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ASSESSMENT ON THE FACTORS INFLUENCING INEFFECTIVE COMMUNICATION AMONG STAKEHOLDERS IN INFRASTRUCTURE DEVELOPMENT

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Abstract

Communication serves as a foundation for the planning and development of infrastructure projects. Because the infrastructure projects are complex and involve multiple stakeholders, ineffective communication could significantly negatively impact the whole development process. Hence, this paper aims to determine the significant factors that lead to ineffective communication among project participants in infrastructure development in Malaysia and explore initiatives to address the problems. The research data were gathered via responses from a questionnaire survey and semi-structured interviews with Grade G7 contractors and consultant engineers who were involved in infrastructure development. The study starts by distributing questionnaires to the target population to determine the significant factors influencing the ineffectiveness of communication among the project participants. At the second stage, 28 industry practitioners were interviewed to gain their deeper insight on the initiatives to address the problems. The result revealed seven significant factors contributing to the communication ineffectiveness in infrastructure development in Malaysia. There were eight initiatives recommended to be taken by project participants to address the problems, namely, to channel the site problems to the right and authorized person/party, encourage a cooperative attitude towards achieving the project goal, avoid confrontational attitudes, provide timely feedback, create a harmonious and effective working environment, promote a no-blame culture, encourage respect for others, and keep written communication at all times. The outcome of the study could mitigate the impacts of ineffective communication in infrastructure planning and development by helping to ensure that all the participants involved are on the same page and aligned with project goals.

Keywords: Communication, Development, Infrastructure, Project Participants

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INTRODUCTION

Effective communication is the backbone of successful construction planning and development. It enhances collaboration, minimizes misunderstandings, and ensures that all project stakeholders work together harmoniously towards achieving the project's goals (Ahmed & Othman, 2013; Al-Mayahi et al., 2018; Ling et al., 2013; Mohd Fateh et al., 2023). According to Zhang and Fan (2013), communication skills are the capacity to carry out efficient communication among project participants in order to facilitate the project's implementation. Poor communication among the project participants could result in inefficiencies, errors, and delays in task completion, especially for a large-scale and complicated development like infrastructure projects. In their study, Ismail et al. (2021) found that the frequency of poor communication between the contractor and the engineer in infrastructure projects was only moderately satisfactory. This could be attributed to the construction projects' characteristics, which are fragmented and segmented in nature. In addition, it is also a dynamic sector that operates in frequently changing sets of relationships which are contractually driven. Hence, ineffective communication may lead to poor project planning and performance as well as conflict among project participants. Therefore, this paper aims to determine the significant factors that lead to ineffective communication among project participants in infrastructure development in Malaysia and explore initiatives to address the problems.

LITERATURE REVIEW

The engineers' communication skills are vital as they act as the leaders in the infrastructure project implementation team. In the traditional procurement method, the engineer represents the client and is the leader of the design team. According to Yu and Shen (2013), an engineer's ability to communicate effectively is essential for a successful integration of the participants in the implementation of building projects. In addition, the engineer is in charge of ensuring that a project's planning phase includes a comprehensive task definition, resources, a time schedule, and a list of requirements. To do this, the engineer must conduct clear and effective communications.

On the other hand, good communication skills by the contractor are also critical in this type of procurement method since the designs are prepared by the design team. In ensuring the smoothness of the construction process, a good understanding of the design is paramount. Therefore, a contractor requires good skills in communicating with the design team. Subsequently, the main contractor must ensure the information flows efficiently to the numerous subcontractors' organizations (Rahmat, 2008). In addition, it is vital in infrastructure projects because of the involvement of large numbers of subcontractors compared to general building projects.

There is a provision in both FIDIC Standard Form of Contract and PWD 203A Standard Form of Contract allowing the engineer and superintending officer (S.O.) to delegate their authority to engineer's assistant or S.O.'s representative provided that such delegation is put in writing. Indeed, this provision might lead to conflict if the engineer's assistant or S.O.'s representative has lack of communication skills because all of their authorised instruction must be obeyed by the contractor (Zulkifli et al., 2011). According to Zakaria et al. (2013), under FIDIC Standard Form of Contract, clear and effective communication is important due to different roles of engineer and engineer's assistance. Meanwhile, under PWD 203A, based on the practice in Malaysia, the S.O (in almost all cases) is appointed based on a public post but not based on expertise and experience (Zakaria et al., 2013). This might cause problems in achieving effective communication, thus the delegation of authority to the S.O.'s representative can overcome the problems.

