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FACTOR AFFECTING VARIATION ORDERS ON MOSQUE CONSTRUCTION IN PERAK

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ABSTRACT

The mosque symbolizes the fundamental aspects of Islamic thought throughout the Muslim world. Therefore, the construction of mosques in this country increases over time. As a postcolonial nation, Malaysia's mosques have incorporated a variety of architectural styles and serve as a visual representation of the nation's multicultural population. However, with varying styles of architecture, most of the mosque construction projects in Perak had undergone many variation orders, which increased client expenditures beyond the planned budget. Hence, the objective of this research was to identify the factors affecting variation orders on mosque construction in Perak. This research conducted based on a thorough review of the literature review and qualitative method by case studies on three (3) mosques construction in Perak. The findings showed that the recurrent factors all the mosque construction in Perak have undergone variation because of the changes of scope, changes in specification, changes in design by consultant, changes in schedule, and impediment to prompt decision making process. Addressing these factors is crucial for efficient and cost-effective mosque construction projects in the future. By understanding and managing these challenges, stakeholders can ensure the successful realization of mosques that symbolize the cultural and religious significance within Malaysia and uphold its diverse heritage.

Keywords: *variation order, mosque construction, Perak*

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INTRODUCTION

Malaysia is a country with many different religions, however, the majority of the population is Muslim (Sanusi et al., 2020). The mosque symbolizes the fundamental aspects of Islamic thought throughout the Muslim world. Therefore, the construction of mosques in this country increases over time. A mosque is a place of prayer for Muslims. The mosque has been crucial to the spreading of preaching and has assisted Islamic missionaries in educating the populace in Malaysia (Mohd et al., 2020).

As a postcolonial nation, Malaysia's mosques have incorporated a variety of architectural styles and serve as a visual representation of the nation's multicultural population. The variety of mosques in Malaysia is amazing, lasting from modest traditional timber buildings to huge modern complexes (Megat et al., 2016). According to Othman et al., (2015), if we look carefully, we can see that the majority of mosques in Malaysia have forms and structures that are similar in nature. Most of them have an exterior form and structure with large domes and minarets, interior ornamentation, and other similar features. These shapes and constructions are modeled after mosques that have existed in Islamic history and have experienced times of grandeur. For instance, we can see that the Federal Mosque (Masjid Wilayah), the *Masjid Putra* in Putrajaya, and the *Masjid Sultan Salahuddin Shah Alam*, all have distinctive designs. Religious buildings such as mosques in Perak have elaborate domes, minarets, and prayer halls, in varying styles of architecture (Abdullah et al., 2021).

Throughout the years, construction projects have become more complex than before which increases the possibility of project failure. Today's construction industry meets many difficulties that make it impossible for projects to be completed within the budget that was planned. Governmental construction projects frequently experience project variations, which can have a significant impact on the timeline, cost, and community requirements of the project (Aladwan et al., 2022). With varying styles of architecture, most of the mosque construction projects in Perak had undergone many variation orders, which increased client expenditures beyond the planned budget (Abdullah et al., 2021). Variation orders, which have become common on most construction projects, are the issue that has the biggest impact on project costs (A.KA. Al-Btoush, 2021). According to Abdullah et al., (2021), it can be determined that the total variation order cost of ten (10) mosques in Perak comes to RM417,479.79 . Given the construction industry's ongoing difficulty, there is a current need for continuous discussion on this sector. Since the work progress increased the construction time and cost, variation order has become a severe concern on most building projects in Malaysia, affecting the construction industry.

The most important elements creating variance on a construction project, out of all the causes influencing variation, came out as project complexity, value engineering improper/inadequate planning, technological advancements a lack of equipment and materials, and a different site circumstance, the owner's alteration/change of scope, finally, the scope of labor isn't well-defined, and the weather isn't cooperating conditions (Jyotindra Thakar, 2020). Therefore, the objective of this research was to identify the factors affecting variation orders on mosque construction in Perak.

Factors Affecting Variation Orders

Variations were specified in the building contract dictionary as alterations, additions, or work omission, materials omission, working hours omission, workspace omission, and so on (Ghafoor et al., 2020). It may be characterized as revisions to the contract papers in the initial agreement, such as a change in quality or quantity, or any other type of change that has an impact on the project (Jaafar A.A., 2018). According to Wikipedia (2020), mosques are often covered structures, although they can also be outdoor courtyards or any other location where prayers (sujud) are offered. The mosque functions as a location for Muslim congregations, as well as a hub for knowledge, instruction, and conflict resolution (Afridi, 2011). The potential factors affecting variation orders are summarized as below.

