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ORIGINAL PAPER

Critical success factors of construction projects in Jordan: an empirical investigation

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Abstract

The construction sector is considered one of the most important engines of the national economy in any country; in addition to that, it clearly contributes to improving the quality of life of individuals. In the construction industry, project success is crucial, because it reflects positively on the growth of the national economy, in partnership with other sectors related to it directly and indirectly. However, construction projects often come with disappointment in completion within time, cost, and quality, for multiple reasons throughout the project life cycle. The aim of this study is to determine the factors that affect the success of construction projects, based on realistic project data. To achieve this goal, data were collected and analyzed from the final reports of a number of projects that had been implemented in 15 years. The result illustrates that the most significant and vital factors for the success of the construction project are: quality-related factors, cost-related factors, time-related factors, contract-related factors, and related external factors. Results help project stakeholders improve construction project performance by identifying factors that have affected project success. This allows them to take appropriate measures for every worker to ensure the success of their projects. In addition, this study contributes to the current body of knowledge by being one of the few studies that analyze project data to identify critical success factors for construction projects in developing countries.

Keywords Economical construction · Longitudinal · Normalization values · Success factors · Success criteria

Introduction

The construction sector is one of the key drivers of the national economy for any country. It is considered to be one of the most important and supportive pillars of the economic climate. In fact, it is a major driver of growth for other sectors of the economy (Khlaifat et al., 2019). Therefore, the base of every nation improvement lies in construction and infrastructure projects (Hajiani et al., 2018). As well, construction and engineering administrations assume a significant function in the economic rise of the world, producing openings for work for a great many specialists (Musarat et al., 2020). The interrelationship between the construction industry and the economy overall stems primarily from the three characteristics of the industry: the client of the public sector, its large market size with investment potential, and its multiplier effect as a major source of jobs, both directly and indirectly (Amoa-Abban & Allotey, 2014a).

The success of the project plays an important role in developing the economy by achieving the main three measures of project success (time, cost, and quality). Many researchers considered cost, time, and quality compliance as a parameter to measure project success (Barclay & Osei-Bryson, 2010; Meredith, et al., 2017). These parameters, referred to as the "iron triangle", although often criticized,

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are still considered as the gold standard for project success measures (Papke-Shields et al., 2010).

The study of project success and critical success factors is, therefore, timely as it is one of the vital ways to improve the effectiveness of project delivery (Chan et al., 2004). Despite the continuous efforts in all developed and developing countries to achieve the success of projects, but most projects still face many challenges that prevent their success. Therefore, many studies seek to investigate these challenges, which differ from one country to another depending on the economic, political, and social conditions. It is essential to determine the success factors specific to the local environment to ensure that appropriate mechanisms are implemented accordingly. One of the reasons for the difficulties in managing projects, especially in the government sector, is the failure to determine the CSFs across project phases and the failure to identify success elements in the form of efficiency and effectiveness measurement (Takim et al., 2004).

The definition of success factors differs from different studies as most of these studies were context specific, and their implementation and impact are usually limited to the countries and operating environment where these studies were conducted (Nguyen & Ogunlana, 2004; Ogunlana, 2008). Moreover, Yong and Mustaffa (2017) noted that there is a lack of efforts to contextualize the results in local contexts where the structure, culture, and maturity of the organizations involved varies.

Therefore, this study goes to conduit the gap by re-evaluating the critical success factors of Jordanian construction projects to facilitate an updated understanding of the current conditions of the local industry, by analyzing the data gathered from the final reports of a number of construction projects. A discussion will also be held on the various features and comparison of the results with the results of research conducted in other developing countries. Identifying these factors provides project managers to develop plans to improve the performance of existing and future construction projects in the region. Besides, decision-makers can use the findings to strategically manage available resources to improve project performance.

Literature review

Project success

The construction sector is a vital and influential sector in the national economy of most countries. Thus, the pursuit of a successful project is the main goal of all stakeholders involved in the project. However, unfortunately, there are major challenges for both customers and contractors in modern construction projects to successfully deliver the project due to growing complexity in design and stakeholder participation (Doloi, 2009). The failure to complete the project not only affects customers, but also other members of the undertaking (e.g., the contractor, the consultant, and the owner) and the public as a whole (Adil et al., 2019). Project success is seen as meeting predetermined project objectives, which usually included criteria such as time, cost, and performance (Kerzner, 2013). According to several studies, cost, scope, and time are the three success criteria for a construction project (the triple constraint). This three-part success criterion—meeting cost, schedule, and performance targets—has become widely used as a standard success criterion in the decades since, and is often referred to as the "iron triangle" (Williams, 2016). Any deficiencies in any of these criteria will hinder the success process, which means that the success or failure of the project depends on achieving these criteria with high efficiency.

