

Factors Hindering Quality Performance in Construction Projects: An Empirical Study

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Abstract. *The construction industry is crucial for the economy of any country. Learning from failure is important to reach effective quality performance in construction projects. This will, in turn, contribute to the development of the construction industry and the country as a whole. Although quality is an important criterion in project management success, it receives less attention than cost and time in project management literature. Moreover, critical success factors (CSFs) are identified more often than critical failure factors (CFFs) in construction literature. Hence, there is still a lack of attention on critical failure factors affecting quality performance in construction projects. The construction industry is full of uncertainties, especially in the current era of COVID-19 Pandemic. This adds to the necessity of studying critical failure factors in the construction industry. This study aims to identify the critical factors that have an adverse effect on quality performance in construction projects, address their relative importance, and suggest ways to attain good quality performance in construction projects. Based on the literature review, an initial list of failure attributes of quality performance in construction projects was prepared. Then it was refined based on suggestions from experienced professionals in the construction industry in the Jordanian context. A questionnaire was distributed to experts in the construction industry. The responses were analyzed using Statistical Package for the Social Sciences (SPSS). The analyses used here are factor analysis and tests of its appropriateness. Using these analyses, the most critical factors that impede quality performance in construction were identified and ranked. The study revealed that the most influencing failure factors are the managerial factor, the culture and environment factor, and the contractor factor.*

Keywords: Failure Factors, quality performance, construction projects, factor analysis

JEL Codes: L- Industrial Organizations

1. Introduction

The construction industry is complex and associated with uncertainty (Mahamid, 2020). There are many causes of uncertainty in construction projects, such as the performance of construction parties, resources availability, and contractual relations (Abd El-Karim et al., 2017). The uniqueness of construction projects, the highly competitive environment, and the challenges facing the construction industry give rise to many problems, such as delays, conflict, and deficiency of a quality assessment system (Bitamba and An, 2020). The quality of construction projects affects the development of the construction industry (Vadivel et al., 2016).

In general, project management success is measured according to cost, time, and quality. The three criteria have been known as the “iron triangle” (Larsen et al., 2016). Besides, scholars recognize it as a “triple constraint” (Anoop et al., 2016). Moreover, in the golden triangle people are placed at the center of the iron triangle; because people help maintain a balance among cost, time, and quality (Abiodun et al., 2017).

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Quality in construction refers to customer's satisfaction within a specified budget (Modi et al., 2017). A number of scholars affirmed the importance of quality in projects. Time and cost are the primary areas of focus in project management, while quality is a secondary one (Jha and Iyer, 2006). Construction projects and quality cannot exist without each other (Modi et al., 2017). Focusing on quality will result in guiding the project management toward a strategic viewpoint (Ganesh, 2016; Jugdev and Müller, 2005). It is essential to guarantee quality due to the high cost of buildings (Davidkumar and Kathirvel, 2015). Quality is one of the vital factors in any construction project. Besides, poor quality leads to problems in cost, time, and safety (Modi et al., 2017), which in turn influences the construction industry and the country's economy (Abd El-Karim et al., 2017).

To improve the effectiveness of construction projects, CSFs and CFFs have been studied by a great number of scholars. For a project to be successful, it is necessary to understand the CSFs right from the beginning (Ranawat, et al., 2018). Rockart was the first to use the term 'CSF' in the context of project management in 1982 and defined it as "those factors predicting success on projects" (Sanvido et al., 1992 in Chan et al., 2004). The CSFs were developed from CFFs which were defined as "the deficiency or lack of various critical factors" (Pinto and Mantel, 1990). Learning from failure is important for all engineering works (El-sokhn and Othman, 2014; Pol and Konnur, 2017). Moreover, Kisavi and Ngugi (2019) pointed to the crucial importance of project performance which is achieved through avoiding the project's failure. In the United States of America (USA), several educational resources have been developed for nearly a decade to make it easier for engineering students and practicing engineers to learn from failures (Delatte, 2010).