Change of scopes

One of the most important causes for variation is changes in the design or scope of construction projects, which are subject to high volatility. This is the key factor for variation on any construction project. The reason for this is that the owner/employer does not keenly participate in the planning and designing phase (Jyotindra Thakar, 2020). Abdullah et al.,(2021) stated that change of scope refers to the addition or omission of original scope of works as per contract which would either increase or decrease the contract amount. Due to requests from the end user, such as extra room for dining or cooking, additional fixtures like chandeliers, furnishings, CCTV, and air conditioning systems, these circumstances frequently arose during the construction of mosques. The project's scope or plan may change for a variety of reasons, including improper project planning or the owner's failure to participate in the design phase. These changes may cause variations from the project's cost estimate but may also have an impact on the completion contract (Balbaa et al., 2019). Change of plan or scope of the project is one of the most significant causes of variation in construction projects and is usually the result of insufficient planning at the project definition stage, or because of lack of involvement of the owner in the design phase (Mohammad et al., 2017). Therefore, change of scopes is a very common factor of variation order.

Errors and omissions in design

Design errors and omissions emerged as the second most frequent cause of variation requests. The finding implies that design errors and omissions are frequent in Sulaimani project implementation when a project's productivity of work and timetable are impacted by an inadequate coverage of all project aspects or by errors and omissions (Ali et al, 2020). Delays and changes may happen depending on when the project's errors arise (Mohammad et al., 2017). Jyotindra Thakar (2020) argued that the primary cause of consultant differences is the design modifications made by the design consultant at each step, which have an impact on the project's overall performance.

Changes in specification

Modifications to the project due to changes in the specification could cause a delay and raise the total cost. If the owner decides to alter the requirements for a design, this could result in changes throughout the construction phase (Mohammad et al., 2017). Due to insufficient project objectives, the consultant frequently modifies the specification. When additional funds from donations are available, mosque building requirements may be updated. Examples include adding more air conditioning, performing more interior or exterior work, or thickening the carpet. Change in specification refers to a change in the product's quality that occurs during the building phase and is typically brought on by the authority's requirements, the condition of the site, or an unapproved SIRIM product (Abdullah et al., 2021). One of the major causes of variations in construction projects is changes to specifications. Project changes result from modifications to the owner's specifications or design requirements after execution, (Jyotindra Thakar, 2020).

Design complexity

According to Oyewobi et al.,(2016), the delivery of the project can be impacted by the drawings' complexity because it may be challenging to turn complex drawings into actuality without errors or variations, which could postpone delivery and have a negative impact on the project. The complexity of the design draws attention to the need for professional knowledge and construction techniques. Meanwhile, it impacts the progress of activities of works, while simpler projects are easier to be constructed. The challenge increases with design complexity, and this increases the possibility of project variations (Ali et al., 2020). This would suggest that the likelihood of variations occurring increases with the complexity of a construction plan (Mohammad et al., 2017). The complexity of construction affects how construction operations are conducted and calls for high levels of skill. Changes may result if the complexity arises during the construction phase (Jyotindra Thakar, 2020). Construction of mosques, particularly in Malaysia, is complex and multidimensional as a result of overlapping patterns from the Arabic, Malaysian, Indonesian, and Chinese cultures

(Megat et al., 2016). To perform fine tasks like an arch, Islamic patterns, beautiful timber facial board, mihrab wall, and other intricate aspects untypical of mosque design, undertaking mosque building requires significant competence in execution (Abdullah et al., 2021).

Poor procurement process

As per research by Abdullah et al.'s (2021), certain mosque construction procurement methods opt for design and build contracts that provide broad project descriptions, placing the onus on consultants to design and construct the mosque without comprehensive knowledge of the client's specific requirements. This often results in a series of modifications during the project's initial stages. Consequently, a project's many changes were caused by a bad procurement process. Contractors must have a good procurement and resource plan and any procurement problem may lead to variation during the construction phase and affect the completion of the project (Balbaa et al., 2019).

Owner's financial problems

This issue may result in modifications to the plans and standards for the project, which could lower the construction's quality (Mohammad et al., 2017). The owner's financial issues have an impact on the project's overall development and quality, which causes changes to the work plans and specifications (Jyotindra Thakar, 2020). Due to his financial situation, the owner had to request variations, which resulted in the projects being put on hold and the contract amount being reduced in order to make the project viable and the budget compatible with his financial situation (Ali et al., 2020). The effect of the owner's financial issues on the cash flow and the cost management plan has a significant impact on how a project is implemented. Because the owner might be compelled to alter the material, specifications, or quality in order to meet financial obligations, this could lead to a rise in project variation (Balbaa et al., 2019).

