Determining Success Factors for a Construction Organization: A Structural Equation Modeling Approach

Kamalendra Kumar Tripathi[1] and Kumar Neeraj Jha, Ph.D.[2]

Abstract: Ensuring success in the construction business is the aim of the owner/top management of the construction organizations. Previous research indicates that the presence of certain factors in an organization make it more successful compared with the organizations without those factors. Because the construction business is one of the riskiest businesses in the world, identification of such factors and adoption of these factors in the work ethic of the company is of vital importance for the owner/top management of the construction organizations. This study aims to test the hypothesis that success factors influence the success of the construction organization and also explores the impact of these factors on the success of the construction organization. The research methodology involved seeks responses from experts in the construction industry through a questionnaire survey. A total of 106 industry experts from 90 different construction organizations operating in India participated in the survey. Structural equation modeling (SEM) was used to test the hypothesized positive relationships between six success factors, and the success of the construction organization is measured against five performance factors. The findings of the study indicate that top management competence is the most important factor followed by "experience and performance." The study could provide an excellent value addition to the professionals working in the field of construction management. Further, the results would enable professionals to focus on fewer factors rather than attending numerous factors for optimum result. **DOI: 10.1061/(ASCE)ME.1943-5479.0000569.** © *2017 American Society of Civil Engineers.*

Author keywords: Success factors; Performance factors; Questionnaire survey; Structural equation modeling (SEM); Construction organization.

Introduction

The construction industry is an important sector of any economy, and it has direct or indirect linkages with other sectors. It contributes significantly to the socioeconomic development and employment opportunities in the country. The construction industry of India also contributes approximately 8% of India's gross domestic product (GDP) and is the second largest employer in the country after agriculture. The construction industry provided direct and indirect employment to about 41 million people in 2011, and it is anticipated to add 6 million inhabitants per year. Thus, about 60 million additional job opportunities are likely to be available by 2022. Apart from the jobs in the construction sector itself, it also provides ample opportunities for jobs and growth to other manufacturing sectors like cement, bricks, iron and steel, tiles, paints, bitumen, chemicals, equipment, and so forth. This industry is one of the most rapidly growing industries and contributes significantly to the Indian economy. It has been growing at a compounded annual growth rate (CAGR) of about 11.1% over the last few years. The construction industry of India is valued at over $126 billion (Indian Planning Commission 2013). The desperate need of infrastructure development in the country has increased the demand of the construction sector in India.

Construction organizations are the building blocks of the construction industry. The success and failure of the construction organizations significantly affect the construction industry, other industries linked to it, and thus the entire nation. Like any other business, ensuring success is the objective of the construction organizations and achieving that success is highly critical for them to survive in a competitive market. The construction business witnesses tough competition due to a large number of competitors in the industry (Arslan and Kivrak 2008). This business is also considered one of the riskiest businesses in the world. A large number of construction organizations are entering the market every year and fail or even go bankrupt after a few years due to a number of reasons. However, every construction organization has an opportunity to grow by proper planning and allocation of available resources demanding an investment of time and money. It is tough for any organization to decide where and how the resources should be allocated. Hence, the top management of the organization must think about a particular success factor, which should be addressed first, and how such a decision will benefit the organization (Abraham 2003). Therefore, for the top management of the organizations, it is imperative to identify those success factors.

This study has focused on the identification of the success factors of the construction organizations working in India. A questionnaire survey and structured interview approach were adopted for this study. Although researchers in the past have identified various success parameters at the level of projects in different countries, very few studies are reported to determine and evaluate the success parameters at that level of organization in India. Identification of success factors will help the construction organizations because it will be an opportunity for them to enhance their success by addressing their weak and problem areas, the significance of which was not known before.

[1]Research Scholar, Dept. of Civil Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India (corresponding author). E-mail: kktripathi05@gmail.com

[2]Associate Professor, Dept. of Civil Engineering, Indian Institute of Technology Delhi, Hauz Khas, New Delhi 110016, India.

Note. This manuscript was submitted on April 7, 2017; approved on July 18, 2017; published online on November 6, 2017. Discussion period open until April 6, 2018; separate discussions must be submitted for individual papers. This paper is part of the ***Journal of Management in Engineering***, © ASCE, ISSN 0742-597X.

Literature Review

Traditionally, the construction organizations were considered successful if they had a good record of completing the project within the estimated time and cost with specified quality parameters (Abraham 2003). However, if the projects are successful, it is not always the case that the organization also will be successful. The organization can fail or even go bankrupt due to the high risk involved in the business (Jha 2015). If the project was successfully delivered to the satisfaction of various stakeholders but fails to meet the business requisite as expected by the organization financially (increased turnover, profitability, and so forth), strategically (market share owned and so forth), or both, then it will fail. However, it is not possible to isolate the project success from the success of the construction organization because a major part of the income is from projects only for a project-based organization. The factors affecting the success of the project will necessarily affect the success of the organization, but the factors responsible for the success of the organization may or may not be responsible for the success of the projects. Therefore, it is essential for a construction organization to think about its success at the level of the organization rather than just focusing at the level of the projects (Abraham 2003).

The success of an organization is defined as the degree to which its goals and expectations are met; on the other hand, failure is the inability of an organization to pay its obligations when they are due (Arslan and Kivrak 2008). The success factor can be defined as a situation in which it needs special attention from management because of the importance that it brings to the organization (Hutchings and Christofferson 2001). Critical success factors (CSFs) refer to the limited number of areas in which satisfactory results will ensure successful competitive performance for the organization. These are the few key areas in which "things must go right" for the business to flourish (Luu et al. 2008). As per Morrison (2009), CSFs are those limited factors that are essential to the success of the organization in the sense that, if objectives associated with these factors are not achieved, the organization will fail. The performance of construction organizations is usually measured by parameters called key performance indicators (KPIs). In this study, KPI is referred as a performance factor, which includes financial and nonfinancial measures used to help an organization measure progress toward a stated organizational goal or objective. The PFs helps top management to monitor the performance of the company or department at regular intervals (Morrison 2009). Performance measurement is the process of determining how successful an organization or an individual has been in attaining their objectives and strategies. Hence, it helps an organization to determine the objectives and optimize its operations (Kagioglou et al. 2001).

Many types of research and studies are conducted to determine the success factors. Success factors in the construction industry can be broadly grouped under three heads: at the level of the project, at the level of organization, and at the industry level. Most of the studies are project specific and area specific. They concentrate on determining the success factors at the level of the project. Research conducted for the success of the construction organization is limited. In India, a few previous efforts have been made to identify the success factors that can be used to make the construction projects successful. No insight is provided into the overall success of the construction organizations. Therefore, a set of success factors that can be used for the success of the construction organization is lacking. To bridge this gap, this research aims to identify the success factors that can be used by construction professionals at the level of the organization in India. However, to put things into perspective, some of the studies performed at the level of projects are discussed in the following sections.

Chan et al. (2004) developed a framework to determine the success of a construction project. They concluded that the project would be executed more successfully if the project is of low complexity, the duration of the project is shorter, managerial actions are effective, a private and experienced client is funding the project, the client is competent in decision-making, team leaders are competent and experienced, and the project is executed with developed technology and appropriate organizational structure in a stable environment. Iyer and Jha (2005) identified six success factors of construction projects in India using factor analysis. These factors are the project manager's competence, top management support, the project manager's coordinating and leadership skill, monitoring and feedback by the participants, coordination among project participants, and the owner's competence. Further, Tabish and Jha (2012) studied the success factors of public sector projects in India and applied the structural equation modeling (SEM) technique to test the hypothesized positive relationships between success traits and project success. They found that the human factors such as project management competency, the commitment of all project participants, the owner's competence, proper coordination between project participants, and the availability of trained resources play a decisive role in making a project successful.

While determining the success factors of construction companies based on a questionnaire survey of the top 400 contractors identified by the *Engineering News Record* (ENR) 2000, Abraham (2003) concluded that the success factors at the level of the project as well as an organization should be assessed simultaneously to compete in the construction industry successfully. Later on, Flanagan et al. (2007) identified the mechanisms that enhance the competitiveness in construction at the project, organization, and industry level and suggested that the overall improvement in construction can be accomplished with the combined efforts of all parties, i.e., the project team, the organizations, and the industry.

The literature reveals several studies across the globe for determining the success factors of construction organization, and they are summarized in Table 1.

Table 1 shows that various researchers have identified various parameters affecting the success of construction organizations. Also, the majority of the researchers have just concluded that the success factors affect the success of the construction organizations without correlating these success factors to a set of performance factors. Such studies do not indicate which success factor(s) should be handled properly for the betterment of these performance factors. The practice of investigating the role of success factors in isolation of the performance factors gives rise to an inaccurate conclusion. In this study, success factors have been correlated with performance factors so that one can easily find the factor(s) to be targeted for improving a set of performance factors. This study attempts to fill this gap by empirically examining the relationships between success factors and the success of the construction organization measured against different performance factors.

Further, most of the researcher's focus was mainly a particular region or a country, but very few of researchers have drawn attention to the Indian construction industry. The success factors identified for a construction organization in one country may or may not be the same as that of another construction organization in another country. For example, El-Mashaleh et al. (2006) reported that the information technology (IT) application is a very important factor for the success of a construction organization in the United States, whereas Lu et al. (2008) found that it is not a CSF for the construction organizations in China. Also, most of the researchers have only targeted contractors in their study and ignored other stakeholders.

