Quantification of critical success factors of contractors in Cambodia: AHP approach

Serdar Durdyev[1], Hai Theng Eng[2], Kam Yuen Cheng[1]

[1] Lecturer, Department of Engineering and Architectural Studies, Ara Institute of Canterbury, Christchurch, New Zealand

[2] Research Student, Department of Civil Engineering, Zaman University, Cambodia

JOMEINO
ISSN: 2522-381X (Print) 2521-7054 (Online)
DOI: 10.31039/jomeino

Received 18 March 2018
Revised 07 April 2018
Accepted 26 April 2018

Citation: Durdyev, S., Eng, H. T., & Cheng, K. Y. (2018). Quantification of critical success factors of contractors in Cambodia: AHP approach. *Journal of Management, Economics, and Industrial Organization, 2*(2), 51-61. http://doi.org/10.31039/jomeino.2018.2.2.4

Corresponding author:
DurdyevS@ara.ac.nz

Abstract

Project success is commonly defined as a completion of a construction project within stipulated time, estimated cost and required quality. Undoubtedly, contractor's, who is one of the influencing stakeholders for project activities, performance is critical for successful project completion. Thus, being the first work in its kind, this study evaluates the CSFs for contractors in Cambodia. The AHP approach was adopted for pairwise comparison of 22 identified critical success factors (CSFs) documented by 41 construction experts of various construction projects in Cambodia. The research findings revealed that the most critical factors for contractor's success are: complexity of a project; social/cultural environment; ability to make timely decision; client confidence in construction team; contractor's cash flow; client influence; project size; site management; contractor's experience; and project planning.

Keywords: construction industry, critical success factors, analytical hierarchy process, Cambodia.

Introduction

The construction sector is a significant contributor to Cambodian economy, as its contribution to the GDP accounts for 10% (Durdyev et al. 2018a) and it is also a significant employment generator. Due its linkages, it also helps to financially strengthen the allied sectors in the country. The value of approved construction projects in 2016, which has significantly accelerated comparing to the value in 2015, shows strong investor appetite (Hawkins & Sek, 2017). Paradoxically, anecdotal evidence suggests that there are issues that negatively affect the sector's performance, which are low productivity performance, overruns in stipulated project cost and duration (due to the contractor related, workforce related issues) (Durdyev et al. 2017).

Construction sector has a dynamic nature due to a number of uncertainties in duration, budget, technology and development process (Saqib et al. 2008). The sector-specific characteristics, which sharply differentiate it from other sectors, may cause highly-severe failures that eventually affect the stakeholder's performance (Elattar, 2009). Therefore, project performance and productivity level, in other words success, has always been significantly concerned among the industry stakeholders (Abdul-Rahman et al. 2011; Durdyev & Mbachu, 2011). Since every construction project has its unique features, there is lack of industry-wide consensus on the definition of project success. Therefore, success of a project, which an ultimate goal of every industry stakeholder, has been a topic of number of discussions and researches (Gudiene et al. 2013).

While the construction project delivery process involves various stakeholders, efforts contributed by each stakeholder plays a significant role to the successful completion of a project. Therefore, stakeholders' performance is a significant factor, which eventually has an influence on a successful project completion (Takim and Akintoye, 2002). The level of stakeholders' performance heavily depends on managerial quality, financial capacity, technical capabilities and organizational performance, particularly for proper management of risks arise due to the competitive business and unstable economic and political environments (Kim, 2010; Takim & Akintoye, 2002).

Although it has been considered as a successful project completion, there are doubts about who and what is responsible for project success. Thus, this issue has been reported by various researchers worldwide. In the earliest studies factors contributing to a project success are reported as: regular financial statement reviews (Gerstel, 1991); construction site safety (Grodon, 1997); and continuous training and education of workforce (Bednarz, 1997). Lim and Mohamed (1999) propose two approaches to define a project success, which are the macro and micro. For the macro one project

completion within stipulated duration and overall stakeholder satisfaction are the most significant factors, while the only project completion factor represent project success from micro point of view. Faridi and El-Sayegh (2006) reported the findings from the study conducted in the United Arab Emirates where lack of skilled workforce, inappropriate leadership, poor site management, lack of or breakdown of equipment, and poor supervision are the most significant factors hindering the project success in terms of delay causation. Hutchings and Christofferson (2001) report the findings of the questionnaire survey conducted among residential contractors in the United States, where the most significant success factors were: quality subcontractors; skilled workforce; client communication; honesty; reputation; and on time project delivery. Hanson et al. (2003) examined the project success in terms of client satisfaction, where the most contributing factors to poor level of satisfaction in South Africa were poor workmanship, conflict and incompetence of contractors. On the other hand, Nkado and Jasper (2007) highlighted the significance of the attitude to, and quality of service are the key factors hindering project procurement in South Africa.