Managers avoid discussing failure circumstances for different reasons. So, knowledge about failures in construction is not well organized (Ortega, 2000). Although a number of scholars have studied Critical factors of the construction industry in different developing countries, there is still a lack of empirical evidence on these factors within the developing countries. Besides, the results are limited to the countries in which such studies have been conducted (Toor and Ogunlana, 2008). There is a lack of studies on CFFs affecting the quality performance of construction projects in the Jordanian context. To cover this gap, the current study attempts to identify and evaluate such factors in the Jordanian context.

2. Research Elaboration

2.1. Problem

The main problem of this study is the deficiency of studies on CFFs affecting the quality performance of construction projects in the Jordanian context.

2.2. Objectives

Towards covering the gap mentioned above, the study aims to attain the following objectives:

- Firstly, identifying factors impeding the quality performance of construction projects and addressing their relative importance.
- Secondly, providing project managers and other construction stakeholders with useful recommendations, in consideration of the study results, to reach a good quality performance in construction projects.
- Finally, providing scholars with fruitful insights for future studies.

2.3. Importance

The study importance stems from the following:

- This study will cover a gap in the literature on studies of CFFs in one of the developing countries.
- The importance of the realm of study; the construction industry is pivotal for the economy of any country.
- The study will enrich the understanding of CFFs influencing quality in construction projects.
- The study will add to the cumulative science by providing scholars with important insights for further researches.

3. Literature Review

There exists a considerable body of literature on critical factors in projects. Scholars have studied critical factors in projects in diverse manners. Some scholars have prepared a list of critical factors without grouping them (Othman and Mydin, 2014). On the other hand, other scholars have aggregated critical factors in groups (Babalola and Ojo, 2016). Moreover, some scholars have ranked the critical factors by the degree of importance (Babu, 2015). Others have not studied the relative importance of critical factors (Othman and Mydin, 2014). The focus in some studies has been on CSFs (Pol and Konnur, 2017), while others have focused on CFFs (Santoso and Gallage, 2019). Besides, few studies have recognized both types, i.e., CSFs and CFFs (Jha and Iyer, 2006). Concerning the measures, some studies have covered the three main performance measures, i.e., time, cost, and quality (Oke et al., 2016). Others have covered two measures, such as: quality and cost (Zehro and Jkhsi, 2020), cost and time (Abd El-Karim et al., 2017) or one performance measure, for example, cost (Iyer and Jha, 2006), quality (Jha and Iyer, 2006). Some scholars have recognized critical factors in the construction industry theoretically from literature (Chan et al., 2004). On the other side, critical factors are identified empirically using questionnaires (Davidkumar and Kathirvel, 2015). Some studies investigated critical factors in Construction projects in general (Santoso and Gallage, 2019). Other body of literature studied critical factors in Joint venture construction projects (Mba and Agumba, 2018), or Home building construction (Zehro and Jkhsi, 2020), or road construction projects (Kisavi and Ngugi, 2019).

Scholars have identified lists of critical factors affecting quality performance in construction projects. For instance, Singh and Sharma (2020) drew attention to the significant areas in which critical factors are usually identified such as employees and skills, functions, methods, and technologies.

A study by Irfan et al. (2019) on a random sample from different developing countries, revealed a negative relationship between stakeholder conflicts and quality in construction projects.

Dorcas et al. (2019) found construction mistakes, use of unskillful labors, destitute checking and inspection, destitute motivation system, destitute management commitment and leadership styles, deficiency of good quality construction materials, restriction of finance, and weak timely supervision as the most significant factors that influence projects' quality in Nigeria.

Santoso and Gallage (2019) identified the top 10 critical factors affecting the performance of large construction projects in Sri Lanka, namely large project scope, site management by the contractor, complication of the project, poor planning and scheduling of activities, weakness of experience of the contractor, schedule suspensions, unstable government policies regarding the project, imprecise cost estimates, construction errors and quality issues of completed work, and imprecise time estimates.

Sheikh et al. (2019) findings indicated that the significant factors that influence the process quality of building projects in Pakistan during the construction phase are the selection of a suitable contractor, the presence of a feedback system, and the quality of shop sketches received from subcontractors.

A study conducted by Kusi et al., (2018) in the Nepalese context indicated that the main two failure factors were the lack of knowledge and commitment of the contractor on construction quality and overall quality culture and working environment.