Owing to the presence of so many stakeholders in today's diverse project environment, the concept of success itself has undergone many modifications (Chan et al., 2002). With requirements and guidelines, the idea of project success is designed to help project participants achieve projects with the most favorable outcomes (Chan & Chan, 2004). Project success is an elusive subject and applied beyond the success of the project management and traditional requirements, and the absence of an agreed concept and a set of standards for the performance of the construction project has long been a factor in the failure to assess success (Kerzner, 2013). These sets of ultimate objectives or standards are frequently referred to as success criteria (Lim & Mohamed, 1999; Mladenovic et al., 2013).

Success criteria are essential in project management practice, because they allow project managers to assess the goal levels (i.e., success) of their projects (Chan et al., 2002). It is worth noting that determining success criteria differs from one study to another. Some criteria are objectively measurable, while others are subjective or psycho-social in nature (Bryde, 2005). There are different criteria for success set by different studies. A study by Chan and Chan (2004) presented two types of success criteria for construction projects: objective and subjective measures. In comparison to subjective measures of success, objective success criteria are easily and objectively measurable R494. According to Al-Tmeemy et al. (2011), there are three dimensions to project success: project management success, product success, and market success (Osei-Kyei & Chan, 2017). According to the researchers, project management success is determined by meeting management objectives in terms of time, quality, and cost. The second dimension is concerned with the end product's objectives in terms of customer satisfaction, technical specifications, and functionality, whereas the third category is concerned with the project's potential in terms of reputation, revenue, market share, and competitive advantage, which contributes to the company's long-term success.

Another study by Liyanage and Villalba-Romero (2015) presented six success criteria in construction projects: time, cost, quality, contract, process and results, and stakeholders' satisfaction. While, Mladenovic et al. (2013) stated profitability, customer and owner satisfaction, environmental impact, value for money, efficiency, level of services, and effectiveness as other project success criteria. On the other hand, some people attempt to categorize sets of criteria: Shenhar's empirical work (Shenhar et al., 2002) employed 13 criteria, which were classified as "meeting design goals", "benefits to customers", and "commercial success and future potential".

Perspectives on project success

The definition of project success can vary according to who is the stakeholder. According to the owner, success means safety in use, for consultant means quality, and for contractor it means profitability. According to Lim and Mohamed (1999), project success perspectives can be divided into two types, macro and micro.

- ***The macro views of project success***
  In the macro view of project success, the question will be answered: is the original purpose of the project achieved? If it does, the project will prove to be successful. If not, then this would be a failure for the project.
- ***The micro views of project success***

The micro view of project success will deal with smaller component-level project achievements. It is generally applied after the construction process of the project and the construction parties involved.

Success factors

Success factors are almost well known in the management of construction projects, but their function differs in both public and private projects (Roshani et al., 2018). A construction project is a collection of different activities throughout the project's life cycle, scheduled or unscheduled, which is under the influence of the surrounding environment changes (Naderpour et al., 2018). Researchers consider those changes that influence project success as success factors. For example, success factors are described as factors that are affecting, constituting, and deciding a project's success (Han et al., 2012).

In project performance, there are four different dimensions of essential success factors. The first factor is following the objectives of the design, which relates to the agreement signed with the customer. The second factor is the benefit to the end consumers, which relates to the benefit of the end products of the project to the clients. The third factor is the benefit of the developing organization which relates to the benefit achieved as a result of the implementation of the project by the developing organization. Finally, the gain to the national technological infrastructure as well as the technological infrastructure of the business participating in the production phase is the last dimension. The mixture of all these dimensions offers an overall evaluation of project performance (Sadeh et al., 2000).

