherwise, the accuracy of data received will be low as it cannot represent the actual population responses. But, the cost and time constraint will increase when too large a sampling size is selected only to maximise the accuracy of reliable data (Kibuacha, 2021). To conclude, the sampling should be middle-sized, representing the large population with high precision and generalizability (Dolnicar, Grün and Leisch, 2015). Yap, Low and Wang (2017) mentioned that the sample size should be within thirty (30) to five hundred (500), which is most appropriate to generate an accurate and reliable data output. This is because sample sizes of 30 or more are widely deemed to be adequate for the Central Limit Theorem (CLT) to stand. Moreover, the sampling size should also be at least 100 for the proper data analysis test (Gorsuch, 2015). This minimum sample size was also supported by the Rule of 5, followed by the principal requirement for the Factor Analysis to narrow down the 20 factors of communication studied in Objective 2 (Theodoros, 2018). Therefore, in this study, the sample size is at a minimum of a hundred (100) responses with at least 50 respondents for each sampling group, including main contractors and sub-contractors.

3.5.3 Target Respondents

The targeted respondent for this research is one of the vital construction parties – the contracting organisation based in the Klang Valley region. The targeted respondents should be registered under the CIDB Register of Contractors with different license grades ranging from Grade 1 to Grade 7. Klang Valley is an urbanised area centred in Kuala Lumpur and the adjoining city and towns in Selangor (Mohd and Ghani, 2009). As shown in the Quarterly Construction Statistics, First Quarter of 2021 report by the Department of Statistics Malaysia (2021b), the Klang Valley area has been reported as the region that obtains the first and second-ranking construction work done in Malaysia. Hence, the main contractors and sub-contractors involved in this area are eligible as data collecting respondents because they have sufficient industry knowledge and expertise. Indeed, the accuracy of data collected from the selected sample in the Klang Valley region is highly dependent. As they have broad and outstanding involvement in different construction project types and extensive experience and knowledge regarding the research topic. Hence, the data collected can be dedicated to the study's discussion and outcome.

3.6 Data Collection Method

Data collection is vital for research to collect the most reliable and accurate data. The data collection method is classified into two types: primary data and secondary data. The information gathered by the first approach or first-hand resources is classified as primary data, whereas the current information published by others is called secondary data (Kumar, 2011). Moreover, the differences between primary and secondary data are based on the structure form, sequential order, depth and freedom that the researcher can obtain throughout the research study (Kumar, 2011).

Primary data is those data first come into the hand of research and are not yet published to any resource. It is much more valid, reliable and close to the research objective. The most common primary data is collected from surveys, questionnaires, structured or unstructured interviews, observations and experiments. The primary information is valuable as the sources are

minimal, increasing the researcher's difficulty. The limited sources can be referred to as the scarcity of the targeted population and lack of commitment to sampling (Kabir, 2016).

The review study on the previous research study is based on secondary data. Kabir (2016) mentioned that the involvement of secondary data is vital for a research study because of the limitation of time and cost for the researcher to have a new survey that captures the existing data. Besides, secondary data is the current published data in any source. Example of secondary data includes data and information from books, biographies, newspapers, data archives, internet articles, statistical data, databases, article, journals and so on (Kabir, 2016). Although secondary data is less valuable than primary data, it is still significant for ongoing research. When the primary data is difficult to obtain, the secondary data is always available to get access when only do a click-search on the Google website and all the databases.

In this study, both data collection methods were adopted to increase the data accuracy and reliability. The primary data for this research is collected through online structured questionnaires with close-ended questions. The raw data will be received from the respondents by answering the questionnaire. Furthermore, online journals, articles, books, e-books and conference papers published by the previous researchers acted as the secondary data for this research. Universiti Tunku Abdul Rahman (UTAR) library database serves as the prior platform for accessing the secondary data. All the secondary data is collected from 2015 until 2021 to ensure that the data utilised in the study is accurate and reliable.

3.7 Research Instrument

The research instrument is a priority tool for the data collection to be carried out smoothly. The quantitative approach used in this research used the way of a questionnaire. First, the questionnaire collects the respondent's feedback by answering all the pre-defined questions. The questionnaire distribution is only through email and social media platforms in the Google form method. The questionnaire is the most economic research tool regarding cost and time consumed.

3.7.1 Designation of Questionnaire

Before answering the survey, the respondents were given a brief introduction to understand the research and highlighted the three key research objectives. Following that, a self-completion questionnaire was developed based on previous in-depth research investigations. It was written to communicate the ideas to the respondents, resulting in the desired response rate. The questionnaire was divided into four sections to gather relevant data concerning the study's goals. The targeted respondents were required to spend 10 minutes completing the questionnaire.

Section A was prepared to collect the personal information about the targeted respondents. This section's questions were made up of the type of organisation, working experience, academic qualification, and age. Next, Section B began by questioning the respondents regarding their level of agreement that communication-related problems can significantly affect project performance. Then, it focuses on the 10 reasons for the respondent's perception of the need to adopt effective communication in construction projects. Besides, Section C proposed the question about the existing factor of communication faced by the targeted respondents with the rating method that impacted the construction performance (20 factors of communication). The respondents were then needed to rate the potential measurers to enhance effective communication in the construction project in Section D (10 effective strategies). Five-point Likert scales were used in Sections B, C and D of this survey. This is because Darko, et al. (2018) explained its ability to allow respondents to answer their ideas quickly and produce direct results. Table 3.1 shows the five-point Likert scale that was utilised in the survey.

Table 3.1: Five-point Likert Scale for Sections B, C and D.

Weighting	Section B	Section C	Section D
1	Strongly disagree	Strongly disagree	Ineffective
2	Disagree	Disagree	Somewhat effective
3	Neutral	Neutral	Effective
4	Agree	Agree	Very effective
5	Strongly agree	Strongly agree	Extremely effective

3.7.2 Pre-Test

The pre-test is a pre-run survey before handing out the questionnaire to the targeted respondents. This pre-test can make sure the research instrument provided and allocated is ideal for obtaining appropriate and reliable data from the sampling population. In this pre-test, five (5) sets of questionnaires were distributed to 3 main contractors and 2 sub-contractors respondents. The discussion and analysis of data will not include the responses from the pre-test. All the feedback from the pre-test will be absorbed and amended on the actual questionnaire to be handed out to the targeted respondents.

3.8 Data Analysis

After data collection, the data received will be organised and evaluated. These findings will be examined with the study's aims. The main purpose of data analysis is to ensure that respondents' data is appropriately understood, resulting in reliable research findings. During the data analysis phase, the collected data will be processed, organised, and tabulated in order to proceed to the results interpretation step. There are six (6) tests adopted to analyse the data collected:

(1) Cronbach's Alpha Reliability Test
(2) Normality Test – Shapiro-Wilk Test
(3) Measures of Central Tendency: Mean
(4) Mann-Whitney U Test
(5) Spearman Correlation Test
(6) Factor Analysis

The software for analysing data collected is testing in the Statistical Package for the Social Sciences (SPSS). SPSS is commonly used to create tabulated reports, charts, and distribution plots. It's also capable of performing complex statistical analyses.

3.8.1 Cronbach’s Alpha Reliability Test

In 1951, Cronbach's alpha, α, was established by Lee Cronbach. It is a technique used to measure the data authenticity collected through the questionnaire survey conveniently. This reliability test can act as an indicator

to determine whether all of the collected data reflects the same opinion or idea and to understand the data's inter-relationships in a research project. Five-point Likert scales were used to score the questions in Sections B, C, and D of the survey. Therefore, the level of authenticity of the five-point Likert scale measurement can be performed by this reliability analysis in this circumstance. Glen (2015) mentioned the general formula of this technique, and it is shown in (3.1).

$$\propto = \frac{N(c)}{V + (N-1)(c)} \tag{3.1}$$

Where,

N = the number of survey items

C = the average covariance between the item-pairs

V= the average variance

The alpha value is represented between zero (0) to one (1), whereby the higher the alpha value represents, the higher reliability of the data collected. If the alpha value is higher than 0.700, the data collected is highly correlated and high consistent, as shown in Table 3.2 (Son, Lee and Kim, 2015). In other words, an alpha value of less than 0.700 is unacceptable.

Table 3.2: Cronbach's Alpha Rule of Thumb.

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.900$	Excellent
$0.900 > \alpha \geq 0.800$	Good
$0.800 > \alpha \geq 0.700$	Acceptable
$0.700 > \alpha \geq 0.600$	Questionable
$0.600 > \alpha \geq 0.500$	Poor
$\alpha < 0.500$	Unacceptable

3.8.2 Normality Test – Shapiro-Wilk Test

The normality test is vital to research because it tests the result normality (Ghasemi and Zahediasl, 2012). Shapiro-Wilk test is the test being selected

instead of other tests such as Kolmogorov–Smirnov test and Skewness test due to the sample size of this research. Also, Razali and Wah (2011) mentioned that the Shapiro-Wilk test has the most outstanding ability for a specific level of significance. In this research, the Shapiro-Wilk test's is used to verify the sample data collected from the targeted respondents are normally distributed or non-normally distributed. By examining the data collected with the Shapiro-Wilk test, when the significant value, p is more than 0.050, it is considered normal. On the contrary, it is deemed to be considered non-normal. The following are the hypothesis statements:

H_0 : The significant value is more than 0.050, or $p > 0.050$.
H_1 : The significant value is less than 0.050, or $p < 0.050$.

3.8.3 Measures of Central Tendency: Mean

Measures of central tendency is used to determine the central value of a set of data and represent it in a single number or value. Mean, mode, median are the three modes of measures in the central tendency. The most popular measure which is the mean measure is applied in this research. Usually, the mean can be known as average or arithmetic in data analysis tests. Besides, mean is the quantity calculated by summing all the ratings received and divided by the total set of the questionnaire received. Moreover, the mean carries a unique characteristic that the sum of the deviations of each value from the mean is always zero (LaerdStatistics, 2018). In this research, mean test is conducted to calculate the mean score of each variables and assess the ranking based on the opinion of respondents. The formula of mean is shown in Equation (3.2) (Sykes, Gani and Vally, 2016).

$$Mean = \frac{\sum x}{N} \tag{3.2}$$

Where,
$\sum x$ = the sum of all the scores from each data set
N = the total number of data set

3.8.4 Mann-Whitney U Test

Mann-Whitney U test is a non-parametric test widely used in past research to test whether there are discrepancies in continuous measures between two independent groups (Glen, 2021). In this research, the Mann-Whitney U test was adopted to examine and evaluate the perspective of main contractors and sub-contractors regarding the needs of effective communication, factors of communication and practical strategies to enhance effective communication at the construction site.

