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Critical Delay Factors in Typical Physical Projects: The Case of the Ministry of Home Affairs in Malaysia

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Abstract: In Malaysia, public projects have been consistently reported as dilapidated and delayed, causing the government to bear financial losses. Furthermore, the purposes of the projects have not been fully achieved, thus affecting the public interest. This study examined the critical contributing factors to the delay in implementing physical projects in the Ministry of Home Affairs (MOHA). The scope involved the physical construction projects of the Immigration Department of Malaysia's offices and premises in Malaysia, which was mandated in the 11th Malaysia Plan. A total of 105 respondents, including contractors, consultants, end-users and clients, participated in a survey on the factors and effects of physical project delay. The data were analysed using the relative importance index (RII) and Spearman's correlation to identify the most critical delay factors and their association with delay effects. A total of 38 delay factors were identified, with contractor-related factors being the most critical, followed by consultant-related, client-related and other factors. These delay factors were found to be positively correlated with the effects of delay, including time and cost overrun, quality, litigation and arbitration, and abandonment.

Keywords: Construction project, Project delay, Delay factors and effects, Ministry of Home Affairs, Government projects

INTRODUCTION

The construction industry is one of the largest sectors, consisting of a mix of diverse companies and professions that have a significant and strong influence on the global economy (Brookes, 2013). On a national scale, this industry has a vital role in economic growth as revenue generation, capital formation and job creation contribute to a country's gross domestic product and socioeconomic development (Khan, Liew and Ghazali, 2014). In Malaysia, the government has been investing in the construction industry to ensure economic stability. For instance, during recessions, some states relied on construction investments to raise employment opportunities and their local economy (Rafat and Ahmed, 2017). This data shows that Malaysia has always taken a balanced development approach that emphasises economic growth and people's well-being.

Malaysia's Quarter Construction Statistics reported that the value of construction work in Quarter 1 of 2019 was MYR37.4 billion (Department of Statistics Malaysia, 2019). Of that amount, the private sector propelled construction activities

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with a 56% share (MYR20.9 billion/USD4.64 billion) and the public sector with a 44% share (MYR16.5 billion/USD3.67 billion). In the public sector, the government is the main client of the construction industry, specifically through the development of government buildings and public amenities, aiming at improving Malaysia's service, functionality and well-being (Pulmanis, 2015).

As the construction industry produces both trade and capital, making it an essential contributor to the economy, delays in project achievement are an important issue (Al-Adwani, Mollasalehi and Fleming, 2018). Hisham and Yahya (2016) state that as a developing country, Malaysia is growing its position in the construction industry. However, the delay in implementing projects significantly impacts the country's planning and economy. The Implementation Coordination Unit (ICU) of the Prime Minister's Department reported that in the 4th Rolling Plan 2019, 139 physical projects were listed as delayed or behind schedule (Department of Statistics Malaysia, 2019). The report elaborated that the activities in the project implementation phase, specifically building work, appear to be the most problematic. As of September 2019, 37% of Ministry of Home Affairs' (MOHA) projects were categorised as being behind schedule and late in their physical progress (Kementerian Dalam Negeri, 2019). Although extensive research has been carried out on project delays, most have focused on construction types, such as general, residential, petrochemical, oil and gas, and road constructions.

Even though government projects are studied in Malaysia, a limited number of studies have examined the construction projects of specific security agencies, namely agencies under the MOHA, Royal Malaysia Police, Immigration Department of Malaysia and Prisons Department. These agencies have unique criteria and technical specifications regarding safety and design that vary from regular and standard building construction requirements. For example, facilities such as police lockups, prison cells and immigration detention centres vary from regular buildings in terms of material used, specifications and installation of specific equipment. Accordingly, this paper aimed to examine the critical contributing factors to the delay of these projects and their relationships with the effects of the delay. The scope was the physical construction projects of the Immigration Department of Malaysia's offices and premises in Malaysia.

LITERATURE REVIEW

Physical Project Delay

Development activities in Malaysia are planned and implemented using five-year plans introduced since 1966. The 12th Malaysia Plan began in 2021, following the 11th Malaysia Plan from 2016 to 2020. In the latter, a budget of MYR260 billion was allocated and approved for development expenditure (physical and non-physical projects), of which the MOHA received MYR9.24 billion (Economic Planning Unit, 2015). The Development Division of MOHA was responsible for managing, monitoring and coordinating the physical development of projects for the ministry and its 11 agencies. The physical projects in MOHA included office buildings, staff quarters, detention centres, police stations, police headquarters, prisons, maritime jetties, immigration complexes and rehabilitation centres. In addition, the Royal Malaysia Police received the highest physical project allocation of MYR1.34 billion, followed by the Immigration Department of Malaysia with MYR169.27 million and the Malaysian Prison Department with MYR131.18 million.