Table 1. Summary of Literature Review on Success/Failure Factors of Construction Organizations

Researcher's name	Tools used	Country	Success/failure factors	Attributes/factors identified
Butler et al. (2003)	Descriptive statistics	United States	Success factors	Quality workmanship, good employees, location of the product, customer service, effective sales and marketing, company reputation, fair pricing and value, and cost control effort
Cheah et al. (2004)	Conceptual framework	Global	Success factors	Combinations of operational, financial, technological, and human factors
Gunhan and Arditi (2005)	AHP	United States	Success factors	Track record, specialist expertise, project management capability, and international network
Isik et al. (2010)	SEM	Turkey	Success factors	Resources, strategy, project management competence, and relationship with other parties
Abu Bakar et al. (2011)	RII	Malaysia	Success factors	Proper management of the organization, efficient organizational structure, new technology and automation, customer's satisfaction, market knowledge, bank loans, and other credit facilities
Tan and Ghazali (2011)	AHP	Malaysia	Success factors	Contractor's experience, decision-making effectiveness, contractor's cash flow, project manager's experience, overall managerial actions, project team experience, project team monitoring, site management and supervision, project delivery system, and ability to make and carry out decisions
Jagofa and Wood (2012)	Input and output model already designed by Koksal and Arditi (2004)	—	Failure factors	Management incompetence, lack of business knowledge, poor relationships with clients and government, poor technical and technological capability, fraud, insufficient capital, and industry weakness
Ofori and Lean (2001)	Descriptive statistics	Singapore	Success factors	Contractor's role, government and institutional help, practitioner's support, financial assistance from outside the industry, and client's help
Skrt and Antoncic (2004)	Hypothesized model	Slovenia	Success factors	Strategic planning; precise formulation of vision and strategy; incorporation of the elements of internationalization and networking in the company; accurate analysis of market and competition; correct formulation of generic business strategies focusing on growth, profit, and market
Dikmen et al. (2005)	ANN and MR	Turkey	Success factors	Ability to benefit from market opportunities, capabilities and culture of an organization, joint venturing, and appropriate organizational structure
Lu et al. (2008)	Descriptive statistics	China	Success factors	Bidding strategy, management skills, organization structure, resources, competitive strategy, relationships, bidding, marketing, and technology
Arslan and Kivrak (2008)	SMART	Turkey	Success factors	Business management factors, financial conditions, and owner manager characteristics
Thwala and Phaladi (2009)	Descriptive statistics	Northwest province of South Africa	Failure factors	Unfavorable government policies, such as lack of access to finance, late payment by the government, lack of capital, difficulty in arranging guarantees, and high-interest rate

Note: AHP = analytical hierarchy process; RII = relative importance index; ANN = artificial neural network; MR = multiple regression; SMART = simple multiattribute rating technique.

Hence, it was felt necessary to identify the success factors vital for the Indian construction organizations particularly engaged in the real estate business. In this study, apart from the contractors, other stakeholders, such as clients and project management consultants (PMCs), have also been included. Accordingly, the following objectives were set for the study:

1. To test the hypothesis that success factors influence the success of the construction organizations and
2. To explore the relative impact of the success factors in the success of the construction organizations measured against various performance factors.

An extensive data set of a company's information and the annual financial report were required to achieve these objectives. No owner agreed to reveal data about their organization to the public due to the data preservation and privacy reasons and because the company's financial reports would be susceptible to manipulation. Hence, a questionnaire survey and structured interview approach were adopted for this study. The viewpoints of the experts in the Indian construction industry were used to apply the SEM to test the hypothesis that the success factors positively influence the success of the construction organizations.

SEM

The SEM is a multivariate statistical technique that comprises two types of models: a measurement model (confirmatory factor analysis) and a structural model (regression or path analysis) (Chen et al. 2012). A measurement model determines how well a number of observed variables measure latent variables and confirms their reliability and validity, whereas the structural model establishes the relationship among latent variables (Molenaar et al. 2000; Wong and Cheung 2005). The advantages of using SEM are that it models and analyzes the relationships among multiple independent and dependent constructs simultaneously (Ozorhon et al. 2007; Molwus et al. 2013). Unlike other multivariate statistical methods, such as regression analysis, SEM also considers the measurement errors and explains the entire set of relationships in a single model (Molenaar et al. 2000; Iacobucci 2009; Molwus et al. 2013). There are two streams of SEM: covariance-based SEM (CB-SEM) and variance-based SEM (VB-SEM). The CB-SEM uses software, such as, and the VB-SEM uses a partial least-square (PLS) algorithm. The CB-SEM is based on the covariance matrices, which explains the relationship between observed variables and latent variables and confirms the theoretical rationale specified by the model. The VB-SEM establishes the relationship among latent variables by describing the amount of variance explained (Davcik 2014). The CB-SEM aims to confirm theories by determining how well a model can estimate a covariance matrix for the sample data, whereas the VB-SEM operates much like a multiple regression analysis (Hair et al. 2014). The most commonly used method of calculating the covariance in a SEM is the maximum likelihood method (Cho et al. 2009).

The SEM has been used in various domains of construction management due to the advantages mentioned previously, for example, to establish a relationship between trust and partnering success (Wong and Cheung 2005), organizational justice and cooperative behavior in the construction project claims process (Aibinu et al. 2011), determinants of organizational flexibility in the construction business (Lim et al. 2011), success traits for a construction project (Tabish and Jha 2012), investigating factors affecting delay in Indian construction projects (Doloi et al. 2012), interrelationships among CSFs of construction projects (Chen et al. 2012), the role of leadership in fostering an innovation (Chan et al. 2014), and determinants of safety performance in construction projects (Patel and Jha 2016). Thus, existing literature supports the soundness and application of SEM.

In this study, success attributes identified in the previous study by authors were grouped to explain six latent success factors. These success factors were then grouped to explain the success of the construction organization. Similarly, the performance attributes were grouped to explain five latent performance factors. These performance factors were then grouped to measure the success of the construction organization.

Research Method

The overall research method consists of a total of five steps. The first two steps were performed in a previous study by the authors, and the remaining three steps are about the present study. These steps are explained in detail in the following sections.

Step 1: Identification of Success and Performance Attributes

From the literature, 30 success attributes and 20 performance attributes for construction organizations were identified. Tables 2 and 3 show the list of success attributes and performance attributes, respectively, along with their sources. The list of these attributes was discussed in detail personally with three experts, who had more than 30 years of experience at the top management level in the construction industry, to check the appropriateness of these attributes for the Indian scenario. The purpose of this discussion also was to ensure that no significant attributes pertaining to the Indian construction industry were left out. All experts were satisfied with the list of attributes, and no further modification was suggested.

Step 2: Data Collection Using Questionnaire Survey

A questionnaire was designed based on the 30 success attributes and 20 performance attributes identified in Step 1. A five-point Likert scale was used to measure the relative importance of various success and performance attributes of a construction organization. A five-point Likert scale was preferred over a seven-point Likert scale because it increases the response rate and response quality along with reducing the respondents' frustration level (Buttle 1996). It is quite simple for the interviewer to read out the complete list of scale (Dawes 2008). A five-point Likert scale has been used widely in the determination of success factors of construction organizations, such as in the study of Cheng and Li (2002), Dikmen et al. (2005), Bassioni et al. (2005), Luu et al. (2008), Lu et al. (2008), and so forth. A pilot survey was then undertaken to test the language and understanding of the questions, and necessary modifications were made in the questionnaire (Enshassi et al. 2013). Three industry experts with more than 30 years of working experience at the top management level participated in the pilot survey (Dikmen et al. 2005; Doloi 2009). The questionnaire consisted of four parts: Part 1 included questions on success attributes, Part 2 included questions on performance attributes, Part 3 contained information on the respondent's organization, and Part 4 had questions on the respondent's details. An extract of Part 1 of the questionnaire is shown in Table 4, in which respondents were asked to put a check mark ($\surd$) beside or highlight the relevant cell to rate the success attributes given in Column 2 of this table. The rating was to be provided on a five-point scale from very low effect = 1 to very high effect = 5 with respect to the degree of their effect on the success of the construction organizations.

After preparation of the questionnaire, the next step was a sample selection. Construction organizations operating in India are registered with several government bodies or some other autonomous bodies set up under the guidance of the government of India. The sample selection of construction organizations used in this study was made from two groups: the Builders Association of India (BAI) consisting of 154 members and the Confederation of Real Estate Developers Association of India (CREDAI) comprising 254 members. The members of the BAI are largely contractors executing building construction projects, and the members of the CREDAI are largely real estate developers. Hence, the authors selected only these two groups because the focus of this study was the organizations involved in building construction projects. Apart from the members of BAI and CREDAI, some PMCs were also included in the survey that were not members of BAI or CREDAI but had vast experience in construction industry. The sample size was calculated using the following formula (Ali et al. 2013):

$$n = \frac{n'}{\left(1 + \frac{n'}{N}\right)} \tag{1}$$

where

$$n' = \frac{p \times q}{V^2} \tag{2}$$

where n = sample size; n' = the first estimate of sample size; N = the size of the population; p = the proportion of the characteristic being