The Mann-Whitney U test offered two hypotheses: the null hypothesis (H_0) and the alternative hypothesis (H_1). H_0 denotes that no significant differences exist between two independent populations, but H_1 denotes that substantial differences exist between two separate samples. If the significant value is less than or equal to 0.050, the conclusion made is that the main contractors and sub-contractors groups are significantly different (Glen, 2021). Thus, the alternative hypothesis (H_1) should be accepted; meanwhile, the null hypothesis (H_0) is rejected (Glen, 2021). The following are the hypothesis statements:

H_0 : There are no significant differences between the main contractor and sub-contractor firm regarding the needs, factors of communication met, and practical strategies to enhance communication at the construction site.

H_1 : There are significant differences between the main contractor and sub-contractor firm regarding the needs, factors of communication met, and practical strategies to enhance communication at the construction site.

3.8.5 Spearman's Correlation Test

Spearman's Correlation test is also a non-parametric analysis used to measure the degree and strength of the relationship between two independent variables. The ranking is used to calculate and examine the correlation of the selected variables. The result varies from -1 to 1. When the result calculated is closer to a negative one, it reflects there is a perfectly negative relationship. Otherwise, it showed the relationship is perfectly positive, whereby if the correlation is

zero, the two independent variables have no connection (Pallent, 2011). However, the negative sign of the correlation value only reflects simply the direction of the link, not its strength. For this research, this test is applied to examine the relationship between communication factors' impact on performance and potential measures for enhancing effective communication. Table 3.3 outline the correlation strength with their interpretations (Pallent, 2011).

Table 3.3: Correlation Strength and Interpretations of Relationship.

Correlation Strength	Interpretations
0.500 to 1.000 (-0.500 to -1.000)	Strong correlation
0.300 to 0.490 (-0.300 to -0.490)	Medium correlation
0.000 to 0.290 (0.000 to -0.290)	Weak correlation

3.8.6 Factor Analysis

Factor analysis is a method to summarise the data in a large set of variables into more minor significant variables (Pallant, 2011). Somehow, it might be called "dimension reduction" because the variables will are arranged according to the significant variables. According to Yap, et al. (2017), factor analysis is vital for summarising plenty of the data to enhance better analysis afterwards. This data analysis technique was applied when the researcher found more than 15 variables and might not allow the researcher to analyse the data thoroughly and accurately. Factor analysis can be carried out in two main approaches: exploratory and confirmatory approaches. However, the exploratory factor analysis technique is used in this research. As Pallant (2011) described, the exploratory approach explores the observed variables' interrelationship, while the confirmatory method is used to test whether the observed variables are correlated to the predefined hypothesis.

A Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity are employed prior to conducting the factor analysis. These tests are vital because both of them can enhance the suitability of the data collected to be adopted in the actual factor analysis. KMO values range from zero (0) to one (1) (Zulkepli, Sipan and Jibril, 2017). A KMO value of higher than 0.900

indicates that the sample is excellent; a weight of 0.600 to 0.890 is regarded as adequate, and a value of 0.500 - 0.590 is in the acceptable boundary. (Kaiser, 1974). The factor analysis is unlikely to produce reliable results if the value is less than 0.500.

The correlation matrix is evaluated to see if it is an identity matrix. Factor analysis is no longer meaningful if the matrix is an identity matrix. Furthermore, the null hypothesis of the correlation matrix is tested by Bartlett's Test of Sphericity (Kolaventi, Tezeswi and Kumar, 2018). Significant results of less than 0.05 are considered acceptable (Zulkepli, Sipan and Jibril, 2017).

In this research, the exploratory factor analysis approach is adopted. It is much more suitable to narrow down and summarise the 20 items of factors of communication that impact construction performance into smaller principal dimensions that cause poor performance in the construction industry.

3.9 Summary of Chapter

In conclusion, this chapter outlines the research methodology adopted in this research, the quantitative approach. This chapter additionally developed and presented the research design. A questionnaire survey was used to conduct the quantitative study, and it was emailed to the sample population. A pre-test of the questionnaire with five respondents was undertaken prior to the distribution of the main survey to ensure that the questions are so to be answered by targeted respondents. Furthermore, the official questionnaire was distributed to 315 targeted respondents. The respondents for this research were main contractors and sub-contractors based in Klang Valley region. This chapter also outlined the six (6) data analysis tests to be conducted by the SPSS software to perform the research's findings including, "Cronbach's Alpha Reliability Test", "Shapiro-Wilk Test", "Mean", "Mann-Whitney U Test", "Spearman's Correlation Test" and "Factor Analysis".

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the data obtained from the quantitative approach. It begins with the tabulated response rate from questionnaire surveys and continues with respondents' general information from the main contractor and sub-contractors firms. Next, the data collected from the questionnaire survey were analysed using the data analysis techniques mentioned in the preceding chapter. The SPSS was used to reorganise, process, and tabulate the obtained data in this study. Lastly, a summary of this chapter is outlined to offer a clear and detailed explanation of the study's findings.

4.2 Outcome of Pre-Test

A pre-test survey was conducted on the first of December and lasted for one week with a 100% responses rate on 3 main contractors and 2 sub-contractors respondents. However, all the five pre-test responses would not be incorporated in the data analysis. This is because a longer timeframe for answering the survey and present of grammatical errors on questions which made the wrong interpretation of question were the feedbacks reverted from the respondents. Therefore, amendment was made on the main questionnaire survey and the 5 pre-test responses were considered invalid as the questions were changed according to the feedback from targeted respondents.

4.3 Response Rate on Main Survey

A total of 315 questionnaire surveys were delivered to the targeted respondents who are based in the Klang Valley region via email, LinkedIn and WhatsApp. The distribution period started in the middle of December and ended in the middle of February. In order to improve the response rate, a gentle reminder was issued to the non-responders after two weeks. Indeed, a total of 120 valid responses were adapted in this study. As a result, the main

survey has attained a satisfactory response rate of 38.10%, which is considered reliable (Yap, et al., 2020b).

4.4 General Information of Respondents

Table 4.1 demonstrates the respondent's profiles regarding their working experience, academic qualification, and age. In the main survey, the responses received were almost evenly among 65 main contractors (54.2%) and 55 sub-contractorss (45.8%) within the Klang Valley area. This ratio could present both respondent groups' balanced views to offer a reasonable discussion. Among all the respondents, around 52% have at least six years of working experience, and 36.7% of them are experienced and knowledgeable as they have been working in the construction industry for over ten years. The rest of the respondents (48.3%) have less than five years of experience in the contractor field.

Furthermore, most of the respondents had achieved tertiary education, which are diploma, bachelor's degree, and postgraduate. This result can reflect the current status of the Malaysian construction industry being occupied by undergraduate employees who has better communication skill and critical thinking skill in resolving communication problems. Besides, 70 respondents (58.3%) are between 21 years old and 30 years old; meanwhile, 50 respondents (41.7%) are more than 31 years old. The age difference would show discrepancy concerning communication management on construction performance due to the generation gap in terms of educational level and experiences. In short, the profiles of the respondents were considered to indicate that they are capable of delivering reliable information on construction sites in Malaysia.

Table 4.1: Respondent's Demographic Profiles.

Parameter	Categories	Respondents Group		Total	Frequency (%)
		Main Contractor	Sub Contractor		
Working Experience	0-5 years	36	22	58	48.3
	6-10 years	7	11	18	15.0
	11-15 years	8	9	17	14.2
	16-20 years	10	12	22	18.3
	More than 20 years	4	1	5	4.2
Academic Qualification	High School	-	1	1	0.8
	Diploma	1	6	7	5.8
	Bachelor's Degree	59	43	102	85.0
	Postgraduate (Master Degree, PhD)	5	5	10	8.4
Age	21-30 years old	42	28	70	58.3
	31-40 years old	18	18	36	30.0
	41-50 years old	2	9	11	9.2
	50 years old and above	3	-	3	2.5

4.5 Level of Agreement on Communication Problems

In Section B of the questionnaire, the level of consent that communication-related problems can significantly affect project performance was asked before answering the questions regarding the objective. Figure 4.1 illustrates the number of respondents to their respective options. In total, nearly 90% (103 respondents) agreed and strongly agreed on options that the communication problems had significantly affected the project performance. As previously stated, poor project performance can be reflected in cost overruns, delays and unsatisfied quality. Hence, the result shows that the respondents are highly in agreement that communication management is significantly a problem that has led to negative project performance. Moreover, this result is akin to Olanrewaju, Tan and Kwan (2017), who found that communication problems had significantly affected the project performance with the 41% of project delay and 71% cost overrun.

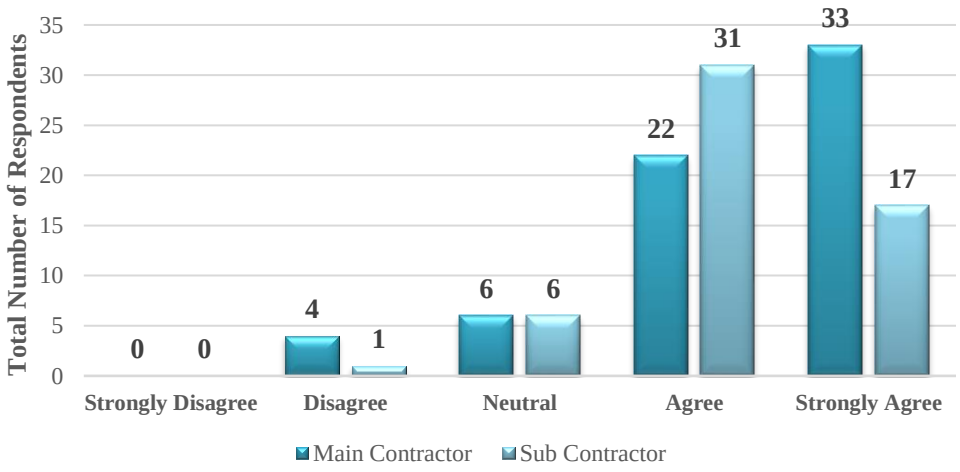

Figure 4.1: Level of Agreement on Communication Problems.

4.6 Cronbach's Alpha Reliability Test

Reliability Test was the first test adopted in this study in order to check the reliability of the data collected. The alpha value represents the consistency of the responses to each variable. The higher the alpha value, the higher the consistency of sampling from the respondents (Livingston, et al., 2018). Table 4.2 shows the tabulated alpha value for three variable groups. Livingston, et al. (2018) stated that an alpha value of 0.700 is intended to be acceptable reliability and good internal consistency. In this study, the alpha value is 0.832

for needs of communication, 0.885 for factors of communication that impact construction performance and 0.843 for effective strategies for effective communication. With all the alpha values above 0.700, this suggests that the scale has a strong internal consistency.

Table 4.2: Cronbach's Alpha Value, α for Reliability Test.