The success of project development is crucial for stakeholders, clients, contractors and purchasers. A successful project execution is measured by its completion within schedule, the recognition of obligation and the satisfaction of stakeholders (Nguyen, Ogunlana and Lan, 2004). Short-term project completion criteria, such as staying within budget and time goals as well as fulfilling project requirements, are determined prior to the completion of the project. In contrast, long-term criteria such as tangible and intangible benefits are evaluated after project completion (Johnson, 2017). However, Riazi, Riazi and Lamari (2013) reported that 80% of public sector projects in Malaysia were behind schedule. Jatarona et al. (2016) added that public projects in Malaysia were reported to be neglected, late and abandoned. Furthermore, the projects' goals have not been entirely achieved and the impact on target groups has been significantly underwhelming (Johnson, 2017).

Project delay is one of the most significant problems. Delays result in the government not being able to reap the best value for money in terms of the expenditure it has incurred for projects. According to the Project Management Institute (2017), the "iron triangle" (cost, scope and time), perceived benefits and stakeholder satisfaction are the three main factors that define project success. In this context, project delay can cause severe consequences to a project's life, resulting in cost overrun, time overrun, litigation, disputes, arbitration and project abandonment (Hisham and Yahya, 2016). Delay incurs a loss of output and revenue since contractors cannot engage in other projects (Al-Kharashi and Skitmore, 2009; Alsuliman, 2019). Therefore, the profit lost by the contractor is equal to the opportunity cost of the projects missed by the contractor.

Identifying and studying delays come under the project monitoring and control phase. The analysis of schedule delays is a permanent problem for practical application in project management (Guida and Sacco, 2019). In the construction industry, delays are categorised into three principal types (Chandu, Sheetal and Bhalerao, 2016): critical (non-excusable), excusable and concurrent. Of the three, a critical delay is the one that causes the project duration to be extended by some period. Guida and Sacco (2019) mention that delays can also be classified according to the origin of the problem or the responsible parties, such as the owner, client, contractor or simply force majeure.

Such underperformance has resulted in further issues, including public complaints and the government's loss of reputation and revenue. Public sector projects are of major concern because they directly relate to public and national socioeconomic growth. Thus, the constant recurrence of similar issues in public building projects has raised public concern. This situation calls for an exploration of the factors affecting the relationship between project management performance and project success (Rafat and Ahmed, 2017). Johnson (2017) suggests that comprehensive research and planning need to be done before attaining approval for a project, including project site information, briefing, ceiling, costing and scheduling. This is important to ensure all projects are delivered according to schedule and with the best value for money for the government.

Delay Factors and Effects

The main effects of delay are mostly related to project completion time and the extra cost or budget required to complete the project. Other than that, a delay also affects the quality of the project's end product, which can further contribute to project disputes, arbitration and litigation (Rashid, 2020). Finally, the project may be scrapped in some situations, significantly affecting a country's socio-economy. Table 1 summarises the effects of project delays as reported in various construction types across different countries, including Malaysia. In the context of MOHA's project implementation structure, the factors contributing to delay can be categorised into four groups, namely contractor-related, consultant-related, client-related and other factors.

Table 1. Effects of project delay

Effect of Project Delay	**Author (Year) Country**						
	Hisham and Yahaya (2016) Malaysia	**Khair et al. (2016) Sudan**	**Aibinuand Jagboro (2002) Nigeria**	**Rashid (2020) Pakistan**	**Riazi, Riazi and Lamari (2013) Malaysia**	**Nawi et al. (2016) Malaysia**	**Gebrehiwet and Luo (2017) Ethiopia**
Time overrun	✓	✓	✓	✓	✓	✓	✓
Cost overrun	✓	✓	✓	✓	✓	✓	✓
Dispute	✓		✓		✓		
Arbitration	✓		✓		✓		✓
Litigation	✓		✓	✓	✓		✓
Total abandonment	✓		✓	✓			

Orangi, Palaneeswaran and Wilson (2011) state that a project delay, such as in securing approval, leads to severe time and cost overruns in linear construction projects in Australia. However, another study indicates that delays only impact project duration, not project costs (Senouci, Ismail and Eldin, 2016). Hisham and Yahya (2016) used correlation analysis to evaluate the linear effect of delays on time and cost overruns. Their data revealed that subcontractors are the most common cause of delay, which has an empirical influence on time and cost overruns.