While Arslan and Kivrak (2008) define the success in a traditional approach, which is meeting the project goals and client expectations, from different perspective, Elattar (2009) claims that success is a complex task taking into account the goals concerned with professional, technical, social and financial issues. Al-Tmeemy et al. (2010) defined project success as a concept where strategical alignment of company goals (short and long-term) are conceptualized. In another study, Abdul-Aziz and Kassim (2011) evaluate the success factors of the housing projects of public-private partnership method of delivery, where the following factors reported as the research findings: project and organization reputations, and early project completion. Gudiene et al. (2013) quantified the critical success factors (CSFs) for building projects in Lithuania, which were further grouped under 7 broad categories related to external, institutional, project, project management, project manager, client and contractor.

Completing a project within the stipulated time, allocated budget and required quality, or in other words achieving project success is essential for every construction stakeholder to survive in the sector. Particularly, it is essential in Cambodia, where year-by-year increase has been observed in number of approved construction projects or those waiting for their approvals. Based on the previously reported studies, this study aims at identifying and evaluating the CSFs affecting contractors' success in Cambodia. Although there are many CSFs reported in the literature pool, it is of strategic importance for the industry players to invest their limited resources in fewer number of CSFs as those presented in other countries may not be fully applicable in Cambodia.

1. Research method

The methodological framework of this study presented by Figure 1. This study adopted a questionnaire survey method as an appropriate, convenient and cost-effective method for data collection (Durdyev & Ismail, 2016; Durdyev et al. 2018a). The designed questionnaire comprised 22 CSFs identified via comprehensive literature analysis (refer to Table 1). To ensure the clarity and validity of the questions, structured interviews conducted with 3 experts in the construction industry in Cambodia to validate the identified CSFs as this approach has been used by several research studies (Durdyev et al. 2017; Lessing et al. 2017). Thus, the questionnaire survey of the study was designed based on the content validation, which has also been subjected to pilot study (Durdyev et al. 2018b) prior to the administration of the survey to the potential respondents. The Analytical Hierarchy Process (AHP) approach, where 9 point assessment system adopted, has been used to prioritise the identified CSFs. AHP is a decision support tool (Raisbeck & Tang. 2013) that has been widely adopted in the construction-related studies worldwide (Al Haadir & Panuwatwanich, 2011; Aminbakhsh et al. 2013). For instance, Chou et al. (2013) implemented fuzzy AHP to evaluate the weights of factors influencing the project cost.

2. Research findings

The decision makers, who are the construction professionals, were invited to participate in the AHP survey. Completed surveys collected from 41 participants with an average of 9 years of industry experience in Cambodia. Due to the time-consuming nature of the AHP questionnaire survey, the number of respondents was found to be acceptable, where respondents devoted at least 2 hours of their time to complete the questionnaire survey for pairwise comparison of the CSFs. The respondents were asked to answer the questions in terms of pairwise comparison based on 9-point scale of significance (1 = equally, 3 = moderately, 5 = strongly, 7 = very strongly, and 9 = extremely), while 2, 4, 6, 8 represented the degrees of significance between the odd ratings (Saaty 1990). For further information on the process of, and equations involved in AHP approach, readers are recommended to refer to the studies reported with various applications of the approach (Podvezko et al. 2010; Wang et al. 2013).