Not limited to the traditional procurement method, the importance of communication skill among the participants is emphasized by researchers in other types of procurement method as seen in Design and Build (Adnan et al., 2008), Joint Venture (Famakin et al., 2012), and Build-Operate-Transfer (Kumaraswamy & Morris, 2002). Therefore, the communication effectiveness of both contractor and engineer, as well as their representatives involved in infrastructure projects, is important to be researched in order to understand how conflict manifests and eventually affects the project's success.

Factors Influencing the Communication Effectiveness in Infrastructure Projects

In literature, the characteristics of infrastructure projects are dominantly associated with complexity in design and construction as well as uncertainty in its implementation would make the participants of the project impossible to strictly comply with what is stipulated in the contract (Ismail et al., 2023). Therefore, the characteristics of infrastructure projects that might affect the communication effectiveness are important to be researched. Apart from project characteristics, the quality of Standard Forms of Contract also plays a major influence on the communication. Since a Standard Forms of Contract is used by the contracting parties to regulate their legal relationship and to provide administrative procedures in project implementation (Chong & Zin, 2010), any flaws or unfair clauses might affect the communication effectiveness among the project participants and eventually might cause dissatisfaction and conflict among them. Similarly, external factors and attitudes of the project participants during project implementation are also reported in the literature as the factors that contribute to good or failed communication in a construction project (Yuslim, 2023; Shehu et al., 2014). Therefore, the determinants of communication

effectiveness in infrastructure projects explained in this study were the characteristics of civil engineering projects, the quality of Standard Form of Contract (SFoC) used, external factors and attitude of individual project participants domain as shown in Table 1.

Table 1: Possible Contributing Factors to Ineffective Communication Among Project Participants

Category	Possible contributing factors to ineffective communication among project participants	Reference
Project characteristics	Project type, project size, type of SFoC use, procurement method used, adequacy of design details and specification, project complexity, ground uncertainty, surrounding uncertainty, project scope change, design changes, ease of site access, tight project milestone, technological advancement requirement, multicultural team	Krima et al. (2007); Marique (2013); Ismail (2021); Guo et al. (2016)
External factor	Resources availability, changes in government regulations and laws, bureaucracy of government agencies, weather condition	Yuslim (2023); Yong & Mustaffa (2016); Sambasivan & Soon (2007); Yu & Shen (2013); Shehu et al. (2014)
Quality of SFoC	Fairness of SFoC content, clarity of SFoC content, completeness of SFoC content, trust produced by SFoC content	Shehu et al. (2014); Ahmed & Othman (2013); Gosling et al. (2013)
Attitude of participants	Level of SFoC compliance, level of understanding the content of SFoC, familiarity of procurement method used, Cooperation in solving problems, Competency of engineer	Chan (2003); Rameezdeen & Rodrigo (2010); Ali & Wilkinson (2010); Chong & Zin (2010)

RESEARCH METHODOLOGY

In order to address the issues related to the communication between the participants in infrastructure projects, this study focused on determining the factors contributing to the effectiveness of communication and then, followed by the initiatives that can be suggested to address them. Hence, the data collection method was conducted in two stages, starting with a survey conducted via questionnaire distribution to determine the significant contributing factors: the next stage was semi-structured interviews were carried out to suggest the initiatives to overcome the communication problems. There were two target population frames, which comprised of professional engineers registered under the Board of Engineer Malaysia (BEM) and Grade G7 contractors registered with the Construction Industry Development Board (CIDB) identified as the respondents. Based on the 4151 eligible target population, the estimated sample size of this study was 255, which was calculated using Raosoft sample size calculator. This sample size calculator has been used by many researchers in the

similar field of study as this research, for example, Desa et al. (2012) and De Araujo et al. (2018), hence showing that the sample size calculation is rational and reliable for this study.

Based on literature reviews carried out, under the four aforementioned domains, 27 factors that might contribute to the communication problems were found as shown in Table 1. Then, the survey was phrased to ask the respondents to rate the level of influence of the 27 factors based on their judgement and working experience in infrastructure projects. These possible influencing factors were presented for assessment to determine which of them has the highest contribution to the communication issues in infrastructure projects in Malaysia. The 5-point Likert scale was used to measure the level of influence of the factors on the communication effectiveness where (5) denotes very high influence, (4) high influence, (3) moderate influence, (2) low influence, and (1) very low influence. This kind of scale is used to calculate the mean score for each factor, which is then used to determine the relative ranking of each factor by assigning a ranking to mean score, with the low mean score assigned low ranks and high scores allocated high ranks (Aziz & Abdel-Hakam, 2016; Shehu et al., 2014).