Moreover, these success factors are further classified into two main categories. The first classification can be associated with hard success, which includes objective, tangible, and measurable success criteria. The other concerns soft success, which consists of subjective, intangible, and less measurable success criteria (Chan et al., 2004; Silva et al., 2016). It is important to note that there is a difference between the concept of project success factors and project success criteria. Whereas success criteria mean the criterion by which a project's success or failure is measured (Cooke-Davies, 2002).

Critical success factors in construction projects

There are various success factors in construction projects considered by several number of researchers. For example, Tsiga et al. (2016) classified the most critical success factors in construction projects into 11 groups, namely: external challenge, client knowledge, and experience, top management support, institutional factors, project characteristics, project manager competence, project organization, contractual aspects, project team competence, project risk management, and requirements management.

Also, there are nine basic categories of critical success factors identified by Alzahrani and Emsley (2013), which are: safety and efficiency, past results, economic, administrative and technical aspects, financial, organization, expertise, size, type of previous projects, and financing.

Success factors in Jordan

Regarding the study of project success factors in Jordanian construction projects, there are limited studies, while most studies address the problems that construction projects suffer from. For instance, delay is one of the most prominent problems facing construction projects in Jordan, according to what Al-Momani (2000) indicated in his study, as the results showed that the reasons for the delay are: designers, user changes, weather, site conditions, delay in delivery, economic conditions, and increase in quantity. According to Odeh and Battaineh (2002), the main causes of cost overrun and delay in projects are as follows: the agreement between contractors and consultants on owner involvement with project work, ineffective contractor skills, financing and payment, labor productivity, poor decision-making,

inappropriate planning, subcontractors. Besides, Khlaifat et al. (2019) noted that the factors contributing to the failure of construction projects are related to the internal hierarchy of the system, especially those of the contractor.

Positioning this study

There are limited studies addressing success factors in construction projects in Jordan. Also, the majority of studies depend on the questionnaire to collect the data necessary for the study. Generally, the questionnaire deals with the factors of previous studies. In this case, these factors are not unique to the area of study. Besides, the results of the questionnaire are based on the opinion poll of the respondent, which often does not fully represent fact. Therefore, the current study seeks to realistically define critical success factors in construction projects, based on realistic data collected from the final reports of construction projects that have been implemented in Jordan.

Methodology

This study was designed in four parts to achieve the study's objectives. The first part focused on an in-depth review of several research studies into the success factors of construction projects. The second part focused on collecting real data from construction projects implemented in Jordan. While the third part was related to assessing success factors based on the data collected in the first two parts. The fourth part concerns the analysis of the collected data. Finally, the fifth part presents a discussion of the results of the data analysis, based on which the conclusions and recommendations were also presented, as summarized in Fig. 1.

Data collection

Data from literature review

At the second part, the most critical success factors for construction projects were extracted according to what was mentioned in the previous studies are suitable for Jordanian construction projects. From the literature review, 14 critical success factors were selected to be evaluated based on an analysis of the project data collected, as summarized in Table 1.

Real data from construction projects

The first part in current study includes extracting information from 42 construction projects carried out in Jordan. While there were more projects during that period, only projects containing details about their costs, time, and quality were selected for extraction. This information is necessary to evaluate the success of the construction project in terms of completing the project within the required time, cost, and quality. The review started by extracting the following project information: location of the company; contract type, tendering process, project cost (contract value, actual value,