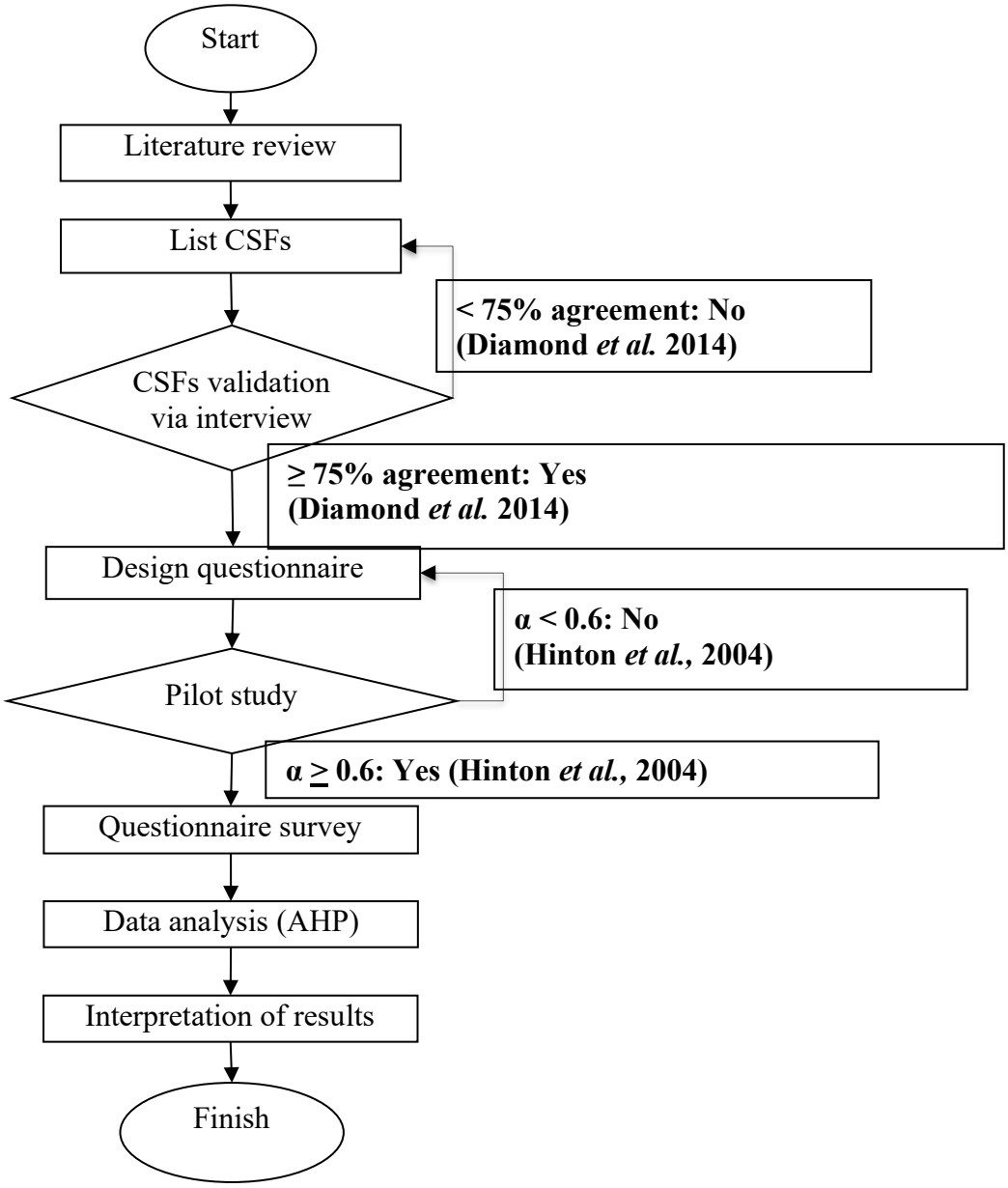

Figure 1: Methodological framework

Based on the data documented by the respondents, consistency ratio (CR) was calculated to assess the degree of matrix consistency following the recommendation of (Saaty 1990). The matrix is considered to be consistent if the calculated CR is smaller than 0.1. The CR for each judgment were calculated accordingly, which allows to rank the CSFs in terms of their impact on contractor's performance. Thus, Table 1 presents weights of CSFs, where the top ten factors affecting contractors' performance in Cambodia are: 1) complexity of a project; 2) social/cultural environment; 3) ability to make timely decision; 4) client confidence in construction team; 5) contractor's cash flow; 6) client influence; 7) project size; 8) site management; 9) contractor's experience; and 10) project planning.

