Project Delivery Method for Construction Projects: Review of Malaysian Public Sector Practice

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Appropriate project delivery method (PDM) is vital to ensure good performance of construction project. For decades, numerous researches have been conducted to develop a structured and descriptive decision-making framework for selecting an appropriate PDM. However, the adoption of structured and descriptive decision-making in selecting PDM in the construction industry is still understudied, especially in the Malaysian public sector. Thus, this paper attempts to investigate the practices and constraints of the Malaysian public sector in PDM selection for construction projects. This paper adopts an interpretive approach by conducting in-depth literature reviews of the numerous related researches, government policy and guidelines of PDM selection. This paper also assesses the effectiveness of the current PDM selection practices based on previous study findings and reports on PDM performance. Findings indicate that the traditional delivery method is prevalent PDM in most Malaysian public-funded construction projects. The Malaysian public sector has practised authoritarian and prescriptive decision-making governed by the government procurement guidelines in selecting PDM, which intentionally preserves political interests. Inappropriate PDM selection in project execution has produced an unconvincing performance by showing optimism bias on the expected outcome. The Malaysian public sector needs to improve the decision-making process by introducing a structured and descriptive PDM selection framework to derive better outcomes and convincing results. Thus, this paper is significant in improvising the decision-making mechanism in selecting appropriate PDM for the Malaysian public construction project.

Keywords: *Public sector, public sector construction project, project delivery method, project delivery method selection, decision-making*

1.0 INTRODUCTION

1.1 Study Background

The public sector construction project is the development of the social amenities and public facilities that significantly support the country's socio-economic development. Successful delivery of the public sector project will contribute to the expansion of economic growth for the country. As one of the developing countries, Malaysia has spent 43.9% out of RM146.6 billion of the construction sector for the public sector construction project, contributing to 1% of the total 3.6% gross domestic product (GDP) growth for 2019 (DOSM, 2020). However, due to the contentious public sector project environment, a conservative mechanism using a prescriptive approach in project management decision-making could contribute to project failure. The external environment factors, such as unexpected events or unforeseen issues, greatly influence public sector organisations compared to the private sector (Gomes et al., 2013). Zamani et al. (2021) reveal that the Covid-19 outbreak at the end of 2019 had created unforeseen operational and financial issues in the construction industry that urged stakeholders and policymakers to look thoroughly at the effect on the project delivery. Most contractors or developers will face significant losses and financial burdens (i.e. overhead cost) due to supply chain disruptions, labour shortages and increment in the material prices, while the project's client potentially faces several unfinished and unsuccessful projects. Besides, the existing prescriptive decision-making approach in the project delivery method (PDM) selection of public sector projects is incapable of dealing with the contractual implication due to the uncontrolled and uncertain issues.

1.2 Problem Statement and Objective of Study

In Malaysia, the construction industry has always been criticised for poor and inefficient project delivery practices. Jatorana et al. (2016), in their study of public construction projects performance in Malaysia, have summarised 69 low-performance factors in all stages of the project life cycle (early investigation, design, contract, construction and upon closing project). They had found inappropriate contract execution methods as one of the key problems in the public construction project. Additionally, the National Audit Department (2017) revealed that one of the Eleventh Malaysia Plan (11thMP) projects, Refurbishment Work for 534 schools in Malaysia with a cost of MYR2.5 billion, has failed to be implemented according to the project objective due to project delivery issues. Until October 2018, only 22.1% of the project was completed within schedule. The Audit has reported that inappropriate PDM selection is among the factors affecting the project's performance. For decades, numerous researches have been conducted to develop a structured and descriptive decision-making framework for selecting an appropriate PDM for the construction project. However, the adoption of structured and descriptive decision-making in selecting PDM in the construction industry, especially in developing countries' public sectors like Malaysia, is still understudied (Jaafar & Radzi, 2013; Jin Lin et al., 2015). Thus, this paper attempts to investigate the practices and constraints of the Malaysian public sector in PDM selection for construction projects.

1.3 PDM Selection In Public Sector

Scholars have discussed PDM in several terminologies to clarify its role as a project execution mechanism in construction project management. Some scholars applied PDM terminology as a procurement strategy (Masterman, 2002; Watermeyer, 2012), or project delivery system (Gajurel, 2014; Konchar & Sanvido, 1998) or recently quoted by scholars as a project delivery method (Ahmed & El-sayegh, 2021; Bingham et al., 2016; Carpenter & Bausman, 2016; Mesa et al., 2019). Scholars also define PDM in several ambiguous interpretations. Some scholars define PDM as role and relationship (Bingham et al., 2016), contractual framework (Carpenter & Bausman, 2016), business model to manoeuver resources (Mesa et al., 2019) and assignment of responsibilities to establish project execution framework (Ahmed & El-sayegh, 2021) among related parties. Therefore, a conclusive definition of PDM could be described as a project execution mechanism that

defines a method of funding, a procurement system, interrelated parties working responsibilities, execution strategy, compensation mechanism, and part of a business strategy in achieving the project objective.