Table 2. List of Success Attributes and Their Sources

Sl number	Success attributes	Sources
1	Availability of qualified staff in the organization	Abraham (2003); Arslan and Kivrak (2008); Butler et al. (2003); Gunhan and Arditi (2005); Luu et al. (2008); Mbugua et al. (1999)
2	Availability of cost control measures in the organization	Arslan and Kivrak (2008); Butler et al. (2003); Isik et al. (2010); Lu et al. (2008)
3	Efficient supply chain management	Isik et al. (2010); Luu et al. (2008); Mbugua et al. (1999); Tan and Ghazali (2011)
4	Availability of effective cash flow management plan	Arslan and Kivrak (2008); Tan and Ghazali (2011)
5	Good relationship with local bodies, government organization, suppliers, subcontractors, and client	Butler et al. (2003); Dikmen et al. (2005); Isik et al. (2010); Lu et al. (2008); Mbugua et al. (1999)
6	Financial soundness of the organization	Arslan and Kivrak (2008); Gunhan and Arditi (2005); Dikmen et al. (2005); Isik et al. (2010); Luu et al. (2008); Mbugua et al. (1999)
7	Efficient sales and marketing team in the organization	Arslan and Kivrak (2008); Butler et al. (2003); Lu et al. (2008)
8	Favorable market conditions in which organization operates	Abraham (2003); Abu Bakar et al. (2011); Gunhan and Arditi (2005)
9	Favorable external environment	Luu et al. (2008); Tan and Ghazali (2011)
10	Favorable government policies in support of the project	Butler et al. (2003); Gunhan and Arditi (2005); Isik et al. (2010); Lu et al. (2008); Tan and Ghazali (2011)
11	Country's economic conditions	Arslan and Kivrak (2008); Tan and Ghazali (2011)
12	Experience in construction business (number of years in construction business)	Arslan and Kivrak (2008); Butler et al. (2003); Dikmen et al. (2005); Isik et al. (2010); Tan and Ghazali (2011)
13	Company's reputation/track record in completing the project on time with good quality and fair pricing	Arslan and Kivrak (2008); Butler et al. (2003); Gunhan and Arditi (2005); Isik et al. (2010); Lu et al. (2008); Mbugua et al. (1999)
14	Client's satisfaction in terms of product and services	Abu Bakar et al. (2011); Arslan and Kivrak (2008); Butler et al. (2003); Mbugua et al. (1999)
15	Customer satisfaction in terms of product and services	Abu Bakar et al. (2011); Butler et al. (2003); Mbugua et al. (1999)
16	Receipt of timely payment of bills as per contractual provision	Arslan and Kivrak (2008)
17	Implementing technological innovation plans in the organization	Abu Bakar et al. (2011); Arslan and Kivrak (2008); Butler et al. (2003); Isik et al. (2010); Luu et al. (2008); Mbugua et al. (1999)
18	Implementation of health and safety management plan	Butler et al. (2003); Isik et al. (2010)
19	Developing an appropriate organizational structure	Abraham (2003); Abu Bakar et al. (2011); Dikmen et al. (2005); Luu et al. (2008); Tan and Ghazali (2011)
20	Technical competencies of the organization in terms of latest technology and technical staff	Abraham (2003); Arslan and Kivrak (2008); Dikmen et al. (2005); Isik et al. (2010); Tan and Ghazali (2011)
21	Effective risk management capability in the organization	Arslan and Kivrak (2008); Gunhan and Arditi (2005); Isik et al. (2010); Lu et al. (2008)
22	Competitive strategy used by the organization	Abraham (2003); Dikmen et al. (2005); Isik et al. (2010); Luu et al. (2008)
23	Effectiveness of project management in improving schedule, cost, and quality of the construction project	Abu Bakar et al. (2011); Arslan and Kivrak (2008); Butler et al. (2003); Gunhan and Arditi (2005); Isik et al. (2010); Tan and Ghazali (2011)
24	Availability of dynamic leadership in the organization	Arslan and Kivrak (2008); Isik et al. (2010); Lu et al. (2008)
25	Effectiveness human resources in its functioning	Dikmen et al. (2005); Isik et al. (2010); Luu et al. (2008); Mbugua et al. (1999)
26	Number of competitors in the market/industry	Arslan and Kivrak (2008); Gunhan and Arditi (2005); Dikmen et al. (2005)
27	Proper selection of the project type	Dikmen et al. (2005); Isik et al. (2010)
28	Professionalism/culture of the organization	Butler et al. (2003); Gunhan and Arditi (2005); Dikmen et al. (2005)
29	Availability of equipment, material, and labor as per requirement of the project	Gunhan and Arditi (2005)
30	Effectiveness of information flow in the organization	Dikmen et al. (2005); Luu et al. (2008); Tan and Ghazali (2011)

measured in the population, where $q = 1 - p$; and V = standard error of sampling population. The value of p and q was taken as 0.5 to get the maximum sample size. The standard error was kept at 5% (maximum allowable value of the standard error is 10%). Based on Eq. (2), the required sample size was 78. However, the sample size of 106 for this study was comparable or larger than the previous studies by Ofori and Lean (2001), Cheng and Li (2002), Arslan and Kivrak (2008), Isik et al. (2010), Abu Bakar et al. (2011), and so forth.

A total of 106 respondents selected for this study were from 90 different medium- to large-size construction organizations. Of 106 responses, 77 responses were received via a personal interview, and 29 responses were received via e-mail for which 58 questionnaires were distributed. The response rate was 50%, which is considered acceptable (Sekaran 2003) Table 5 depicts the profile of the respondents in terms of their professional roles and experience. The age of construction organizations ranges from 5 years to over three

Table 3. List of Performance Attributes and Their Sources

Sl number	Performance attributes	Sources
1	Size of the organization (measured in terms of turnover, market share, number of employees, etc.)	Mbugua et al. (1999); Chan (2009)
2	Productivity of employees (value added per employee)	Bassioni et al. (2004); Chan (2009); Cox et al. (2003); Horta et al. (2010); Kagioglou et al. (2001); Mbugua et al. (1999); Skibniewski and Ghosh (2009); Rimbalová and Vilčeková (2013); Yu et al. (2007)
3	Good track record of timely completion of the projects (number of projects completed in time)	Bassioni et al. (2004); Chan (2009); Cox et al. (2003); Kagioglou et al. (2001); Luu et al. (2008); Menches and Hanna (2006); Rimbalová and Vilčeková (2013); Skibniewski and Ghosh (2009)
4	Health and safety consciousness (number of accidents/100,000/ year and worker's fatality/100,000 workers)	Bassioni et al. (2004); Chan (2009); Cox et al. (2003); Horta et al. (2010); Kagioglou et al. (2001); Lu et al. (2008); Menches and Hanna (2006); Rimbalová and Vilčeková (2013); Skibniewski and Ghosh (2009)
5	Customer satisfaction in terms of product and services (measured as rating provided by the customers after project completion)	Delgado-Hernandez and Aspinwall (2005); Luu et al. (2008); Mbugua et al. (1999); Menches and Hanna (2006); Rimbalová and Vilčeková (2013)
6	Client satisfaction in terms of product and services (measured as rating provided by the client after project completion)	Bassioni et al. (2004); Chan (2009); Kagioglou et al. (2001); Rimbalová and Vilčeková (2013); Skibniewski and Ghosh (2009)
7	Cost performance of projects (number of projects completed within the tender cost)	Bassioni et al. (2004); Cox et al. (2003); Kagioglou et al. (2001); Lu et al. (2008a); Menches and Hanna (2006); Skibniewski and Ghosh (2009)
8	Impact on society (measured in terms of low noise pollution, less disturbance to the occupants in nearby area due to vehicle movement, etc.)	Mbugua et al. (1999); Rimbalová and Vilčeková (2013)
9	Impact on environment (measured in terms of use of low natural resources, low production of waste, preservation of plants and trees, etc.)	Rimbalová and Vilčeková (2013)
10	Optimum liquidity ratio (measured in terms of current ratio = current asset/current liability)	Balatbat et al. (2010); Elyamany et al. (2007); Mbugua et al. (1999)
11	Higher profitability ratio (measured in terms of gross profit margin, return on assets, return on equity, return on invested capital)	Balatbat et al. (2010); Bassioni et al. (2004); Chan (2009); Horta et al. (2010); Kagioglou et al. (2001); Lu et al. (2008); Mbugua et al. (1999); Menches and Hanna (2006); Skibniewski and Ghosh (2009); Rimbalová and Vilčeková (2013); Yu et al. (2007)
12	Higher annual growth rate of the organization (measured in terms of sales growth percentage, earning per share growth percentage, P/E ratio)	Balatbat et al. (2010); Chan (2009); Horta et al. (2010); Luu et al. (2008); Mbugua et al. (1999);Yu et al. (2007)
13	Predictability of cost in design and construction (percentage on target)	Bassioni et al. (2004); Chan (2009); Horta et al. (2010); Kagioglou et al. (2001); Rimbalová and Vilčeková (2013); Skibniewski and Ghosh (2009)
14	Predictability of time in design and construction (% on target)	Bassioni et al. (2004); Chan (2009); Kagioglou et al. (2001); Rimbalová and Vilčeková (2013); Skibniewski and Ghosh (2009)
15	Rework/defect rectification (number of man hours and material used for repairing work as a percentage of total man hours for the entire project and total contract amount	Bassioni et al. (2004); Cox et al. (2003); Kagioglou et al. (2001); Lu et al. (2008); Mbugua et al. (1999); Menches and Hanna (2006); R Rimbalová and Vilčeková (2013)
16	Adopting learning and growth culture in the organization (measured in terms of amount spent for learning and growth as a percentage of total turnover of the company)	Chan (2009); Luu et al. (2008); Mbugua et al. (1999); Rimbalová and Vilčeková (2013)
17	Higher wages of the employees	Rimbalová and Vilčeková (2013)
18	Low staff turnover (percentage of employees leaving the organization)	Chan (2009); Rimbalová and Vilčeková (2013); Yu et al. (2007)
19	Good relationship with client (in terms of repeat business, low dispute, and litigation, timely payment, etc.)	Delgado-Hernandez and Aspinwall (2005); Mbugua et al. (1999); Menches and Hanna (2006)
20	Annual construction demand/market share (yearly order received)	Chan (2009); Lu et al. (2008); Yu et al. (2007)

Note: P/E ratio = price to earnings ratio.