In his study, Shah (2016) found that the most critical factor in project delays in Ghana is payment delay, which significantly impacts projects' progress, quality and service delivery. In Australia and Malaysia, delays are reportedly caused by contractors' lack of planning and scheduling, which has a significant impact on the costs of the approved budget. Rashid et al. (2013) reveal that contractors, clients, consultants, materials and equipment-related factors significantly impact delays in construction projects in Punjab, Pakistan; however, labour and general environmental elements are found to have no impact. Gomarn and Pongpeng

(2018) investigate and confirm the sets of observable delay factors and their underlying correlations.

Results indicate that delays caused by contractors are highly correlated with the delays caused by suppliers. As a result, supplier issues and delays have a direct impact on contractors. Rashid (2020) also discover that delays in construction projects in Pakistan result in significant project time and cost overruns, project abandonment and litigation, all of which put projects in great danger. In addition, Arantes, da Silva and Ferreira (2015), when examining the relationships between the extracted factors (latent causes) and impacts of delay, reveal that a lack of commitment and substandard contracts positively correlate with all impacts. In contrast, bad consultant performance negatively correlates with time overrun.

In conclusion, researchers have employed diverse methods of interpreting and analysing data on the factors and effects of delay in the literature. Accordingly, each study has discovered different delay factors and effects among various levels and sample groups. Previous research has also produced different rankings for factors and effects. The factors and effects of delays vary between countries, locations and projects. Among the factors identified in construction delays are incompetent contractors, tendering process problems, inadequate materials, rising costs and a shortage of workers (as shown in Table 2).

Table 2. Delay factors in physical project implementation

Delay Factors	Contractor-Related	Sources	Consultant-Related	Sources	Client-Related	Sources	Other Factors	Sources
	Poor site management practices	Rashid (2020), Khair et al. (2016), Varghese et al. (2015), Gomarn and Pongpeng (2018) and Hisham and Yahaya (2016)	Incompetent standing supervision on site	Nawi et al. (2016), Khair et al. (2016), Idrus, Ismail and Saleh (2020), Alsuliman (2019) and Razkenari et al. (2015)	Delay in progress payment	Adwani et al. (2018), Khair et al. (2016) and Idrus, Ismail and Saleh (2020)	The inclement weather conditions on site	Al-Adwani, Mollasalehi and Fleming (2018), Amoatey et al. (2015), Razkenari et al. (2015) and Sambasivan et al. (2017)
Indicators	Inadequate experience in construction	Amoatey et al. (2015), Al-Adwani, Mollasalehi and Fleming (2018), Shah (2016) and Sambasivan et al. (2017)	Misunderstanding client's requirements	Sambasivan et al. (2017), Aziz and Abdel-Hakam (2016), Haq et al. (2017), Khair et al. (2016) and Tafazzoli et al. (2017)	Problem with annual financing by client	Khair et al. (2016) and Idrus, Ismail and Saleh (2020)	Fluctuation of material price	Nawi et al. (2016), Varghese et al. (2015), Amoatey et al. (2015) and Van, Sang and Viet (2015)
	Financial mismanagement and lack of capital	Varghese et al. (2015), Gomarn and Pongpeng (2018), Van, Sang and Viet (2015) and Amoatey et al. (2015)	Error or flaw in the design	Azhar (2019), Aziz and Abdel-Hakam (2016), Haq et al. (2017) and Khair et al. (2016)	Variation order or change of scope request during construction	Hisham and Yahaya (2016), Al-Adwani et al. (2018), Azhar (2019) and Idrus, Ismail and Saleh (2020)	Late delivery of material on-site in comparison to the work programme	Nawi et al. (2016) and Varghese et al. (2015)

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Table 2. *Continued*

Delay Factors	Contractor-Related	Sources	Consultant-Related	Sources	Client-Related	Sources	Other Factors	Sources
Indicators	Poor communication between contractor and client	Nawi et al. (2016), Singh and Bala (2018), Tafazzoli et al. (2017) and Gomarn and Pongpeng (2018)	Poor communication between consultant and client	Amoatey et al. (2015) and Tafazzoli et al. (2017)	Slow in decision making and approval upon submission	Rashid (2020), Varghese et al. (2015), Doloi et al. (2012), Tafazzoli et al. (2017), Al-Adwani, Mollasalehi and Fleming (2018), Azhar (2019) and Idrus, Ismail and Saleh (2020)	Poor quality of construction material	Nawi et al. (2016) and Amoatey et al. (2015)
	Incompetent subcontractors	Singh and Bala (2018), Varghese et al. (2015), Hisham and Yahaya (2016) and Durdyev et al. (2017)	Lack of project supervision by the design team	Van, Sang and Viet (2015), Amoatey et al. (2015) and Alsuliman (2019)	Tendering and awarding the contract to an unreasonably low-price bidder	Nawi et al. (2016), Al-Adwani, Mollasalehi and Fleming (2018), Azhar (2019) and Alsuliman (2019)	Unexpected conditions on site (soil, water table, etc.)	Van, Sang and Viet (2015), Amoatey et al. (2015), Alsuliman (2019) and Sambasivan et al. (2017)