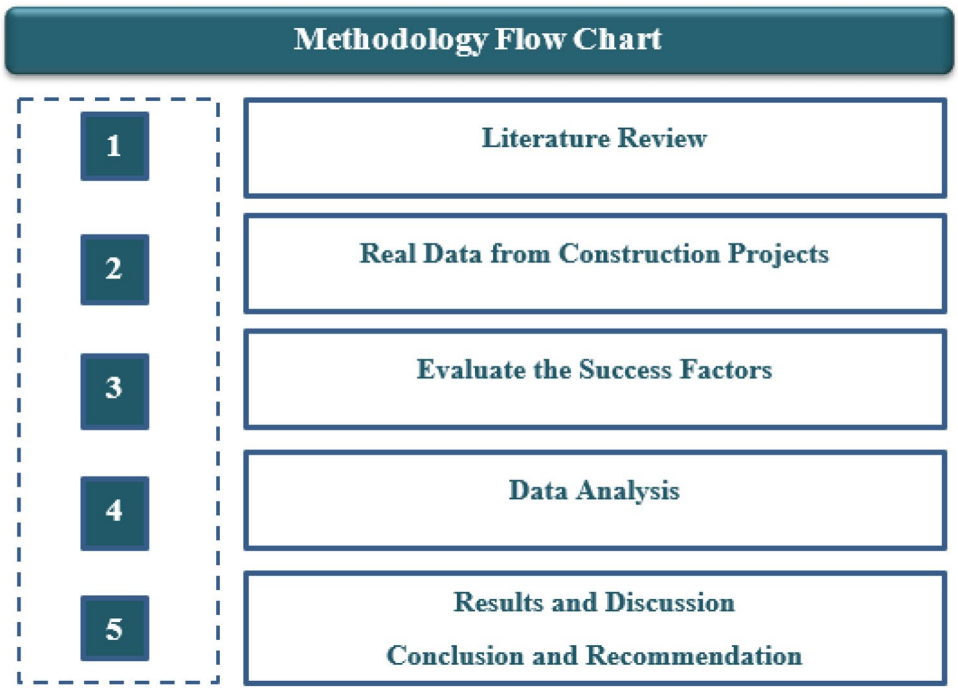

Fig. 1 Methodology flowchart

Table 1 Factors extracted to evaluate the success of construction projects

Code	Description of success factors
F1	No change in material price (no economic risk)
F2	Financial stability and adequate funding
F3	Selection of contract
F4	The value of the bid bond
F5	Conformance to codes and standards
F6	Accurate bill of quantities
F7	No disputes in project
F8	No defects in the project
F9	Project completion date
F10	Climatic condition at the site
F11	Accuracy of the preliminary time estimate
F12	Accuracy of the preliminary cost estimate
F13	Change orders
F14	Location of the company

value of change orders, value of compensation, discounted value of performed works, value of the minimum payment, value of delay damages, bonus for early completion, and value of change orders); project duration (contract project duration, actual project duration, work start date, initial receipt date, and completion date).

Data analysis

Normalization

The data were analyzed using the SPSS software, statistical mean, and standard deviation, in addition to the normalization values determined for each success factor. After computing the normalization values, the criticality of each factor was evaluated (Adabre & Chan, 2019). Specifically, factors with normalization value ≥ 0.50 are considered as critical factors (Osei-Kyei & Chan, 2017). Other studies also use this approach to determine critical factors in their studies. For example, normalization value was used to determine the criticalities of factors for public–private partnership projects in the study by (Osei-Kyei & Chan, 2017). The normalization value for each factor was calculated using the following equation as used by (Adabre & Chan, 2019):

$$\text{Normalized value} = (\text{mean} - \text{min. mean}) / (\text{max. mean} - \text{min. mean}).$$

Factor analysis

Factor analysis is a quantitative multivariate method in which the interrelationships between a set of continuously measured variables are defined through a variety of underlying linearly independent reference variables (Hardcastle et al., 2005). It is widely used by various numbers of researchers in the construction field. For example, the method is used to examine the main stressors in the Gaza Strip that contribute to the stress of construction professionals (Enshassi & Al Swaity, 2015). To load the factors, an oblique rotation of the reference axes was performed, called VARIMAX rotation, and the derived factors and their corresponding loadings were obtained (Hair et al, 2006). For the analysis, factor loads < 0.5 are omitted, and only those with loading values ≥ 0.5 are taken (Durdyev et al., 2017; Sinesilassie et al., 2018; Soewin & Chinda, 2018).

Results and analysis

Results of ranking analysis

As shown in Table 2, only six factors have normalization values ≥ 0.50: no dispute in the project, the value of bid bond, location of the company, no defects in projects, conformance to codes and standards, and accurate bill of quantities. This study considers these factors as the critical success factors for construction projects.

Comparison with other countries

The construction sector plays an important role in economic growth in developing countries, which provides jobs to a substantial proportion of the working population (Megha & Rajiv, 2013). In developing countries, in addition to the general situation of socio-economic stress, some problems and challenges are chronic such as resource shortages and the inability to satisfy the necessary success factors (Ofori, 2000).

To further analyze the results, the six critical success factors in this study are then compared to those of construction projects in other developing countries, including Sri Lanka, Pakistan, Nigeria, Vietnam, Ethiopia, and the Gaza Strip. The authors acknowledge that besides those countries, a list of critical success factors for other developing countries does exist in the existing body of knowledge.

