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Risk Factors for Design and Build Projects in Malaysia – Project Manager's Perception

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ABSTRACT

The design and build concept has become a popular contract system. It requires the owner and contractor to identify, analyse and manage risks and search for the best solutions to improve performance. The objective of this paper is to identify the project manager's perception of risk factors associated with the design and build project in Malaysia. A total of 100 usable questionnaires were received and analysed using mean ranking and factor analysis. The results show that three most risky factors are: "client financial capability", "inadequate cash flow by contractor", and "lack of payment (delayed progress payment by owner to the contractor)". Risk can be grouped into 12 categories, namely: (1) lack of management competency; (2) lack of contractor experience; (3) political issues; (4) lack of standardized system; (5) unpredictable issues; (6) lack of client experience; (7) safety issues; (8) lack of teamwork; (9) poor supervision by client; (10) lack of client information; (11) material availability; and (12) design error.

Keywords: Design and build, project manager, risk factor

INTRODUCTION

Design and build is a method of project delivery where the contractor is responsible for carrying out the design and construction of the project for a client (Modupe et al., 2012). This method of project delivery has increased market share because of the speed of project completion, and cost reduction (Ogunsanmi et al., 2011). However, design and build projects are prone to risks, some of these risks are borne by the design and build

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contractor, client, and in some cases shared by both parties. In addition, this type of contract transfers more risks to the contractors than other construction contracts (Seng & Yusuf, 2006). According to Dada et al. (2003), contractors in developing countries have insufficient experience and knowledge to manage risk effectively. This study aims to identify perceptions of risk factors related to the design and build project in Malaysia. It hopes its findings will help project managers manage risk effectively.

Potential Risk in Design and Build Project

The construction sector is evolving towards a stage whereby cost, time and quality are being stressed. Although the use of design and build contract has been around for some time it has overtime found to be not effective.

According to Azizan and Ibrahim (2015), a design and build project is classified as the riskiest project, because of a combination of design activities, on site supervision and participation in the actual construction project. The contractors exposed to a high degree of control over the entire project. In addition, contractors and owners have insufficient experience and knowledge to manage and control risks involved in design and build projects (Akintoye & Fitzgerald, 1995).

The profit margin has become thinner and thinner due to high inflation rates, rise in labour costs, and more stringent environmental and safety control, affecting quality of work and completion dates (Oztas & Okmen, 2004). A total of 64 risk factors were identified and used in a questionnaire survey to obtain the perception of project manager towards this construction sector.

MATERIALS AND METHODS

This study used a quantitative approach to analyse risk factors and literature review to identify risk factors associated with Design and Build projects. A comprehensive list of 64 risks was identified and used in a questionnaire that was designed to get the perception of the construction professional experts (project manager) in design and build projects. The project manager was chosen for the study because he has acquired the relevant knowledge and skill, to perform effectively in their professional roles. The first section of the questionnaire solicited demographic information related to the respondents. The second section consists of three parts of 64 risk factors, two of which were related to the probability and impact of each risk factor for a design and build project on a five-point Likert scale. The scale for risk probability ranged from 1 (low) to 5 (high). Meanwhile, the scale for risk impact ranged from 1 (insignificant) to 5 (catastrophic). A total of one hundred questionnaires were obtained and by statistical analysis (mean ranking) and factor analysis.

RESULTS AND DISCUSSION

In order to identify the risk factors related to a design and build project on the part of a project manager several statistical analysis techniques were adopted for data analyses.

Risk Ranking in Design and Build Project

The aim of this section is to identify high significance risk factors related to design and build projects as perceived by project managers. It can be seen from the analysis 10 of risk factors among of 64 risk factors the mean value greater than 15.620 was recorded. Table 1 shows, "client financial capability", "inadequate cash flow by contractor" and "lack of payment (delayed progress payment by owner to the contractor)" are high risk factors, each of which has a mean value 17.469 and 16.717. Kartam and Kartam (2001) agreed that financial failure has high significance ranking in surveys done in Kuwait. "Lack of design/build knowledge/ experience/competency" and "contractor's lack of staff knowledge/experience" rank fourth and fifth high risk factors (mean value: 16.661 and 16.157). "Lack of teamwork" was ranked sixth highest risk factor (mean value: 16.016) related to design and build project. "Scope of work is uncertainty" was ranked as the seventh (mean value: 16.016). In order to meet the objective of the project success, time management can play an important role for project managers (Wang & Yuan, 2011). Thus "Insufficient time for completion date" was ranked as the eighth higher risk factors (mean value: 16.006). "Lack of project manager competency and authority" was ranked ninth (mean value: 15.806). Finally, "lack of payment (delayed progress payment by contractor to sub-contractor)" was ranked last with mean value 15.620.

Table 1
Top ten of risk ranking in design and build project as perceived by the project managers

Item	Description	Mean Probability	Mean Impact	Mean Risk	Risk Ranking
PI1	Client financial capability	4.045	4.318	17.469	1
PI2	Inadequate cash flow by contractor	4.045	4.318	17.469	2
PI3	Lack of payment (delayed progress payment by owner to the contractor)	3.955	4.227	16.717	3
PI4	Lack of design/build knowledge / experience / competency	3.818	4.364	16.661	4
PI5	Contractors lack of staff's knowledge/ experience	3.864	4.182	16.157	5
PI6	Lack of teamwork	3.955	4.050	16.016	6
PI7	Scope of work is uncertainty	3.955	4.050	16.016	7
PI8	Insufficient time for completion date	3.820	4.190	16.006	8
PI9	Lack of project manager competency and authority	3.864	4.091	15.806	9
PI10	Lack of payment (delayed progress payment by contractor to the sub-contractor)	3.818	4.091	15.620	10

Factor Analysis on Project Manager Perception

Factor analysis, a data reduction technique, is used to discover patterns among the variation in values of several variables in studying risk in design and build projects. Factor analysis assumes that the underlying dimensions or factors can explain complex phenomena (Oyewobi et al., 2012). There are 12 factors of Principal Factors Extraction.