Variables	Number of items	Alpha Value, α
Needs of effective communication	10	0.832
Factors of communication impact on construction performance	20	0.885
Effective strategies for effective communication	10	0.843

4.7 Normality Test – Shapiro-Wilk Test

It is vital to conduct a normality test in research because a variety of statistical approaches were being affected by the outcome of the normality test. In this research, the Shapiro-Wilk test was performed to see whether the sample of data was taken from the sample population with a normal distribution by studying the significant value, p. The findings generated by SPSS show that the significant value, p of the sample data is 0.000, lower than 0.050. The null hypothesis (H_0) is rejected and asserted that the sample of this research was considered non-normality distributed as the sample involved in this research is relatively small. Hence, the alternative hypothesis (H_1) was accepted. All the statistical analysis tests involved in this research are categorised under the non-parametric tests as the alternative hypothesis (H_1) was applied.

4.8 Needs of Effective Communication

4.8.1 Critical Needs of Effective Communication

Table 4.3 tabulates the mean scores and standard deviations (S.D) and arranges them according to the mean ranking for the ten communication needs in construction project delivery. Whenever two or more independent variables use the same mean score, the one with the lowest S.D. is considered more important (Ishaq, Omar and Yahya, 2019). All of the need for effective

communication in the construction business looked to have a mean score of greater than 3.000, which is considered significant on the grading scale. As a result, it can be concluded that Malaysian contracting parties have a high level of agreement on the utility and advantages of the examined reasons when efficient communication management is used throughout project delivery. The three most significant reasons to adopt effective communication are, overall:

(1) Reduce conflict (Mean = 4.508)
(2) Better collaboration between parties (Mean = 4.458)
(3) Good problem solving (Mean = 4.417)

According to the findings, “reduce conflict” is recognised as the most significant attribute to promoting the adoption of effective communication in a construction project from both the main contractors and sub-contractors. This can reflect that both parties had met the conflict situation in the past construction project. Hence, the contracting parties found that conflicts were reduced when there was an adoption of effective communication during the delivery of the construction project. Conflict is a prevalent issue found during the delivery of construction projects. In contrast, the increasing project costs, delays, reduction in productivity, or harm to company relationships are examples of providing conflict perception (Jaffar, Tharim and Shuib, 2011). Moreover, conflict arising could generate knock-on effects on the construction activities and prolong the negative cycle, leading to further worsening, such as mediation or adjudication. However, this result is somehow contradictory to the findings in Chapter 2 as the “reduce conflict” is ranked at 8 out of 10 of the needs for effective communication. This can be due to the construction parties involved in this study being only part of the construction project's vital parties. Therefore, the perspective of the main contractors and sub-contractors has shown some dissimilar to the previous research. This does provide a new opinion to look further regarding the conflict issue in the project delivery process.

“Better collaboration between parties” is rated second in the overall ranking. Construction project stakeholders are encouraged to share their expertise and experiences so that others can benefit. When it comes to choosing the perfect project solutions, this helps to inspire improved ideas and

teamwork. During the delivery of construction, effective communication strengthens and enhances collaboration. Good relationships are critical to any successful working organisation. This promotes more openness and trust among all parties involved. In addition, as mentioned by Akintan and Morledge (2013), collaboration in the construction project can signify higher profits for the main contractor and lower construction costs to the client. It is then understandable that main contractors have ranked this parameter slightly more elevated than “reduce conflict”. Furthermore, in Australia, most main contractors who had failed the project delivery process oppose the lack of open communication as the key to collaboration (Ng, et al., 2002). As a result, effective communication can enhance the collaboration between parties during the project delivery process. This result is akin to Rahman, et al. (2013), who found that contracting parties in Malaysia are prompt to adopt effective communication to achieve better collaboration between the construction parties.

Moreover, “good problem solving” is in the third place rated by both main contractors and sub-contractors. Contracting parties must be able to effectively convey the issue to other construction parties and their proposals for specific solutions to be effective problem solvers. Proper communication may guarantee that solutions are implemented efficiently and that everyone is on the same page regarding a problem. Unsuccessful communication among the project stakeholders would seem inevitable to create issues and lead to unwanted situations such as conflicts and project failure (Mitkus, 2014). Therefore, the respondents are aware that effective communication during the delivery of construction projects could increase the problems solving cases, providing an effective resolution and positive outcome to the project itself. This result is consistent with the previous study reported by Ishaq, Omar and Yahya (2019).

Interestingly, "better control on client budget" is the least essential requirement for effective communication. It is believed that well-communicated information during the project delivery significantly strengthens the project performance in terms of cost, time and quality (Olanrewaju, Tan and Kwan, 2017). The Project Management Triangle, which

consists of cost, time and scope, also sustain these results. Therefore, when the project time and scope are in the control of the contracting parties, the project budget will not overrun as they are interlinked in the Project Management Triangle. Therefore, it is understandable that this variable has been rated as the 10th most significant in adopting effective communication.

4.8.2 Heterogeneous Perceptions on Needs of Effective Communication

Table 4.3 also illustrates the Mann-Whitney U test results in terms of the consistency of the perceptions between main contractors and sub-contractors. At the 95 percent level of significance, the results reveal that the two contractual parties agree on most of the variables. Yet, the two parties' perspectives differ on the variable of "better long-term relationship" ($p = 0.012$). The mean values obtained are 4.277 and 3.891 by main contractors and sub-contractor, respectively. This finding indicates that main contractors stand differently from sub-contractors in driving effective communication to maintain a positive long-term relationship with other construction stakeholders.

As is commonly understood, the construction sector is constantly evolving as new business strategies and technology emerge, especially in Malaysia (Low and Lau, 2019). Also, the construction stage in a project, the physical labour performed on the production site, is imagined as an economic activity where the main contractor plays a significant role in achieving the project's success. Moreover, the contracting parties have increased rapidly in recent years, which serves the Malaysian construction industry's competitiveness and was aggravated by the imbalance of development projects (Mansor, Abdullah and Abidin, 2014). In light of developments, it's understandable that the main contractors are concerned about forming long-term relationships in order to remain competitive in this market. Furthermore, main contractors can enjoy pricing satisfaction, variable satisfaction and trust from the impact on long-term relationships with the suppliers. The finding agrees with Haksever, Demir and Giran (2019) in UK and Ridwan, Idqan and Yuliati (2020) in Indonesia that the main contractors tend to adopt more effective communication to achieve beneficial feedback from long term relationships compared to sub-contractors.

On the contrary, the highly competitive nature of the construction industry does not appear to have much of an impact on the sub-contractors. As a result, they do not consider long-term relationships one of the most important motivations for adopting effective communication during project delivery.

Table 4.3: Mean and Ranking of Needs of Communication.

Ref.	Needs of Communication	Overall (N=120)			Main Contractors (N=65)			Sub-Contractors (N=55)			Mann-Whitney U Test	
		Mean	S.D	Rank	Mean	S.D	Rank	Mean	S.D	Rank	Chi-square	Asymp.
N8	Reduce conflict	4.508	0.661	1	4.462	0.731	2	4.564	0.570	1	0.226	0.634
N1	Better collaboration between parties	4.458	0.548	2	4.462	0.588	1	4.455	0.503	2	0.090	0.764
N3	Good problem solving	4.417	0.630	3	4.400	0.632	3	4.436	0.631	3	0.113	0.737
N2	High quality project outcome	4.358	0.562	4	4.354	0.543	4	4.364	0.589	4	0.037	0.847
N5	Better project time control	4.225	0.727	5	4.231	0.745	6	4.218	0.712	6	0.037	0.848
N7	Enhance labour productivity	4.192	0.748	6	4.154	0.833	8	4.236	0.637	5	0.050	0.824
N9	Enhance safety performance	4.133	0.766	7	4.169	0.782	7	4.091	0.752	7	0.416	0.519
N6	Better long-term relationship	4.100	0.782	8	4.277	0.673	5	3.891	0.854	9	6.344	0.012*
N10	Manage change	3.958	0.749	9	4.000	0.750	9	3.909	0.752	8	0.341	0.559
N4	Better control on client budget	3.917	0.773	10	3.969	0.706	10	3.854	0.848	10	0.725	0.395

Note: *. The mean difference is significant at the 0.05 level of significance.

4.9 Factors of Communication

4.9.1 Critical Factors of Communication that Impact Performance

For the 22 factors of communication pinpointed, the mean values ranged from 3.517 to 4.292. The ranked variables are presented in descending order shown in Table 4.4. These findings can measure how communication factors impact the construction project performance. All the factors of communication have a mean score of more than 3.000, which is regarded as notable on the rating scale. As a result, it can be concluded that communication variables have a major impact on the performance of Malaysian building projects. The five leading factors of communication from the overall perception are, overall:

(1) Lack of effective communication technique (Mean = 4.292; S.D. = 0.715)
(2) Frequent changes to contract (Mean = 4.292; S.D. = 0.749)
(3) Lack of mutual respect and trust (Mean = 4.282)
(4) Slow information flow (Mean = 4.247)
(5) Unethical behaviour (Mean = 4.225)

Ishaq, Omar and Rahman (2017) found that the most liable party to project execution in the construction sector is the contracting parties. Hence, it is expected that the main contractors ranked “lack of effective communication technique” as the most significant factors of communication driver of the impact on construction performance. In support of the finding, similar results are reported by Yap and Skitmore (2020) that the main contractors must be able to communicate with others in the construction team clearly and concisely. This environment can build a vision that everyone can see. Therefore, for a favourable construction project performance, contracting parties' adoption of suitable communication techniques is significant. Moreover, the main contractors' ability to communicate can help to develop a stronger sense of team to avoid ineffective communication techniques such as loss of attention, zero feedback and misinterpretation. If the project information does not communicate adequately to the construction team member, the main contractor will be the captain of a directionless ship.

Furthermore, "frequent changes to contract" is ranked as the second negative factor of communication impacting project performance. The ranking finding is somehow supported by the USA research by Aslam, Edmund and

Saleem, (2017) and Yap and Skitmore (2017) in Malaysia, where the contract alterations had negatively affected impact project outcomes. Design changes, also known as variation order, have been most commonly seen in a contract change by the client. Karrisson and Kindbom (2018) reported that one of the contractors highlighted that it is difficult to perform what the client wants when the design change is found frequently during project delivery, thus, impacting the project performance. The extension of time (EOT), project budget overrun and low quality of work are the interconnected problems found after the contract changes happen. Moreover, the sub-contractors group has assigned this factor a slightly higher rank than the main contractors. Meanwhile, the main contractors did not suppose that contract renewals are crucial, as they gave it a lower rating (3rd ranking). The finding is akin to Liew, et al. (2012) which recognised that the sub-contractorss have carried more than 50% and capped at a maximum of 90% to the project value. This is because the nature of the construction industry is unique, the labour force is transitory, and numerous sub-contractorss (trades) are engaged to deliver specialist works. Hence, the sub-contractorss agree that "frequent changes to contract" would negatively impact the project performance rather than the main contractors.