Changes in design by consultant

Balbaa et al. (2019) stated that the consultants typically implement design changes with the primary aim of improving the overall design. When construction commences prior to the completion of the design phase, it is common to encounter design modifications. Changes made by the consultant must be checked by the client, which could take some time. If the client does not verify, accept, and approve the change, it may change and lengthen the construction period. The lack of knowledge about all structural mechanical and electrical information necessary to achieve the project's goals may be the cause of the consultant's change in design. The lack of time in the design process may be one of the reasons why consultants frequently alter their designs (Ali et al., 2020). Mohammad et al., (2017) argued that the primary cause of the consultant variations is the design modifications that the design consultant makes at each step, which have an impact on the project's overall performance. In order to

make changes to the design during the building phase, consultants may need to resolve or correct errors discovered through the issuance of variation orders.

Differing site conditions

The term "differing site condition" also referred to as a "changed condition" refers to an unidentified, hidden, concealed, or latent physical condition encountered at a site that differs materially from the reasonably anticipated conditions. Different site circumstances could increase the difference if the contractor is unable to identify them. For instance, the construction site's soil conditions (Jyotindra Thakar, 2020). During construction stage contractor often face with underground or unseen conditions which are unpredicted, it may have a major negative effect on cost and time of execution their activities and generated variations due to site condition (Ali et al, 2020).

Equipment unavailability

If there are not enough or readily available resources to complete the project, either the materials already on site are employed since they are readily available, which results in poor work, or the project could proceed slowly. Sometimes the parties to a project or contract such the client and consultant start variation orders due to financial constraints to skip some activities or adjust some material specifications that may lead to cost savings without sacrificing the quality of the project (Oyewobi et al., 2016). During the construction phase, changes could result from the changing of materials or methods. Variations are more likely to happen during the construction phase if the consultant has inadequate understanding of the equipment or materials that can be used in the process. (Mohammad et al., 2017). Consequently, the consultant must be knowledgeable about the materials and equipment that are available in order to generate a complete design (Balbaa et al., 2019). Because of the supplier issue, the contractor may experience project variations and delays (Jyotindra Thakar, 2020).

Contractor's financial difficulties

Balbaa et al., (2019) argued that due to contractual obligations that require the contractor to pay workers' wages whether or not the owner pays the contractor, the contractor's financial troubles may hinder the project's progress. If these obligations are not met, the project's quality and implementation may also suffer. A contractor may run into resource availability issues if they encounter financial difficulties while working on a project (Memon et al., 2014). If the contractor's finances are unstable and his employees' salary cannot be paid, this results in adjustments during the execution phase (Jyotindra Thakar, 2020). Then, it's crucial to create and implement plans that will keep the project's cash flow sufficient. Because of this, properly managing cash flow will increase the project's cash flow and, as a result, increase the

project's ability to finish on schedule. On the other hand, a cash flow that is not well managed shows the opposite.

Inadequate working drawing details

A simple but common mistake is drawings not being complete. This can be a particular issue if designers lack the training, oversight, quality control procedures, or time necessary to produce the necessary drawings. When the work begins on site, incomplete drawings may result in requests for information and change orders. Some items in the bill of quantities are not fully detailed as per the consultants' final drawing due to time limitations during the pre-contract stage and a lack of detail drawings submitted to the quantity surveyor (Mohd et al., 2021). The working drawings must be clear and concise in order to convey a complete idea of the project design (Mohammad et al., 2017). Construction drawings with insufficient details lead to misinterpretations of the project's needs during the execution phase, which might result in changes. So, it needs to be accurate and unambiguous (Jyotindra Thakar, 2020).

Conflicts within contract documents

Contract documents must be clear, there should be no room for misinterpretation. Conflicts between contractual documents may result in misinterpretations of the project's true requirements if they are accurate (Jyotindra Thakar, 2020). The clarity and precision of contract documentation is also crucial. Lack of information in the contract documents could cause the project to take longer to complete or cost more money (Mohammad et al., 2017). Balbaa et al., (2019) claimed that any discrepancy in the contract papers could add time and money. Therefore, contract papers must be precise and clear. To ensure that the pricing is consistent throughout the building, it is best for an architect to specify the materials in drawings from the design stage (Mohd et al., 2021).

Lack of coordination among stakeholders

Lack of planning and communication between the contractor and the subcontractor may result in project delays when building a mosque (Abdullah et al., 2021). A lack of coordination between parties may result in significant deviations that have a negative effect on the project, making the owner dissatisfied (Mohammad et al., 2017). Jyotindra Thakar (2020) claims that each stage of construction is negatively impacted by the lack of coordination between the parties involved, which results in dissatisfaction or even revision of the work. An increase in the contract point between the parties to the contract can be used to achieve good coordination, and appropriate coordination is a reflection of what each party expects from the other parties in terms of completing the tasks that have been assigned to them (Oyewobi et al., 2016).