As evident in Table A, the results of this study are consistent with the results of previous studies in identifying the following factors as critical factors for the success of construction projects, namely: no disputes in the project,

Table 2 Mean, SD, and the normalized value of success factors in construction projects

Code	Factors	Mean	SD	Normalization	Rank
F7	No disputes in project	1.9524	0.5061	1.0000*	1
F4	The value of bid bond	1.8571	0.3772	0.8787*	2
F14	Location of company	1.8095	0.4915	0.8181*	3
F8	No defects in project	1.7143	0.3542	0.6970*	4
F5	Conformance to codes and standards	1.6667	0.4771	0.6364*	5
F6	Accurate bill of quantities	1.5714	0.5009	0.5151*	6
F1	No change in material price	1.5000	0.2155	0.4242	7
F3	Selection of contract	1.3810	0.4572	0.2728	8
F10	Climatic condition at site	1.3333	0.3772	0.2120	9
F11	Accuracy of preliminary time estimate	1.2619	0.4771	0.1212	10
F13	Change orders	1.2619	0.4450	0.1212	10
F2	Financial stability and adequate funding	1.1667	0.3772	0.0000	11
F9	Project completion date	1.1667	0.4450	0.0000	11
F12	Accuracy of preliminary cost estimate	1.1667	0.3974	0.0000	11

*Normalized value more than 0.50

conformance to codes and standards, and no defects in the project. This agreement comes, because these factors are related to quality, as achieving the required quality is one of the main goals for the success of construction projects in most countries.

While the other factors are not considered in the previous studies, this is generally due to the specificity of the construction projects study in Jordan, which differs economically and culturally from other countries. Also, the current research depends on specific data obtained from project documents to evaluate the efficacy of the success factor in each project separately. Consequently, these factors cannot be evaluated without these data. These factors have not been addressed in other studies due to the nature of the data used (Table 3).

Underlying factors

As shown in Table 4, the results of factor analysis grouped the success factors into five components, which are quality-related factors, cost-related factors, time-related factors, contract-related factors, and external-related factors. The discussion for each component is in the following subsections.

Quality-related factors

This component includes four factors, which are related to quality in construction projects. Therefore, this category was named quality-related factors. As shown in Table 4, the total variance accounted by this component is 25.723%.

One of the main criteria that determine the success of a project is quality. However, due to the enormity of the construction projects, you must face some reasons that lead to not achieving quality. These reasons are works are not conformance to codes and standards, damage caused by adverse weather conditions during the implementation of the projects, and use of poor-quality materials due to the high prices of materials.

Table 3 Success factors in construction projects in developing countries

Code	Success factors	Sri Lanka (Silva et al., 2015)	Pakistan (Saqib et al., 2008)	Nigeria (Ojo & Gbadebo, 2012)	Vietnam (Nguyen & Ogunlana, 2004)	Ethiopia (Belay et al., 2017)	Gaza strip (Enshassi et al., 2009)
F7	No disputes in project	√	√	–	√	–-	–-
F4	The value of bid bond	–	–	–	–	–-	–-
F14	Location of company	–	–	–	–	–-	–-
F8	No defects in the project	–	√	√	–	√	–-
F5	Conformance to codes and standards	–	√	√	–	–-	√
F6	Accurate bill of quantities	–	–	–	–	–-	–-

Table 4 Results of factor analysis for success factors in construction projects

Code	Success factor	Components				
	Quality-related factors	1	2	3	4	5
F1	No change in material price (no economic risk)	0.670		0.466		
F5	**Conformance to codes and standards**	**0.899**				
F8	**No defects in the project**	**0.894**				
F10	Climatic condition at site	0.535	-0.387			
	Cost-related factors					
F2	Financial stability and adequate funding		0.969			
F6	**Accurate bill of quantities**		**0.547**			
F12	Accuracy of the preliminary cost estimate		0.969			
	Time-related factors					
F9	Project completion date			0.870		
F11	Accuracy of the preliminary time estimate			0.832		
F13	Change orders		0.346	0.521		0.342
	Contract-related factors					
F4	**The value of the bid bond**				**0.826**	
F7	**No disputes in project**				**0.792**	
	External-related factors					
F3	Selection of contract					-0.749
F14	**Location of the company**				0.386	**0.664**
Eigenvalue		3.601	2.611	1.583	1.262	1.167
Variance (%)		25.723	18.647	11.305	9.016	8.338
Cumulative variance (%)		25.723	44.369	55.675	64.675	73.029