Table 1: CSFs for contractors

#	CSF	Weight	Reference
1	Complexity of a project	0.1489	Gudiene et al. (2013)
2	Social/cultural environment	0.1143	Faridi and El-Sayegh (2006)
3	Ability to make timely decision	0.0765	Gudiene et al. (2013)
4	Client confidence in construction team	0.0578	Hanson et al. (2003)
5	Contractor's cash flow	0.0536	Takim and Akintoye (2002)
6	Client influence	0.0526	Gudiene et al. (2013)
7	Project size	0.0517	Durdyev and Mbachu (2011)
8	Site management	0.0462	Faridi and El-Sayegh (2006)
9	Contractor's experience	0.0413	Gudiene et al. (2013)
10	Project planning	0.0375	Durdyev et al. (2017)
11	Realistic schedule/urgency	0.0375	Durdyev et al. (2017)
12	Professional capability	0.0348	Elattar (2009)
13	Technical capability	0.0346	Elattar (2009)
14	Contractor’s competence	0.0343	Hanson et al. (2003)
15	Technology and skill availability	0.0283	Tan and Ghazali (2011)
16	Leadership and organisational skills	0.0272	Kim (2010)
17	Construction methods	0.0268	Toor and Ogunlana (2009)
18	Physical work environment	0.0259	Faridi and El-Sayegh (2006)
19	Clear and precise scope and objectives	0.0253	Gudiene et al. (2013)
20	Resource availability (manpower, material, machinery)	0.0251	Frodell et al. (2008)
21	Administrative approvals	0.0119	Durdyev and Mbachu (2011)
22	Motivating skills	0.0080	Gudiene et al. (2013)

3. Concluding remarks and discussion

Project success, which has been defined in various ways by a number of researchers worldwide, is commonly known as a completion of a construction project within stipulated time, estimated cost and required quality. Undoubtedly, contractors are one of the most important stakeholders for both off- and on-site project activities so that their performance can lead to a success or fail of any project. Thus, being the first work in its kind, this study aimed at evaluating the CSFs for contractors in Cambodia. The AHP approach was adopted in this study as an appropriate decision support tool, where

41 construction experts of various construction projects responded to the questionnaire survey for pairwise comparison of 22 identified CSFs.

Based on the research findings, it can be inferred that the complexity, size and planning of a project influences contractor's performance, which is perhaps due to the requirement of highly skilled workforce including design experts and experienced construction managers, which has been previously reported as one of the constraining factors to construction performance in Cambodia (Durdyev and Mbachu, 2017). Clearly, every country has its own cultural aspects, which obviously have an influence on human behaviour. Due to the labour-intensive nature of the construction projects, these culturally influenced attitudes affect project performance; hence, overall performance of a contractor. The findings reveal that the construction client's influence is also significant. Client is considered to be a significant stakeholder, particularly in the decision making process, which consequently affects contractor's performance and ability to make timely decisions on a project's progress. Additionally, being experienced in specific type of construction projects is perceived to be critical for contractor's success for an ongoing or future projects. It is further recommended that contractors in the Cambodian construction industry invest their available resources and efforts into the improvement of skills of workforce at various levels. Further, construction clients should proactively act in the project planning to provide positive input to contractors.

Despite being a limited exercise in scope, this study provides a significant base for future CSFs researches in developing countries. Although lack of information limited the authors to provide a real data, the research findings have sufficiently provided an overall picture of factors that are critical to contractor's success in project in Cambodia.

Acknowledgement

The support of the Department of Engineering and Architectural Studies, Ara Institute of Canterbury and the Research office of Zaman University are acknowledged. Appreciation is given to the construction professionals in Cambodia for providing their opinions, support and assistance.