RESEARCH METHODOLOGY

In this research, the document review was suggested to gain information relating to project specifics from three (3) completed mosque projects in Perak to analyze the factors influencing variation orders in mosque construction in Perak. The rationale behind selecting these mosques as case studies is the availability of comprehensive documentation, facilitating in-depth analysis. This method will be done by reviewing final account of three (3) mosques in Perak. A document review is used when program documents or literature are available and can provide insight into the program or the evaluation. Document review is a way of collecting data by reviewing existing documents. The documents may be internal to a program or organization or may be external.

FINDING AND DISCUSSION

Through document reviewing of 3 mosques in Perak, factors of variation order related to the project are tabulated in Table 1.

Table 1: Frequency of Factors Affecting Variation Order

Factors affecting variation orders / Mosque	Masjid Bandar Universiti	Masjid Al-Ansar	Masjid Ar-Rahmaniah
Changes of scope	√	√	√
Design complexity	√		
Changes in specification	√	√	√
Errors and omissions in design	√		
Changes in design by consultant	√	√	√
Inadequate working drawing details	√		
Poor procurement process	√		
Lack of coordination			√
Value engineering	√		
Changes of schedule	√	√	√

Impediment to prompt decision making process	√	√	√
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Although there are more than eleven (11) factors affecting variation orders recorded in the literature review, some factors are not significant to the mosque construction in Perak. According to the table above, the major factors all the mosques in Perak have undergone variation are changes of scope, changes in specification, changes in design by consultant, changes in schedule, and impediment to prompt decision making process. Apart from that, other factors affecting variation orders in mosque construction in Perak are including design complexity, errors and omission in design, inadequate working drawing details, poor procurement process, and lack of coordination.

The finding shows that one of the major factors all the mosques in Perak have undergone variation is changes of scopes. However, it contradicted the data in the previous literature review because it only ranked second on the matrix table. Anyway, this result has been supported by Mohammad et al., (2017) who have stated that a change of plan or scope of the project is one of the most significant causes of variation in construction projects and is usually the result of insufficient planning in the project definition stage, or because of lack of involvement of the owner in the design phase.

The changes in specification factor also contradict the data in the literature review where only three out of six authors agree that it is the factor affecting variation order while the finding shows that this is a major factor affecting order variation for these case studies. The reason must be due to the insufficient project objectives that require the consultant frequently modifies the specification. This result can be supported by Jyotindra Thakar (2020) who agreed that one of the major causes of variations in construction projects is changes to specifications.

This finding also found that it contradicts the literature review construction on a project begins before the design is complete, design changes are common. Mohammad et al., (2017) argued that the primary cause of the consultant variations is the design modifications that the design consultant makes at each step, which have an impact on the project's overall performance. Furthermore, the lack of time in the design process may be one of the reasons why consultants frequently alter their designs (Ali et al., 2020).

Surprisingly, changes in schedule are one of the highest frequencies in the findings. This factor has become the new finding since there is no change in schedule recorded as the factors of a variation order in the literature review before. According to Memon (2014), a change in schedule can lead to a major reallocation of resources, which requires that the contractor either increase resources or keep existing ones on hold, which could result in costs.

Impediment to prompt decision making process is one of the new findings since this factor is not available in the factors of variation order recorded in the previous literature review. Making decisions quickly is essential to a project's success. Keane (2010) addressed that failure to decide efficiently would cost time and money.

CONCLUSION

This research has successfully examined and identified the factors that contribute to variation orders in mosque construction projects in Perak. The primary objective of this study was to pinpoint these factors, which was accomplished through a meticulous document review process, specifically by analyzing the final reports of three mosques in Perak. The analysis revealed that changes in scope, specification, design by consultants, schedule, and hindered decision-making processes emerged as the major factors influencing variation orders.

The findings of this research provide valuable insights for other researchers in the field, serving as a point of reference for future studies. However, it is recommended that future researchers enhance the study by conducting case studies in states other than Perak. Additionally, utilizing a survey questionnaire as an alternative data collection method could further enhance the research's robustness and comprehensiveness.

Furthermore, this research suggests that researchers consider targeting respondents from diverse backgrounds, including quantity surveyors, contractors, developers, and architects. By including perspectives from various parties, it is possible to gather a wider range of knowledge and experiences, leading to more comprehensive and impactful findings. Overall, this research lays a foundation for further exploration of variation orders in mosque construction, and its recommendations provide valuable guidance for future studies to deepen our understanding of this important topic.

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Tarikh : 20 Januari 2023

Prof. Madya Dr. Nur Hisham Ibrahim
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