Table 4. Extract of Part 1 of the Questionnaire

		Very low effect	Low effect	Moderate effect	High effect	Very high effect
Sl number	Success attributes	1	2	3	4	5
1	Availability of qualified staff in the organization					
2	Availability of cost control measures in the organization					
3	Attributes as given in Column 2 of Table 2					

Table 5. Summary of Respondents' Profile

Category	Experience (years)				Total by category	Percentage by category
	<10	10–20	20–30	>30		
Developer	6	19	21	3	49	46.0
Contractor	7	12	24	3	46	43.5
Project management consultant	0	4	5	2	11	10.5
Total by experience	13	35	50	8	106	—
% by experience	12	33	47	8	—	—

decades. The respondents were senior and top management professionals who worked with more than one organization. The viewpoints of such respondents are based on the presence of these attributes in their previous as well as present organization. For the respondents who only worked with a single organization, their viewpoints are based on the presence of these attributes in their present organization only. Thus, viewpoints of all the respondents are based on the presence of these attributes in the Indian construction organization. The survey was conducted during the months of May and June 2015.

Step 3: Identification of Success and Performance Factors

Based on the responses received from the questionnaire survey, success and performance attributes identified in Step 1 were grouped into six success factors and five performance factors. The grouping of the attributes was based on the various statistical analysis, such as descriptive analysis, t-test, and factor analysis, conducted on these attributes by authors in their previous study. First, from the five-point Likert's scale used in the questionnaire, the success and performance attributes were ranked according to their mean value and standard deviation. If two or more attributes had the same mean value, then the attribute with lower standard deviation was ranked higher. The attributes with mean values 3.5 and above were only considered for further analysis (Tables 6 and 7). The t-test was conducted to test the statistical significance of the attributes at mean value 3.5. Two success attributes (S9 and S26) and three performance attributes (P1, P8, and P17) were not found significant at mean value 3.5; hence, they were removed from the study for further analysis. The factor analysis was performed using statistical package for social science (SPSS) *AMOS 21* (for Windows) on the rest of the attributes to reduce a large number of observed variables (attributes) into a manageable number of latent variables (factors).

A data set of 106 used in this study for application of factor analysis was sufficient from the viewpoint of an absolute number as well as subject to the variable ratio (STV). According to Gorsuch (1983) and Kline (1979), at least 100 samples are required irrespective of the number of variables, whereas a STV should be at least two in the factor analytical investigation (Kline 1979). In this study, the principal components method of extraction using varimax rotation was used to extract factors. Varimax rotation maximizes the variance of the squared loadings for each factor and produces clear factor loadings (Cho et al. 2009). Only the attributes with a factor loading greater than 0.5 were considered (Leung et al. 2010). The Kaiser Meyer Olkin (KMO) was greater than 0.5 in both cases, which shows that the sample was adequate for factor analysis (Field 2009). Bartlett's test of sphericity was used to verify the null hypothesis that the correlation matrix is an identity matrix. The probability associated with Bartlett's test of sphericity should be less than the level of significance (Doloi 2009). The number of factors was based on the factor loading of a rotated component matrix and scree plot. A scree plot is a graph of the eigenvalues associated with a factor in descending order versus the number of the factors (Field 2009). It is used to visually assess the factors explaining most of the variability in the data. Six success factors identified are experience and performance (EP), top management competence (TMC), project factor (PF), supply chain and leadership (SCL), availability of resources (RES), and effective cost control measures (CCMs), as shown in Table 6. Similarly, five performance factors identified are profitability (PRO); satisfaction of key stakeholders (SKS); predictability of cost and time (PCT); environment, health, and safety (EHS); and quality consciousness (QC) as shown in Table 7. The success of the construction organization is measured against performance factors.

Sample Size for SEM. For a reliable result, SEM requires a statistically adequate sample size. Existing literature recommended that sample sizes between 100 and 400 are sufficient and suitable for SEM analysis (Molwus et al. 2013). Sample size is an important issue because it relates to the stability of the parameter estimates (Schreiber et al. 2006). According to Iacobucci (2009), a minimum sample size of 50 and a maximum of 100 can be sufficient, and the vague and mythical rules of thumb are suggesting that minimum sample sizes of at least 200 can be conservative and simplistic. Hence, a sample size of 106 in the present study can be considered sufficient.

Reliability Test. To ensure the internal consistency within the attributes grouped under factors and reliability of the data, the most commonly used Cronbach's alpha ($C\alpha$) reliability analysis was performed using the SPSS *AMOS 21*. The internal consistency is explained by the reliability coefficient, which is based on the average correlation between the attributes and the number of total attributes in the factor. The value of $C\alpha$ varies from 0 to 1. A higher value of $C\alpha$ indicates the greater internal consistency and vice versa. The $C\alpha$ value for factors EP, TMC, PFs, SCL, RES, and CCM were 0.750, 0.680, 0.531, 0.565, 0.530, and 0.481, respectively (Table 6), and the overall value of $C\alpha$ within all the attributes was 0.830. Similarly, the $C\alpha$ value of PRO, SKS, (PTC), EHS, and QC were 0.708, 0.756, 0.856, 0.647, and 0.615, respectively (Table 7), and overall $C\alpha$ value within all performance attributes was 0.765. Because all $C\alpha$ values for all the factors except CCMs were greater than 0.5, the attributes grouped under the individual success factors and performance factors were considered reliable for further analysis (Hair et al. 2010).

Several general issues must be addressed in SEM research because the study is based on a statistical method. Apart from the model fit, measurement model validity and reliability, issues related to missing values and outliers, means, and standard deviations for each variable should be incorporated in the research (Hazen et al. 2015). In the present study, there were no missing data. No outliers were found when Mahalanobis D^2 (d-squared) test was conducted. Means and standard deviations for each variable are reported in Tables 6 and 7.

Step 4: Development of a Hypothesized Model

After grouping of the attributes, a hypothesized model was developed to test the relationship between success factors and the success of the construction organizations, as shown in Fig 1. The

Table 6. Success Factors and Their Attributes

Sl number	Success factor	Success attributes	Descriptive statistics: Mean	Descriptive statistics: Standard deviation	Cronbach's alpha
1	EP	Client's satisfaction in terms of product and services (EP1)	4.358	0.706	0.750
		Customer satisfaction in terms of product and services (EP2)	4.302	0.745	
		Company's reputation/track record in completing the project in time with good quality and fair pricing (EP3)	4.179	0.837	
		Experience in construction business in terms of number of years in construction business (EP4)	3.783	0.926	
2	TMC	Effective risk management capability in the organization (TMC1)	3.726	0.911	0.680
		Professionalism/culture in the organization, whether autocracy or democracy (TMC2)	3.962	0.850	
		Competitive strategy used by the organization, which keeps it apart from others in the market (TMC3)	3.849	0.903	
		Financial soundness of the organization in terms of better liquidity and working capital (TMC4)	4.302	0.719	
3	PF	Availability of effective cash flow management plan in the organization (PF1)	4.443	0.677	0.531
		Effectiveness of project management in improving schedule, cost, and quality of the construction project (PF2)	4.434	0.648	
		Receipt of timely payment of bills as per contractual provision (PF3)	4.236	0.711	
4	SCL	Efficient supply chain management in terms of supplying right materials in right quantity at right time at right price (SCL1)	4.302	0.706	0.565
		Availability of dynamic leadership in the organization (SCL2)	4.415	0.615	
5	RES	Availability of qualified staff in the organization (RES1)	4.396	0.628	0.530
		Availability of equipment, material, and labor as per requirement of the project (RES2)	4.566	0.633	
		Effectiveness of human resource department in its functioning, such as recruitment of good employees and monitoring their performance (RES3)	3.972	0.736	
6	CCM	Effective cost control measures in the organization (CCM1)	4.217	0.817	0.481
		Favorable government policies such as tax exemptions on projects, various taxes on construction materials, low bank interest rate, and easy access to finance in support of the project (CCM2)	3.745	0.895	

Note: EP = experience and performance; TMC = top management competence; PF = project factor; SCL = supply chain and leadership; RES = availability of resources; CCM = effective cost control measures.

hypothesized model was analyzed using *AMOS 21* software, which is used for CB-SEM. The covariance matrices have distinct statistical advantages over VB-SEM (Schumacker and Lomax 2004; Hair et al. 2010). The maximum likelihood method of estimation was used in this study.

Based on the proposed model, the hypothesis that success factors have a significant positive influence on the success of construction organizations was tested as follows:

1. Null hypothesis (H_0): Path coefficient between success factors and success of construction organization is not significantly different from zero.
2. Alternate hypothesis (Ha): Success factors have a significant positive influence on the success of a construction organization.

Step 5: Validation of the Hypothesized Model

The SEM model is tested by assessing its appropriateness. The adequacy of the model is evaluated from the results of the covariance structural analysis, which is indicated by the goodness of fit (GOF) indices. If its appropriateness is not good, then it needs to be revised. Different criteria have been proposed by various researchers in the SEM literature for assessing the GOF of a specified model. Different GOF indices measure the appropriateness of a model from different aspects. From the several fit indices proposed in the SEM literature, the following GOF measures were selected in this study for validating the hypothesized relationship between success factors and the success of the construction organizations (Molenaar et al. 2000; Wong and Cheung 2005; Schreiber et al. 2006; Cho et al. 2009; Doloi et al. 2012).

1. The ratio of chi-square (χ^2) to the degree of freedom (df): It compares the observed covariance matrix with the covariance matrix estimated by assuming that the tested model is true (Chen et al. 2012).
2. The goodness of fit index (GFI): It is an absolute fit index that indicates how well the hypothesized theory fits the data. It is affected by sample size and ranges from 0 to 1 and increases with larger samples (Molwus et al. 2013).
3. Incremental fit index (IFI): It compares a chi-square for the model tested to the hypothesized model. It indicates the relative improvement in fit of the model compared with a statistical baseline model (Kline 2011).
4. Tucker-Lewis index (TLI): It considers a correlation between model complexity and sample size (Patel and Jha 2016).
5. Comparative fit index (CFI): It represents the relative improvement in the fit of the hypothesized model (Chen et al. 2012). It takes sample size into account and performs well even if the sample size is small (Xiong et al. 2015).
6. The RMS error of approximation (RMSEA): It measures the difference between the observed and the estimated covariance matrices versus the unit df (Chou and Yang 2012).