"Lack of mutual trust and respect" is in the third place. Effective communication is planned to fail without mutual trust and respect between each other. Nevstad, et al. (2018) had mentioned that trust could be understood as the pre-requisite or an outcome. Therefore, it is considered the contracting parties are ranking this variable in third place out of the twenty factors of communication. This finding is similar to Jiang, Lu and Le (2016) study in China. Trust and respect between the construction stakeholders can enhance knowledge sharing, resolve issues, better relationships boundaries and achieve the project objectives. To achieve a fruitful project performance, construction stakeholders should position themselves with a high level of information sharing. In short, "lack of mutual trust and respect" can result in poor project performance. Still, it can also increase transaction costs, impede information exchange, discourage joint initiatives, and destroy the groundwork for growing moral interactions on the construction site.

Moreover, “slow information flow” is ranked in fourth place. Communication is always binding with coordination and cooperation. The construction parties have to coordinate with each other to communicate the project information. Given the volume of information shared between construction stakeholders, failing to obtain and process the relevant information on time can result in significant difficulties and project delays. This result is consistent with several existing studies that the most effective way to avoid project delays is by ensuring the construction supply chain’s information is well transferred and communicated between the construction stakeholders (Ghaith, 2017; Joshua, Arvinlucy and Peterson, 2016). In addition, the troublesome issues required a speedy, economic judgement to prevent the unwelcome negative outcome. In short, the flow of the project information is the key to the early achievement of the project objectives.

"Unethical behaviour" is ranked fifth, as shown in Table 4.4. One of the most important aspects of professionalism is ethics which is applicable in every industry; Malaysia's construction industry does as well. The growth in the market in the construction industry is causing unethical behaviour to spread at an uncontrollable rate. The quality sector of the project performance directly relates to the unethical behaviour of the construction stakeholders (Hamzah, et al., 2010). This coincides with the research by Rahim, et al. (2019) in Malaysia regarding corruption being ranked first under the type of unethical behaviour found in Malaysia. Bribery is one of the corrupt practices to approve substandard work that would inevitably raise overall project costs when additional costs are necessary to correct the deficiencies of poor quality work (Rahim, et al., 2019; Yap, et al., 2020a). Therefore, this finding indicates that the Malaysian contracting parties are aware of unethical behaviour as one of the factors of communication that would significantly affect the project performance in terms of quality.

4.9.2 Homogeneous Perceptions on Factors of Communication

The Mann-Whitney U test is now used to determine the similar opinions of the main contractors and sub-contractors on the factors of communication that influence project performance. The findings generated by the Mann-Whitney

U test are shown in Table 4.4. All of the outcomes reported were greater than the 0.050 significant level; hence, the null hypothesis (H_0) is accepted. Thus, the results indicate no significant difference in the perception between main contractors and sub-contractors at the 95% confidence level.

Table 4.4: Mean and Ranking of Factors of Communication.

Ref.	Factors of Communication	Overall (N=120)			Main Contractors (N=65)			Sub-Contractors (N=55)			Mann-Whitney U Test	
		Mean	S.D	Rank	Mean	S.D	Rank	Mean	S.D	Rank	Chi-square	Asymp.
F6	Lack of effective communication technique	4.292	0.715	1	4.308	0.747	1	4.273	0.592	3	0.185	0.667
F9	Frequent changes to contract	4.292	0.749	2	4.292	0.701	3	4.291	0.685	2	0.110	0.740
F10	Lack of mutual respect and trust	4.282	0.742	3	4.215	0.795	6	4.345	0.673	1	0.758	0.384
F4	Slow information flow	4.247	0.686	4	4.215	0.758	7	4.273	0.679	4	0.009	0.925
F11	Unethical behaviour	4.225	0.750	5	4.215	0.820	9	4.236	0.666	5	0.035	0.852
F20	Lack of open communication	4.200	0.740	6	4.292	0.749	4	4.091	0.776	8	2.071	0.150
F5	Unclear objective	4.192	0.770	7	4.292	0.785	5	4.073	0.742	9	3.250	0.071
F14	Poor communication skills	4.183	0.756	8	4.308	0.748	2	4.036	0.744	13	4.050	0.051
F18	Inaccessibility of information	4.150	0.729	9	4.123	0.839	13	4.182	0.580	6	0.002	0.965
F7	Lack of communication management plan	4.150	0.774	10	4.185	0.864	10	4.109	0.658	7	1.027	0.311
F3	Language barrier	4.125	0.762	11	4.215	0.760	8	4.018	0.757	14	2.256	0.133
F15	Impropriate communication channel	4.092	0.710	12	4.138	0.788	12	4.036	0.607	11	1.016	0.313
F8	Improper communication time management	4.075	0.780	13	4.154	0.815	11	3.982	0.733	16	1.945	0.163
F2	Complexity of project	4.067	0.683	14	4.092	0.678	14	4.036	0.693	12	0.131	0.718
F16	Stressful working environment	4.025	0.804	15	4.000	0.829	15	4.055	0.780	10	0.170	0.680
F1	Adversarial culture	3.975	0.727	16	3.954	0.623	17	4.000	0.577	15	0.182	0.669
F19	Knowledge hoarding	3.975	0.601	17	3.985	0.739	16	3.964	0.719	17	0.056	0.813
F12	Lack of support of advanced technology	3.917	0.816	18	3.892	0.886	19	3.954	0.731	18	0.055	0.815
F17	Poor feedback	3.867	0.777	19	3.923	0.872	18	3.800	0.650	19	1.275	0.259
F13	Different level of education	3.517	0.840	20	3.600	0.898	20	3.418	0.762	20	2.043	0.153

4.10 Practical Strategies

4.10.1 Practical Strategies to Enhance Effective Communication

Table 4.5 tabulates the mean score and S.D. for each strategy in descending order. It is regarded that all effective strategies are notable in the rating scale as all of them have a mean value higher than 3.000. The three most effective methods are discussed in the following paragraphs to improve effective communication adoption. The three most practical measures to enhance effective communication are, overall:

(1) Understand client's needs (Mean = 4.092)

(2) Use effective communication channel (Mean = 4.067)

(3) Maintain integrity and trust (Mean = 4.058)

"Understand client's needs" is ranked the highest. As a result, it is recognised as the most efficient technique for improving effective communication. Failure on the side of the contracting parties to comprehend the client's perspective leads to misunderstandings between the project parties, making communication more difficult. In this line of thought, Ishaq, Omar and Tahya (2019) opined that successful project delivery only happens when the contractors construct the building to meet the client's requirement. To achieve communication effectiveness, the client also plays a vital role in the project's success (Susanne, Ylva and Lars, 2009). Some previous experience with similar projects by the client and a firm understanding of its own needs allows the maximisation of the contracting parties to enhance effective communication at the construction site. A similar finding was found in Ishaq, Omar and Yahya (2019). Moreover, the appropriate transmission of meaning between contractor and client by providing understanding and meaningful information decreases the project performance gap, eliminates ambiguity, avoids client disappointment, and boosts client satisfaction (Susanne, Ylva and Lars, 2009). In short, contractors understand client requirements and the client has the capability to produce a high-quality brief to achieve communication effectiveness at the construction site.

In addition, “use effective communication channel” was ranked as the second most effective measure that leads to effective communication. Projects in the construction sector are highly dependent on the project information flow,

which indicates the participation of a broad group of stakeholders at various levels in a network of communication. Communication is critical at all stages of a construction project, including pre-contractor and post-contract phases (Aladeloba, Godwin and Osunsanmi, 2019). As a result, any gap or lack of communication may lead to the project's failure. Therefore, it's critical to establish an effective communication channel for effectiveness within the construction project. This finding is in line with the results reported in South Africa by Zulch (2012), who found that in any communication process, information can quickly transfer from sender to receiver if the communication channel and technique are successful. The fluent transmission of project information thru the combination of different communication channels allows for the maximisation of the communication effectiveness and achieves a profitable project success (Hailemicheal, 2012). Furthermore, one of the interviewees from Hailemicheal (2012) study in Europe mentioned that meetings and email communication are the most common forms of official communication. The interviewee also stated that informal communication is vital in the project since it facilitates staff participation.

Another point worth mentioning is that "lack of mutual trust and respect" has been ranked as the third most critical factor of communication impacting project performance. On the other hand, "maintain integrity and trust" was ranked as one of the top three measures drivers of effective communication. Trust is earned over the entire construction process or in certain situations, several projects (Malik, Peter and Swan, 2007). People form relationships with others thru repeated interactions. Similarly, the trust may readily be broken when there is a confrontation. This is in agreement with Wong, et al. (2007) in Hong Kong, who established that trust is the most significant behavioural aspect in relationship management. Stable relationships enhance communication effectiveness throughout the construction project. Furthermore, with the trend of economic globalisation, both general contractors and sub-contractorss have more opportunities to conduct business with overseas companies (Zhang, Chen and Fu, 2020). The main contractors and sub-contractors must conduct thorough due diligence before engaging in a

contract with an international business. In short, maintaining integrity and trust can enhance effective communication management to be formed.

4.10.2 Heterogeneous Perceptions on Practical Strategies

Mann-Whitney U test is implemented to study the perceptions among the main contractors and sub-contractors with the ten effective strategies. According to Table 4.5, the findings demonstrate that the respondent groups have homogeneous perceptions of the potential measures to enhance effective communication adoption. Except for “use effective communication channel” and “partnering”, which are significantly different from the perception of main contractors and sub-contractors at the confidence level of 95%.

The mean score allocated for “use effective communication channel” is 4.215 and 3.891 by the main contractors and sub-contractors, respectively, with the p-value equal to 0.014. This finding shows that main contractors have a higher level of agreement on the use of communication channels than the sub-contractors to enhance effective communication in the construction project. This is because communication channels allow the critical construction stakeholder to ensure better coordination and correlation for providing a high-productivity and high-performance construction project (Ishaq, Omar and Yahya, 2019). As a result, the project goals are accomplished and the client is satisfied. Appropriate communication channels enable the sharing and exchange of ideas and the generation of problem-solving solutions (Cheng, et al., 2011). A combination of communication channels allows the maximisation of effectiveness and efficiency. However, the sub-contractors who act as the secondary level in the hierarchy of construction stakeholders may find it doesn’t embody the significance of adopting the communication channel in a construction project. The involvement of each the sub-contractor is short compared to the main contractors in a delivery construction project. The sub-contractors might not be able to adopt the most effective communication channels for the extensive information exchanges among project stakeholders (Elaz, et al., 2019). Therefore, the sub-contractors stand to have a literally low agreement in the “use of effective communication channel”.

