An exploration into cost-influencing factors on construction projects

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Abstract

Construction cost overrun is a common problem in construction industries. The objective of this research is to extract the key cost-influencing factors with new concept and methods to help control the expenditure. Hence, this research adopts the Modified Delphi Method (MDM) with 2 groups and 2 rounds and Kawakita Jiro method (KJ) to consolidate the experts' opinions and identify and rank the key factors that affect project costs. Ninety cost-influencing factors are collected from literary review and interviews with experts with practical cost control experiences in the construction companies (Group 1). The KJ method is used to consolidate these factors into 4 categories and down to a total of 42 factors. 2 rounds of questionnaires are then conducted to filter the key factors. In order to verify views of those in the first group, Group 2 consists of experienced experts from the public sectors, consulting firms and construction companies as a comparison. Results of the analysis indicate that there are 16 key cost-influencing factors. Severity Index computation was then adopted to rank these key cost-influencing factors. The study renders that clearly defined scope of project in the contract and cost control are the major determinants for cost overrun.
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Keywords: Cost-influencing factors; Cost control; Modified Delphi Method; KJ method

1. Introduction

It's customary in construction industries to win projects with the lowest bids. Therefore, without controlling key cost-influencing factors, construction companies will not be able to control the expenditure effectively, which will in turn increase project costs and affect overall profit. In fact, construction cost overrun is a common problem in construction industries. Flyvbjerg et al. (2002) pointed out that historically, large construction projects have been plagued by cost and schedule overruns. Shane et al. (2009) stated that final project costs have been higher than the cost estimates prepared in too many cases. Doloi (2011) brought up that cost overrun is a chronic problem for most projects. Love et al. (2013) calculated cost

overruns from 276 construction and engineering projects and revealed a mean cost overrun of 12.22%. No significant differences for cost overruns were found among contract size, project type, and procurement method. Kaming et al. (1997) also discussed construction time and cost overruns in developing countries such as Nigeria, Saudi Arabia and Indonesia. However, construction overrun is not unique to developing countries. It is a worldwide issue worsened by the global financial crisis due to increasing price competition. As construction companies usually rely on various financing approaches to meet their capital needs during construction, the inherent financial constraint poses further influence on the overall costs and the ultimate profit if the key cost-influencing factors cannot be controlled. Therefore, this paper takes the standpoint of the construction companies to explore and discuss key factors that affect project costs during construction. The methodology integrates literary review, interviews, the KJ method (Kawakita Jiro method, affinity diagram), and the Delphi Expert Assessment (with 2 groups and

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2 rounds) to locate the key cost-influencing factors from various layers, and to assist the construction companies with effective cost control both during the preparation stage and after the construction proceeds in order to reduce risks derived from costs or escalating expenditure.

2. Literature review

Kaming et al. (1997) identified factors influencing construction time and cost overruns in Indonesia and analyzed the correlation between the two. The scope of this particular research only focuses on the high-rise projects. Dissanayaka and Kumaraswamy (1999) identified and grouped factors significantly related to time and cost performance and then developed the time and cost overrun models. Chang (2002) identified the reasons for cost and schedule increases and classified them into 3 aspects — owner's control, consultant control, and beyond control. Although Chang used case studies to analyze the reasons and qualify their contributions, he only focused on engineering design projects. Elhag et al. (2005) mainly takes the standpoint of the quantity surveyors to explore cost-influencing factors. He identified 67 variables which affect pre-tender construction cost estimates through literature and interviews. These factors are divided into 6 categories — client characteristics, consultant and design parameters, contractor attributes, project characteristics, contract procedures and procurement methods, and external factors and market conditions. Questionnaires were then used to evaluate and rank these factors. Chen and Hsu (2008) identified and quantified the factors that influence corporate financing. He concluded 4 component groups with corresponding weight and 14 significant factors. Shane et al. (2009) proposed escalation factors for construction project costs through case studies. He identified 11 internal factors and 7 external factors and verified them with over 20 U.S. state highway agencies through interviews. Chan (2012) investigated the principal factors affecting project overheads with questionnaire. Eight factors were extracted from 27 variables. Doloi (2013) identified 48 major factors affecting cost overruns and analyzed the relationship among the factors and 3 key stakeholders — client, consultant, and contractor. The previously referenced studies successfully utilized literature, interviews, questionnaire or MDM to determine the critical factors which impact the project cost. Therefore, based on the success of the above-mentioned studies and with new concepts introduced to existing methods, this study will identify the key cost-influencing factors with a more deliberate process. This research is conducted in 2 stages. During the first stage, cost-influencing factors are deduced from the construction company's perspective. The perspectives of the public sector and consulting firms (client) are then introduced to further identify the key factors. The research process is explained in the following section.

3. Research process

The Delphi method is suitable for extracting usable data from personal experiences which can be transformed into empirical data for future studies. As shown in the flowchart in Fig. 1, this study adopts the Modified Delphi Method (MDM) with 2 groups and 2 rounds to identify the key cost-influencing factors. The reasons for adopting 2 groups are to verify the construction company's view from a different perspective and to give the study more objectivity. Literary review is first conducted on local and international literatures concerning project cost control. Experts with years of cost control experiences in the industry are then interviewed to provide an understanding of the actual cost control process and issues as well as a preliminary list of cost-influencing factors recognized by the industry or in the literatures. Meanwhile, the KJ method is adopted to organize the factors collected at this point and develop a more refined list. The factors are then categorized and used in the questionnaires for the MDM, and the questionnaires are distributed to 2 groups of experts in 2 separate rounds. The cost-influencing factors obtained from expert assessments are then ranked by Severity Index (SI).

4. Research methodology

4.1. KJ method

The KJ method is a qualitative technique developed by Kawakita Jiro in 1953. It adopts the bottom-up sorting process and is very useful for classifying data. It is used to organize data into useful categories, or in other words, transform data into
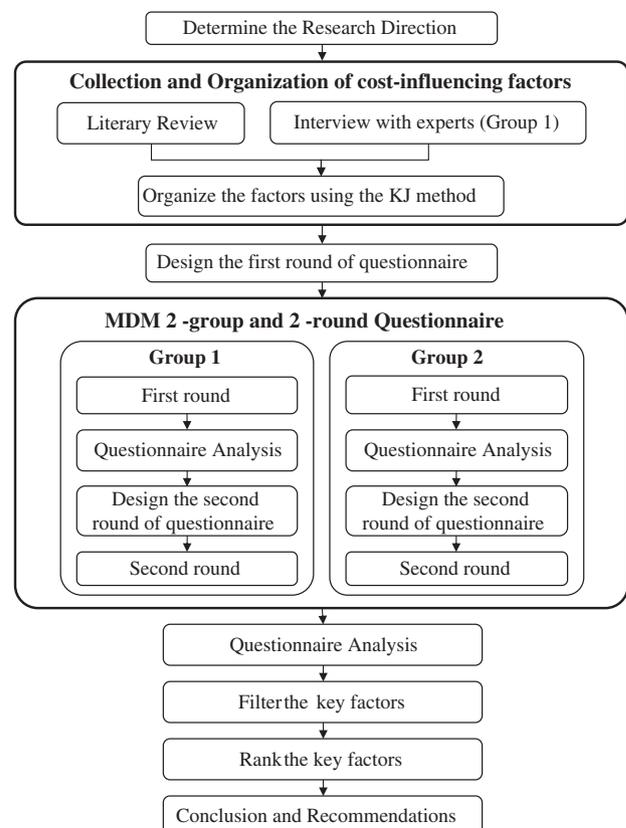

Fig. 1. Research process.