Table 7. Performance Factors and Their Attributes

Sl number	Performance factor	Performance attributes	Descriptive statistics: Mean	Descriptive statistics: Standard deviation	Cronbach's alpha
1	PRO	Higher annual growth rate (measured in terms of sales growth percentage, earning per share growth percentage, and P/E ratio) (PRO1)	4.086	0.786	0.708
		Higher profitability ratio (measured in terms of gross profit margin, return on assets, return on equity, and return on invested capital) (PRO2)	3.752	0.830	
2	SKS	Customer's satisfaction in terms of product and services (measured as rating provided by the customer after project completion) (SKS1)	4.440	0.598	0.756
		Client's satisfaction in terms of product and services (measured as rating provided by the client after project completion) (SKS2)	4.440	0.614	
3	PCT	Predictability of cost in design and construction (measured in percentage on target) (PCT1)	4.152	0.731	0.856
		Predictability of time in design and construction (measured in percentage on target) (PCT2)	4.219	0.693	
4	EHS	Impact on environment (measured in terms of use of low natural resources, low production of waste, and preservation of plants and trees) (EHS1)	3.724	0.966	0.647
		Health and safety consciousness (number of accidents/100,000/year and workers fatality/100,000 workers) (EHS2)	3.952	0.836	
5	QC	Rework/defect rectification (cost of rework as a percentage of total construction cost) (QC1)	3.771	1.031	0.615
		Adopting learning and growth culture in the organization (measured in terms of amount spent for learning and growth as a percent of total turnover of the company) (QC2)	3.695	0.810	

Note: PRO = profitability; P/E ratio = price to earnings ratio; SKS = satisfaction of key stakeholders; PCT = predictability of cost and time; EHS = environment, health, and safety; QC = quality consciousness.

7. Expected cross-validation index (ECVI): It tests to examine the stability of the results of the model tested (Schreiber et al. 2006).

The recommended level of these measures is given in Table 8 (Molenaar et al. 2000; Wong and Cheung 2005; Cho et al. 2009; Doloi et al. 2012).

Table 8 shows the results of GOF measures of the hypothesized model. The value of χ^2/df = 1.469; GFI = 0.768; IFI = 0.826; TLI = 0.796; CFI = 0.818, RMSEA = 0.067, and ECVI = 6.082 indicates that the hypothesized model was not sufficiently appropriate to explain the interrelationships between success factors and the organizational success. Therefore, the hypothesized model was revised. Usually, two methods are used to revise the model. The first method involves deleting the path with low causal relationship, i.e., low path coefficients, and the second method involves adding the causal relationship (Molenaar et al. 2000; Wong and Cheung 2005; Chen et al. 2012). In this study, the first method was used to revise the model. The hypothesized model was revised three times until it performed well with the GOF and the theoretical expectation (Chen et al. 2012). The PF and the attribute effectiveness of the Human Resource Department in its functioning (RES3) under the factor RES were not found appropriate due to a very low path coefficient, and they were removed from the analysis to get the better fit model. The final revised model is shown in Fig. 2.

Results and Discussion

The last column of Table 8 lists the results of GOF measures of the revised model. It indicates that the level of appropriateness of the revised model improved significantly to χ^2/df = 1.380; GFI = 0.804; IFI = 0.878; TLI = 0.854; CFI = 0.872, RMSEA = 0.06, and ECVI = 4.333, which suggest that the revised model can better explain the interrelationships between success factors and the success of the construction organizations. Therefore, the model is acceptable for interpretation.

Table 9 shows the unstandardized path coefficient, standardized path coefficients, significance level, standard error, and t-values. All of the standardized path coefficients are positive and statistically significant in the desired direction as t >1.96, indicating relationships. The larger the path coefficient, the more important the attributes or factors can be considered as an indicator of the success. Accordingly, TMC emerges as the most CSF with a path coefficient of 0.853. The hypothesis H_1, which assumes that success factors have a significant positive impact on the success of the construction organization, is found to be supported because the path coefficient (0.99) is significant at a 0.05 significance level.

When the total, direct, and indirect effect of the success attributes and the success factors on the success of the construction organizations were examined through *AMOS 21* output, it was found that success factors had a direct influence on the success of the construction organization, whereas the success attributes had an indirect influence on the success of the construction organization through success factors. The factors emerging from the SEM output are briefly explained in the following paragraphs.

TMC

The TMC is the most CSF with a path coefficient of 0.853. This factor consists of the following attributes: (1) an effective risk management capability in the organization (TMC1), (2) professionalism/culture in the organization (TMC2), (3) competitive strategy used by the organization (TMC3), and (4) financial soundness of the organization in terms of better liquidity and working capital (TMC4). Because these attributes are directly governed by the top management, the name is top management competence. Risk in a construction business is hard to avoid. It affects the productivity, performance, quality, and budget in a significant manner. However, the risk

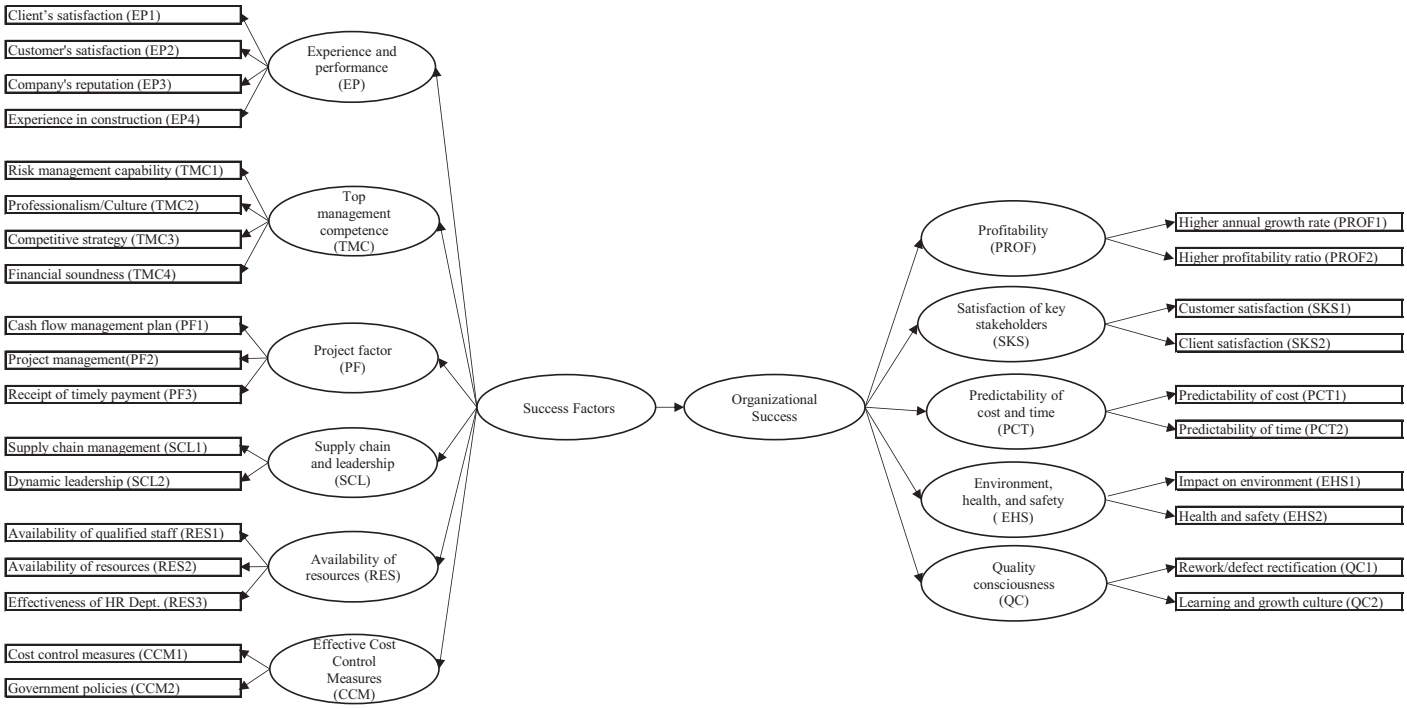

Fig. 1. Hypothesized model

Table 8. GOF Measures (Adapted from Wong and Cheung 2005; Schreiber et al. 2006; Doloi et al. 2012)

Sl number	GOF measure	Recommended level of GOF measures	Value obtained in hypothesized model	Value obtained in revised model
1	Chi-square/degree of freedom (χ^2/df)	1 to 2	1.469	1.380
2	GFI	0 (no fit) to 1 (perfect fit)	0.768	0.804
3	IFI	0 (no fit) to 1 (perfect fit)	0.826	0.878
4	TLI	0 (no fit) to 1 (perfect fit)	0.796	0.854
5	CFI	0 (no fit) to 1 (perfect fit)	0.818	0.872
6	RMSEA	<0.05 (very good) to 0.1 (threshold)	0.067	0.060
7	ECVI	Lower value is better fit	6.082	4.333

Note: GFI = Goodness of fit index; IFI = incremental fit index; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = RMS error of approximation; ECVI = expected cross-validation index.

involved in the business can be transferred, accepted, minimized, or shared (Isik et al. 2010). Risk management is a prominent component of project management due to the complex, dynamic, and challenging nature of the construction projects. Sometimes the construction organizations anticipate a higher profit margin on riskier projects. Therefore, the organizations develop a risk management plan that increases the probability of success by identifying and managing the high-risk factors identified during the risk assessment process. Risk management is an important aspect of decision-making in construction, and now it is widely accepted as a vital tool in project management. The aim of developing these risk management techniques is to add value to project delivery and improve the efficiency of the construction industry during practice (Tang et al. 2007). According to Kangari (1995), risk should be managed properly to decrease or eliminate its unwanted affects.