In the Indian context, Ganesh (2016) classified the main causes of reduced quality in building projects into four groups, namely capable labor absenteeism, material deficiency, rework, and meager supervision. Project design cost, project complication, deficiency of resources, quality of equipment, and raw materials in the Nigerian construction industry were pointed out by Oke et al. (2016) as factors of poor quality performance of consultants.

The results of Shanmugapriya and Subramanian (2015) indicated that leadership and process-related problems are the most distinctive factors of quality performance in construction projects in India.

El-sokhn and Othman (2014) identified twenty-one project failure factors from literature review and classified them according to project stage, project player, and the failure factors source.

Othman and Mydin (2014) pointed out that the main failure factors in housing projects are inadequate communication, poor information, insufficient controls, shortage of technical skills, and deficient feedback leading to repetitive errors.

A study in India by Jha and Iyer (2006) revealed that conflict among project participants, adverse socio-economic environment, disturbing climatic condition, PM's obliviousness and lack of knowledge, imprecise project conceptualization, and offensive competition during tendering are the CFFs affecting the quality performance of projects.

An earlier study by Atkinson (1999) indicated that most defects in construction projects are due to human error.

4. Methodology

Based on an extensive review of various pieces of literature on factors of poor quality performance in construction projects in different developing countries, an initial list of failure attributes was prepared. Since the selected attributes were from studies in countries other than Jordan, the initial list was introduced to seven experienced professionals in the construction industry in Jordan to

refine it. As a result, a final list of 25 failure attributes was developed. A questionnaire-based survey approach was used. Through email and direct distribution, responses were collected from experts in the construction industry, who work either for consultancy services or for contractors. A five-point Likert scale was used, with 5=strongly agree, 4=agree, 3=neutral, 2=disagree, and 1=strongly disagree. A total of 171 responses were received. The responses were analyzed using SPSS software. Factor analysis was conducted to reduce the list of failure attributes to a meaningful smaller number of factors and to address their relative importance them.

5. Results and Discussion

5.1 Tests of Appropriateness

Before performing Exploratory Factor Analysis (EFA), it is necessary to conduct tests of the appropriateness of factor analysis for factor extraction. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity was conducted. KMO value is 0.802, which is considered meritorious indicating that the distribution of data is adequate for conducting factor analysis. Besides, the significant value for Bartlett's Test of Sphericity is 0.000, which is less than the significant level 0.05, so it indicates that the data are approximately multivariate normal and acceptable for factor analysis.

5.2 Failure Factors Extracted by Factor Analysis

Factor analysis was conducted on 25 attributes to attain a smaller number of expressive factors and to rank them based on their relative importance. The extraction method used was Principal Component Analysis (PCA). Varimax with Kaiser Normalization was the rotation method used. Factor loadings (± 0.5) or greater were taken into consideration since they are significant (Hair et al, 2010:135). Five failure factors were extracted. Names were assigned to the factors according to the attributes contained within them. The extracted failure factors, variance explained by each of them, cumulative variance explained and rank are shown in Table 1.

Table 1. Total Variance Explained and Rank

Failure Factor Number (Name)	Variance explained	Rank
Failure Factor 1 (Managerial)	18.92%	1
Failure Factor 2 (Culture and Environment)	13.76%	2
Failure Factor 3 (Contractor)	12.56%	3
Failure Factor 4 (Labor and Technology)	10.88%	4
Failure Factor 5 (Client)	10.61%	5
	Cumulative Variance Explained = 66.73 %	

Extraction Method: Principal Component Analysis

It can be seen from Table 1. that the variances explained by the five failure factors are 18.92%, 13.76%, 12.56%, 10.88%, and 10.61% respectively.

Variance explained by each factor is an indication of its relative importance (Zikmund et al., 2008:596). Thus, the five factors are ranked in descending order as follows: managerial, culture and environment, contractor, labor and technology, and client. In total, the five factors explain 66.73 % of the variance. This is equivalent to R square in multiple regression analysis (Zikmund et al., 2008:596) and indicates that the researcher has 66.73 % of the information in the 5 factors that are in the original 25 attributes.