Furthermore, the findings show that perceptions of "partnering" as a successful method varied statistically significantly between respondent groupings. Although the mean ranked between the main contractors and sub-contractors is only a rated difference, the confidence level is less than 0.050; hence the alternative hypothesis (H_1) should be applied. Partnering is a strategy for integrating the construction industry's supply chain, improving client-customer relationships, and increasing project efficiency and quality. Gustavo and Nicholas (2011) mentioned that the main contractor should embrace partnership concepts since it will benefit both stakeholders in the long run, mainly because builders will be familiar with the capabilities of trade sub-contractorss familiar with the job and procedures. Several similar themes emerged from examining sub-contractorss' explanations for why a relationship had deteriorated (Gustavo and Nicholas, 2011). The issue such as uncertain contracts and consequent litigation, changes in scope and timelines, inability to fulfil, loss of trust, and underbidding contracts are all subject matters that explain why the sub-contractorss are less attentively adopting the partnering relationship. Ilmi's (2013) findings further mentioned the low levels of partnership adoption between the project stakeholders, despite the literature's promoted benefits of cooperation, such as enhancing sub-contractors management. However, this finding is akin to Tan, Xue and Cheung (2017), whereby the partnering relationship between the main contractor and sub-contractors benefits the main contractors. The partnering sub-contractorss' quotations are more competitive, accurate, and feasible based on their expertise. Consequently, main contractors wouldn't have to spend so much time in the bidding process reevaluating their professional skills fully. Therefore, it explained the heterogeneous perception of main contractors and sub-contractorss regarding "partnering" as the practical strategy to enhance effective communication.

Table 4.5: Mean and Ranking of Practical Strategies.

Ref.	Practical Strategies	Overall (N=120)			Main Contractors (N=65)			Sub-Contractors (N=55)			Mann-Whitney U Test	
		Mean	S.D	Rank	Mean	S.D	Rank	Mean	S.D	Rank	Chi-square	Asymp.
S9	Understand client's needs	4.092	0.830	1	4.122	0.839	2	4.055	0.826	2	0.285	0.594
S6	Use effective communication channel	4.067	0.775	2	4.215	0.820	1	3.891	0.685	5	6.069	0.014*
S4	Maintain integrity and trust	4.058	0.813	3	4.000	0.935	4	4.127	0.640	1	0.201	0.654
S2	Adoption of BIM technology	4.000	0.799	4	4.015	0.760	3	3.982	0.850	3	0.003	0.959
S1	Adoption of Information and Communication Tools (ICT)	3.900	0.864	5	3.846	0.870	7	3.964	0.860	4	0.599	0.439
S5	Team building	3.842	1.021	6	3.954	1.007	5	3.709	1.031	7	1.836	0.175
S8	Long-term relationship	3.783	0.900	7	3.862	0.950	6	3.691	0.836	8	1.400	0.237
S10	Avoid noise environment	3.658	1.025	8	3.538	0.969	10	3.800	1.078	6	3.035	0.081
S7	Provide language training	3.617	0.945	9	3.754	0.902	8	3.455	0.978	9	2.041	0.153
S3	Partnering	3.400	0.902	10	3.554	0.884	9	3.218	0.896	10	4.965	0.026*

Note: *. The mean difference is significant at the 0.05 level of significance.

4.11 Spearman's Correlation Test

Spearman's correlation is a non-parametric test adopted to assess the analytical relationship between the factors of communication and practical strategies for effective communication. The findings of the Spearman correlation test are presented in Table 4.6. Each of the factors of communication was revealed to be correlated with at least nine practical strategies. The "avoid noise environment" variable has the weakest relationship with the practical strategies (9 correlations), followed by "provide language training" with 11 correlations.

Information and Communication Technologies (ICT) was discovered to be the most pratical strategies as it has most significant correlations (18). Delay and unclear project information can hamper the scheduled activities, demotivating the construction performance. To manage the problems found, ICT adoption is the most appropriate and practical effective communication strategies to be considered as the major characteristic of ICT is information synchronous (Rimmimgton, Dickens and Pasqire, 2015). Hosseini, et al. (2012) mentioned that ICT in the Australian construction industry revealed that ICT adoption during project delivery positively impacts project costs, scheduling, and quality of construction projects. A similar finding can also be found in Turkey (Kivrak, Arslan and Cagatay, 2010) and in Malaysia (Moshood, Adeleke and Tagod, 2021), where ICT can literally contribute to communication effectiveness that produces a positive outcome on project success. Therefore, the use of ICT within the construction project was the most productive strategy that could motivate the construction stakeholder to communicate effectively.

Moreover, understanding the client's needs was also recognised as a practical strategy for communication effectiveness that was substantially correlated with the factors of communication with 16 significant correlation values. Wu, et al. (2017) mentioned that the ineffective communication between client and contractor would worsen the project performance. This is because the inability of the contractor to fulfil the client's requirement due to the misunderstanding by the contractor leads to conflict and rework issues (Ishaq, Omar and Yahya, 2019). The project contracting parties must have a

comprehensive awareness of customer requirements and be capable of fulfilling them for project success (Rahman and Alzubi, 2015). Moreover, mutually focused strategies for understanding clients' needs result in the formation of a collaborative workplace with better communication (Akintoye and Main, 2007). The client can better clarify their requirements, while the contractor receives a clearer understanding of the requirements, potentially reducing conflicts and enhancing communication effectiveness. This is in agreement with Rahman and Alzubi (2015), a more remarkable accomplishment on client's satisfaction by contractors able to improve communication effectiveness and enable mutual consent between the client and contractor. Therefore, it is practicable to understand the client's requirement by contracting parties whereby the conflict can be reduced and a collaborative environment was formed to enhance communication effectiveness.

There is a total of 140 relations between factors of communication that impact performance and practical strategies. According to Cohen (1988), the findings disclose 34% having a medium strength relationship and 65% having a weak relationship. This finding also revealed that a lack of mutual respect and trust (F10) is strongly correlated to the ability to maintain integrity and trust (S4) with the significant level of 0.503.

In this study, lack of trust and respect was ranked first overall as the worst consequence of project performance in Malaysian contracting parties' perceptions, which should be addressed to improve effective communication. Due to the presence of solid relationships, it is reasonable to assume that maintaining trust and integrity is one of the most fundamental resolutions compared to other effective strategies. In China, Tai, Sun and Zhang (2016) emphasised that the uncertainties and fragmentation of the construction process indirectly cause unsatisfied project performance as poor trust has been recorded during the project delivery. One after another, other negative impacts such as conflicts and project delays are also occurring frequently. Moreover, the trust between the contractors, client and consultants team is a must. In the meantime, Ramli, et al. (2017) reported that the Malaysian private construction sector had a 66.7% of project delays in the year 2017, and it is

expected to increase rather than decrease in the coming year. This would wear out the trust between contractors and clients, like contractors to sub-contractors (Mirawati, Othman and Risyawati, 2015). Furthermore, the lower the trust, the higher the unwillingness to cooperate, leading to a drop in the economy (Low and Lau, 2019). The construction sector is regarded as one of the most influential economic industries (Jatarnora, et al., 2015).

In view of the above, Tai, Sun and Zhang (2016) recognised the necessity of building project delivery on trust and integrity. It is achievable to eliminate antagonistic interactions through trust-building while the parties' resources and knowledge are combined. The contractors will be deemed trustworthy if they always follow through on their promises (Matthews, Tyler and Thorpe, 2006). Instilling a strong sense of trust can help people avoid undesirable consequences and modify their restrictive mindsets to create a common culture and knowledge of shared expectations and values.

Table 4.6: Correlation between Factors of Communication and Practical Strategies for Effective Communication.

Factors \ Strategies	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Total Sig.
F1	0.247**	0.260**	0.181*	-	-	-	0.227*	-	-	0.256**	5
F2	0.310**	0.429**	-	0.182*	0.208*	0.229*	0.215*	0.180*	0.366**	0.212*	9
F3	0.208*	0.198*	0.204*	-	0.262**	0.274**	0.292**	-	0.183*	-	7
F4	-	-	0.318**	-	0.212*	-	-	0.227*	0.189*	-	4
F5	-	-	0.400**	-	0.299**	0.298**	0.268**	0.250**	0.265**	-	6
F6	0.281**	-	0.367**	0.269**	0.240**	0.406**	0.322**	-	-	-	6
F7	0.305**	0.258**	0.349**	0.358**	0.433**	0.467**	-	0.358**	0.347**	-	8
F8	0.307**	0.340**	0.423**	0.213*	0.377**	0.396**	-	0.393**	0.494**	-	8
F9	0.239**	0.271**	-	0.193*	0.185*	0.236**	-	0.182*	0.392**	0.280**	8
F10	0.315**	0.329**	-	0.503**	0.396**	0.285**	-	0.238**	0.288**	0.333**	8
F11	0.234*	-	-	0.307**	0.329**	0.193*	-	0.186*	0.203*	0.297**	7
F12	0.327**	0.319**	0.311**	0.214*	0.219*	0.246**	0.272**	0.280**	0.357**	0.382**	10
F13	0.272**	0.340**	0.228*	-	-	-	0.316**	-	-	-	4
F14	0.292**	0.328**	0.180*	0.262**	0.361**	0.458**	-	-	0.306**	-	7
F15	0.261**	0.256**	-	0.311**	0.245**	0.475**	0.273**	0.201*	0.208*	-	8
F16	0.202*	0.238*	-	-	-	-	0.179*	0.261**	0.271**	0.401**	6
F17	0.239**	-	0.287**	0.255**	-	0.190*	0.198*	0.305**	-	0.221*	7
F18	0.274**	0.323**	-	0.287**	0.218*	0.233*	-	0.247**	0.258**	-	7
F19	0.250**	0.197*	0.228*	-	-	-	-	0.291**	0.253**	0.250**	6
F20	0.297**	0.241**	0.308**	0.259**	0.289**	0.348**	0.218*	0.283**	0.321**	-	9
Total Sig.	18	15	13	13	15	15	11	15	16	9	

Note: **. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Note to Table 4.6:

F1- Adversarial culture; F2- Complexity of project; F3- Language barrier; F4- Slow information flow; F5- Unclear objective; F6- Lack of effective communication technique; F7- Lack of communication management plan; F8- Improper communication time management; F9- Frequent changes to contract; F10- Lack of mutual respect and trust; F11- Unethical behaviour; F12- Lack of support of advanced technology; F13- Different level of education; F14- Poor communication skills; F15- Impropriate communication channel; F16- Stressful working environment; F17- Poor feedback; F18- Inaccessibility of information; F19- Knowledge hoarding; F20- Lack of open communication.

S1- Adoption of Information and Communication Tools (ICT); S2- Adoption of BIM technology; S3- Partnering; S4- Maintain integrity and trust; S5- Team building; S6- Use effective communication channel; S7- Provide language training; S8- Long-term relationship; S9- Understand client’s needs; S10- Avoid noise environment.