Professionalism/culture adopted should be such that every employee enjoys working in the organization with the freedom to express his or her viewpoints and ideas. Appropriate culture in the organization encourages the employees to work with dedication, which increases the chances of success of the construction organization. Corporate culture refers to a company's values, beliefs, business principles, traditions, and ways of operating and internal work environment (Neves and Bugalho 2008). It determines the way employees think and act in the organization. A strong corporate culture that adapts to a changing world is associated with a strong financial result.

The organization should develop a strategy to establish a unique position and to keep the organization apart from the others in a particular marketplace (Abraham 2003). Differentiation strategies refer to the differentiation of products or services that provides competitive advantage to the organization and allows it to operate effectively without the threat of new entrants to the market (Porter 1979). Organizational management strategies involve decisions about the company's reporting structure, planning, controlling, coordinating systems, and the management of the relationships between the different parties within the organization (Isik et al. 2010). Financial soundness of the organization in terms of better liquidity and working capital indicates its strength and capabilities to

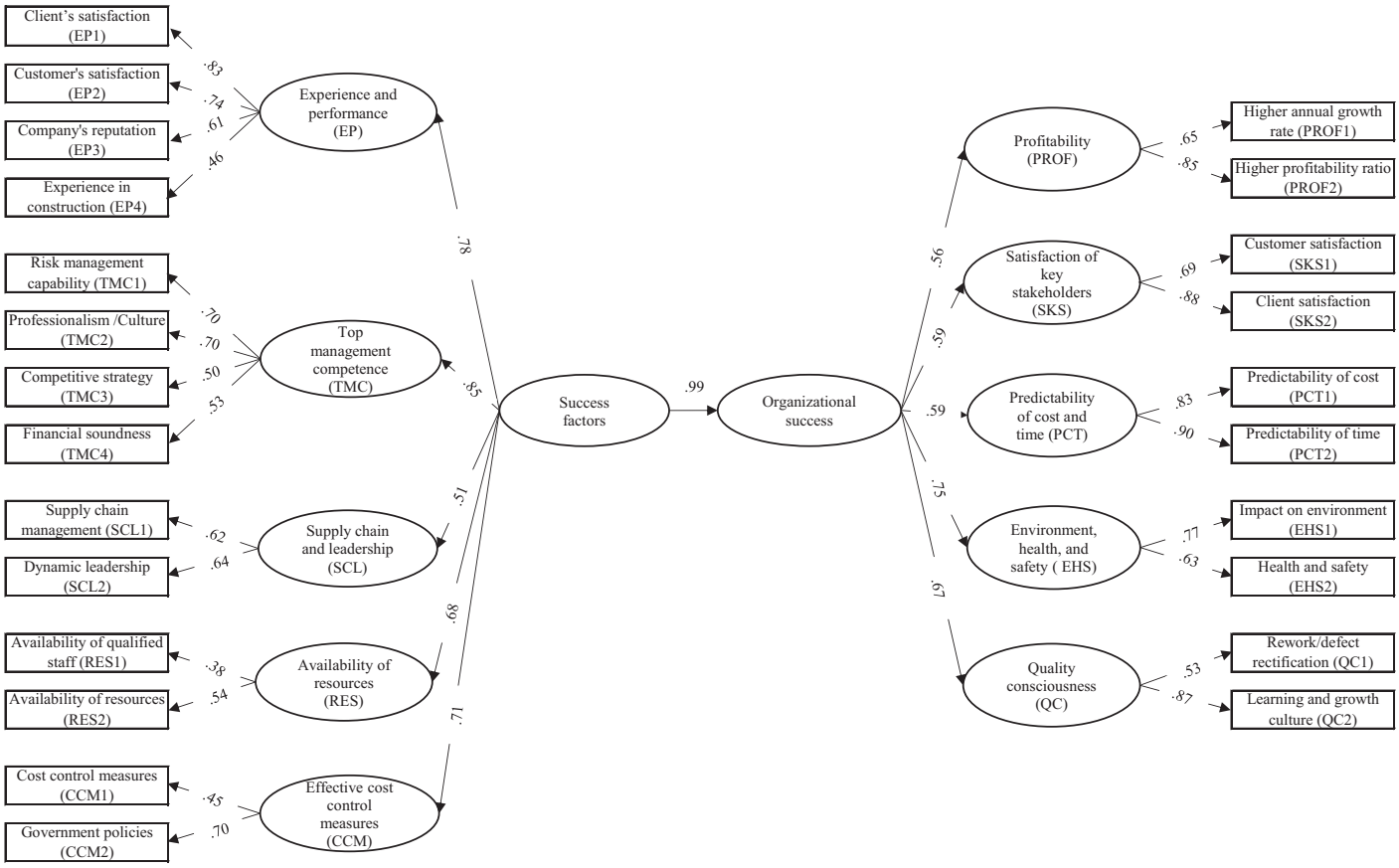

Fig. 2. Revised model

execute the projects. The stronger the company's financial position, the better is its ability to perform its strategic plans; they can be in a position to take higher risks for higher returns (Isik et al. 2010). The credibility and reputation of the organization also increase among their clients and suppliers with an increase in their financial soundness. The organizations with weaker financial positions are always under pressure to keep the costs down, which can directly influence the quality of the work performed by the organization. Financially sound organizations are able to invest in the best people, processes, and technology, without fear. These organizations are committed to long-term business that leads to sustainable growth and success. This finding is in line with Cheah et al. (2004).

EP

The EP is the second most important success factor with a path coefficient of 0.776. The attributes under this factor are (1) client's satisfaction in terms of product and services (EP1) and (2) customer satisfaction in terms of product and services (EP2), (3) the company's reputation/track record (EP3), and (4) experience in the construction business (EP4). EP is highly significant for the success of organizations, which is related to a company's knowledge management competency. Learning in the organization can be effective only when the lessons learned in the past could be used in future (Isik et al. 2010). It is important for the organization to compare its performance with that of its competitors and improve the performance regularly, based on market need, to survive in the market. Because the construction business is a market-oriented business, the construction organization should depict an image that satisfies the needs of the clients. The satisfaction of clients and customers in terms of product and services affects the construction business in terms of repeat business from the client. No business could be run for a long time if the client is not retained. Clients can be retained by understanding and fulfilling their requirement up to their satisfaction. The importance of client and customer satisfaction has also been highlighted in Butler et al. (2003) and Abu Bakar et al. (2011).

CCM

The CCM received a path coefficient of 0.714 and was placed at the third position. The attributes under this factor are (1) availability of cost control measures in the organization (CCM1) and (2) favorable government policies (CCM2). The lowest possible overall cost in the organization can be achieved only when the cost control measures taken by the organization are effectively keeping in view the objectives of the owner's investment. Favorable government policies also indirectly contribute to the overall cost of the organization. Cost control measure was among the top five determinants for the success of a construction organization in the research conducted by Butler et al. (2003).

RES

The RES was placed at the fourth position with a path coefficient of 0.678. The attributes under this factor are (1) the availability of qualified staff in the organization (RES1) and (2) the availability of equipment, material, and labor as per requirement of the project (RES2). Availability of qualified staff in the organization is the key to its success in a competitive market. A company's capability in terms of qualified staff is considered an important

Table 9. Path Coefficient

Path	Unstandardized estimate (B)	Standardized estimate (β)	Sig. (p)	Standard error (ε)	t-value
From success factors to success	1.031	0.992	***	0.257	4.007
From success factors to EP	0.734	0.776	***	0.220	3.336
From success factors to TMC	0.721	0.853	***	0.198	3.646
From success factors to SCL	0.449	0.515	0.006	0.163	2.749
From success factors to RES	0.511	0.678	0.003	0.171	2.982
From success factors to CCM	1.000	0.714	***	—	—
From EP to EP1	1.375	0.826	***	0.310	4.437
From EP to EP2	1.296	0.740	***	0.301	4.302
From EP to EP3	1.316	0.669	***	0.318	4.137
From EP to EP4	1.000	0.459	***	—	—
From TMC to TMC1	1.674	0.696	***	0.365	4.587
From TMC to TMC2	1.568	0.699	***	0.341	4.595
From TMC to TMC3	1.186	0.497	***	0.315	3.764
From TMC to TMC4	1.000	0.529	***	—	—
From SCL to SCL1	1.123	0.624	0.006	0.409	2.744
From SCL to SCL2	1.000	0.637	***	—	—
From RES to RES1	0.701	0.378	0.031	0.325	2.159
From RES to RES2	1.000	0.535	***	—	—
From CCM to CCM1	0.584	0.454	0.003	0.196	2.985
From CCM to CCM2	1.000	0.702	***	—	—
From success to PRO	0.843	0.559	***	0.214	3.935
From success to SKS	0.680	0.588	***	0.162	4.209
From success to PCT	0.795	0.594	***	0.184	4.317
From success to EHS	1.029	0.750	***	0.227	4.540
From success QS	1.000	0.665	***	—	—
From PRO to PRO1	0.720	0.646	***	0.186	3.880
From PRO to PRO2	1.000	0.850	***	—	—
From SKS to SKS1	0.761	0.689	***	0.165	4.600
From SKS to SKS2	1.000	0.882	***	—	—
From PCT to PCT1	0.970	0.830	***	0.146	6.665
From PCT to PCT2	1.000	0.903	***	—	—
From EHS to EHS1	0.947	0.630	***	0.205	4.631
From EHS to EHS2	1.000	0.768	***	—	—
From QC to QC1	0.770	0.526	***	0.216	3.570
From QC to QC2	1.000	0.869	***	—	—

Note: *** = Sig. (p) < 0.001.

factor in the assessment of potential bidders in the international construction business (Gunhan and Arditi 2005). The availability of the resources like equipment, material, and labor as per requirement of the project are the primary strength of the organization. It ensures the success of the project to a great extent if properly handled. The findings of Dikmen et al. (2005) also highlighted the importance of resources as a driver of organizational effectiveness.