Bold factors represent the identified critical success factors in this study

F5: Conformance to codes and standards

Conformance to codes and standards in the construction projects is one of the critical success factors in this study. One of the main objectives in construction projects is to complete projects according to the codes and standards that led to a successful project. Failing to follow the stated codes and standards will result in poor and inefficient quality, unsafe structures, delays, cost overruns, and disputes in construction (Mashwama et al., 2017). Quality is intertwined with technical performance issues, requirements, and the achievement of functional objectives, and it is the achievement of these parameters that will most likely be subject to variations in interpretation by multiple project stakeholders (Prabhakar, 2008).

F8: no defects in project

Failure to implement projects according to the specifications and standards specified in the contract leads to defects in the project. Defects in construction sites frequently occur and can be expensive for contractors and owners of construction (Mashwama et al., 2017). Also, 54% of the construction defects are due to human factors (Mashwama et al., 2016). In contrast, 12% of construction defects result in material and system (Waje, 2013). Project defects need to be reworked, which requires additional costs and time.

F1: no change in material price (no economic risk)

The duration of execution of construction projects is often long, and therefore, changes in the prices of materials occur during this period. Contractors are therefore compensated for these changes in accordance with the approved principles and for the materials specified in the contract. In this study, projects which are subject to change in the price of materials are identified on the basis of the compensation values set out in the project data. The change in material prices occur due to material fluctuation is one of the major causes of cost overrun (Silva et al., 2015). Increased material prices in construction projects have added additional costs, in addition to causing contractors to delay their purchase until they drop.

F10: climatic condition at site

All contractors prefer to start their project during the spring and summer seasons due to the appropriate weather to carry out work, other than the winter weather that delayed work. The study (Olatunji et al., 2018) revealed that weather conditions impact the success of the project through considered causing completion delay and cost overrun in infrastructure projects. Prior studies also indicate that weather conditions influence project success (Amade et al., 2015a, 2015b).

Climatic condition affects other factors within this component, such as F5 and F8. The climatic condition during the life cycle of the project may cause defects in the work and materials of the project. For example, the bad weather in winter affects concrete works, in addition to the damage to the materials used. As a result, the weather condition is an obstacle to carrying out the work per codes and standards.

Cost-related factors

This component had three factors, which are related to cost. In general, cost output is defined as the value of the completed work compared to the actual cost of progress made on the project (Baccarini & Love, 2013). In the planning stage, an accurate bill of quantities and accuracy of the preliminary cost estimate is important to indicate the value for project funding, which avoids the project as additional costs.

F6: accurate bill of quantities

Accurate bill of quantities is considered as one of the factors that affected the final cost of construction projects (Bekr, 2016). In addition, the bill of quantities has the best to control the cost of contract varieties. Accuracy of the bill of quantities can reduce the problems of extra quantities that ultimately lead to overrun costs in the project. Consequently, the change in the contract quantity has affected the success of construction projects; in that, it leads to an increase in project costs over the estimated cost. Failure to complete the project within the estimated cost is one of the obstacles to the success of projects, as cost is one of the criteria for success in construction projects.

F2: financial stability and adequate funding

The financial stability and adequate funding meant that the value of the contract at the end of the project is equal to or less than the estimated contract value. The study (Silva et al., 2015) also suggests that this factor is a critical success factor in construction projects. Owners sometimes do not have sufficient funds to complete their projects and usually do not pay contractors on time, as specified in the contract (Amoa-Abban & Allotey, 2014b). In this case, the contractor will not be able to provide the site with adequate materials and labor, which will negatively affect the project's success in completing it in the limited time.

F12: accuracy of preliminary cost estimate

Accuracy of the preliminary cost is an important factor in construction projects that led to a successful project, because the cost is an important element in projects, so any increase in cost led to a failure in the project. Therefore, it is important to ensure the accuracy of cost estimation in the early stage of projects. The factors affecting the accuracy of cost estimate are: clear and detailed drawings and specifications, pricing experience of construction projects, perception of estimation value, equipment, complexity of the project, clear description of scope, accuracy and reliability of cost information, site restrictions, availability of materials, customer's financial capabilities, and the availability of a bid database for similar projects (Hasanzadeh et al., 2014). Several researchers agreed that the success of the project depends on the accuracy of cost estimation (Gudienė et al., 2013; Williams, 2016).