1.4 PDM Concept and Classification

PDM has evolved for the past few decades to promote an effective operation and execution of construction projects. The evolution of PDM is based on several factors related to the project owner's requirement, construction technology advancement, socio-economic development, and changes in government policy (Bolton & Heller, 2018; Mesa et al., 2019). Literature reveals that several types of proliferated PDMs practised by the construction industry could be identified according to the basic concept of PDM, either segmented, integrated, packaged, or collaboration (Flanagan & Jewell, 2018; Rwelamila & Edries, 2007). The segmented delivery approach, universally known as Design-Bid-Build (DBB) or the traditional delivery method, is the most prevalent PDM for construction projects (Franz et al., 2020; Haugen et al., 2017). Meanwhile, the alternative project delivery occasionally deployed by the worldwide construction industry is Design-Build (DB), Construction Management (CM), Public-Private Partnership (PPP) and Integrated Project Delivery (IPD) (Mccollough, 2021). The functionality and characteristics of PDMs are distinguished according to project organisational structure (roles and relationships), contractual structure (assignment and responsibilities) and operational system (working framework and strategies). Each PDM has different success factors, strengths, and weaknesses and is significantly influenced by the project characteristics and the construction industry's nature (CMAA, 2012).

1.5 PDM Selection Decision-Making Framework

The emergence of numerous alternative delivery methods has generated demand by the project owners to explore a systematic and universal framework for selecting the most appropriate delivery method (Skitmore & Marsden, 1988). Literature reveals that an appropriate PDM could benefit organisations to; (i) achieve project owner goals and objectives (Tran et al., 2016); (ii) maximise project performance (B. Liu et al., 2016); (iii) maximise benefit and return of investment (Al Nahyan et al., 2018); (iv) create effective project management (Bugrov & Bugrova, 2018); (v) produce fair roles and stable relationship among project participants (Ke et al., 2019); and (vi) important success factor for the project execution (Montalbán-Domingo et al., 2018). However, selecting an appropriate PDM presents a critical decision-making challenge for the project owner due to the complexity of the construction project's nature and the ambiguity of human thinking in real-life decision-making.

The PDM selection process typically involves eradicating unrelated and inappropriate methods until reasonable alternative delivery remains. However, Masterman (2002) asserted that it is important to consider the concepts of decision-making before assessing and developing the PDM selection framework. In PDM selection, a common characteristic of theoretical decision-making is related to the project's structured or strategic decision-making activity, which requires a sequence of logical steps to gather all relevant information throughout the project life cycle. The logical steps of the PDM selection process proposed by several scholars are summarized in Figure 1.

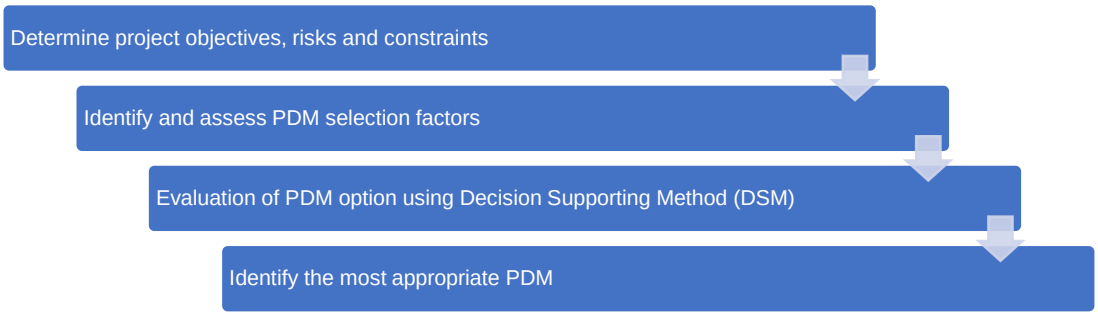


Figure 1: The Logical Steps of The PDM Selection Process

Su et al. (2019); Hosseini et al. (2016); Martin et al. (2016); Moselhi and Popic (2013); Ibbs and Chih (2011); Love et al. (2010b); Pishdad and Beliveau (2010); Touran et al. (2009); Mahdi and Alreshaid (2005); Cheung et al. (2001); Alhazmi and McCaffer (2000)

However, the PDM decision-making is an intricate process that involves various factors due to complexity, uncertainties, and many activities involved in the construction project (Lahdenperä, 2015). Evaluating these various selection factors entails ambiguity and vagueness, which is difficult to define by a generalised set of frameworks. Thus, the PDM selection is typically a multi-attribute decision-making problem that can be effectively solved using Decision Supporting Methods (DSMs) (Zhao & Ying, 2019). Scholars explored numerous DSMs to reduce the fuzziness and subjectiveness of evaluation factors in identifying appropriate PDM. The use of DSM in a PDM selection provides the most objective way of assessing the decision-maker's needs and priorities, which could provide structured and descriptive results. These DSMs could be categorised based on their functionality in processing the input, such as multi-criteria decision making (MCDM), artificial intelligence (AI), predicting techniques (PT), analysis of economic and organisational aspects (EO), computer-aided system (CAS), and hybrid method (Ibbs & Chih, 2011; Zhao & Ying, 2019). However, scholars currently have no consensus on which workable DSMs could standardise the PDM selection framework (Feghaly et al., 2019). A theoretical PDM selection framework that several scholars (An et al., 2018; Khwaja et al., 2018; X. Liu & Liu, 2019) recently cited is proposed by Ibbs & Chih (2011) and illustrated in Figure 2.

