A NOVEL DECISION SUPPORT TOOL FOR ASSESSING THE SUITABILITY OF DESIGN-BUILD METHOD FOR CIVIL CONSTRUCTION PROJECTS IN MALAYSIA

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DOCTOR OF PHILOSOPHY

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SUPERVISOR'S DECLARATION

We hereby declare that We have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Doctor of Philosophy in Project Management and Construction.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Kaedah pengurusan projek adalah keputusan penting untuk menentukan kualiti projek pembinaan. Dua kaedah utama penyampaian projek yang digunakan dalam projek pembinaan iaitu secara reka dan bina atau "Design-Build" (DB) dan pembinaan konvensional meliputi tiga proses iaitu reka, tender dan bina atau "Design-Bid-Build" (DBB). Terdapat beberapa kajian telah mensyorkan pengunaan alat sokongan keputusan atau dikenali sebagai "Decision Support Tool" dapat menentukan ketepatan keputusan perlaksanaan DB mahupun DBB bagi projek tertentu. Membuat sesuatu keputusan dalam projek pembinaan sangat penting dan bergantung kepada banyak faktor. Sebagai contoh, keadaan tanah, lokasi projek, status kewangan syarikat, pengalaman kakitangan projek pembinaan dan lain-lain. Selain itu, ketepatan sesuatu keputusan untuk mana-mana projek juga bergantung kepada ciri-ciri yang ada pada pemunya projek, perunding, dan kontraktor bagi memastikan kejayaan projek. Kajian terdahulu mendedahkan bahawa perkongsian maklumat yang lemah, prestasi kurang memuaskan terhadap kaedah sokongan keputusan, serta ciri-ciri projek yang berbeza dan dinamik adalah faktor halangan dan mengagalkan projek pembinaan awam di negara-negara seperti United Kingdom dan Amerika Syarikat. Oleh yang demikian, alat sokongan keputusan untuk DB (DST-DB) telah dibangunkan dalam kajian ini untuk menilai kesesuaian perlaksanaan DB bagi projek pembinaan. Secara tidak langsung, pengunaan DST-DB dapat mencegah kelewatan projek atas sebab ketidaktepatan keputusan yang dibuat. Dengan adanya maklumat-maklumat penting berkaitan projek seperti faktor kejayaan perlaksanaan DB atau dikenali sebagai "Critical Success Factor" (CSF) dan faktor penggalak DB sebagai "Key Driver" (DBD) telah dilengkapkan dalam DST-DB untuk membantu perlaksanaan sokongan keputusan yang lebih sempurna. Kesemua faktor-faktor berkaitan telah dikenal pasti dalam kajian tersebut melalui tinjauan literatur yang luas serta input penting diperolehi dari pakar-pakar industri pembinaan. Seramai 111 peserta terlibat dalam kajian ini dan kaedah kuasi-eksperimen telah dijalankan untuk membandingkan prestasi profesional industri pembinaan khususnya dari golongan pemunya projek, perunding, dan kontraktor yang bekerja di syarikat berprestij di seluruh Malaysia. Kesemua data dianalisis menggunakan teknik analisis multivariat, seperti nilai norminal (NV), sisihan piawai (SD), dan analisis varians (ANOVA). Keputusan menunjukkan bahawa ukuran prestasi utama DST-DB (iaitu, kebolehgunaan, kebarangkalian, ketepatan, keyakinan, dan kepuasan) adalah lebih tinggi daripada yang dicatatkan untuk proses membuat keputusan secara konvensional dalam projek pembinaan awam di Malaysia. Sebelum dan selepas tinjauan kajian telah mendedahkan bahawa DST-DB secara berkesan meningkatkan prestasi membuat keputusan berdasarkan faktor pemilihan kaedah DST (iaitu, taklimat pelanggan yang berkesan, memaksimumkan sumber, dan perkongsian kepakaran). Oleh yang demikian, hasil kajian boleh dijadikan sebagai rujukan untuk menilai kaedah penyampaian projek dalam sektor pembinaan awam, sumber untuk ahli akademik dalam jurusan pengurusan projek pembinaan, dan panduan untuk kakitangan profesional bagi membantu dan meningkatkan proses membuat keputusan yang lebih tepat bagi projek pembinaan di Malaysia.

ABSTRACT

Project delivery method is a crucial decision that determines the quality of construction projects. The two main project delivery methods used in construction projects are design-build (DB) and design-bid-build (DBB), which are comparable in terms of project quality, decision strategies, and risk factors. Although the DB method is prominent among practitioners, experts, and scholars; only a handful of studies have assessed a decision support tool (DST) to determine the suitability of a DB procurement method in civil construction projects. The decision-making process in civil construction projects heavily relies on the suitability of DB methods, which is also dictated by many factors and drivers. The decision support for any civil project depends on client, consultant, and contractor - the main players who ascertain project success. Past studies revealed that poor information sharing, low performance of decision models, and diverse project characteristics as the most common barriers that fail the DSTs in civil construction projects. Multiple projects are being undertaken across many countries and in diverse domains, such as building, highway, and underground civil projects. Referring to the study findings, a Decision Support Tool for Design-Build (DST-DB) was developed in this study to assess the suitability of a DB method in assisting civil construction project experts, contractors, and practitioners to adopt or reject DB for their construction projects, while concurrently preventing project setbacks. The main critical success factors (CSFs) and the DB drivers were identified and compiled from an extensive and in-depth literature review, while crucial inputs were captured from a panel of industry experts. A questionnaire was developed to gather insights from academicians, experts, and workers; while the DST-DB tool was developed to assess the suitability of the DB method by validating the identified factors and drivers. A total of 111 participants were involved in this study and the quasi-experiment method was conducted to compare the performances of practitioners, experts, and academicians specifically from clients, consultants, and contractors working in prestigious firms across Malaysia. The practitioners selected two commonly applied construction project methods; DST-DB and conventional decision-making methods. The decision-making performances retrieved from the two methods were ranked based on a set of conditions using an actual project to exhibit the practical value of the findings. All data were analyzed using multivariate analysis techniques, such as normalized value (NV), standard deviation (SD), and one-way analysis of variance (ANOVA). The results showed that the key performance measures of DST-DB (i.e., usability, likelihood, precision, confidence, and satisfaction) were higher than those recorded for conventional decision-making process in the civil construction projects undertaken in Malaysia. The pre- and post-surveys revealed that the DST-DB effectively improved the decision-making performance based on the key selection factors used in most countries (i.e., effective client briefing, maximizing resources, and sharing of expertise). Essentially, this study is one of the first decision support studies executed for DB construction projects that captured direct assessment and view from three main stakeholders of civil construction project practitioners (project clients, consultants, and contractors). The study outcomes may serve as a reference for assessing the project delivery method for civil construction projects, a resource for academic scholars working in construction projects domain, and a guide for construction practitioners to enhance their decision-making process. This study paints a comprehensive picture for a DB construction project to embark upon and accomplish future decision-making process.

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