The extracted failure factors, the attributes included in each of them, and their loadings are presented in Table 2.

Table 2. Failure Factors Structure

Failure Factor Description	Loading
Failure Factor 1 (Managerial)	
Conflicts between project manager (PM) and top management	0.829
Conflicts between PM and other outside stakeholders such as sub-contractor and owner	0.765
Suspending important decisions	0.738
Unawareness of proper planning tools and techniques by PM	0.728
Poor monitoring and feedback tools	0.637
Negative attitude of PM and project participants	0.601
Disorganized resources allocation	0.594
Failure Factor 2 (Culture and Environment)	
Overlooking the project quality objectives to achieve schedule and cost	0.721
Conflicts among team members	0.668
Tendency to pass on the blame to others	0.664
Unfavorable political and economic environment	0.576
Unfavorable social environment	0.563
There is no adequate consideration of the quality issues during contractor's selection	0.558
Too many constraint codes discourage contractor in implementing quality	0.547
Failure Factor -3 (Contractor)	
Lack of awareness of contractor about benefits of implementing quality management tools in construction.	0.729
Inadequacy of understanding of contractor about construction quality	0.707
Scantiness of understanding of contractor that cost of poor quality is much higher than that of operating process.	0.639
Destructive competition among contractors at tender stage	0.630
Failure Factor 4 (labor and Technology)	
Insufficient investment in advanced technology	0.898
Shortage of adequate training	0.752

Scarcity of skilled labor	0.634
Extreme rotation of the labor in construction organizations	0.581
Failure Factor 5 (Client)	
Insisting on speedy processes by client while issuing tender	0.730
Mismatch in capabilities of client and designer	0.727
Dearth of client commitment to quality	0.727

Rotation Method: Varimax with Kaiser Normalization

The failure factors extracted in this study along with the most distinguishing attributes Comprised in them are described below.

Failure Factor 1 (Managerial)

The attributes of failure factor 1 in Table 2. are mainly related either to PM or to top management. Thus, it is labeled as a managerial factor. Attributes included in this factor are ranked in descending order according to loading. Loading indicates the strength of the relationship between each attribute and the failure factor. (Zikmund et al., 2008,594). So, conflicts between PM and top management, conflicts between PM and other outside stakeholders, and suspending important decisions are the top three attributes in factor 1. If PM and top management work with a team spirit and positive attitude, the desired quality is achieved. Moreover, the management should give priority to crucial decisions, apply appropriate planning and monitoring tools, and allocate resources professionally.

Failure Factor 2 (Culture and Environment)

Attributes under failure factor 2 are linked to a quality culture and external environment. So, it is named culture and environment. Quality objectives should be given the same importance as schedule and cost objectives. Besides, it is essential for people in projects to put conflict aside. Moreover, a culture of being responsible should be disseminated instead of passing blame to others. The external environment is full of risks and challenges, especially during this era of COVID-19 Pandemic. To be able to cope with the dynamic political, economic, and social environment, flexible plans should be prepared at an early stage of the project life cycle with risk management embedded in them. Also, it is important to consider quality issues during contractor selection and to reduce constraint codes to encourage contractors to implement quality.

Failure Factor 3 (Contractor)

The contractor is assigned as a name for failure factor 3 since attributes within it revolve around the contractors. If contractors lack awareness and understanding about the importance of construction quality and the consequences of neglecting quality in construction, it hinders quality. In addition, destructive competition at the tender stage affects quality adversely. The selection of a low bidder usually leads to poor quality performance in projects. Quality performance in construction projects is enhanced if contractors increase their awareness about construction quality, about the costs of poor quality, and about the welfares of implementing quality management tools in construction. Moreover, if destructive competition is replaced with a positive one, it is well for all parties and quality performance in construction.

Failure Factor 4 (labor and Technology)

Attributes in failure factor 4 describe labor and construction technology. This factor includes insufficient investment in advanced technology, shortage of adequate training, scarcity of skilled

labor, and extreme rotation of labor in construction organizations. If construction organizations invest in advanced technology, provide suitable training for labor, and reduce rotation of them, it has a progressive effect on the quality performance of construction projects.