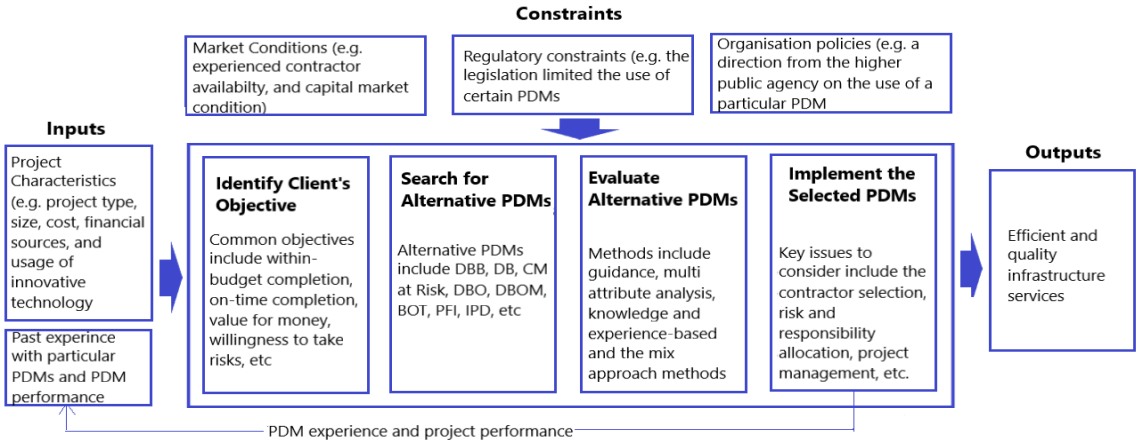


Figure 2: A PDM Selection Framework (Ibbs and Chih, 2011, pp. 529)

1.6 PDM Selection Constraint in Public Sector Construction Projects

Several scholars reveal that most PDM selection practices in the public sector construction projects are authoritarian and conservative (Jin Lin et al., 2015; Love et al., 2010a). Statutory and government policy constraints influence the public sector decision-makers to make PDM selection intuitive, general terms, and based on previous experiences. This prescriptive approach is due to the complexity and various needs of the public sector nature. Klakegg and Volden (2017) described that public sector projects entail multiple project objectives due to political interests that normally circulate as project objectives, making public sector projects more complex than the private sector. The development of public sector projects is not profit-oriented, and the projects' developmental nature concentrates on people's necessity and benefits to the nation. In addition, project management best practice in the industry does not apply to the public sector due to strict rules and regulations to accommodate government policy. The long list of project execution processes and procedures normally relates to deep-rooted hierarchical structure and bureaucracy. Besides, the funding of public sector projects depends on the government's financial abilities, which relate to the country's economic stability. The funding needs to be organised accordingly and efficiently, which require a high level of accountability from the public sector organisation due to public interest.

1.7 PDM Selection Framework in Developed Countries

In developed countries such as Australia, the UK, and the USA, the public sector construction industry is rapidly growing and well established. Koppinen and Lahdenpera (2004) asserted that these countries are the most innovative in employing the various concept of alternative project delivery to deal with various characteristics of projects and the complexity of the industry environment. A review of these countries' procurement policies reveals that, currently, public sector agencies conduct a structured and descriptive decision-making process in selecting PDM guided by particular guidelines or frameworks for the public construction project. In Australia, the Australian Government (2018) has published a National Guidelines for Infrastructure Project Delivery to promote cross-government consistency and best practice approaches for public project execution. Meanwhile, in the UK, the government have published the Government Construction Strategy (2011), which details the procedures for procuring public projects to preserve public interest by ensuring the government earns a good bargain and receives a long-term social and economic benefit. In the USA, the amendment of the government procurement policy in 1996 under the Clinger-Cohen Act has permitted public sector agencies to deploy alternative project delivery in construction and infrastructure projects (Perkins, 2009). The US Federal Highway Administration (FHWA) has introduced A Guidebook for the Evaluation of Project Delivery Methods as a principal reference that provides strategic guidelines in developing a PDM selection framework for road and highway projects (Touran et al., 2009).

1.8 PDM Selection in Developing Countries

However, in developing countries, the public sector agencies currently practice authoritarian and prescriptive decision-making mechanisms in selecting PDM for construction projects. Literature reveals that developing countries like Nigeria and Saudi Arabia, which depend on oil revenues as the main source of public funds, like Malaysia, favour traditional delivery methods in public sector construction project execution (Jimoh et al., 2016; Mosley & Bubshait, 2019). The PDM selection is according to the government's decreed procurement policy and guidelines. Nigeria's government enacted the Public Procurement Act in June 2007 as ethical standards in procuring public construction projects. Olanrewaju et al. (2016) reveal that the public decision-makers selected PDM prescriptively intuitive and based on experience because of vague project delivery selection guidelines under the Act. While in Saudi Arabia, PDM

selection is according to the Government Tenders and Procurement Law (GTL). GTL explicitly demonstrated the formal contracts for the construction project are established in a separate contract for design, consulting, and construction services. Aljohani (2019) stated that Saudi Arabia's public institutions are governed by a quadripartite system (Client-Contractor-Consultant-Designer), which tends to employ the traditional delivery method for public construction projects.