4.12 Factor Analysis

The exploratory factor analysis approach is adopted in this study to summarise the twenty factors of communication into smaller principal groupings of representative border factors. The KMO and Bartlett's sphericity tests were employed to verify the variables' feasibility before performing the factor analysis (Zulkepli, Sipan and Jibril, 2017). The KMO value is demonstrated in Table 4.7 which is larger than 0.500 thus the findings indicate sufficient intercorrelations (Yap, et al., 2018). Besides, Bartlett's test of sphericity is 935.660 with 0.000 in significant level. Thus, the population correlation matrix is not an identity matrix (Kolaventi, Tezeswi and Kumar, 2018). In short, the findings are satisfactory to perform factor analysis.

Table 4.7: Results of KMO and Bartlett's Tests.

Parameter Value	Value
Kaiser-Meyer-Olkin measure of sampling adequacy	0.823
Bartlett's test of sphericity	
Approximate chi-square	935.660
Degree of freedom	190
Significance	0.000

In this study, both the screen plot and Eigenvalues were adopted to perform the factor extraction. Figure 4.2 shows the screen plot for 20 factors of communication. A survey by Kolaventi, Tezeswi and Kumar (2018) recommended that factors with Eigenvalues more significant than one be allowed to discuss and analysed. Hence, five principal dimensions are extracted by the Eigenvalues more than 1. Moreover, Table 4.8 tabulates the total variance explained, and the five major dimensions account for 61.32% of the variance. The "total variance explained" meets the percentage criterion, indicating that the dimensions validated the construct validity of this study. Each factor of communication has a place just with one of the five dimensions grouping created by the element examination, with the loading on each element beyond 0.400. The five dimensions are named just after variables with the highest factor loadings or the entire collection of variables and demostrates in Figure 4.3.

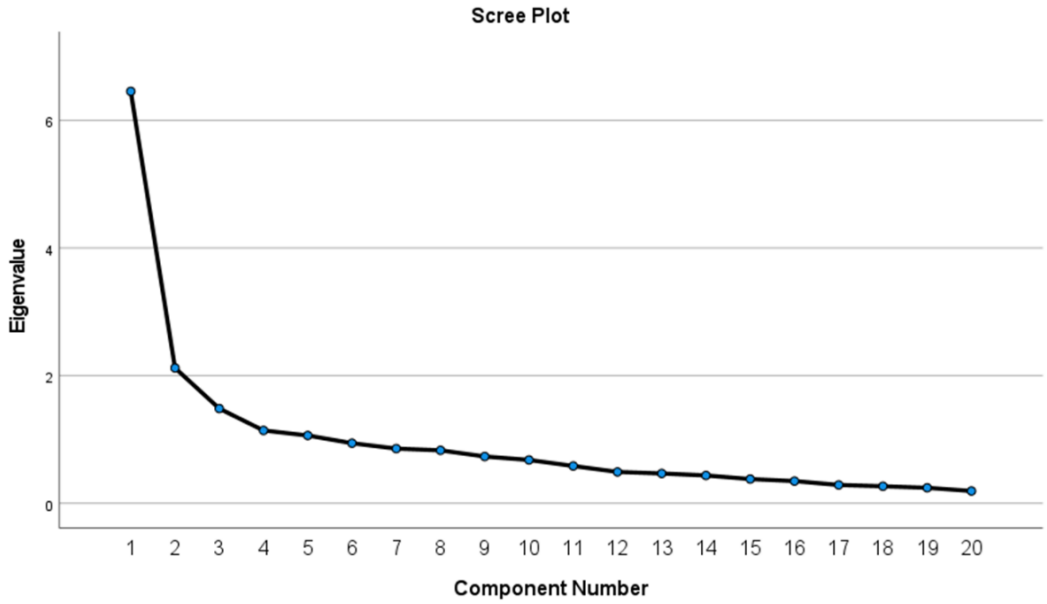

Figure 4.2: Scree Plot for 20 Factors of Communication.

Table 4.8: Total Variance Explained.

Component	Initial Eigenvalues		
	Total	Percentage of variance (%)	Cumulative percentage (%)
D1	3.521	17.606	17.606
D2	2.708	13.540	31.146
D3	2.416	12.082	43.228
D4	1.962	9.809	53.038
D5	1.657	8.284	61.322

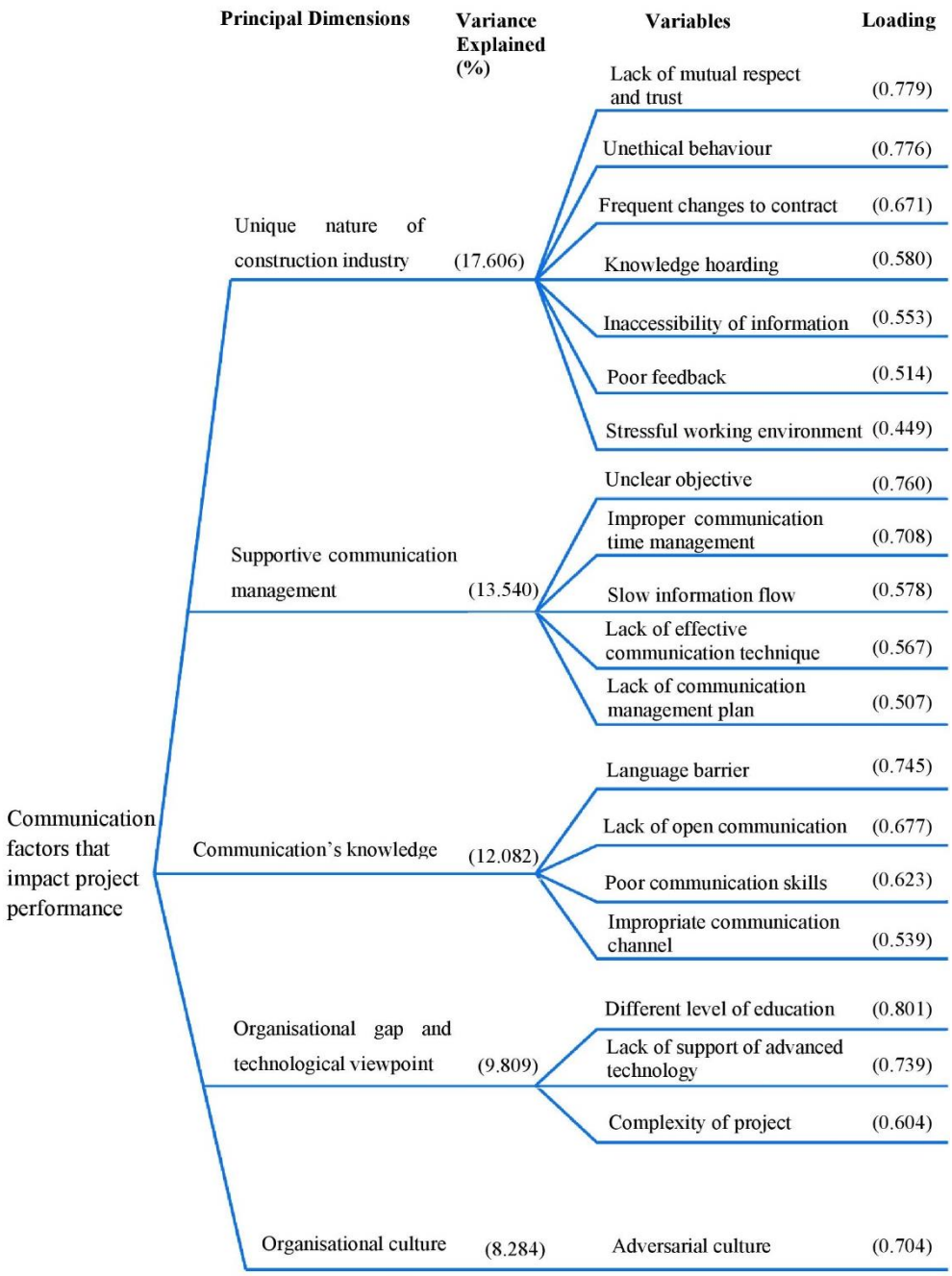

Figure 4.3: Dimensions Profile for Factors of Communication.

Dimension Grouping Description

Dimension 1: Unique nature of construction industry

The total variation of the first dimension is 17.606% which is rated as the most prominent factor. The highest factor loading is lack of mutual trust and respect (0.779), followed by unethical behaviour (0.776) and frequent changes to contract (0.671). This dimension reflects how the unique nature of the construction industry impacts construction performance. Due to its nature, the construction sector is prone to barriers in transmitting project information that impact project performance (Othman, et al., 2018). The fragmentation procedure with many project stakeholders declines the trust and respect between the parties, inclining toward poor project performance (Baluch and Bahauddin, 2014). It makes it even harder for contractors to combine their construction expertise, reducing the possibility of creating trust for open communication, especially in traditional contractual practice (Nawi, Baluch and Bahauddin, 2014). In addition, its nature does hinder the process of sharing information and experiences, which results in a weak relationship of trust between the project stakeholders, hence leading to poor performance in construction (Cheung, Tak and Lam, 2013).

Besides that, the large sum of payment and lack of transparency in the construction projects are prone to unethical behaviour such as corruption (Rahim, et al., 2019). The tendering process is rated as the most common corruption issue found as it involves competition of getting the project (Zhang, et al., 2017). Although the competition environment tends to benefit the construction project, the contractors are prone to negotiate and structure the bid among themselves (Shah and Alotaibi, 2018). This situation is known as bid-rigging, whereby the contractors would lower the overall quality ascertained by the project client or raise the construction price. If the contractors had undertaken the bid-rigging action, it would affirm that it significantly affected the end product with poor quality and unsatisfied client requirements (Shah and Alotaibi, 2018).

Moreover, due to the complexity of the construction, changes are inevitable. But failure in the adoption of effective communication between the construction parties results in the team members' weak adaptability and

resiliency to respond to the changes (Gamil and Rahman, 2017). This dimension stresses the construction sector's significantly unique characteristic that impacts the project performance.

Dimension 2: Supportive communication management and leaderships

This dimension records the second most significant variation of 13.540%. It consists of five variables titled "unclear objective", "improper communication time management", "slow information flow", "lack of effective communication technique" and "lack of communication management plan" with factor loadings varying between 0.507 to 0.760. This dimension illustrates why supportive communication management significantly impacts the construction industry for promoting project performance. Project communication management is widely known as one of the knowledge areas contributing to the systematisation of project activities, leading to the effective execution of work (Project Management Institute, 2017). However, supportive communication management is challenging since construction stakeholders are increasing, making it extremely difficult to deal with project information (Kivrak, Arslan and Cagatay, 2010). From this perspective, Dubem, Stephen and Abdulaziz (2014) in Saudi Arabia and Gamil and Rahman (2018) in Yemen have proven that project performance is much concerned with communication management. Both of them are working out in the same direction. That is to say, successful projects often have superior project management plans. Gamil and Rahman (2017) added that the contracting parties' effectiveness in managing and monitoring the information exchange could significantly improve performance.

