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ORIGINAL ARTICLE

Identification of coordination factors affecting building projects performance

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Abstract Construction projects performance requires improvement to fulfil the complexity of the stakeholders' needs and expectations. Coordination process is proposed as an efficient solution for weak performance of construction projects. Therefore, coordination factors are vital in ensuring a successful implementation of all project phases. This study aimed to identify and prioritise coordination factors that influence the performance of building projects in Malaysian context. A vast body of literature on coordination process was reviewed and resulted in 53 coordination factor. Three rounds of Delphi technique were conducted. The most effective coordination factors were ranked based on the Relative Importance Index (RII) such as Scheduling (RII = 0.97), Quality assurance plan (RII = 0.93), and all parties' participation in plans (RII = 0.89). These coordination factors have fulfilled the research gap and provided better management and higher performance for project parties. The results offer insightful perspectives to define the most effective coordination factors, for addressing the dependency between project tasks and the parties to enhance project performance.

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1. Introduction

In the past fifty years, the construction industry has changed tremendously in terms of size and complexity of the projects. Currently, many construction projects have a complex design of electrical and mechanical installations, employ sophisticated structure systems and serve the diversified requirements of different end-users. The project complexity is a result of the industry fragmentation, which requires effective coordination

between the project parties. In addition, construction projects are unique in nature, and involve myriads of interrelated activities and work packages [1]. Project parties deal with large amounts of information derived from various stakeholders, such as owners, designers, contractors, subcontractors, suppliers, banks and governmental units. Thus, accessing the required information at the right time and location is rather difficult in such circumstances. Therefore, construction projects have commonly suffered from poor quality and productivity, cost and time overruns [2,3].

Construction industry has extensive linkages with the rest of the economy, for example, the manufacturing industry and financial services industry. This industry is responsible for building the nation's physical infrastructure, providing

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transportation facilities, accommodations, businesses, and institutions. Over the past decade, the Malaysian construction industry has contributed significantly to the economy as an enabler of growth to other industries [4]. The Construction Industry and Development Board (CIDB) reported that the value of construction projects awarded in 2015 reached USD 28.72 billion and estimated that, it would be USD 32 billion in 2016 [5,6]. Moreover, the construction industry represents nearly 3–5% of the total Gross Domestic Product (GDP) and provides employment for about 10% of the total Malaysian labour force [7–9]. Building construction is considered to be an essential element of the construction industry in Malaysia, and it forms about 64.6% of the overall construction work [6].

Project completion on time, standard of quality and within the assigned budget are the common goals of construction projects. However, there is lack of a proper coordination practice amongst construction parties. Moreover, many problems may be encountered on a large construction projects, making it necessary to coordinate the efforts of the involved parties, including the owner, contractors, designers, suppliers as well as local authorities. Although the coordination process has not been clearly defined [10,11], it is regarded as one of the critical project management functions that determines the appropriate actions in the successful project completion. It has been widely recognised that the coordination process influences the project performance and eventually affects the project's success [12–14]. In order to manage a building project efficiently, the coordination process must be applied as one of the essential functions in project management. The purpose of the coordination process is to add value to project delivery and to improve efficiency by dealing with the dependencies between project tasks and parties, in other words, “*Managing dependencies between activities*” [15,20].

Coordination factors are considered as the main components of coordination process, which affect the performance of building projects. Furthermore, to improve the coordination amongst construction parties, it is important to identify these factors. Furthermore, in construction projects, contractors are the major role players in construction sites, to satisfy the owner's objectives against reasonable profit, under the consultant supervision. Thus, all parties are required to coordinate the tasks before and during the construction phase to ensure its successful delivery [20].

An increasing number of studies have investigated the importance of the coordination factors in other industries, such as computer science and car manufacturing [16–18]. Meanwhile, it has been found that the construction industry has a discouraging record of performance during the past decades, owing to the lack or inefficiency of coordination process [12], whilst, in the Malaysian construction industry, objective studies in identifying and assessing coordination factors are scarce. Therefore, an objective study to identify the effective coordination factors for building projects is urgently required [12].

This study covers the gap of unidentified and non-prioritised coordination factors affecting construction projects' performance in Malaysia [19]. The significant contribution to body of knowledge of this study is that, it is the first study to identify and prioritise coordination factors affecting building projects performance in Malaysia. To achieve this, Delphi technique was used to rank the identified coordination factors

from the related literature. The Delphi technique is a survey method used for obtaining the opinion of experts in a number of consecutive rounds [21]. The information obtained in a round is used as a basis for the questionnaire of the next round, with a high degree of anonymity about each expert response [22]. In fact, many researchers utilise this method in identifying critical factors and improving the performance of construction projects [23–25].

2. Literature review

Coordination is one of the major considerations in managing building projects and an essential contributor for projects success and objectives achievement. Besides, the coordination best practices in the Malaysian construction projects can be enhanced significantly, once the effective coordination factors are identified through knowledge explicating and sharing [42–45,12,26]. However, construction projects performance status is not affected only by coordination, and also by a large number of elements that could be related to various dimensions such as projects managers' competence, top management support, monitoring and feedback by the participants and decision-making process [40]. On the other hand, the coordination of building projects has significant impacts on various aspects of the project outcomes [12–14,27–30].

It is difficult to establish a clear definition of coordination theory. This is because coordination can be derived and used in the theoretical context of the coordination theory, which is known as “*a body of principles about how the activities of separate actors can work together harmoniously*” [31]. At the same time, the term coordination can also be used in its more common meaning rather than in the theoretical context of the coordination theory [32]. When discussing coordination, practitioners usually refer to the condition of dependency, connections or hard to work together [33,34]. Nevertheless, coordination factors in construction projects can be defined as a body of procedures such as detailed procurement plan, resources priorities for critical tasks, and task dependencies identification and components such as plans, meeting and reports of an effective coordination process to provide a harmonious working environment. It is important to realise that there is not yet a solid definition of coordination factors in this domain [20,12].

The factors for a successful coordination process have been studied and grouped under three dimensions: *mandate*, *systems* and *behaviours*. Therefore, if these factors in the three groups are recognised with enough importance and are put in place over time, the success of the activities is more likely and will occur sooner [20,35]. Basically, a series of coordinated activities are triggered since the project is an idea and needs continued coordination during the implementation stages until objectives achievement. Some of these activities require support from various parties to improve the project progress with a high satisfaction status, e.g. coordination meeting [31].

Developing the coordination process has been purposed for the investigation in [36]. The coordination factors were based on the roles and responsibilities of key parties or a set of coordination procedures required combining the knowledge, expertise and information of many parties that support project optimisation. The identified coordination factors were, well-developed relationships amongst key implementation parties,

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