1.9 The Effect of Authoritarian and Prescriptive PDM Selection

The authoritarian and prescriptive decision-making mechanism in selecting PDM in developing countries has caused the adoption of an inappropriate delivery method that could generate a poor outcome for the government, especially on value for money efficiency. Mohammed (2019) study on the Public Procurement Act and Economic Performance in Nigeria discovered that the prescriptive procurement process in Nigeria did not give a statistically significant difference in respondents' perceptions of the public procurement efficiency in Nigeria's economic performance. Meanwhile, in Saudi Arabia, Alofi et al. (2016) reveal in their study that the low performance of public construction projects is due to construction delivery method issues. The policy of selecting the lowest bidder and traditional delivery, in which the contractor bears all risk, is the major weakness of the current construction delivery method. Hence, establishing a structured and descriptive decision-making framework in selecting an appropriate PDM allows developing countries' public sector to reap the benefits of numerous PDMs by well managing the uncertainty and unexpected events in project execution for a better project outcome.

2.0 METHODOLOGY

This paper attempts to analyse the practices and constraints of the Malaysian public sector in PDM selection for construction projects. An in-depth literature review of secondary data via reviewing and critically reasoning the existing documents, either academic or non-academic published sources, is sufficient to achieve the objective of this paper. Typically, the public sector policy or programs are governed according to the presence of rational rules and procedures under a bureaucratic system (Parker & Bradley, 2000). The policies and guidelines of Malaysian public sector construction project procurement or PDM adoption are viable sources to dictate the public agencies' current practice of PDM selection. Thus, an in-depth literature review of these documents supported by studies conducted by scholars on a related subject is reliable to achieve the objective of this paper.

The first stage of data collection is by exploring journals, conferences, news, magazines and other published articles related to the public sector PDM selection in the electronic database of SCOPUS, Web of Science, ScienceDirect, SAGE Journal, and Google Scholar. The articles are screened based on the topic and abstract, which discussed public sector construction PDM selection in Malaysia and PDM selection framework in other countries' public sectors as a comparison. Thirty-six published articles relevant to the subject area are retrieved from the electronic database. Then, the second stage of data collection is by assembling achievable information from the government reports, government policy and guidelines statute or other related published reports on the several accessible government websites. All the documents are assembled in the reference management software Mendeley. The review process is conducted using an interpretative approach based on a thematic analysis finding that provides patterns and describes a comprehensive overview of the subject area. The interpretive approach is a catch-all term that refers to a particular perspective on organisational reality, one that is predicated on the belief that reality is socially constructed or given meaning by actors' perceptions and interpretations of events (Putnam & Banghart, 2017). The finding and results are intuitively discussed based on cognitive inference of the public sector agencies' practice in PDM selection.

In order to support the finding and results, this paper assessed the PDM performance from prior studies and public agency reports to determine the effectiveness and constraint of the current practices. In Malaysia, there is a lack

of research conducted to overview the PDM performance of the public sector construction projects. Thus, to support findings from published studies, this paper accessed the Malaysian public sector project execution report through the Public Works Department Project Monitoring System (SKALA). Due to the limitation of Malaysian public project performance data and the subjectiveness of public project performance, this paper only reviews the published articles and reports on the PDM performance based on the iron triangle (cost, time, and quality). The iron triangle will indicate the short-term project performance, which is critical to the immediate success of a client's project (PMI, 2017).

3.0 FINDINGS

Since independence, the Malaysian public procurement system has been inherited from the British colonial era, which meets international standards while preserving Malaysian values such as multi-racial development and preference for local and indigenous (Bumiputera) communities (Jones, 2018). The adjustment and infiltration of political imperatives and local values intentionally secure people's interests by emphasising public accountability, transparency, value for money, and open and fair competition in the procurement guidelines (MOF, 2013c). Malaysian procurement is governed by the Financial Procedures Act 1957 and the Government Contracts Act 1949, with the objective to support government programmes (MOF, 2010). These Acts were supplemented, amended, and clarified through various administrative instruments, including Treasury Instructions, Treasury Circulars, and Federal Central Contract Circulars, to specify the procedures and guidelines of public procurement. The regulations apply to all federal and state ministries/departments, local governments within states, and federal and state statutory bodies engaged in procurement. The Ministry of Finance (MOF) is responsible for formulating and enforcing these procurement procedures and guidelines.

In the context of the public construction projects, procurement guidelines under Treasury Instruction (2008), clause 182 has assigned the technical department, Public Works Department (PWD), to manage and execute all public works (construction and maintenance) of building and infrastructure projects. Established in 1872, PWD serves as a technical department and is accountable for implementing infrastructure and building construction and maintenance projects for various ministries, departments, statutory bodies, and state governments (PWD, 2020). PWD is responsible for all projects with a value greater than MYR100,000, including managing pre-contract and post-contract phases. In terms of contract approval, PWD jurisdiction is for the contract value less than MYR100 million, while the contract value greater than the stated is required reassessment and approval by the MOF. Like most countries, the acquisition of works in the Malaysian procurement process varies depending on; the nature and volume of the works, the anticipated contract value, and the range and capacity of the contractors.