Time-related factors

Three factors are involved within this component, where all of them are related to time; it is named time-related factors. As shown in Table 4, the total variance accounted by this component is 11.305%.

Realistic ‘building time’ has become more and more relevant, since it often serves as a critical criterion for measuring project success and contractor productivity (Chan & Kumaraswamy, 2002). The results of the study by Mahamid, (2016) revealed that the delivery of a project in time is one of the determinants for project success. Therefore, any delay will reflect on project success. Generally, change orders considered as one of the main causes of delays in construction projects. For instance, the results of the study by (Bin Seddeeq et al., 2019) revealed that the most frequent cause of delay is change orders.

F9: project completion date

Construction time and cost are the key and the most important factors for evaluating the performance of any project (Rahman et al., 2012). Complete the project within required time is one of the main objectives to achieve the success of the construction project. Unfortunately, most projects cannot finish within the completion date due to various problems during the implementation stage. Also, many construction projects in developing countries

are defined by delays in time (Sweis, 2013). The date of completion time is an important factor in construction (Satankar & Jain, 2015), since time in construction projects means cost. It is, therefore, necessary to avoid problems that lead to delays in the date of completion, such as changes in orders, additional works, and changes in design, in addition to other problems.

F11: accuracy of preliminary time estimate

The accuracy of the preliminary estimated time of the construction project is considered to be an important factor in the success of the project; where the accuracy and realistic project time estimate reduce the delay rate for completion of the project. Time is generally recognized as the minimum performance assessed and one of the key indicators for project success (Ali & Rahmat, 2010; Cha & Kim, 2011; Meng, 2012). The majority of construction projects were not completed within the time specified in the contract which was mostly due to the estimators relying only on experience in estimating the project duration.

F13: change orders

Procedures for the execution of change orders are set out in the contract's general terms and conditions. The project could turn into a patchwork of change orders if the original contract documents are poorly prepared. This can lead to a sharpening of the adversary roles of the contractor and owner, which can substantially disrupt job performance. The process of confirming change orders by the owner or his manager often takes a long time, which negatively affects the construction project and the term of the contract (Amoa-Abban & Allotey, 2014b). Therefore, the success of a construction project is affected by the monitoring of change orders and their causes and impacts (Desai et al., 2015).

Contract-related factors

Only two factors included in this component, and all of them are related to contract. The total variance accounted by this component is 9.016%. The projects in this research have two types of the value of bind bond: percentage from the value of the tender and specific value. The specified value is referred as a success factor, because it has security for the contractors.

F7: no disputes in project

Disputes are among the key factors that contribute to delays in the construction schedule, raised project costs, and adverse impact on the relationship between the project's participants. Therefore, disputes are considered as the important factors that prevent the successful completion of the construction project (Cakmak & Cakmak, 2013). Work on the construction project is a team effort that needs cooperation between the shareholders. Any dispute between the stakeholders would harm the success of the project. For example, some disputes between the contractor and the owner may be brought to the courts, which may result in a failure to complete the project. The study (Tabish & Jha, 2011) had an agreement with the current study in considering the absence of disputes among the most important success factors.

F4: the value of bid bond

A bid bond is offered to the prospective client by a third-party lender, on behalf of the bidder, in addition to the company's offer for a given project (Boswall, 2010). It is important to recognize proof of guarantee to the owner of the project in which the contractor can conform to the bid contract and perform the job as set out in the contract (Oke et al., 2013).

When the value of the bid bond is determined by a high value, it leads to the identification of the related contractors. In this situation, the contractor who can pay this value will undoubtedly have the financial capacity to overcome any challenges that will occur during the project implementation phase. Thus, the value of the bid bond contributes to the success of the project by guaranteeing the contractor's financial ability.

External-related factors

The factors in this category are related to external issues of a construction project. Therefore, this category is named external-related factors. The total variance accounted for this component is 8.338%. The selection of unqualified contractors creates price changes and raises project costs (Banaitiene & Banaitis, 2006). Conversely, there are two types of tendering in general: open tendering and selective tendering. In this research, the selective tendering approach is a success factor in construction projects, because, in this approach, owners usually invite contractors with good project history to execute the project. Hence, they guarantee the success of their projects.