The data collection process started with sending out 1000 questionnaires to the targeted population. After the result of the questionnaire responses was obtained, the data collection method proceeded with semi-structured interviews. Previously, in the questionnaire forms, the respondents were requested to participate in the subsequent semi-structured interview session for detailed thoughts on the most significant factors and the initiatives to be taken to address the communication issues. 28 of them gave positive feedback and agreed to take part in the interview session. Thus, they were informed on the most significant factors resulted from the questionnaire. Interview questions were developed to guide them during the interview session. Before the interview data were analysed, each interview discussion was transcribed into a text document. Overall, 28 interview audios were transcribed and then analysed manually.

ANALYSIS AND DISCUSSION

Questionnaire Result and Analysis

Prior to distributing the questionnaire, a pilot survey was administered by distributing 60 questionnaires to the target population. 38 responses were received for this preliminary survey. The reliability test was conducted, and the overall Cronbach's coefficient alpha value was 0.802. This verifies that all variables in the study demonstrated internal consistency and the main survey could be administered to the target population. After a period of six weeks, with 29% response rate, a total of 288 responses were received. There were 151 contractor respondents and 137 engineer respondents. As depicted in Table 2, all of the respondents' positions were at the executive level, suggesting that the data

gathered in this study came from reliable sources because the respondents were at the forefront of project execution.

Table 2: Respondent's Position in Their Organisation

Respondents position in their organisation	**Engineer**		**Contractor**	
	Frequency	**(%)**	**Frequency**	**(%)**
Manager	17	12	19	12.6
Civil Engineer	120	88	20	13
Quantity Surveyor	0	0	112	74.2
Total	137	100	151	100

As portrayed in Table 3, most respondents have extensive experience dealing with infrastructure projects for more than 10 years. 49% of engineer respondents and 46% of contractor respondents have experiences between 6 to 10 years. Very few respondents have experiences between 2 to 5 years with only 8% of the total respondents.

Table 3: Respondents Experience in Infrastructure Projects

Year of experience in infrastructure projects	**Engineer**		**Contractor**	
	Frequency	**(%)**	**Frequency**	**(%)**
Less than 2 years	0	0	0	0
2 to 5 years	0	0	12	8
6 to 10 years	67	49	69	45.7
More than 10 years	70	51	70	46.4
Total	137	100	151	100

Table 4: Types of Infrastructure Projects Procured by Respondents

Types of Infrastructure project	**Frequency (No)**	**Percentage (%)**
Road/Highway	259	90
Railway	39	14
Bridge	101	35
Drainage/Canal	36	13
Tunnel	26	9
Port	14	5
Airport	56	19
Dams	17	6

In terms of the type of projects that the respondents have experience being involved with, majority of them (90%) have had experience in managing and constructing road or highway projects. It is followed by projects involving bridges (35%), airports (19%), railways (14%), drainage or canals (13%), tunnels (9%), dams (6%) and ports (5%). As portrayed in Table 4, the subsequent result of the study represented more on the road/highway infrastructure projects.

Significant Factors Influencing Ineffective Communication in Infrastructure Development Projects

Table 5 portrayed the ranking of the 27 factors that contribute to Ineffective Communication among project participants in infrastructure projects. Based on the result, it was found that out of the 27 factors assessed, only seven of them were significant in causing ineffective communication among project participants rated by all respondents with the mean scores ranging from 4.05 to 4.34. They were familiarity of procurement method used, poor in following condition of contract, scope changes, cooperation in solving problems, competency of project participants, trust produced by SFoC and clarity of SFoC. The factors which were found to have a moderate influence on the communication effectiveness among project participants were project complexity, bureaucracy of government agencies, adequacy of details and specifications, changes in government regulations and laws, weather conditions, changes in initial design, site access, tight project milestone, level of understanding condition of contract, project size, resources availability, ground uncertainty and site surrounding uncertainty. On the other hand, the remaining six factors were found to have low influence.