At the early stage of Malaysia's development, the government practised traditional delivery methods on public construction projects for decades until the 1990s. Due to the economic recession in 1997/1998, the government has introduced the fast-tracking delivery method such as DB, Project Management Consultant (PMC), and Build-Operate-Transfer (BOT) to stimulate economic growth. The introduction of fast-tracking project delivery aims to manage the growing number of projects that exceed the technical department's capabilities. This approach also tends to manage the escalation of the complexity, especially related to large-scale projects' requirements. Based on SKALA Report (2019), PWD was responsible for managing 378 public building and infrastructure projects between 2009 to 2019. The report reveals that from the total of 217 building projects, 148 (68.2%) projects deployed DBB and 69 (31.8%) projects used the DB delivery method, whereas, for the infrastructure projects, 111 (68.9%) projects used DBB and 50 (31.1%) projects employed DB. In early 2000, the government had ceased applying the PMC delivery method for the public fund projects due to fraught issues related to poor project performance (Ibrahim et al., 2010). Conversely, the government introduced PPP and PFI approaches starting in

2005 in Ninth Malaysia Plan (9thMP) to reduce the government's financial burden. The government's objective is to increase private sector involvement in the public project development to trigger positive economic growth (UKAS JPM, 2009), for which it has approved 83 PPP projects for various sectors with a total investment of MYR51.95 billion from 2013 to 2018 (UKAS JPM, 2019).

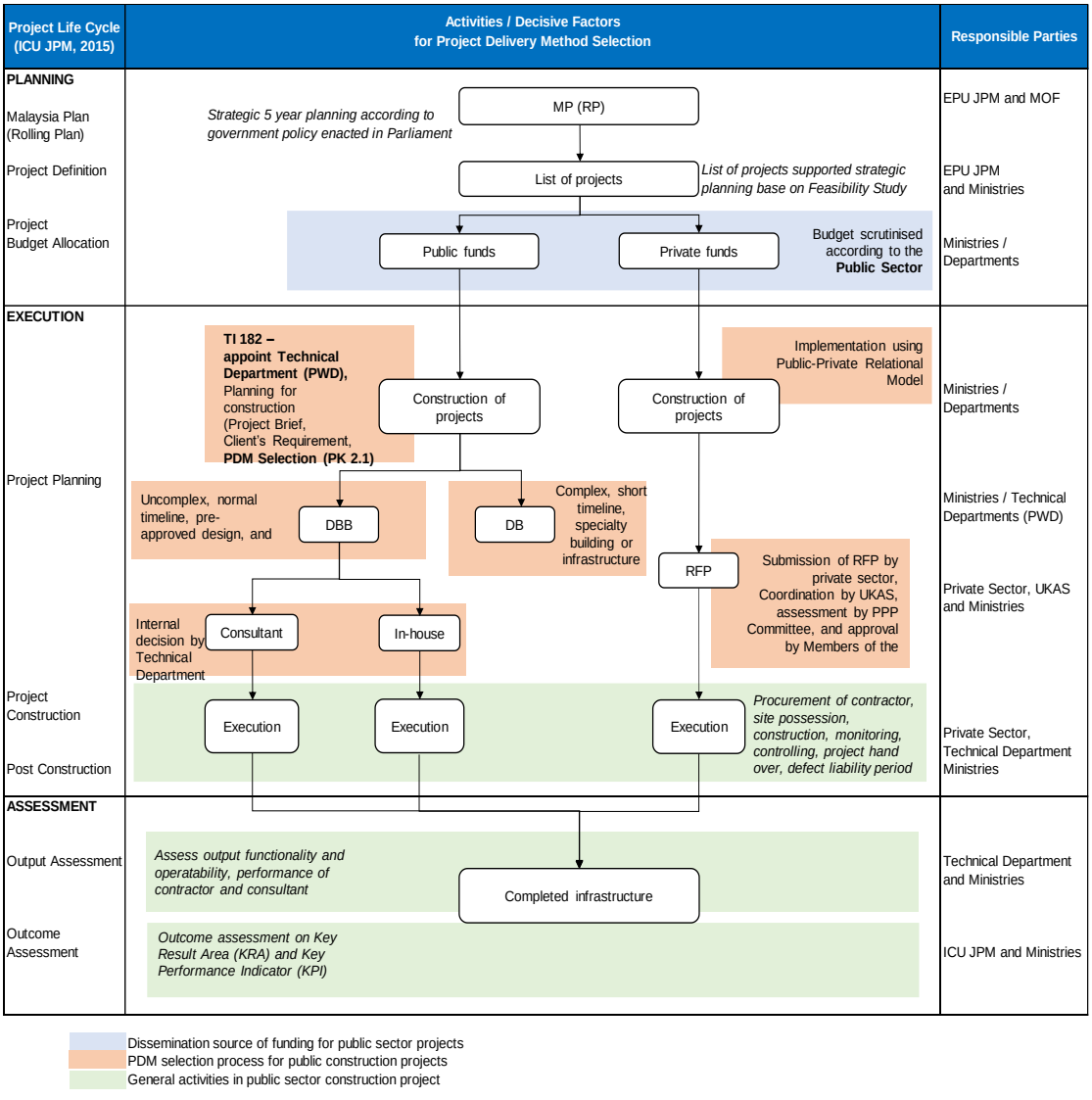
The selection of PDM for public fund construction projects is governed by the guidelines enforced under Treasury Circular PK 2.1: Government Procurement Method (2013a) and PK 4.1: General Government Procurement Contract Administration (2013b), which urges all public construction projects to deploy traditional delivery methods (DBB) in projects execution. DB delivery method may only be applicable for selection if the project characteristic is complex and has a short timeline for execution. However, any projects initially have pre-approved drawings and specifications are also restricted to deploying the DB delivery method. DBB delivery methods are classified as either DBB (in-house) or DBB (consultant) (ICU JPM, 2015). DBB (in-house) uses the internal technical capabilities of the technical department in the planning, design and monitoring phases, while DBB (consultant) uses appointed consultants in the design and monitoring of the construction carried out by the contractor. Although the literature indicates three delivery methods (DBB, DB and PMC) commonly used in the Malaysian construction industry, Ting (2013) revealed that the industry presently deploys only DBB and DB delivery methods. The traditional delivery method is still the most preferred PDM in public construction projects, whereas the PMC approach was ill-favoured at the end of 2004 due to issues of delays and uncompleted projects. The DB and PPP approaches are the applicable alternatives delivery method for the Malaysian public sector.