References

Abdul-Aziz, A. R., & Jahn Kassim, P. S. (2011). Objectives, success and failure factors of housing public-private partnerships in Malaysia, *Habitat International*, 35, 150–157. http://dx.doi.org/10.1016/j.habitatint.2010.06.005

Abdul-Rahman, H., Wang, C., & Muhammad, N. B. (2011). Project performance monitoring methods used in Malaysia and perspectives of introducing EVA as a standard approach, *Journal of Civil Engineering and Management*, 17(3), pp. 445–455. http://dx.doi.org/10.3846/13923730.2011.598331

Al Haadir, S., & Panuwatwanich, K. (2011). Critical success factors for safety program implementation among construction companies in Saudi Arabia. *Proceeding Engineering*, 14, 148-155. http://dx.doi.org/10.1016/j.proeng.2011.07.017

Al-Tmeemy, S. M. H. M., Abdul-Rahman, H., & Harun, Z. (2010). Future criteria for success of building projects in Malaysia, *International Journal of Project Management*, 29(3), 337–348. http://dx.doi.org/10.1016/j.ijproman.2010.03.003

Arslan, G., & Kivrak, S. (2008) Critical factors to company success in the construction industry, *Engineering and Technology*, 45(9), 43–46.

Bednarz, T. F. (1997). Winning strategy: the nine laws of business success, *Air Conditioning, Heating & Refrigeration News*, 32-33.

Chou, J. S., Pham, A. D., & Wang, H. (2013). Bidding strategy to support decision-making by integrating fuzzy AHP and regression-based simulation, *Automation in Construction*, 35, 517-527. https://doi.org/10.1016/j.autcon.2013.06.007

Diamond, I. R., Grant, R. C., Feldman, B. M., Pencharz, P. B., Ling, S. C., Moore, A. M., & Wales, P. W. (2014). Defining consensus: A systematic review recommends methodologic criteria for reporting of Delphi studies. *Journal of Clinical Epidemiology*. 67(4), 401–409. https://doi.org/10.1016/j.jclinepi.2013.12.002

Durdyev, S., & Mbachu, J. (2011). On-site labor productivity of New Zealand construction industry: Key constraints and improvement measures. *Australasian Journal of Construction Economics and Building*, *11*(3), 18-33. http://dx.doi.org/10.5130/AJCEB.v11i3.2120

Durdyev, S., & Ismail, S. (2016). On-site construction productivity in Malaysian infrastructure projects. *Structural Survey*, 34 (4/5), 446–462. https://doi.org/10.1108/SS-12-2015-0058

Durdyev, S., Omarov, M., Ismail, S., & Lim, M. (2017a). Significant contributors to cost overruns in construction projects of Cambodia, *Cogent Engineering* 4(1): 1–10. https://doi.org/10.1080/23311916.2017.1383638

Durdyev, S., Omarov, M., & Ismail, S. (2017b). Causes of delay in residential construction projects in Cambodia, *Cogent Engineering*, 4(1): 1-8. http://dx.doi.org/10.1080/23311916.2017.1291117

Durdyev, S., & Mbachu, J. Key Constraints to Labour Productivity in Residential Building Projects: Evidence from Cambodia, *International Journal of Construction Management*. (Forthcoming). https://doi.org/10.1080/15623599.2017.1326301

Durdyev, S., Mohamed, S., Lay, M., & Ismail, S. (2017c). Key factors affecting construction safety performance in developing countries: Evidence from Cambodia. *Construction Economics and Building*, 17(4), 48-65. http://dx.doi.org/10.5130/AJCEB.v17i4.5596

Durdyev, S., Zavadskas, E. K., Thurnell, D. Banaitis, A., & Ihtiyar, A. (2018a). Sustainable construction industry in Cambodia: Awareness, drivers and barriers. *Sustainability*, 10(2), 392. https://doi.org/10.3390/su10020392

Durdyev, S., Ismail, S., & Kandymov, N. (2018b). Structural equation model of the factors affecting construction labor productivity. *Journal of Construction Engineering and Management*, 144(4), 1-11. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001452

Elattar, S. M. S. (2009). Towards developing an improved methodology for evaluating performance and achieving success in construction projects, *Scientific Research and Essay*, 4(6), 549–554.

Gerstel, D. (1991). *The builder's guide to running a successful construction company*. Newton, CT: The Taunton Press. USA.

Gordon, M. (1997). Safety saves money. *Contract Journal*, 19(3.