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Table 2. *Continued*

Delay Factors	Contractor-Related	Sources	Consultant-Related	Sources	Client-Related	Sources	Other Factors	Sources
	Construction equipment's quality and availability	Amoatey et al. (2015), Sambasivan et al. (2017) and Khair et al. (2016)	Failure to obtain approval from local authorities before tender	Al-Adwani, Mollasalehi and Fleming (2018), Aziz and Abdel-Hakam (2016), Haq et al. (2017) and Varghese et al. (2015)	Late in handing over the site from clients to contractors	Al-Adwani, Mollasalehi and Fleming (2018) and Alsuliman (2019)	Unreliable supplier or vendor	Singh and Bala (2018) and Doloi et al. (2012)
Indicators	Shortage of workforce	Shah (2016), Razkenari et al. (2015) and Khair et al. (2016)	Delay in preparing design and changes	Azhar (2019), Idrus, Ismail and Saleh (2020), Amoatey et al. (2015), Al-Adwani, Mollasalehi and Fleming (2018) and Alsuliman (2019)	Unrealistic contract period in comparison to the complexity of the project	Al-Adwani, Mollasalehi and Fleming (2018), Alsuliman (2019) and Doloi et al. (2012)		
	Unrealistic project scheduling and planning	Durdyev et al. (2017), Al-Adwani, Mollasalehi and Fleming (2018), Shah (2016) and Razkenari et al. (2015)	Delay in performing final inspection	Al-Adwani, Mollasalehi and Fleming (2018) and Haq et al. (2017)	Communication and coordination problems of clients	Azhar (2019), Van, Sang and Viet (2015), Amoate et al. (2015) and Khair et al. (2016)		

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Table 2. *Continued*

Delay Factors	Contractor-Related	Sources	Consultant-Related	Sources	Client-Related	Sources	Other Factors	Sources
	Construction mistakes and defective works	Idrus, Ismail and Saleh (2020), Sambasivan et al. (2017) and Aziz and Abdel-Hakam (2016)	Poor communication between consultant and contractor	Van, Sang and Viet (2015) and Khair et al. (2016)	Lack of experience in construction among clients	Alsuliman (2019), Razkenari et al. (2015) and Khair et al. (2016)		
Indicators	Failure to comply with local authority requirements	Al-Adwani, Mollasalehi and Fleming (2018)	Delay in the evaluation of progress payment	Hisham and Yahaya (2016) and Azhar (2019)	High turnover rate in clients' department	Amoatey et al. (2015) and Al-Adwani, Mollasalehi and Fleming (2018)		
	Failure in the coordination of resources in constructions	Durdyev et al. (2017) and Aziz and Abdel-Hakam (2016)	The excessive safety factor in payment evaluation	Tafazzoli et al. (2017) and Azhar (2019)				

METHODOLOGY

This study aimed to examine the contributing factors of delay and their relationships with the effect of delays in government physical projects, particularly MOHA's physical construction projects. The physical construction projects in the Immigration Department of Malaysia's offices and premises that were implemented in the 11th Malaysia Plan were chosen as the case study in the current study. The choice of MOHA as the case of interest allowed a detailed investigation into the situation. Based on the quantitative approach, a survey questionnaire was developed as the measurement tool to gauge clients', consultants', contractors' and end-users thoughts, opinions and feedback on project implementation delays from MOHA's standpoint. The content validity of the developed questionnaire was established upon consulting a MOHA practitioner with more than 10 years of experience in project management. The approximate number of the total population (*N*) and the minimum number of samples based on Krejcie and Morgan's (1970) recommendation is shown in Table 3. A total of 105 respondents participated in the survey, comprising contractors, consultants, end-users and clients of the physical construction projects mentioned above. The data were analysed using the Relative Importance Index (RII) and Spearman's correlation to identify the most critical delay factors and determine their association with delay effects.

Table 3. Total population, minimum sample size and actual responses

Respondents	Total Population (*N*)	Minimum Sample Size (*S*)	Collected Responses
Clients and end-user	60	52	56
Contractors and consultants	50	44	49
Total	110	96	105

Note: Clients include superintendent officers and development division officers, engineers and technical assistants from MOHA; End-user refers to the Immigration Department of Malaysia.

RESULTS AND DISCUSSIONS

Reliability Analysis

The reliability results for this study are shown in Table 4. The values of Cronbach's alpha for all variables were more than 0.700, indicating that the measures were reliable.