Under the privatisation policy, the Malaysian government has encouraged public and private collaboration through the PPP approach in developing, operating, and maintaining public facilities (UKAS JPM, 2009). This policy aims to reduce the government's financial expenditure on public amenities development by sharing the roles with the private sector besides eagerly bargaining for much better quality facilities for the public's interest. The government initially established the Public-Private Partnership Unit (UKAS) to facilitate strategic partnerships between the public and private sectors through the PPP program. UKAS has introduced PPP Guideline (2009) as guidance to public agencies or private companies intending to participate in the PPP programme. The guideline focuses on the technical proposal for the PPP project and characterises the standard of contractual relationships between public and private entities, such as concession agreement, targeted output, payment term and performance standard.

An extensive review of government circulars and guidelines indicates no guideline or framework published by the government to determine the appropriate delivery method for public construction projects. Currently, there is no structured PDM selection framework published or used by practitioners in the Malaysian construction industry. Typically the selection is carried out based on experience and acceptable risk by the project client. Jin Lin (2014), in her research on the PDM selection decision-making framework for the Malaysia public university maintenance project, states that in public sector guidelines, Treasury Circular only entails the procurement process without thoroughly discussing the PDM selection process. All construction projects approved under the annually Malaysian strategic rolling plan, allocated under public funds, are exerted using the traditional or integrated delivery method. Meanwhile, large-scale and limited fund projects are proposed to deploy collaboration partnerships with the private sector.

A review of the PWD tender announcement in 2021 (PWD, 2021) reveals that out of 487 tender notices, 461 projects are adopting DBB (in-house) delivery methods as project delivery, which urged bidders to acquire bills of quantities and tender drawings. Only 26 projects allow for contractors to joint pre-qualification tenders for DB project delivery. These findings indicate that PWD has identified that most Malaysian public construction

projects are not complex and can be executed using conventional in-house expertise in planning, designing, and managing the projects. Identifying or assessing the project's complexity or organisation abilities in managing the projects is not recorded and published in any department's reports or standard operating procedures. Thus, the selection solely depends on the department's top management experiences and intuitive judgment according to guidelines enforced by MOF. The decision-making on the PDM selection under the project life cycle with the responsibilities and decisive factors for the Malaysian public sector construction project is illustrated in Figure 3.



* Project Life Cycle (ICU JPM, 2015), EPU JPM = Economic Planning Unit, Jabatan Perdana Menteri (Prime Minister Department), UKAS = Unit Kerjasama Awam Swasta (Public-Private Partnership Unit), ICU JPM = Implementation and Coordination Unit, Jabatan Perdana Menteri, MP = Malaysia Plan, RP = Rolling Plan TI = Treasury Instruction, PK 2.1 = Treasury Circular PK 2.1: Government Procurement Method, RFP = Request for Proposal

Figure 3: PDM Selection under The Project Life Cycle with The Responsibilities and Decisive

3.1 Factors for The Malaysian Public Sector Construction Project

Due to limitations on the current PDM selection guideline, public clients and technical department decision-makers have restricted information and knowledge on the consequences and effect on the project outcome in deciding a delivery method for project execution. Riazi and Nawi (2018) asserted the incapability of the public sector in project planning, especially in selecting appropriate PDM, is the major problem that causes public sector projects' poor performance. Although the government introduced several initiatives to encounter this problem, especially by introducing alternative project delivery such as DB and PMC for the large and complex projects; however, domination and restriction on the traditional approach is the major cause of this issue. Endut et al. (2005) study on cost and time overruns of projects in Malaysia found that 92% of public sector projects are fraught with cost overruns compared to 62.7% of the private sector. The project delays show the worst statistic; the public sector has 81.8% of project delays while the private sectors indicate 71.65%. A recent statistic reported by Shehu et al. (2015) indicates that the public sector still significantly experiences more project delays compared to the private sector, with only 21% of public sector projects being completed within the contract period while 33% of private sector projects. These findings are consistent with the data accessed in PWD SKALA Report, which indicated that over 279 (73.8%) projects were identified for late completion, and 152 (40.2%) projects were overrun costs from 378 building and infrastructure projects managed by PWD between the year 2009 until 2019. However, the PWD client charter (2018) reported that 76.4% out of 4,669 public sector projects managed to be executed according to the project planning. This contrast report needs further investigation to establish an accurate and relevant result of the project performance for the Malaysian public sector as a future reference.