According to Opsahl, et al. (2015), a defined project objective from the project inception to project closing appears to have superior power and influence. It relies on the simultaneous development of strategies. Tipili, Ojeba and Muhammad (2014) further stressed that failure in communication could increment disruptions and amendments by contractors during project execution. Also, high construction waste and lengthy construction duration will significantly negatively impact the project stakeholders (Opsahl, et al., 2015). Garbharran, Govender and Msani (2012) further expounded that slow

information flow and weak communication techniques could minimise project performance and efficiency of the project activities. Clearly, these studies bring to light that managing communication is vital for project performance within the construction industry.

Dimension 3: Communication's knowledge

Dimension 3 consists of four items and accounts for 12.082% of the total variance explained. This dimension is named communication's knowledge and comprises items of "language barrier", "lack of open communication", "poor communication skills" and "impropriate communication channel". The factor loading ranges from 0.539 to 0.745.

According to Forero, et al. (2015), the delivery process becomes a simple task of significant complexity due to unstable communication between the project's major stakeholders. Also, insufficient knowledge has forced communication bridges to be broken amongst the vital project stakeholders involved from start to finish (Opsahl, et al., 2015). Tool-box meeting has been recognised as one of the most effective communication channels, but the main contractors' communication skills would result in two opposite directions (Antonio and Senol, 2012). The positive outcome is achieved whenever positive wording is transferred, such as "well done", while "stupid" or "idiot" are typically wording to generate the negative outcome. This is also proven by Agumba (2016) study that the main contractors who adopted the appropriate communication channel in a project but with poor communication skills could only produce a non-desirable outcome of the project quality.

Nevertheless, fluent usage of contracting parties' communication knowledge on the construction project, such as selecting the appropriate communication channel and skills and allowing for open communication, implies effective communication, leading to desirable project outcomes (Daou, et al., 2015). It is because the adoption of adequate communication knowledge allows the communication duration to be shortened. Hence, decision making is produced in a speedy mode to respond to unforeseen issues (Hamzeh, et al., 2012). Therefore, presumed that ample communication knowledge from the contracting parties is essential to affect the project performance.

Dimension 4: Organisational gap and technological viewpoint

Dimension 4, which had a total variance explained of 9.809% and had three key elements: "different level of education", "lack of support of advanced technology" and "complexity of project", holding factor loadings of 0.801, 0.739 and 0.604, respectively. This dimension shows that every construction project's performance would be affected by the organisational gap and different viewpoints on technology adoption. The complex feature of multi-disciplinary professions in the construction industry tends to have an apparent organisational gap (Sackey, Tuuli and Dainty, 2015). Moreover, Khanna, et al. (2014) highlighted that the gap hinders collaboration, cooperation, and communication to be conducted smoothly as the project stakeholders work inside their operational islands towards the project objective. The operational islands were formed due to management and functional gaps (Project Management Institute, 2017). The lower educational workers are being arranged at the lower hierarchy level compared to the higher education workers who have expertise. Meanwhile, the project's complexity would result in the different functional groups of stakeholders. Therefore, the organisational gaps refuse effective communication and inhibit the project performance.

Moreover, technological opinions from the project stakeholders play a significant role in impacting the usage of advanced technology in promoting effective communication. This statement coincides with a study in China, which revealed that higher productivity is obtained from technological-communication-based projects than face-to-face communication. The high technological opinions and adoption of advanced technology in the construction projects can achieve more heightened safety awareness, accurate and latest information, lesser construction waste, and lesser changes (Hatem, Naji and Alkreem, 2018). Liu, Nederveen and Hertogh (2016) also found a similar result that adopting BIM as the advanced technology in the construction project would allow better information transfer and better allocation of resources to the project activities. The project stakeholders can collaborate more systematically.

Dimension 5: Organisational culture

Dimension 5 comprised 8.284% of the variance explained, which only consists of a factor of communication named organisational culture. Adversarial culture with the factor loading of 0.704 demonstrates that this dimension influences project performance and productivity. In the construction project, it is common to include the coordination and integration of a large amount of complex data, procedures, and systems. Still, it results in low project performance and unsatisfied with the client's requirement due to the fragmentation characteristic (Lu, et al., 2015; Steven, 2003). Yet the fragmentation characteristic does foster the expansion of organisational culture. The organisational culture significantly impacts decision-making, communication effectiveness, and workplace relationships (Arditi, Nayak and Damci, 2017). The procurement has grown in complexity and length, resulting in a large number of contracts. Hence, contracting parties may have inequitable or unequal distribution of authority and risk, resulting in conflicts.

Furthermore, as stated by Arditi, Nayak and Damci (2017), most construction projects are one-of-a-kind. It's likely that the project team has never collaborated before, or they have rarely worked on a project like this before, and therefore that they only have a limited timeframe to construct trust. Bishop, et al. (2009) brings to light the industry's fundamentally established power variances, the mindset of self-protection and disbelief, and the majority of contractors' cynical exploitation of market power. All of these issues work against efforts at collaboration, causing the project's productivity to decline.

4.13 Summary of Chapter

In short, this chapter presented the findings generated from the responses of 120 contracting parties within the Klang Valley region. Cronbach's alpha reliability test, Shapiro-Wilk test, mean, Mann-Whitney U test, Spearman's correlation test, and factor analysis were adopted to analyse the data collected. The response rate in the main survey is 38.10%. After conducting the reliability test, all the data contained in this study were reliable and in a strong internal consistency. The significant value is obtained less than 0.050, hence, the results are non-normality distributed.

Furthermore, "reduce conflict", "better collaboration between parties," and "good problem solving" were founded to be the top three most important reasons for effective communication. On the other hand, "lack of effective communication technique", "frequent changes to contract", "lack of mutual respect and trust", "slow information flow" and "unethical behaviour" were recognised as the top five factors of communication that impact to project performance. Besides, the three most effective communication strategies were "understand client's needs", "use effective communication channel" and "maintain integrity and trust".

Moreover, the results of the Mann-Whitney analysis revealed that the respondent groups (main contractors and sub-contractors) had significant differences in their perceptions on the needs of effective communication and potential communication techniques in construction projects. Spearman's correlation test showed a solid correlated relationship between lack of mutual respect and trust and the ability to maintain integrity and trust. Lastly, from a total of 20 factors of communication, the factor analysis had successfully identified five principal dimensions, namely "unique nature of construction industry", "supportive communication management", "communication's knowledge", "organisational gap and technological viewpoint" and "organisational culture".

CHAPTER 5

CONCLUSION

5.1 Introduction

Chapter 5 is the concluding chapter of the study. It begins with reviewing the chapters to highlight the research methods used to achieve the research aims and the findings. This chapter also includes a brief review of the research contribution to the construction industry and body of knowledge and its limitations. Lastly, several recommendations for future studies were proposed at the end of this chapter.

5.2 Conclusions

In a developing country such as Malaysia, one of the crucial sectors in promoting economic growth is undoubtedly the construction sector. The construction sector has provided an additional alternative for investors to diversify their strategies. However, the construction sector is plagued by ineffective communication management and a lack of understanding, impacting project performance, mainly cost and time. Consequently, research into communication management in the construction industry is critical to increase project performance and the knowledge and awareness among construction practitioners.

The foremost construction practitioners (client, consultant and contractor) are constantly being explored as a body to the communication management in most research. Yet, the contracting parties have a significant association with the construction performance, as the project execution accounted for more than half of the entire project progress. To fill in this gap, this study has therefore been conducted to investigate the effective communication management by the contracting parties has been closely monitored as an optimal strategy for improving project performance. As on that account in this way, this study was conducted to evaluate the importance of effective communication, factors of communication that impact

construction performance, and practical strategies to enhance communication effectiveness in the management of construction projects.

Consequently, a detailed review of relevant literature was conducted to find out the previous studies regarding communication management at the construction site. This had successfully identified 10 reasons, 20 factors of communication and 10 potential strategies. After that, closed-ended question surveys were distributed to collect the primary data from the contracting parties regarding their perceptions on communication management. In this study, the questionnaire survey yielded 120 valid responses from the contracting parties from the Klang Valley region. The reliability test and normality test were adopted to test the data reliability and normality before further statistical analysis.

All in all, the research questions and research objectives were answered and achieved, and the following section gives a summary.

5.2.1 Objective 1

The first objective was to identify the need for effective communication in the construction project delivery while the corresponding research question was, why is good communication significant in the delivery of construction projects? All of the 10 reasons are deemed to be relevant and the top three significant reasons obtained from the mean test are:

(1) Reduce conflict
(2) Better collaboration between parties
(3) Good problem solving

Besides that, he two respondent groups have a strong point of view regarding overall rankings, except for "better collaboration between parties". This reason has been ranked slightly higher by main contractors because they are the main parties with the most contractual relationships between construction stakeholders such as clients, sub-contractorss, suppliers, and so forth. In addition, there was a contradiction of opinion between the respondent groups regarding the “better long-term relationship” by using the Mann-Whitney U test. It was deduced that the discrepancy was due to the competitive nature of the construction project.

5.2.2 Objective 2

Furthermore, the impact on construction performance due to the factors of communication was investigated through the second research objective with the research question asking, what factors of communication contribute to bad performance? The research findings revealed that the top five significant factors of communication that would significantly impact project performance are:

(1) Lack of effective communication techniques
(2) Frequent changes to contract
(3) Lack of mutual respect and trust
(4) Slow information flow
(5) Unethical behaviour

Interestingly, the Mann-Whitney U test revealed that all respondent groups do not have heterogeneity of perspectives on the degree of factors of communication that impact project performance. Moreover, factor analysis was adopted to examine the 20 factors of communication and five principal dimensions that explained the factors were revealed. The underlying elements that have developed serve to enhance the current understanding of communication issues in the construction industry and give more profound insights into how to establish effective communication management to improve project performance. The five dimensions were named as:

(1) Unique nature of construction industry
(2) Supportive communication management
(3) Communication’s knowledge
(4) Organisational gap and technological viewpoint
(5) Organisational culture

5.2.3 Objective 3

In addition, the third research objective was to recommend measures to enhance communication effectiveness in the management of construction projects with the related research questions of how to improve communication effectiveness in the management of construction projects? According to the

summarised perspectives from contracting parties, the top three key strategies to enhance effective communication are:

(1) Understand client's needs

(2) Use of effective communication channel

(3) Maintain integrity and trust

Moreover, the Mann-Whitney U test revealed that "use effective communication channel", and "partnering" found a significant discrepancy between the respondent groups. It is due to the different hierarchy levels between the main contractors and sub-contractors having different perceptions towards the effective strategies to enhance effective communication at the construction site.

Besides, Spearman's Correlation analysis was conducted to investigate the relationship between the impact of factors of communication and practical strategies to improve the effective communication management at the construction site, and 140 relations were founded within the variables. The findings revealed that lack of mutual respect and trust (F10) is significantly correlated to the ability to maintain integrity and trust (S4). Particularly compared to other outlined measures, it is feasible to conclude that maintaining trust and integrity can dramatically enhance project performance that a lack of trust and respect has harmed.