SCL

The SCL was placed at the last position with a very low path coefficient of 0.515. The attributes under this factor are (1) efficient supply chain management (SCL1) and (2) availability of dynamic leadership (SCL2). Supply chain management has a strong correlation with project success. It is a network of different parties, processes, and activities that produce products or services. Efficient supply chain management means the supply chain management team should ensure the delivery of the right materials in the right quantity at the right time at a fair price. Lu et al. (2008a) also found efficient supply chain management to be a significant factor for the success of construction organizations. Dynamic leadership means developing and communicating mission, vision, and values to the members of an organization. Successful leadership is expected to create an environment for empowerment, innovation, learning, and support (Isik et al. 2010). The effectiveness of leadership has been found as a major determinant of success or failure of a company or even the success of the country as a whole (Koech and Namusonge 2012).

The findings of this study suggest that these factors could be used as a yardstick for the owner/top management of Indian construction organizations for their success. Most of these factors form the basis of contractor selection. To reduce the risk of time overruns, budget overruns, low quality, suffering from workforce scarcity, lack of supervision, and so forth, most of the clients prefer the previously mentioned criteria to be fulfilled by the contractor. It is recommended that improving the performance by meeting these criteria would increase the chances of getting more and more business despite the competition in the market.

The scope of this study was limited to the medium- to large-size construction organizations, associated with only real estate business, operating in India due to the complexity of this industry. Hence, the result might not be the same for the construction organizations in other countries. Also, the respondents that participated in this study are from different professional groups, namely, contractors, developers, and PMCs, so their viewpoints

may be different. Hence, the findings of the survey may further be refined by focusing on specific respondent groups and similar sized organizations. Despite the earlier limitations, the study may be useful for South Asian countries, such as Pakistan, Afghanistan, Bangladesh, Nepal, Sri Lanka, Bhutan, the Maldives, and other developing countries due to the similarity in work environment and other conditions.

Conclusions

The construction business is one of the riskiest businesses in the world, and the goal of any business is to be successful. There are many factors that contribute to the success of a construction organization. Because of the availability of limited resources, it is difficult for any business owner to focus on too many factors at a time. Hence, it is essential to identify those factors that are of prime importance to the success of the organization (Mbugua et al. 1999). This study attempts to find a set of factors affecting the success of a construction organization engaged in the real estate business. A questionnaire survey and the SEM approach were adopted for the study to analyze the causal relationship between the success factors and the organizational success and the level of influence of success factors on organizational success measured against different performance factors. The results point out a clear implication for the top management of an organization to gain a better understanding and valuable insights so that an appropriate strategy can evolve and proper resources are deployed to ensure success. The final SEM supports the hypothesized positive interrelationships between success factors and the organizational success with a very strong path coefficient of 0.99 at a 0.05 significance level.

The final SEM model reveals that the TMC is the most important factor for the success of a construction organization with a path coefficient of 0.853 followed by EP (path coefficient = 0.776), CCM (path coefficient = 0.714), RES (path coefficient = 0.678), and SCL (path coefficient = 0.515). These success factors have a direct implication on the success of the construction organization, whereas the success attributes have an indirect influence on the success of the construction organization through success factors. The probability of the success of the construction organizations will increase if proper attention is drawn toward improvement in these areas. Experts believe that the organization should attentively consider how to create value for their clients and customers during the planning phase. Strategic thinking recognizes the need for the clients, customers, organization, and the other stakeholders involved in the process and helps achieve their needs. Strategic thinking assesses the strengths as well as the weaknesses of the organization and looks forward to novel and superior ways to improve. It is the top management's responsibility to ensure that the business is strategically planned. The study of Mackey (2008) revealed that executive leaders and top management teams are critical to the success of the organization. Organizational outcomes are significantly influenced by the top management team because they formulate a common purpose, instill values, influence culture, and determine the strategic plan for the organization. The study shows that CEOs alone can account for as much as 29.2% of the overall variance in a firm's performance in terms of sales, earnings, and profit margins. Further, the proper management of the organization received the first rank in the study performed by Abu Bakar et al. (2011) for determining the factors for the growth of the construction organizations in Malaysia. Hence, the current study is supported by Mackey (2008) and Abu Bakar et al. (2011).

The findings of this study are based on the perspective of the Indian construction professionals engaged in building projects in India. However, the viewpoint of construction professionals involved in other segments might be different; thus, different sets of success attributes/factors should be identified based on their focus. The study may, therefore, be further performed by including different segments of construction organizations in India along with some other developing countries. Consequently, the success factors of the construction organizations engaged in building projects can be compared with that of the construction organizations involved in other segments operating in India as well as other similar developing countries, which might be valuable research.

References

Abraham, G. (2003). "Critical success factors for the construction industry." *Proc., Construction Research Congress*, K. R. Molenaar, and P. S. Chinowsky, eds, ASCE, Reston, VA, 1–9.

Abu Bakar, A., Abd Razak, A., Yusof, M. N., and Abd Karim, N. (2011). "Factors determining growth of companies: A study on construction companies in Malaysia." *Afr. J. Bus. Manage.*, 5(22), 8753–8762.

Aibinu, A. A., Ling, F. Y. Y., and Ofori, G. (2011). "Structural equation modelling of organizational justice and cooperative behaviour in the construction project claims process: Contractors' perspectives." *Constr. Manage. Econ.*, 29(5), 463–481.

Ali, H. A. E. M., Al-Sulaihi, I. A., and Al-Gahtani, K. S. (2013). "Indicators for measuring performance of building construction companies in Kingdom of Saudi Arabia." *J. King Saud Univ. Eng. Sci.*, 25(2), 125–134.

AMOS 21 [Computer software]. SPSS, Armonk, New York.

Arslan, G., and Kivrak, S. (2008). "Critical factors to company success in the construction industry." *Int. J. Soc. Behav. Educ. Econ. Bus. Ind. Eng.*, 2(9), 997–1000.

Balatbat, M. C. A., Lin, C., and Carmichael, D. G. (2010). "Comparative performance of publicly listed construction companies: Australian evidence." *Constr. Manage. Econ.*, 28(9), 919–932.

Bassioni, H., Price, A., and Hassan, T. (2004). "Performance measurement in construction." *J. Manage. Eng.*, 10.1061/(ASCE)0742-597X(2004)20:2(42), 42–50.

Bassioni, H. A., Price, A. D. F., and Hassan, T. M. (2005). "Building a conceptual framework for measuring business performance in construction: An empirical evaluation." *Constr. Manage. Econ.*, 23(5), 495–507.

Butler, R. C., Christofferson, J. P., and Hutchings, D. M. (2003). "Factors leading to construction company success: Comparisons of the perceptions of production and small-volume home builders." *Proc., 39th Annual Conf., Associated Schools of Construction, Clemson Univ., Clemson, SC*, 267–276.

Buttle, F. (1996). "SERVQUAL: Review, critique, research agenda." *Eur. J. Marketing*, 30(1), 8–32.

Chan, A., Scott, D., and Chan, A. (2004). "Factors affecting the success of a construction project." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2004)130:1(153), 153–155.

Chan, I., Liu, A., and Fellows, R. (2014). "Role of leadership in fostering an innovation climate in construction firms." *J. Manage. Eng.*, 10.1061/(ASCE)ME.1943-5479.0000271, 06014003.

Chan, T. K. (2009). "Measuring performance of the Malaysian construction industry." *Constr. Manage. Econ.*, 27(12), 1231–1244.

Cheah, C., Garvin, M., and Miller, J. (2004). "Empirical study of strategic performance of global construction firms." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2004)130:6(808), 808–817.

Chen, Y., Zhang, Y., Liu, J., and Mo, P. (2012). "Interrelationships among critical success factors of construction projects based on the structural equation model." *J. Manage. Eng.*, 10.1061/(ASCE)ME.1943-5479.0000104, 243–251.

Cheng, W., and Li, H. (2002). "Construction partnering process and associated critical success factors: Quantitative investigation." *J. Manage. Eng.*, 10.1061/(ASCE)0742-597X(2002)18:4(194), 194–202.

Cho, K., Hong, T., and Hyun, C. (2009). "Effect of project characteristics on project performance in construction projects based on structural equation model." *Expert Syst. Appl.*, 36(7), 10461–10470.