Endut et al. (2005) reveal that the traditional delivery method (DBB) causes 79% of project delays, DB 72.4% and PMC with 66.7% of project delays. Additionally, Shehu et al. (2015) research reveal consistent figures from the previous study, DBB cause 79% of delays, DB 72%, and PMC 67% of project delays. These findings are synchronal with the PWD SKALA Report (2019); the data shows that 74.9% over 259 DBB projects and 71.4% over 119 DB projects were recorded for delayed completion. In terms of project cost performance, it recorded that 36.7% of DBB projects and 47.9% of DB projects were cost overruns. Meanwhile, Jaafar and Radzi (2013), in their research on the level of satisfaction with the delivery method in public sector projects, reveal that the traditional delivery using Lump Sum Bill Quantities (LSBQ) contract gained the highest satisfaction compared to DB with the turnkey contract. The result does not indicate overall satisfaction of delivery methods due to the domination of traditional approaches in public sector projects that restrict industry players from assessing alternative delivery in the construction industry. Upon extensive review of the literature, the results of the PPP method project performance in Malaysia are still indefinable by scholars, although the method has been vastly deployed in public sector projects since 2009. Nonetheless, Mohamad et al. (2018) asserted that the PPP project performance should be measured according to finance and market indicators: operational cost, construction cost and construction period, technology innovation, and financial innovation. It is not relevant to assess PPP performance based on traditional iron triangle criteria.

4.0 DISCUSSION

Analysis of the Malaysian public sector practice in PDM selection indicates that public agencies use authoritarian and prescriptive decision-making mechanisms in selecting a delivery method for project execution. Literature, government procurement policies, and related published reports reveal that the PDM selection mechanism for public fund projects in Malaysia governs accordingly by the government procurement guidelines. The procurement guidelines do not feature the decision-making process in selecting four types of PDM options (DBB (in-house), DBB (consultant), DB, and PPP) available in the Malaysian public sector construction project. The guideline strictly prioritises and leads to choosing the traditional delivery method using in-house expertise for

the project execution. The alternative project delivery, like the DBB (consultant) and DB method, might be selected by the public decision-maker based on experiences and intuitive decisions to justify the complexity of the planned projects. Meanwhile, the guidelines for public and private collaboration projects are not comprehensively evaluating the appropriateness of the proposed project characteristic with the numerous PPP delivery method, which is typically assessed based on the compliance of the business proposal.

4.1 The constraint on statutory and strict guidelines by the government

The decision-making mechanism based on statutory and strict guidelines in the Malaysian public sector prohibits sagacious judgement of public decision-makers for selecting appropriate PDM. Constraints by statutory and government policy also make decision-makers tend to make selection intuitive, in general terms and based on previous experiences. Thus, improvisation on the guidelines to enforce a more structured and descriptive framework in selecting PDM needs to be reviewed by the Malaysian public sector. Most developed countries such as Australia and the US have amended the procurement policy by giving flexible authority to public decision-makers in selecting PDM. The decision-making process is conducted based on a systematic and comprehensive assessment of the project business case study. The appropriateness of the project characteristic, public agencies' capabilities and external market environment with available PDM options are holistically assessed instead of common cost-benefit analysis, value management and risk assessment to achieve better value for money and meet the needs and expectations of the public client. The comparison of PDM selection assessment between developed countries (Australia, UK, and the USA) and Malaysia are summarised in Table 1. A review of project delivery performance in Australia by AIPM and KPMG (2020) found an increment of client satisfaction of 52% in 2020 compared to 2019 with 46%. The report also found that 25% of the projects in 2020 were delivered successfully compared to 2019 with 19%. This finding indicates that 40% of projects were likely delivered within cost, 42% delivered within the timeline, and 51% were likely to meet the original goal and business intent.

Table 1: The Comparison of PDM Selection Assessment Between Developed Countries (Australia, UK, and the USA) and Malaysia

Country	PDM Statutory and Guidelines	PDM Selection Framework	Assessment for PDM Selection
Australia	National Guidelines for Infrastructure Project Delivery (Australian Government, 2018)	Procurement Options Analysis (Australian Government, 2008)	Robust financial analysis and value for money assessment in the business case study. It considers a few criteria such as project objectives, cost analysis, policy context, market analysis, agency capability, project characteristics, project fund, and risk analysis through market engagement
UK	Government Construction Strategy (Cabinet Office UK, 2011)	The Common Minimum Standards (Cabinet Office UK, 2012)	The Common Minimum Standards details the strategy as a guideline for delivery method selection. Promote integrated delivery (PPP/PFI, Design & Build, Prime-type Contracting, and framework arrangements consistent with the Construction Strategy) The identification and decision on project delivery options will be evaluated and assessed in the business case as guided in Green Book (HM Treasury, 2020). The Green Book describes how major public sector investment projects are assessed. It provides "technical guidance" to help officials advise ministers on how best to achieve a given policy objective. It does not set policy objectives but "sets out a rigorous yet pragmatic approach to weighing up the costs and benefits and illuminating the key issues, uncertainties and risks" in potential projects.
USA	Federal Acquisition Regulation (US Government, 2022) Clinger-Cohen Act 1996	*A Guidebook for the Evaluation of Project Delivery Methods (Touran et al., 2009)	A principal reference in developing a PDM selection framework for roads and highway projects. A three-tiered decision framework for the project owners to examine the advantages and disadvantages of each delivery method Tier 1 is a qualitative approach that enables the user to document the benefits and drawbacks of each competing delivery method Tier 2 is a weighted matrix using a quantitative approach that enables users to measure the effectiveness of competing delivery methods and choose the one with the greatest score Tier 3 assesses delivery strategies through the risk analysis concept, which concentrates on risk-based cost estimation approaches, typically the most quantitative and objective
Malaysia	Financial Procedures Act 1957 and the Government Contracts Act 1949 Treasury Instruction (MOF, 2008)	Treasury Circular PK. 2: Government Procurement Method (MOF, 2013a)	The traditional delivery method is the preferred delivery. Integrated delivery is only applicable if public decision-makers define the project as complex, specialist building and infrastructures and have a short timeline for execution