Table 5: The Ranking of Factors that Influenced Ineffective Communication Among Project Participants

Factors influencing poor communication project participants	**Overall**		**Engineer**		**Contractor**		**Mann-Whitney U *Sig. p***
	Mean	**Rank**	**Mean**	**Rank**	**Mean**	**Rank**	
Familiarity of procurement method used	4.34	1	4.30	1	4.38	1	0.199
Poor in following condition of contract	4.27	2	4.22	3	4.31	2	0.088
Scope changes	4.26	3	4.25	2	4.26	3	0.746
Cooperation in solving problems	4.07	4	4.03	6	4.10	4	0.039*
Trust produced by SFoC	4.05	5	4.04	5	4.05	5	0.952
Competency of contractor	4.04	6	4.07	4	4.01	7	0.032*
Clarity of SFoC	4.03	7	4.02	7	4.04	6	0.497
Project complexity	3.91	8	3.85	12	3.97	8	0.001*
Bureaucracy of government agencies	3.91	9	3.96	9	3.87	9	0.078
Adequacy of details and specifications	3.88	10	3.99	8	3.78	12	0.001*
Changes in government regulations and laws	3.87	11	3.87	11	3.87	10	0.908
Weather condition	3.87	12	3.96	10	3.79	11	0.000*
Changes in initial design	3.77	13	3.80	13	3.74	13	0.204
Site access	3.26	14	3.28	14	3.25	14	0.560

Factors influencing poor communication project participants	Overall		Engineer		Contractor		Mann-Whitney U *Sig. p*
	Mean	Rank	Mean	Rank	Mean	Rank	
Tight project milestone	3.21	15	3.26	16	3.16	16	0.054
Level of understanding condition of contract	3.17	16	3.27	15	3.07	19	0.000*
Project size	3.16	17	3.15	19	3.17	15	0.632
Resources availability	3.16	18	3.26	17	3.07	20	0.000*
Ground uncertainty	3.15	19	3.15	20	3.15	17	0.886
Surrounding uncertainty	3.14	20	3.12	21	3.15	18	0.458
Completeness of SFoC	3.05	21	3.17	18	2.93	20	0.000*
Technological advancement	2.85	22	2.99	22	2.72	22	0.000*
Multicultural team	2.76	23	2.73	24	2.79	21	0.197
Fairness of SFoC	2.66	24	2.90	23	2.45	23	0.000*
Procurement method	2.52	25	2.66	25	2.40	24	0.000*
Project type	2.35	26	2.43	26	2.28	25	0.014*
Type of SFoC	2.31	27	2.41	27	2.21	26	0.000*

Based on the p-values of each of the seven critical factors contributing to ineffective communication among project participants depicted in Table 5, there was no significant difference in the opinion of both types of respondents on these factors except for cooperation in solving problems and competency of project participants. With the p-value of 0.039 and 0.032 respectively, the cooperation in solving problems and competency of project participants were found to have a higher influence on communication project participants perceived by contractor respondents compared to engineer respondents. Overall, this can be concluded that, out of 27 factors assessed, only seven factors were found to be of significant influence on ineffective communication among project participants namely familiarity with the procurement method used, changes in project scope, poor in following condition of contract, cooperation in solving problems, competency of project participants, clarity of Standard Form of Contract (SFoC) and trust produced by SFoC.

Semi-Structured Interview Result and Analysis

The purposive sampling strategy was adopted to select the semi-structured interview participants. Sekaran and Bougie (2010) mentioned that purposive sampling is narrowed to a specific group of people who can deliver the needed information. The participants are selected based on the characteristics of the population that fulfil the criteria set by the researcher. Hence, the suitable participants for this study were the engineers and the contractors. The analysis of the interviews focused on in-depth discussion of the seven significant factors contributing to the communication effectiveness obtained from the questionnaire analysis.

Participants' background

There were 28 participants who volunteered to take part, including 12 engineers and 16 contractors. All of the participants have had more than five years of experience in dealing with infrastructure development projects in Malaysia, where most of them have exceeded ten years of experience. Both engineers and contractor participants' positions were at the executive level and directly involved in the project implementation.