Gudiene, N., Banaitis, A., & Banaitiene, N. (2013). Evaluation of critical success factors for construction projects – an empirical study in Lithuania. *International Journal of Strategic Property Management*, 17(1), 21-31. https://doi.org/10.3846/1648715X.2013.787128

Faridi, A., & El-Sayegh, S. (2006). Significant factors causing delay in the UAE construction industry. *Construction Management and Economics*, 24(11), 1167–1176. http://dx.doi.org/10.1080/01446190600827033

Frodell, M., Josephson, P. E., & Lindahl, G. (2008). Swedish construction clients' views on project success and measuring performance, *Journal of Engineering, Design and Technology*, 6(1), 21–32. http://dx.doi.org/10.1108/17260530810863316

Hanson, D., Mbachu, J., & Nkando, R. (2003). Causes of client dissatisfaction in the South African building industry and ways of improvement: the contractors' perspectives, in CIDB, South Africa.

Hawkins, H., & Sek, O. (2017). *Construction Investment Skyrockets in 2016*. The Cambodia Daily. https://www.cambodiadaily.com/business/construction-investment-skyrockets-in-2016-123668/

Hinton, P.R., Brownlow, C., McMurray, I., & Cozens, B. (2004). *SPSS Explained*. Routledge: New York.

Hutchings, M., & Christofferson, J. (2001). Factors leading to construction company success: perceptions of small-volume residential contractors, *ASC Proceedings of the 37th Annual Conference*, University of Denver, Colorado, 263-270, 2001.

Kim, S. G. (2010) Risk performance indexes and measurement systems for mega construction projects, *Journal of Civil Engineering and Management*, 16(4), 586-594. http://dx.doi.org/10.3846/jcem.2010.65

Lessing, B., Thurnell, D., & Durdyev, S. (2017). Main factors causing delays in large construction projects: Evidence from New Zealand. *Journal of Management, Economics, and Industrial Organization*, 1(2), 63-82. http://doi.org/10.31039/jomeino.2017.1.2.5

Lim, C. S., & Mohamed, M. Z. (1999) Criteria of project success: an exploratory re-examination, *International Journal of Project Management*, 17(4), 243–248. http://dx.doi.org/10.1016/S0263-7863(98)00040-4

Mbachu, J., & Nkado, R. (2007) Factors constraining successful building project implementation in South Africa, *Construction Management and Economics*, 25(1), 39–54. http://dx.doi.org/10.1080/01446190600601297

Podvezko, V., Mitkus, S., & TrinkunienJ, E. (2010). Complex evaluation of contracts for construction. *Journal of Civil Engineering and Management*, 16(2), 287-297. https://doi.org/10.3846/jcem.2010.33

Raisbeck, P., & Tang, L. C. M. (2013). Identifying design development factors in Australian PPP projects using an AHP framework, Construction Management and Economics, 31(1), 20-39. http://dx.org/10.1080/01446193.2012.729133

Saaty, T. L. (1990). How to make a decision: the analytic hierarchy process, *European Journal of Operational Research*, 48(1), 9-26. https://doi.org/10.1016/0377-2217(90)90057-I

Saqib, M., Farooqui, U. R., & Lodi, H. S. (2008). Assessment of critical success factors for construction projects in Pakistan. In: *Proceeding of the First International Conference on Construction in Developing Countries (ICCIDC–I-2008)*, Karachi, Pakistan, August 4-5 2008, 394–404.

Takim, R., & Akintoye, A. (2002) Performance indicators for successful construction project performance. In: Greenwood, D. (Ed.), *18th Annual ARCOM Conference*, 2-4 September 2002, University of Northumbria. Association of Researchers in Construction Management, 2545–2555.

Tan, D. J. Z., & Ghazali, F. E. M. (2011). Critical success factors for Malaysian contractors in international construction projects using Analytical Hierarchy Process. *International Conference on Engineering, Project, and Production Management*, 20–21 September, 2011, Singapore.

Toor, S., & Ogunlana, S. O. (2009). Construction professionals' perception of critical success factors for large-scale construction projects. *Construction Innovation*, 9(2), 149-167. https://doi.org/10.1108/14714170910950803

Wang, W. C., Yu, W. D., Yang, I.-T., Lin, C. C., Lee, M. T., & Cheng, Y. Y. (2013). Applying the AHP to support the best-value contractor selection – lessons learned from two case studies in Taiwan. *Journal of Civil Engineering and Management*, 19(1): 24–36. http://dx.doi.org/10.3846/13923730.2012.734851