Table 4. Reliability analysis

Variable	Measurement Items	Sources	Cronbach's Alpha Coefficient
Contractor-related (11 items)	Poor site management practices Inadequate experience in construction Financial mismanagement and lack ofcapital Poor communication between contractor and client Incompetent subcontractors Construction equipment's quality and availability Shortage of workforce Unrealistic project scheduling and planning (ineffective work program) Construction mistakes and defective works Failure to comply with local authority requirements Failure in the coordination of resources inconstruction	Rashid (2020), Khair et al. (2016), Varghese et al. (2015), Gomarn and Pongpeng (2018), Hisham and Yahaya (2016), Amoatey et al. (2015), Al-Adwani, Mollasalehi and Fleming (2018), Shah (2016) and Sambasivan et al. (2017)	0.864
Consultant-related (11 items)	Incompetent standing supervision onsite Misunderstanding client's requirements Error or flaw in the design Poor communication between consultant and client Lack of project supervision by the design team Failure to obtain approval from local authorities before tender Delay in preparing design and changes Delay in performing final inspection Poor communication between consultant and contractor Delay in the evaluation of progress payment The excessive safety factor in paymentevaluation	Nawi et al. (2016), Khair et al. (2016), Idrus, Ismail and Saleh (2020), Alsuliman (2019), Razkenari et al. (2015), Sambasivan et al. (2017), Aziz and Abdel-Hakam (2016), Haqet al. (2017) and Tafazzoli et al. (2017)	0.900

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Table 4. *Continued*

Variable	Measurement Items	Sources	Cronbach's Alpha Coefficient
Client-related (10 items)	Delay in progress payment Problem with annual financing by client Variation order or change of scope request during construction Slow in decision making and approvalupon submission Tendering and awarding the contract to an unreasonably low-price bidder Late in handing over the site from clients to contractors Unrealistic contract period in comparison to the complexity of the project Communication and coordination problems of the client Lack of client experience in construction The high turnover rate in the client's department	Rashid (2020), Varghese et al. (2015), Doloi et al. (2012), Tafazzoli et al. (2017), Al-Adwani, Mollasalehi and Fleming (2018), Azhar (2019) and Idrus, Ismail and Saleh (2020)	0.864
Others (6 items)	The inclement weather condition on site Fluctuation of material price Late delivery of material on-site in comparison to the work programme Poor quality of construction material Unexpected conditions on site (soil, water table, etc.) Unreliable supplier or vendor	Van, Sang and Viet (2015), Amoatey et al. (2015), Alsuliman (2019) and Sambasivan et al. (2017)	0.786
Effects of delay	The project unable to be finished within the original contract term The cost of the project will be increased The annual budget would not be able tobe utilised as expected for the year Poor quality of work received by the end-user The operation of the department or process will be interrupted Total abandonment of the developmentproject Arbitration and litigation due to contract termination	Hisham and Yahaya (2016), Rashid (2020), Aibinu and Jagboro (2002), Rashid (2020) and Riazi, Riazi and Lamari (2017)	0.794

Delay Factors

This study explored the critical factors that caused delays in the implementation of government physical projects. A total of 38 delay factors were identified related to physical project implementation in MOHA. The delay factors were grouped according to the parties involved (contractor, consultant and client). Relative important index (RII) analysis was performed to rank the overall factors where RII = $\Sigma W/(A*N)$ with W = Weightage to each factor by respondent, A = the highest weight and N = Total number of respondents.

A five-point Likert scale was used to determine the crucial level of delay factors, with ratings ranging from 1 (Lowest) to 5 (Highest). The factor with the highest RII was at the top of the list, while the factor with the lowest was at the bottom. As summarised in Table 5, all the delay factors were significant (score > 0.6). According to the analysis results, there were three factors with an RII value greater than 0.8000, indicating high criticality. The factors were: (1) Financial mismanagement and lack of capital (RII = 0.8305), (2) Incompetent subcontractors (RII = 0.8229) and (3) Shortage of manpower (RII = 0.8171). All the top three factors were in the contractor-related group. The most critical factor groups among contractor-related, consultant-related, client-related and others were determined using mean score (MS) ranking in SPSS descriptive analysis. The contractor-related group was ranked the most critical group, followed by others. The third group was the consultant-related group. The least important group was the client-related group.