Chou, J.-S., and Yang, J.-G. (2012). "Project management knowledge and effects on construction project outcomes: An empirical study." *Project Manage. J.*, 43(5), 47–67.
Cox, R., Issa, R., and Ahrens, D. (2003). "Management's perception of key performance indicators for construction." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2003)129:2(142), 142–151.
Davcik, N. S. (2014). "The use and misuse of structural equation modeling in management research: A review and critique." *J. Adv. Manage. Res.*, 11(1), 47–81.
Dawes, J. G. (2008). "Do data characteristics change according to the number of scale points used? An experiment using 5 point, 7 point and 10 point scales." *Int. J. Market Res.*, 50(1), 61–104.
Delgado-Hernandez, D. J., and Aspinwall, E. M. (2005). "Improvement tools in the UK construction industry." *Constr. Manage. Econ.*, 23(9), 965–977.
Dikmen, I., Birgonul, M., and Kiziltas, S. (2005). "Prediction of organizational effectiveness in construction companies." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2005)131:2(252), 252–261.
Doloi, H. (2009). "Analysis of pre-qualification criteria in contractor selection and their impacts on project success." *Constr. Manage. Econ.*, 27(12), 1245–1263.
Doloi, H., Sawhney, A., and Iyer, K. C. (2012). "Structural equation model for investigating factors affecting delay in Indian construction projects." *Constr. Manage. Econ.*, 30(10), 869–884.
El-Mashaleh, M., O'Brien, W., and Minchin, R. (2006). "Firm performance and information technology utilization in the construction industry." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2006)132:5(499), 499–507.
Elyamany, A., Basha, I., and Zayed, T. (2007). "Performance evaluating model for construction companies: Egyptian case study." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2007)133:8(574), 574–581.
Enshassi, A., Mohamed, S., and Modough, Z. (2013). "Contractors' selection criteria: Opinions of Palestinian construction professionals." *Int. J. Constr. Manage.*, 13(1), 19–37.
Field, A. (2009). *Discovering statistics using SPSS*, 3rd Ed., Sage Publications, London.
Flanagan, R., Lu, W., Shen, L., and Jewell, C. (2007). "Competitiveness in construction: A critical review of research." *Constr. Manage. Econ.*, 25(9), 989–1000.
Gorsuch, R. L. (1983). *Factor analysis*, 2nd Ed., Lawrence Erlbaum Associates, Hillsdale NJ.
Gunhan, S., and Arditi, D. (2005). "Factors affecting international construction." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2005)131:3(273), 273–282.
Hair, J. F., Jr., Black, W. C., Babin, B. J., and Anderson, R. E. (2010). *Multivariate data analysis*, 7th Ed., Pearson Prentice Hall, Upper Saddle River, NJ.
Hair, J. F., Jr., Sarstedt, M., Hopkins, L., and Kuppelwieser, V. G. (2014). "Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research." *Eur. Bus. Rev.*, 26(2), 106–121.
Hazen, B. T., Overstreet, R. E., and Boone, C. A. (2015). "Suggested reporting guidelines for structural equation modeling in supply chain management research." *Int. J. Logist. Manage.*, 26(3), 627–641.
Horta, I., Camanho, A., and Da Costa, J. (2010). "Performance assessment of construction companies integrating key performance indicators and data envelopment analysis." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)CO.1943-7862.0000145, 581–594.
Hutchings, M., and Christofferson, J. (2001). "Factors leading to construction company success: Perceptions of small-volume residential contractors." *Proc., ASC Proc. of the 37th Annual Conf.*, Associated Schools of Construction (ASC), Fort Collins, CO, 263–270.
Iacobucci, D. (2009). "Structural equations modeling: Fit indices, sample size, and advanced topics." *J. Consum. Psychol.*, 20, 90–98.
Indian Planning Commission. (2013). *Twelfth five year plan (2012–2017): Economic sectors, Volume II*, SAGE Publications India, New Delhi, India.
Isik, Z., Arditi, D., Dikmen, I., and Birgonul, M. (2010). "Impact of resources and strategies on construction company performance." *J. Manage. Eng.*, 10.1061/(ASCE)0742-597X(2010)26:1(9), 9–18.
Iyer, K. C., and Jha, K. N. (2005). "Factors affecting cost performance: Evidence from Indian construction projects." *Int. J. Project Manage.*, 23(4), 283–295.
Jagofa, K., and Wood, G. (2012). "A turn-around model for construction company rescue: Failure to success." *Proc., Engineering Project Organizations Conf.*, University of Salford, Manchester, U.K.
Jha, K. N. (2015). *Construction project management theory and practices*, 2nd Ed., Pearson India, New Delhi, India.
Kagioglou, M., Cooper, R., and Aouad, G. (2001). "Performance management in construction: A conceptual framework." *Constr. Manage. Econ.*, 19(1), 85–95.
Kangari, R. (1995). "Risk management perceptions and trends of U.S. construction." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(1995)121:4(422), 422–429.
Kline, P. (1979). *Psychometrics and psychology*, Academic Press, London.
Kline, R. B. (2011). *Principles and practice of structural equation modeling*, 3rd Ed., Guilford Press, New York.
Koech, P. M., and Namusonge, G. S. (2012). "The effect of leadership styles on organizational performance at state corporations in Kenya." *Int. J. Bus. Commerce*, 2(1), 1–12.
Koksal, A., and Arditi, D. (2004). "An input/output model for business failures in the construction industry." *J. Constr. Res.*, 5(1), 1–16.
Leung, M., Chan, Y., and Chong, A. (2010). "Chinese values and stressors of construction professionals in Hong Kong." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)CO.1943-7862.0000234, 1289–1298.
Lim, B., Ling, F., Ibbs, C., Raphael, B., and Ofori, G. (2011). "Empirical analysis of the determinants of organizational flexibility in the construction business." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)CO.1943-7862.0000272, 225–237.
Luu, T.-V., Kim, S.-Y., Cao, H.-L., and Park, Y.-M. (2008). "Performance measurement of construction firms in developing countries." *Constr. Manage. Econ.*, 26(4), 373–386.
Lu, W., Shen, L. M., and Yam, M., (2008). "Critical success factors for competitiveness of contractors: China Study." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2008)134:12(972), 972–982.
Mackey, A. (2008). "The effect of CEOs on firm performance." *Strategic Manage. J.*, 29(12), 1357–1367.
Mbugua, L. M., Harris, P., Holt, G. D., and Olomolaiye, P. O. (1999). "A framework for determining critical success factors influencing construction business performance." *Proc., 15th Annual ARCOM Conf.*, Vol. 1, W. Hughes, ed., Association of Research in Construction Management, Manchester, U.K., 255–264.
Menches, C., and Hanna, A. S. (2006). "Quantitative measurement of successful performance from the project manager's perspective." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2006)132:12(1284), 1284–1293.
Molenaar, K., Washington, S., and James Diekmann, J. (2000). "Structural equation model of construction contract dispute potential." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2000)126:4(268), 268–277.
Molwus, J., Erdogan, B., and Ogunlana, S. (2013). "Sample size and model fit indices for structural equation modelling (SEM): The case of construction management research." *Proc., Int. Conf. on Construction and Real Estate Management 2013*, ASCE, Reston, VA, 338–347.
Morrison, M. (2009). "Key performance indicators–KPIs." ⟨http://rapidbi.com/writing-key-performance-indicators-kpis⟩ (Aug. 10, 2014).
Neves, J. C., and Bugalho, A. (2008). "Coordination and control in emerging international construction firms." *Constr. Manage. Econ.*, 26(1), 3–13.
Ofori, G., and Lean, C. S. (2001). "Factors influencing development of construction enterprises in Singapore." *Constr. Manage. Econ.*, 19(2), 145–154.
Ozorhon, B., Arditi, D., Dikmen, I., and Birgonul, M. T. (2007). "Effect of host country and project conditions in international construction joint ventures." *Int. J. Project Manage.*, 25(8), 799–806.
Patel, D., and Jha, K. (2016). "Structural equation modeling for relationship-based determinants of safety performance in construction projects." *J. Manage. Eng.*, 10.1061/(ASCE)ME.1943-5479.0000457, 05016017.
Porter, M. E. (1979). "How competitive forces shape strategy." *Harvard Bus. Rev.*, 57(2), 137–145.
Rimbalová, J., and Vilčeková, S. (2013). "The proposal of key performance indicators in facility management and determination the weights of significance." *J. Civ. Eng.*, 8(2), 73–84.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., and King, J. (2006). "Reporting structural equation modeling and confirmatory factor analysis results: A review." *J. Educ. Res.*, 99(6), 323–338.

Schumacker, R. E., and Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*, Lawrence Erlbaum Associates, Upper Saddle River, NJ.

Sekaran, U. (2003). *Research methods for business: A skill building approach*, 4th Ed., John Wiley & Sons, New York.

Skibniewski, M., and Ghosh, S. (2009). "Determination of key performance indicators with enterprise resource planning systems in engineering construction firms." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2009)135:10(965), 965–978.

Skrt, B., and Antoncic, B. (2004). "Strategic planning and small firm growth: An empirical examination." *Managing Global Transitions*, 2(2), 107–122.

Tabish, S., and Jha, K. (2012). "Success traits for a construction project." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)CO.1943-7862.0000538, 1131–1138.

Tan, D. J., and Ghazali, F. E. M. (2011). "Critical success factors for Malaysian contractors in international construction projects using analytical hierarchy process." *Proc., Int. Conf. on Engineering, Project, and Production Management*, National Univ. of Singapore, Singapore, 20–21.

Tang, W., Qiang, M., Duffield, C., Young, D., and Lu, Y. (2007). "Risk management in the Chinese construction industry." *J. Constr. Eng. Manage.*, 10.1061/(ASCE)0733-9364(2007)133:12(944), 944–956.

Thwala, W. D., and Phaladi, M. J. (2009). "An exploratory study of problems facing small contractors in the north-west province of South Africa." *Afr. J. Bus. Manage.*, 3(10), 533–539.

Wong, P., and Cheung, S. (2005). "Structural equation model of trust and partnering success." *J. Manage. Eng.*, 10.1061/(ASCE)0742-597X(2005)21:2(70), 70–80.

Xiong, B., Skitmore, M., and Xia, B. (2015). "A critical review of structural equation modeling applications in construction research." *Autom. Constr.*, 49, 59–70.

Yu, I., Kim, K., Jung, Y., and Chin, S. (2007). "Comparable performance measurement system for construction companies." *J. Manage. Eng.*, 10.1061/(ASCE)0742-597X(2007)23:3(131), 131–139.