*due to varies in regulations between federal and states of the USA, the analysis only focuses on the Federal Highway Administration (FHWA) practice

4.2 *Constraint on uncertainty avoidance culture among public decision-makers*

Besides, the application of prescriptive decision-making due to uncertainty avoidance culture among public decision-makers impeded the public sector to gain benefit from the numerous proliferated PDMs in the construction industry. Multiple types of PDM give an option for the project client, and each PDM will provide different advantages and disadvantages to project performance depending on project characteristics. Moreover, each PDM provides a business model solution that describes how the different resources management could generate contrast value for clients and stakeholders. Several pieces of research reveal that the application of appropriate alternative delivery methods such as DB, CM or PPP produce a better project performance. However, uncertainty avoidance culture practice by the Malaysian public decision-maker tends for choosing familiar and knowledgeable PDM such traditional delivery method impeded the thorough assessment of the suitability of numerous PDM options with public sector project characteristics. Jaafar and Radzi (2013) reveal that the working culture in the Malaysian public sector, from generation to generation, maintained the same work ethic, reluctance on innovation and changes in decision-making practices had sustained the prescriptive mechanism of PDM selection.

4.3 *The propensity of optimism bias on project outcome*

Furthermore, a review of the Malaysian public sector project performance reveals that the driven policy of prescriptive selection of DBB and DB delivery methods in public project execution has not improved the project performance and significantly impacted the public project outcome. Moreover, this kind of non-comprehensive decision-making process based on incomplete information analysis and ambiguous judgement of decision-makers in PDM selection could create optimism bias and strategic misrepresentation for the government. An optimism bias in project delivery is a propensity to underestimate the costs and length of a project while overestimating the outcomes (MacDonald, 2002). The prescriptive PDM selection mechanism could cause the government to overestimate the project outcomes; thus, the aim of value for money and providing public satisfaction in public sector projects is hard to achieve. In the UK, the integrated delivery method has been preferred compared to traditional delivery for the past decades, whereby the government believes this kind of approach provides value for money and has long-term benefits for the public. However, Pollock et al. (2007) concluded in their assessment of the UK National Audit Office (NAO) report that insufficient evidence supports the UK government's policy of prescriptive selection of integrated project delivery could improve cost and time efficiency without an assessment of the appropriateness of PDM.

4.4 *Accountability and transparency issue*

Besides, the prescriptive approach could cause several issues regarding the accountability and transparency of the procurement system in Malaysia. The Star (2021) recently reported that the anti-corruption commissioner agency had arrested a contractor for allegedly being a cartel and manipulating the public sector project delivery system from 2014 until 2020. This case indicates that the government overlooked the weaknesses of the procurement policy, which openly gave big and well-funded companies opportunities to control the market and eventually eroded the spirit of open competition using a traditional delivery approach. It shows that an unreliable project delivery selection mechanism could cause bias in the construction market and industry players. Overreliance on the same procedures and systems for an extended period of time allows irresponsible parties to exploit the flaws in traditional project delivery methods. These issues occur due to ineffective project planning and business case studies to discover proportionate delivery methods according to the capabilities of the public agencies and the external market condition. Therefore, the government needs to improve the existing practice by transforming it into a more efficient and transparent system such as structured and descriptive frameworks in selecting project delivery methods.

5.0 CONCLUSION

How reliable the selection mechanism is depends on the effectiveness of the decision-making process. Findings indicate that the traditional delivery method is prevalent PDM in most Malaysian public-funded construction projects. The Malaysian public sector has practised authoritarian and prescriptive decision-making governed by the government procurement guidelines in selecting PDM, which intentionally preserves political interests. Inappropriate PDM selection in project execution has produced an unconvincing performance by showing optimism bias on the expected outcome. The normative framework in the procurement guidelines that prescribe methods guided intuitive decision-makers judgement without comprehensively evaluating bounded factors produce uncertain and ambiguous results in PDM selection. Therefore, the Malaysian government and scholars need to investigate further the constraint and influence factors in selecting PDM based on Malaysian public sector nature to establish a structured and descriptive decision-making process. A structured approach commonly adopts a descriptive framework concerned with bounded factors that comprehensively analysed would offer much clearer, unambiguous, and easily definable results in PDM selection. Numerous PDM selection framework introduced by several scholars does not apply to the Malaysian public sector nature. The nature of certain countries are different in terms of government policy, project objectives, need and requirements, funding capabilities, project characteristics, government organisational structure, technology accessibility and construction market environment. Thus, these influence factors need to define and thoroughly analysed in the planning and business case study before developing any PDM selection framework. This paper is significant in improvising the decision-making mechanism in selecting appropriate PDM for the Malaysian public construction project. Besides, this paper's findings will be relatively indicative of those countries that adopt prescriptive decision-making in PDM selection.

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