Table 5. Ranking of delay factors

Rank	Delay Factors in MOHA Project Implementation	RII	Factor Group
1	Financial mismanagement and lack of capital	0.8305	Contractor-related
2	Incompetent subcontractors	0.8229	Contractor-related
3	Shortage of manpower	0.8171	Contractor-related
4	Incompetent standing supervision on site	0.7695	Consultant-related
4	Variation order or change of scope request during construction	0.7695	Client-related
6	Late delivery of material on-site in comparison to the work program	0.7562	Others
7	Tendering and awarding contracts to unreasonably low-price bidders	0.7543	Client-related
7	Unrealistic project scheduling and planning (ineffective work program)	0.7543	Contractor-related
9	Slow in decision making and approval upon submission	0.7524	Client-related
9	Failure in resource coordination in construction	0.7524	Contractor-related
9	Poor site management practices	0.7524	Contractor-related
12	Unexpected conditions on site (soil, water table, etc.)	0.7505	Others

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Table 5. *Continued*

Rank	Delay Factors in MOHA Project Implementation	RII	Factor Group
13	Poor communication between consultants and contractors	0.7467	Consultant-related
14	Construction mistakes and defective works	0.7410	Contractor-related
15	Lack of project supervision by design teams	0.7314	Consultant-related
16	Delay in preparing design and changes	0.7276	Contractor-related
16	Poor communication between contractor and client	0.7276	Contractor-related
18	Inadequate experience in construction	0.7124	Contractor-related
19	Poor quality of construction material	0.7048	Others
20	Construction equipment's quality and availability	0.7027	Contractor-related
21	Unreliable supplier or vendor	0.7010	Others
22	Fluctuation of material price	0.6914	Others
23	Poor communication between consultant and client	0.6876	Consultant-related
24	Problem with annual financing by client	0.6819	Client-related
25	Failure to obtain approval from local authorities before tender	0.6781	Consultant-related
26	Error or flaw in the design	0.6762	Consultant-related
27	Communication and coordination problems of clients	0.6724	Client-related
28	Delay in progress payment	0.6686	Client-related
29	Unrealistic contract period in comparison to the complexity of the project	0.6667	Client-related
30	Misunderstanding of client requirements	0.6629	Consultant-related
30	Delay in performing final inspection	0.6629	Consultant-related
32	Delay in the evaluation of progress payment	0.6590	Consultant-related
33	The inclement weather condition on site	0.6552	Others
34	Failure to comply with local authority requirements	0.6495	Contractor-related
35	Lack of client experience in construction	0.6457	Client-related
36	The high turnover rate in client departments	0.6381	Client-related
37	Excessive safety factor in payment evaluation	0.6248	Consultant-related
38	Late in handing over the site from clients to contractors	0.6133	Client-related

These results match those observed in earlier studies by Rashid (2020) and Varghese and Varghese (2015), which find that contractor-related factors contribute the most to delays in project implementation in Pakistan and India.

However, this result differs from that of Shahsavand, Marefat and Parchamijalal (2018), who find client-related factors ranked first in construction project delays in Iran, followed by labour and labour equipment factors and contractor-related factors. This contradictory result may be due to the type, scope and location of construction projects. As stated by Alsulaiti and Kerbache (2020), project delays can be caused by several circumstances, including the project's nature, scale, level of complexity and types of stakeholders involved. From the perspective of MOHA projects, the main contractor's role is critical to project success to ensure that the project is executed as specified in the contract. The main contractor must complete the project on time and to the highest quality standards while also adhering to local rules and regulations to protect the interests of the owners, local communities and employees. This finding highlights the need for contractor engagement in project implementations, including material procurement and delivery to job sites, labour and equipment coordination and management of all subcontractors' work (Tafazzoli and Shrestha, 2017; Anyanwu, 2013).

Contractor-Related Factors

The results in Table 5 reveal that financial mismanagement and a lack of capital were the most critical factors in a physical project's delay (RII = 0.8305). These findings align with previous research, which finds that contractors' financial difficulties and weakness in financial management are among the most common factors of construction project delay (Al-Kharashi and Skitmore, 2009; Thomas and Sudhakumar, 2013). In Malaysia, specifically in MOHA, a similar pattern is found in public projects, as contractors typically lack sufficient assets and rely heavily on outsourced capital, such as bank institutions. This is because contractors in Malaysia, particularly local contractors, have a poor profit margin and lack the monitoring of project cash flow systems (Halim et al., 2010; Salim et al., 2018).

Moreover, the competency of a project team member, including subcontractors in construction, is crucial. This starts with a good relationship between the main contractor and subcontractor, which leads to clear communication of specific project requirements. The improper appointment of a subcontractor can thus cause problems. This is supported by Duma (2012), who mentioned that the main contractor, as a client, should look for a good subcontractor with specific criteria such as financial strength, adequacy of experienced staff and standard of workmanship.