Failure Factor 5 (Client)

It can be observed from Table 2. that insisting on speedy processes by the client while issuing the tender, mismatch in capabilities of client and designer, and dearth of client commitment to quality fall under the last factor. They are associated with the clients. That is why a name (Client) is assigned to this factor. It is obvious that the client may hamper quality performance in construction projects. The client should allow for a suitable time to attain high-quality performance. Besides, the client should be more committed to quality. Moreover, the designer should be able to understand the client's needs and interests as well as being able to convert them into a communicative and satisfying design.

The findings of this study are relevant to the ones concluded in the literature. For instance, Jha and Iyer (2006) study results revealed that conflict among project participants; adverse socio-economic environment, PM's obliviousness, negative attitude of PM and project participants, holding crucial decisions in abeyance, and offensive competition during tendering are among the major factors that adversely affect project quality performance.

Besides, four out of the five extracted factors in the current study overlap with the ones observed by (Kusi et al., 2018) as factors leading to poor quality performance in construction firms. Kusi et al. (2018) ranked four factors in descending order according to importance as follows: the awareness and commitment of the contractors in construction quality, overall quality culture and the working environment, assistance from client and workforce, and construction technology and working system. However, the rank of these factors in the current study is different. Moreover, the results of the current study reveal a fifth new factor, which is the managerial one.

Recalling that in the golden triangle people are central due to their vital role in maintaining a balance among cost, time, and quality (Abiodun et al., 2017), the human element in this study loads significantly in the five extracted factors as presented in Table 2. This also coincides with the findings of Atkinson (1999).

Moreover, it can be observed in Table 2. that conflict attributes have very high loadings; conflicts between PM and top management have a loading of 0.829. Further, the loading of conflicts between PM and other outside stakeholders such as sub-contractor and owner is 0.765. While 0.668 is the loading of conflicts among team members. This result is in line with the findings of Irfan et al. (2019) study which revealed that stakeholder conflicts in construction projects affect quality adversely. At this point, a vital issue stems which is the necessity of studying the root causes of conflicts in construction projects. Irfan et al. (2019) study is a useful one in this realm. It was pointed out that the main cause of conflict in construction is the lack of communication between construction stakeholders. Also, it was recommended to use advanced collaborative technologies which can aid in developing communication in construction.

6. Conclusions

In this study, 25 attributes for reduced quality in construction projects are aggregated in five failure factors by means of factor analysis.

Regarding the relative importance of the extracted factors, results revealed that the most influencing factors are the managerial factor, followed by the culture and environment factor, and then the contractor factor. The labor and technology factor and the client factor are less significant than others.

A quality performance is important to the success of construction projects. In this study, some of the previous conclusions from the literature are re-established. The crucial factors influencing the quality of construction projects basically revolves around the human resource. The human role is significant in all factors including the fourth factor, which is technology and labor.

Among the 25 attributes that constituted the five factors, “conflicts between PM and top management” is found to be the most distinctive attribute within the managerial factor. Whereas, “overlooking the project quality objectives to achieve schedule and cost” is established as number one under the culture and environment factor. Besides, “lack of awareness of contractor about benefits of implementing quality management tools in construction” is the major attribute in the contractor factor. While “insufficient investment in advanced technology” is the most recognized attribute within the labor and technology factor. Finally, “insisting on speedy processes by the client while issuing tender” is the most significant client-related attribute.

7. Recommendations

Based on conclusions drawn in this study, all stakeholders in the construction industry in the Jordanian context are recommended to be aware of and concentrate on avoiding failure factors that impede quality performance in construction projects. By doing so, quality performance in construction projects can be improved, and consequently, the construction industry can be developed.

8. Future Scope

This study was conducted on construction projects in general. Future research could identify CFFs in a specific type of construction project such as joint venture projects. Moreover, further research could be conducted to identify CFFs of construction projects and classify them based on the different stages of the project life cycle. Additionally, CFFs in different contexts could be identified in further research. What is more, the root causes of conflict, which is a distinctive attribute in the current study, could be studied in further research.

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