Table 6: Participants of the Interview

Engineer Participants			Contractor Participants		
ID	Respondent position	Experience (years)	ID	Respondent position	Experience (years)
E1	Resident Engineer	9	C1	Senior Contract Manager	15
E2	Resident Engineer	20	C2	Project Manager	10
E3	Road Engineer	12	C3	Project Engineer	12
E4	Project Coordinator	12	C4	Project Manager	12
E5	Project Engineer	10	C5	Project Engineer	10
E6	Principal Engineer	9	C6	Senior Quantity Surveyor	10
E7	District Engineer	18	C7	Planning Engineer	16
E8	Bridge Engineer	13	C8	Senior Quantity Surveyor	9
E9	Road Engineer	16	C9	Site Quantity Surveyor	8
E10	Road Engineer	10	C10	Site Engineer	6
E11	District Engineer	18	C11	Project Manager	13
E12	Project Engineer	6	C12	Project Manager	9
			C13	Site Engineer	10
			C14	Quantity Surveyor	5
			C15	Site Engineer	7
			C16	Site Engineer	8

Initiatives for improvement of ineffective communication among infrastructure development project participants

There were eight initiatives recommended to be taken by project participants for the improvement of communication among project participants. The initiative recommended by the majority of participants was the engineer to provide timely response to the contractor's inquiry. Timely feedback by the engineer on any contractor's inquiry is very important to ensure good communication between them. Time is the essence in civil engineering projects and the contractor's work progress must be in line with the work program, thus unnecessary delay from the engineer in regards with contractor's inquiry which may lead to dissatisfaction, and this affects the progress on site. The initiative can also be made by the Resident Engineer (RE) by visiting the construction site regularly in order to meet

site staff for discussions as well as to give a timely response. The next initiative recommended to address the communication ineffectiveness was to channel the site problems to the right and authorized person/party. The majority of the respondents highlighted that by channelling the site or construction problems to the right and authorised party, dispute and poor communication between project participants, particularly between engineer and contractor can be avoided. They stressed out that in case any problems occur on site, the contractor must always discuss the problem immediately with the resident engineer or representatives.

The other initiatives suggested were to encourage cooperation towards achieving project goal, create a harmonious and effective working environment, avoid confrontational attitude, no blame culture, encourage respect for others and keep written communication at all times. Infrastructure projects involve many key participants with different roles and responsibility in project implementation. Hence, in the event of any problems in the construction site, each of them must be aware of each other's roles by channelling the problems to the right parties. It could be a provocative action that could affect communication if the problem was channelled to the wrong party. Similarly, a confrontational attitude must be avoided. Hence social integration is needed among key participants to prevent them from being fragmented and unable to work together effectively. Each of the key participants also should encourage cooperation towards achieving the project goal. With good cooperation among them, it could lead to effective communication. Holding regular meetings, joint evaluation and technical collaboration throughout the construction process requires interaction and sharing of knowledge to a substantial extent. Hence, they learn a lot from each other, resulting in broader competence for all participants and facilitating future collaboration.

Creating a harmonious and effective working environment on site could also enhance good communication among the project participants. Under the premise of a friendly atmosphere, the existence of trust helps bilateral members reach the agreement, which contributes to the formation of cooperation and transparent communication among them. On the other hand, communication among the project participants could be strengthened by encouraging respect for others by realizing that everyone has a similarly important role to play in ensuring the accomplishment of the project goal. By understanding and adhering to the condition of contract in completing tasks, each key participant could be encouraged to perform their proper function by securing the parties. From this perspective, the contract may be analysed as a tool to generate trust and encourage a 'no blame' culture in the project. Therefore, it is suggested that all key participants keep written communication at all times. By following all procedures and keeping all transactions in written form, it would ensure authorisation of

instructions or approvals and prevent them from the 'blame game', frustration and conflict.

CONCLUSION

In addressing the communication ineffectiveness among the project participants in the infrastructure development in Malaysia, this study applied both quantitative and qualitative approach via a survey using questionnaires and semi-structured interviews. The findings revealed that seven factors that significantly contribute to the ineffectiveness of communication, namely familiarity with the procurement method used, changes in project scope, poor compliance with conditions of contract, cooperation in solving problems, competency of project participants, clarity of the SFoC and trust produced by the SFoC. Based on the significant contributing factors revealed, this study suggested eight initiatives that must be implemented by all project participants to address the ineffectiveness of communication in infrastructure development projects. Those initiatives were to channel the site problems to the right and authorized person/party, encourage a cooperative attitude towards achieving the project goal, avoid confrontational attitudes, provide timely feedback, create a harmonious and effective working environment, promote a no-blame culture, encourage respect for others, and keep written communication at all times. The outcome of this study highlighted the determinants that are common in construction development projects but very significant in triggering communication problems among the project participants. Understanding the determinants is important, and the initiatives suggested by the study would be useful for the client, consultant, and contractor in planning the protective measures to avoid problems during project implementation.

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