Shortage of workforce was identified as the third most critical factor in the contractor-related group (RII = 0.8171), followed by unrealistic project scheduling and planning (RII = 0.7543), poor site management practices (RII = 0.7524) and failure in the coordination of resources in construction (RII = 0.7524). All these factors are associated with the contractor's internal management issues. These results concur with Gomarn and Pongpeng's (2018) findings, which show that the significant reason for construction delays is inadequate site management and poor planning and scheduling.

Consultant-related Factors

The results in Table 5 show that the critical factor causing a physical project to be delayed was incompetent standing supervision on site (RII = 0.7695). Poor communication between consultants and contractors was the second most critical factor that led to project delays (RII = 0.7467), and the lack of project supervision by the design team was the third most critical factor in the consultant-related group (RII = 0.7314). These findings show that the consultant group's technical competency is the primary cause of delays, concurring with the study by Głuszak and Leśniak (2015), which also find that low-quality construction site supervision among the essential factor of project delays. Accordingly, Khoiry, Kalaisilvan and Abdullah (2018) emphasise the importance of site supervision in ensuring the quality of construction work and minimising future repair or rework issues.

On the management side, the communication problem with the contractor is also a factor reported by Orangi, Palaneeswaran and Wilson (2011). Consultants provide expert advice in all aspects of construction, thus having in-depth knowledge of the field. Therefore, any miscommunication between consultants and contractors may result in design deviations, creating delays and leading to rework due to reparative activities, which has financial implications and puts the project at risk. To meet construction targets, excellent communication and coordination are required in construction management, along with strong relationships between owners, consultants, contractors and site workers.

Client-related Factors

The most critical client-related factor in a physical project's delay was the variation order or change of scope request during construction (RII = 0.7695). This result is consistent with other studies (Ghasemzadeh, 2014; Shahsavand, Marefat and Parchamijalal, 2018), which also list this factor among the top five delay factors in construction projects. The issue in MOHA project implementation was that the project brief was inadequate, owing to the absence of the involvement of all parties throughout the design process, especially clients and end-users. This finding matches the results observed in an earlier study by Mohammad and Hamzah (2019) on the causes of a variation order in Malaysian construction projects from the client's perspective.

The results of this study indicate that clients are the key contributor to the variation order, which includes scope changes and design failures and omissions. Aside from that, the second most critical client factor that causes project delays is tendering and awarding contracts to unreasonably low-priced bidders (RII = 0.7543), while the third most critical factor is slow decision-making and approval upon submission (RII = 0.7524). The awarding of contracts to low-price bidders was also discussed by Alsuliman (2019), who finds delays in Saudi public construction due to focusing on financial analysis and awarding the lowest bidder. To better address this issue, contractors' selection criteria in project implementation should be improved.

Other Factors

The work programme had the highest RII value (RII = 0.7562) of the other factors causing project delays beyond the control of contractors, consultants or clients. This result is not shocking since late material delivery and unanticipated site conditions are frequently evaluated and addressed in the project delay literature. The finding is consistent with studies by Gebrehiwet and Luo (2017) and Riazi and Lamari (2013), which report that due to poor planning and a lack of commitment from vendors or suppliers to accommodate material orders on schedule, there is a shortage of materials or a delay in receiving materials at a project site. The second most critical factor that caused project delays was the unexpected conditions on site (RII = 0.7505). This problem usually occurred after a contract was awarded and was only discovered during site clearance or at the start of piling activity at the construction site. Aswathy, Mittal and Behera (2020) also agree that the presence of a water table, boulders and unexpected underground conditions are challenging to solve, resulting in work being halted.

Effects of Delay

Table 6 shows the RII and simple mean score of every effect statement. The highest RII was the time-related effect (RII = 0.8476, MS = 4.24), when a project failed to be completed within the original contract term. Cost overrun was ranked second and third, with the implications being the rise in a project's cost and thus the annual budget not being utilised as planned for the year. With an RII score of 0.6971, the litigation and arbitration effect had the lowest ranking as an impact of delay in project implementation. These findings are consistent with studies (Rashid, 2020; Senouci, Ismail and Eldin, 2016; Shah, 2016) that find time and cost overruns to be the most significant effects of project delays. This result was further corroborated by MOHA's data (Kementerian Dalam Negeri, 2020). Taking the development project of the immigration post and quarters in Ba'kelalan, Sarawak as an example, MOHA's report mentioned that the project was delayed by 54.5% in March 2020, on top of the 50 days' extension of time (EOT) that had been approved previously. It was also understood at the time that this contract would be terminated. This indicates that the time overrun impacts the completion date and incurs costs in terms of losses due to contract termination and the appointment of a new contractor.

