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Factors governing construction project delivery selection: A content analysis

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Abstract

Comprehensively identifying factors governing project delivery system (PDS) selection is crucial for construction projects. This paper aims at constructing a holistic system of governing factors. Based on review of previous studies, project condition factors and performance objective factors were identified to construct the factor system. To explore the perspective divergences, content analyses on Chinese and developed countries' literature were performed. The emphasizing frequencies of factors were calculated. T tests were performed to compare the relative importance of factors. Principal component analysis was employed to identify key factors. The results show that three groups of factors, namely, internal project conditions, external project conditions and project performance objective factors are the main factors governing PDS selection. Some factors are of different importance in China and developed countries, mirroring the management maturity and philosophy gaps. The proposed factor system acts as a guidance to PDS selection and lays solid foundation for future studies.
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Keywords: Construction project; Project delivery system; Key governing factors; Content analysis

1. Introduction

Clients select PDSs to define the roles of project participants, share authority and responsibility, allocate profit and risk, and organize and incentive participants to fulfill the clients' project objectives (Ibbs and Chih, 2011; Luu et al., 2003b; Oyetunji and Anderson, 2006). In essence, PDSs (such as DBB, DB, EPC, PMC, CM) are selected to integrate resources from participating entities, including consultants, designers, contractors, and suppliers to make up for the clients' incapability in delivering construction projects. In this way, clients adapt PDSs to internal and external project conditions (Kandil et al., 2014; Kumaraswamy and Dissanayaka, 1998). As indicated in many studies on project performance, PDS determines how different parties participate in the project and whether they are assigned to tasks that put their advantages to best use (Chen et al., 2009; Ive and Chang, 2007). Hence, selecting an appropriate PDS is critical to project success, and PDS selection methodology has drawn attention from scholars around the world (Liu et al., 2015). Although numerous studies have focused on PDS selection, there are still issues remaining to be addressed.

On the one hand, in practice, inappropriate PDSs are selected based on limited project information, biased previous experience, and poorly identified, if any, list of factors to be considered (Luu et al., 2003a,b; Rwelamila and Edries, 2007). Touran et al. (2010) conducted interviews with experienced transit project managers in the United States. He found that despite the existence of well-developed and advanced decision support models in the literature, few practitioners fully utilized them due to the difficulties encountered when

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understanding the methodologies and determining the model parameters. In practice, even merely an appropriately identified list of PDS selection factors, by itself, is very helpful to practitioners (Chan, 2007; Wang et al., 2013; Xiao-mei and Xiao-jun, 2011). Moreover, identifying governing factors is fundamental to any profound PDS selection methodology (Cheung et al., 2001; Luu et al., 2003a,b). Therefore, comprehensively identifying factors governing PDS selection is crucial to both industrial practice and academic research, and has been a hot topic in the literature (Minchin et al., 2010). There have been numerous studies on PDS selection but no consensus reached by scholars on which factor should enter the governing factor system or which factor deserves more attention (Chang and Ive, 2002; Zhou and Ke, 2013). Furthermore, findings of existing studies have hardly been fully utilized or integrated to contribute to a more comprehensive and convincing system of governing factors.

On the other hand, construction projects in China have long been criticized for adopting the unitary traditional client dominating PDS with low delivery efficiency (Smith et al., 2004). Since reform and opening up from 1978, PDSs in China's construction industry have been gradually diversified to follow the international trend (Yong Qiang et al., 2010). Nevertheless, the imprint of planned economy on the perspectives of Chinese project management practitioners is slow to fade away (Xu et al., 2005). The deeply ingrained client dominating culture makes Chinese practitioners emphasize on rather different factors, such as "client's management ability", compared to practitioners from developed countries in the market economy environment (Shi et al., 2014; Xiao-mei and Xiao-jun, 2011). Generally, Chinese clients are more prone to adopting DBB method for better project control (Smith et al., 2004). However, there is a lack of quantitative study on the perspective divergences.

This paper aims at bridging these gaps and is organized as follows. Firstly, in Section 2, we elaborate on the project condition factors, the project performance objective factors and the functioning mechanism by which PDS and project conditions contribute to project performance. Thereafter, perspective gaps between practitioners in China and developed countries are also reviewed to facilitate further discussions on this topic. Then in Section 3, factor identification and content analysis methodology are introduced. The system of factors governing PDS selection, composed of project conditions and project performance objectives, is constructed in Section 4. Thereafter, in Section 5, studies on projects in China and developed countries were reviewed to explore their perspective gaps quantitatively. This system, based on theoretical reasoning and content analyses on previous studies, identifies a more holistic list of governing factors and lays solid foundation for future studies on PDS selection. In Section 6, content analysis results are discussed to shed light on the underlying cause of the obvious characteristics of PDS in China and provide suggestions for Chinese practitioners on updating their management philosophy. Finally, conclusions, contributions and limitations are summarized in Section 7.

2. Literature review

Many scholars studied factors governing PDS selection in the context of different countries. Although whether a mutually exclusive set of influencing factors exists is still controversial (Luu et al., 2003a,b; Luu et al., 2006; Skitmore and Marsden, 1988), numerous studies constructed various systems of influencing factors. Basically, the extent to which PDS accommodates the project conditions and the extent to which PDS aligns with the project performance objectives should be considered in the PDS selection process (Yong Qiang et al., 2010).

2.1. Project condition factors

No individual PDS can enjoy absolute advantage over the others, and hence alternative PDSs are compared with each other and selected to align the characteristics of PDS with project conditions. Project conditions here refer to the attributes of project, project participants and external environment factors, which are deemed exogenously given and do not subject to client's will when selecting PDS. Numerous scholars attempted to construct a comprehensive list of project condition factors governing PDS selection. Hughes (1989) studied how external project conditions influence PDS selection. Gordon (1994) identified "project characteristics", "client characteristics" and "market environment" factors. Luu et al. (2003a, b) led a thorough review of previous studies and proposed a list of 34 influencing factors and, by employing principal component analysis, extracted 8 key factors, 3 of which are project condition factors. Mahdi and Alreshaid (2005) emphasized on 5 project conditions, such as "design characteristics" and "policy regulation", and 25 sub-indicators. Touran et al. (2010), by project case analysis, identified 3 project condition factors, such as "policy and regulation" and "client characteristics", and correspondingly 14 sub-factors. The factors identified in the literature fall into two categories, i.e., internal and external project conditions (Yong Qiang et al., 2010). Internal project conditions refer to the in-house attributes of client who is the PDS decision making principal, while other project conditions are regarded as external conditions from the standpoint of client. Generally, clients are more informed of their in-house attributes than those external conditions. So internal and external project conditions are analyzed separately (Cho et al., 2009; Liu et al., 2015).

As above, with more and more in-depth understanding of PDS selection, project condition factors identified in these studies are more and more accurate and detailed, and the constructed factor systems tend to be more and more comprehensive and complex. However, these factor systems are complementary to each other while rather different from each other, and no individual study has won universal acceptance (Luu et al., 2003a,b; Touran et al., 2010). This is attributed to the lack of insight into why these project conditions are to be considered and how project conditions together with PDS function to influence project performance. The lack of functioning mechanism analysis may cause to include unimportant factors or leave out key factors (Chan, 2007; Chang and Ive, 2002; Kumaraswamy and Dissanayaka, 2001).

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