F14: location of the company

Company locality is indicated within the three roots as important facilitators to success (Williams, 2016). In addition, the study (Williams, 2016) agreed with the current

study in indicating the location of the company as a success factor. The company's location in this study is a successful factor, because when the projects are near the head office, the company is able to control the quality of work, cost of work, supply of materials, safety, and productivity of employees. This makes it easier for senior management to monitor and control the project and ensure that the project is completed on schedule and at a lower cost.

F3: selection of contract (low price)

The selection process is based on the biography of contractors, which explained their experiences, efficiency, and capabilities to implement the construction projects. In the current study, the selective tendering is indicated as a success factor in construction projects, because the owner invited contractors with high efficiency and capability to implement the project. In addition, this is important, because in the public sector, political influence and other pressures could bias the selection of the contractor (Halpin et al., 2017). This type kept the quality of production with less disagreement with contractors, because the owner chose suitable contractors. According to the contractor's point of view, any standard methods and procedures adopted for selecting contractors and subcontractors would improve the quality (Joy, 2014). Selecting contractors is an important decision-making process (Fard et al., 2015). In addition, the project contract mechanism considered a critical success factor in construction projects (Sugumaran & Lavanya, 2014).

By comparing the current results with the results of other studies, The study by (Alzahrani & Emsley, 2013) also used the factor analysis to identify the critical success factors, which underlying in nine components, namely: safety and quality, past performance, environment, management and technical aspects, resource, organization, experience, size/type of previous projects, and finance. This study agreed with current study in identifying the quality and finance as critical success factors in construction projects. Also, the results of this study are consistent with those studies (Lim & Mohamed, 1999; Sadeh et al., 2000; Shenhar et al., 2001) in identifying cost, time, and quality as critical factors for the success of construction projects.

Conclusion

Uninterrupted economic growth is critical for developing countries, and construction project failures can intrude that flow. Developing mechanisms to ensure construction project success using findings from other regions and individual perceptions is possible but ineffective. Therefore, the present study uses an alternative data set to identify the critical success factors affecting the local construction industry by analyzing data from documents of some construction projects in the region. The analysis involves 14 factors—11 factors similar to those from previous studies and 3 new factors identified from the project documents. The significant findings of this study are:

- The top critical success factors for construction projects in Jordan are no disputes in the project, the value of bid bond, location of company, no defects in the project, conformance to codes and standards; and accurate bill of quantities.
- From those, three new critical success factors were identified in this study. The factors are no disputes in the project, the value of bid bond, and no defects in the project.
- Also, the success factors can be classified into five underlying factors: (1) quality-related factors, (2) cost-related factors, (3) time-related factors, (4) contract-related factors, and (5) external-related factors.

The results of this study indicate the critical success factors, among many other factors. Depending on these factors, stakeholders can establish best practices for successful project management. For example, identifying no defects in the project as a critical success factor will push the owner to place financial restrictions and fines on these defects. The consultant also directs to organize the process of receiving the implementation phases of the various works to ensure the reduction of defects. In this case, the contractor will focus on providing high-quality materials and selecting skilled workers to ensure the business is free from defects and thus avoids financial discounts. Also, the results of this study encourage future researchers to verify the application and reliability of these critical success factors by conducting a similar survey of a sample of other projects. Also, researchers can explore the newly identified success factors in this study to further expand the construction management body of knowledge.

In addition, the implications of this research study can be summarized as follows:

- Determining the most prominent factors for the success of construction projects in this study will encourage other researchers to search for other causes. In addition, it will contribute to broadening the perceptions of scientific research among researchers for the construction industry.
- Providing a list of the most important factors for success in construction projects, which has a positive impact on improving project performance. This is done by setting specific strategies for these factors within the project management plan, which ensures the effectiveness of these factors. In addition to defining them within the

project goals, it contributes to informing workers of the importance of these factors.

- Some of the success factors in this study are related to the design stage. Therefore, project owners must develop necessary procedures to ensure the efficiency and accuracy of the outputs of the design stage. Thus, this will reduce many of the problems that hinder the implementation of the project in the specified time and cost.

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Declarations

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