Table 6. Results of RII analysis and mean scores for effects of delay in project implementation

<table>
<tr><th>Rank</th><th>Client-related Factors</th><th>RII</th><th>Group</th><th>MS</th></tr>
<tr><td>1</td><td>The project unable to be finished within the original contract term</td><td>0.8476</td><td>Time overrun</td><td>4.24</td></tr>
<tr><td>2</td><td>The cost of the project will be increased</td><td>0.8457</td><td>Cost overrun</td><td rowspan="2">4.19</td></tr>
<tr><td>3</td><td>The annual budget would not be ableto be utilised as expected for the year</td><td>0.8305</td><td>Cost overrun</td></tr>
<tr><td>4</td><td>Poor quality of work received by theend-user</td><td>0.7981</td><td>Quality</td><td rowspan="2">3.96</td></tr>
<tr><td>5</td><td>The operation of the department or organisation will be interrupted</td><td>0.7867</td><td>Quality</td></tr>
<tr><td>6</td><td>Arbitration and litigation due to contract termination</td><td>0.7714</td><td>Litigation and arbitration</td><td>3.86</td></tr>
<tr><td>7</td><td>Total abandonment of the development project</td><td>0.6971</td><td>Abandonment</td><td>3.49</td></tr>
</table>

Relationship Between Delay Factors and Effects

Pearson's correlation was used to determine the association between the delay factors and delay effects in MOHA project implementation (see Appendix). The results show that delay factor groups had a positive correlation with the effects of delay. A positive correlation suggests that as the occurrence of one contributing factor rises, the frequency of its corresponding effect also rises (Arantes, da Silva and Ferreira, 2015). In addition, a statistically significant association between parameters at the significance level (two-tailed) of 0.01 and 0.05 was observed. The results indicate that the effects of project delays significantly associate with each delay factor group, with moderate and low associations, respectively. This is in line with Hisham and Yahya's (2016) finding that most causes and effects of delays are linearly related. However, the results contradict the study of Arantes, da Silva and Ferreira (2015), which finds negative associations between the causes and effects of delay. Specifically, they reveal a negative association between consultant factors and time overrun as well as between client factors and litigation. These differences in Pearson's correlation happen possibly due to the amount of variability in the data sample or the presence of an outlier (Goodwin and Leech, 2006).

CONCLUSION

In Malaysia, public projects have been consistently reported as neglected and late, causing the government to bear financial losses. Worst, the objectives of the projects are not fully achieved, thus affecting the public interest. This study examined the critical contributing factors to the delay in implementing physical projects in MOHA, Malaysia. A total of 38 delay factors have been identified, with contractor-related factors being the most critical, followed by consultant-related, client-related and other factors. These delay factors positively correlate with corresponding delay effects, including time and cost overrun, quality, litigation and arbitration and abandonment. The continued expansion of knowledge and proper understanding of these causes will assist stakeholders in reducing the occurrences of delays and formulating appropriate strategies to improve project schedule performance. In MOHA physical projects, in particular, several areas should be carefully assessed and evaluated in light of the ministry's safety and security concerns. Since this study was limited to the case of MOHA, it is not possible to generalise the findings to other contexts. Further research is recommended to examine how the application of project management tools and techniques can be leveraged to reduce delays in public-sector building projects. Researchers should also examine the relationships among the identified factors in similar or different contexts.

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APPENDIX Pearson's correlation (r) value

	Variables Contractor-related	Delay Factors				Effects of Delay				
		Consultant-related	Client-related	Other factors	Time overrun	Cost overrun	Quality	Arbitration and litigation	Abandonment	
Delay Factors	**Contractor-related**	1.000				0.387** (moderate)	0.241*	0.491** (moderate)	0.293**	0.229*
	Consultant-related		1.000			0.194*	0.278**	0.455** (moderate)	0.337** (moderate)	0.243*
	Client-related			1.000		0.213*	0.299**	0.400** (moderate)	0.401** (moderate)	0.250*
	Other factors				1.000	0.344** (moderate)	0.206*	0.314** (moderate)	0.332** (moderate)	0.255**
Effects of delay	**Time overrun**	0.387* (moderate)	0.194*	0.213*	0.344** (moderate)	1.000				
	Cost overrun	0.241*	0.278**	0.299**	0.206*		1.000			
	Quality	0.491** (moderate)	0.455** (moderate)	0.400** (moderate)	0.314** (moderate)			1.000		
	Arbitration and litigation	0.293*	0.337** (moderate)	0.401* (moderate)	0.332** (moderate)				1.000	
	Abandonment	0.229*	0.243*	0.250*	0.255**					1.000

**Correlation is significant at the 0.01 level (2-tailed) * Correlation is significant at the 0.05 level (2-tailed)
Note : Correlation Coefficient (r) (Cohen, 1988) : 0.10 -0.29 (weak), 0.30 – 0.49 (moderate), 0.50 – 1.