The "lack of management competency" Factor 1 consists of 12 risk factors and includes '*insufficient time for completion date, delay in commencing work because under-estimated time needed to obtain statutory, client financial capability, complexity of the project, lack of design/build knowledge/experience/competency, lack of teamwork, lack of project manager competency and authority, inadequate cash flow by contractor, insufficient communication between team member to meet project success, lack in quality control and assurance, Lack of communication of design/builder with end users to meet their requirements, and contractors lack of staff knowledge and experience*'. This factor accounts for 40.924% of the total variance explained among all risk factors related design and build project. 'Insufficient time for completion date' and 'delay in commencing work because under-estimated time needed to obtain statutory' were highest loading with (Sig = 0.942 and 0.903, respectively). This indicates that 'insufficient time for completion date' is the most critical risk factors.

"Lack of contractor experience" Factor 2 consists of 10 risk factor included '*incompetent sub-contractors, mistake during construction, lack in availability of skilled labour, lack in availability of equipment, lack on supervision of labour and works, team members are not participating in technical discussions with owners, lack of coordination with sub-contractor, lack in effectiveness of communication in design, delay in design approval from client and change of original design from client*'. This factor accounts for 12.128% of the total variance explained among all risk factors. Zou et al. (2007) warned that to keep the project success, experienced contractors need to be highlighted at the early project execution. Wang and Yuan (2011), further interpreted contractor with rich experience will increase their possibilities for better handling risk-based on decisions in construction projects.

"Political issues" Factor 3 consists of eight risk factors '*slow approval permit by BOMBA department, slow approval permit by local authorities, slow approval permit by town planning department, slow approval permit by public work department, exchange rate fluctuation/devaluation, tax rate exchange, owner lack of knowledge and experience and change in government regulation and law*'. This factor accounts for 8.248% of the total variance explained among all risk factors.

The "lack of standardized system" Factor 4 consists of five risk factors '*insufficient time during request for proposal to sub-contractor, insufficient time in preparing tender documents to sub-contractor, insufficient time to evaluate tenders from sub-contractor, lack of standardized systems during tender evaluation and bureaucracy in government agencies*'. This factor accounts for 5.292% of the total variance explained among all risk factors.

The "unpredictable issues" Factor 5 comprises five risk factors '*unidentified utilities, lack of payment (delayed progress payment by owner to the contractor), unforeseen site condition, scope of work is uncertainty and lack of payment (delayed progress payment by contractor to*

the sub-contractor'. This factor accounts for 4.802% of the total variance explained among all risk factors.

"Lack of client experience" Factor 6 consists of two risk factors '*redesign because of over budgeted and insufficient information of site access/right of way*'. This factor accounts for 4.434% of the total variance explained among all risk factors. Gary et al. (1994) stated that many owners lack of experience in design and build project. To ensure that public sector would investigate this situation to prevent it from happening will impact on the project success.

"Safety issues" Factor 7 consists of three risk factors '*lack of training on safety at site, lack of information on safety at site and catastrophes (Act of God)*'. This factor accounts for 3.577% of the total variance explained among all risk factors. Safety issues also play an important role in the success of the project. All parties should be aware of the safety issues during construction project.

The "lack of teamwork" Factor 8 consists of two risk factors '*insufficient of original design and lack of suitable organizational structure*'. This factor accounts for 3.093% of the total variance explained among all risk factors.

"Poor supervision by client" Factor 9 consists of two risk factors '*poor supervision by the client and inflation*'. This factor accounts for 2.757% of the total variance explained among all risk factors.

The "lack of client information" Factor 10 consists of three risk factors '*contractor's detailed design does not meet owner's expectation, insufficient information in contract document and inadequate specification in contract document*'. This factor accounts for 2.688% of the total variance explained among all risk factors. Incomplete design and specification in the design phase of a project result in inaccurate cost estimating and increase the risk in design and build project. The incompleteness of the data and information at the time of project commencement should be considered in the contract document and the risk of inaccurate information assigned to the owners (Moazzami et al., 2011).

The "material availability" or Factor 11 consists of two risk factors '*difficulties in availability of materials and rigid specification in contract document*'. This factor accounts for 2.407% of the total variance of all risk factors.

"Design error" Factor 12 consists of '*errors of original design*'. This factor accounts for 1.924% of the total variance explained among all risk factors. The contractor's design consultants should understand the construction process and develop a cost-effective design on time.

CONCLUSION

This paper examined the perception among project managers of the risk factors in design and build project in Malaysia. The research concludes the most common risk factors are: "client financial capability, inadequate cash flow by contractor and lack of payment (delayed progress payment by the owner to the contractor)". In this study, 12 principal factors: "lack of management competency, lack of contractor experience, political issues, lack of standardized in system, unpredictable issues, lack of client experience, safety issues, lack of teamwork,

poor supervision by client, lack of client information, material availability and design error", are considered as the most critical risk factors by project managers. Lu et al. (2008) suggest identification of risk factors can help project manager to be more focused, manage resources and maximise effort in the interest of design and build projects.

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