5.3 Research Implication

This study provides a broad picture of project communication management in the Malaysian construction industry from contractors' perspectives and it serves theory and practical contributions in the following ways. There is presently limited research on contractors' views on project communication management effectiveness. Hence, the research's theoretical implication is that this study is among the few kinds of research on the matter that has focused on the exploratory factor analysis approach to summarise factors of communication into smaller principal dimension groups. The variables were kept discussed and figured out separately in the preceding studies. The exploratory factor analysis's finding exploits the principal dimensions representing each variable. The research's findings could also be used to

expand on variables in each dimension to identify the causes that contribute to poor performance in a related area of study.

Furthermore, some practical research implications have been acquired through the research findings. The reasons for effective communication and the impacts of factors of communication on performance and practical enhanced solutions were examined in this study. The findings of this study, in particular, are shown to be instructive and provide greater insight for contracting parties in strengthening their awareness and understanding of communication factors' impact on project performance. Besides, the results highlighted the most significant intention of contracting parties in adopting effective communication is to reduce conflict issues that arise during the construction delivery. The project contractor who acts as a moderator is able to reduce the conflict cases by adopting effective communication management that achieves a win-win situation for the conflicting parties. This is because significantly during the execution of the project, the chances of the conflicts between contractors and the consultant team regarding the monthly claims would increase, as both parties tend to stick to the claim amount that they submitted. Therefore, the finding has increased the main contractors' and sub-contractorss' awareness of the importance of good communication in reducing conflicts between the construction stakeholders, especially the conflict between contractors and consultants.

Moreover, conflict plays an essential role in fostering a favourable organisational trust impression. According to the research findings, lack of mutual trust and respect has been rated as one of the top three significant factors that impact project performance. Everyone must be motivated to collaborate for a project to be successfully constructed. Beyond just practicable, a trusting environment should be developed so that project team members would promptly inform one another of any potential project-related issues. It is believed that building trust help strengthens any communication gaps that a construction team may have. It is vital to promote trust and integrity in the construction sector since it impacts it’s development and performance in terms of time, cost, and quality.

In addition, the findings showed that the positive to enhance communication effectiveness, certain measures must be conducted, in particular, understanding the client's needs, using effective communication channels and maintaining integrity and trust should be practically implemented. It is asserted that implementing these practices by contracting parties can provide numerous advantages to the Malaysian construction industry, such as reduced conflict, enhanced project's client satisfaction, saving in cost and time and better overall project quality. Conclusively, this research depicts an industry that will be attempting to improve its capability to communicate effectively. All in all, this research is important because it strengthens contracting parties' attention of the significance of developing effective communication management in the Malaysian construction sector in order to obtain satisfying performance.

5.4 Research Limitation

Although the research contributes to successful communication performance in the construction sector, this study has numerous limitations that must be acknowledged. Firstly, an organised survey with closed-ended questions is utilised in quantitative research. As a result, the results may not always properly reflect the actual situation in a broad sense. Additionally, the respondents' response options are limited because of the researcher's choice. Hence, managing structured surveys hamper respondents' rich and unique experiences from their previous construction projects, as they only allow in-depth interviews. Nonetheless, the study's conclusions are supported by data triangulation, which involves comparing the results to those of earlier studies.

The second limitation concerned is due to the COVID-19 pandemic around the Malaysian community. The internet-based survey is the only method to collect responses. Instead of paper-based or face-to-face questionnaires, an internet-based questionnaire survey has arisen some difficulties in data collection progress. The intended respondents may mistakenly disregard the survey or feel uninterested in answering the study topic; therefore, the online survey commonly has low performance and a lengthy response period. Despite this, the researcher could obtain an adequate

sample size thru multiple distribution methods such as WhatsApp and LinkedIn. Thus, a gentle reminder was also an effective approach to follow up the responses from non-reply respondents.

Moreover, statistical correlation is a helpful tool for measuring the degree to which two variables are connected linearly. Unfortunately, the correlation coefficient doesn't reveal the cause-and-effect relationship. Correlation does not imply causation, which means that just because two variables are correlated doesn't imply they are causally linked. In fact, for being one of the systems-thinking techniques, developing causal loop diagrams in future work would help make the interrelationships (cause and effect relationships) within a system's structure more apparent.

5.5 Recommendations for Future Research

There are a few recommendations are suggested in order to address the research limitations described in subsection 5.4. To further enrich the distinctive experience of contracting parties regarding communication management perspective, future studies should apply a mixed-method approach by distributing questionnaires and conducting in-depth interviews. An in-depth interview is one of the methods in the qualitative approach, which is beneficial in determining whether the data gathered from a questionnaire survey is trustworthy. It can help increase the study's validity and reliability by providing triangulation, such as case studies, interview findings, and survey responses. Furthermore, an in-depth case study will help better understand communication management in the construction business and add new perspectives to the research field.

Moreover, it is essential to highlight that the research's findings are represented the contractors' perspective in the Klang Valley region. To be precise, it is only the data from the West Peninsula Malaysia. Hence, it would be worthwhile to conduct a similar study across East Peninsula Malaysia, especially Sarawak, to correctly represent the Malaysian construction sector. This would verify this study's finding held in other areas, such as East Malaysia.

Finally, in the Malaysian construction industry, there is a highly recommended deeper research into the communication management aspect by contracting parties. It intends to ensure that communication effectiveness studies by contracting parties are carried out thoroughly. It would be interesting to follow up on this study and look at the frequency of occurrence of the five principal dimensions derived from the factor analysis. Future studies should be conducted to identify new principal dimensions in the Malaysian construction sector that contribute to poor project performance due to communication issues.

5.6 Summary of Chapter

The chapter had outlined the summary from the following chapters and the method for obtaining all of the research aims. Aside from that, the research constraints and contributions were established to examine the problem and challenges encountered during the study. Last but not least, to address the limitations, a few recommendations were made that would positively impact future research.

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APPENDICES

Appendix A: Questionnaire.

Project Communication Aspects on Construction Performance: Investigating Contractors' Perspectives

Dear Sir/Madam,

A warmest greetings and best regards to you.

My name is Yu Chooi Yi and I am a final year undergraduate student currently pursuing Bachelor of Science (Honours) Quantity Surveying at Universiti Tunku Abdul Rahman (UTAR). I am currently doing my research entitled "Project Communication Aspects on Construction Performance: Investigating Contractors' Perspectives".

The aim of this survey is to examine the needs, access the communication-related impacts and explore the effective communication strategies based on contracting organizations' perspectives.

This questionnaire consists of FOUR (4) sections and is designed to be completed within 10-15 minutes. I deeply appreciate your help in participating in this survey, your participation will greatly contribute to the success of the survey. All the information collected through this survey will be private and confidential and strictly used for academic purposes only.

Should you require any clarification, please do not hesitate to contact me at chooiyi1002@gmail.com or 016-2522989.

Your precious time and effort in participating the survey are deeply appreciated.

Thank you.

Yours faithfully,
Yu Chooi Yi

* Required

Section A: Background's Information

(Choose only one choice per question)

1. 1. Type of Organizations *

Mark only one oval.

- ◯ Main Contractor
- ◯ Sub-Contractor

2. 2. Working Experience *

Mark only one oval.

- ◯ 0-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ More than 20 years

3. 3. Academic Qualification *

Mark only one oval.

- ◯ High School
- ◯ Diploma
- ◯ Bachelor's Degree
- ◯ Postgraduate (Master Degree, PhD)

4. 4. Your Age *

Mark only one oval.

- ◯ 21-30 years old
- ◯ 31-40 years old
- ◯ 41-50 years old
- ◯ 50 years old and above

Section B: Needs of Effective Communication in Construction Industry

5. 5. Do you agree that communication related problems can significantly affect project performance? *

Mark only one oval.

- ◯ Strongly disagree
- ◯ Disagree
- ◯ Neutral
- ◯ Agree
- ◯ Strongly Agree

6. 6. Please indicate your level of agreement on the following reasons to establish effective communication in construction project delivery? *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Better collaboration between parties	◯	◯	◯	◯	◯
High quality project outcome	◯	◯	◯	◯	◯
Good problem solving	◯	◯	◯	◯	◯
Better control on client budget	◯	◯	◯	◯	◯
Better project time control	◯	◯	◯	◯	◯
Better long-term relationship	◯	◯	◯	◯	◯
Enhance labour productivity	◯	◯	◯	◯	◯
Reduce conflict	◯	◯	◯	◯	◯
Enhance safety performance	◯	◯	◯	◯	◯
Manage change	◯	◯	◯	◯	◯

Section C: Communication Factors that Impact Construction Performance

7. 7. In your opinion, which of the following communication factors would impact construction performance? *

Mark only one oval per row.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Adversarial culture	◯	◯	◯	◯	◯
Complexity of project	◯	◯	◯	◯	◯
Language barrier	◯	◯	◯	◯	◯
Slow information flow	◯	◯	◯	◯	◯
Unclear objective	◯	◯	◯	◯	◯
Lack of effective communication technique	◯	◯	◯	◯	◯
Lack of communication management plan	◯	◯	◯	◯	◯
Improper communication time management	◯	◯	◯	◯	◯
Frequent changes to contract	◯	◯	◯	◯	◯
Lack of mutual respect and trust	◯	◯	◯	◯	◯
Unethical behaviour	◯	◯	◯	◯	◯
Lack of support of advanced technology	◯	◯	◯	◯	◯
Different level of education	◯	◯	◯	◯	◯
Poor communication skills	◯	◯	◯	◯	◯
Impropriate communication channel	◯	◯	◯	◯	◯
Stressful working environment	◯	◯	◯	◯	◯
Poor feedback	◯	◯	◯	◯	◯
Inaccessibility of information	◯	◯	◯	◯	◯
Knowledge hoarding	◯	◯	◯	◯	◯
Lack of open communication	◯	◯	◯	◯	◯

Section D: Effective Strategies for Effective Communication Aspect in Construction Project

8. 8. In your opinion, how effective are the following strategies in enhancing communication effectiveness in the management of construction projects? *

Mark only one oval per row.

	Ineffective	Somewhat effective	Effective	Very effective	Extremely effective
Adoption of Information and Communication Tools (ICT)	☐	☐	☐	☐	☐
Adoption of BIM technology	☐	☐	☐	☐	☐
Partnering	☐	☐	☐	☐	☐
Maintain integrity and trust	☐	☐	☐	☐	☐
Team building	☐	☐	☐	☐	☐
Use effective communication channel	☐	☐	☐	☐	☐
Provide language training	☐	☐	☐	☐	☐
Long-term relationship	☐	☐	☐	☐	☐
Understand client's needs	☐	☐	☐	☐	☐
Avoid noise environment	☐	☐	☐	☐	☐