Australian Journal of Science and Technology

ISSN Number (2208-6404)
Volume 4; Issue 2; June 2020

Research Article

Contractors' commitment to early completion of projects

Benjamin Boahene Akomah, Zakari Mustapha, Emmanuel Kwaku Ofosu

Department of Building Technology, School of Engineering, Cape Coast Technical University, Cape Coast, Ghana, West Africa

ABSTRACT

The complex nature of construction projects has been mostly attributed to the advancement in knowledge and technology. Project team faces unprecedented changes in relation to their respective activities and environment. The study sought to determine construction practices that influence the success of construction projects. A snowball sampling technique was used to select professionals (clients, consultants, project managers, site supervisors, quantity surveyors, and civil engineers) for the study. A total of 175 professionals constituted the sample size for the study. Most of the questionnaires were delivered through electronic means (WhatsApp social media platform) and those within reach, by hand. Findings show that "Time Factor" was ranked first among the various factors that affect the success of construction projects, with a mean of 4.201 and a standard deviation of 0.899. The factor loadings for "Time Factor" range from 0.568 to 0.958, with two other factors "Environmental, and Regulatory and Community Satisfaction" factors having the highest factor loadings (0.958 and 0.923), respectively. Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity (df) were found to be 0.658 and 0.45, respectively, and significant at 0.000 for all the factors affecting the success of construction projects. The most dominating factors (time, workers, health and safety, and innovation/educational) were ranked high. Management practices are what momentously impact site operations. Therefore, they should put systems and structures in place to ensure that their activities on site are carried out in more efficient ways.

Keywords: Knowledge of performance, leadership, Project performance control, team relationship, work-behaviour

Submitted: 14-04-2020, **Accepted:** 02-05-2020, **Published:** 30-06-2020

INTRODUCTION

Construction industry plays a major role in the development and attainment of the goals of societies. Construction industry contains large number of parties as clients, contractors, consultants, stakeholders, shareholders, and regulators. The performance of the construction industry is affected by national economies.[1] Several researchers[1-3] have posited that the success of any construction project is mainly related to the problems and failure in performance. Ronie[1] remarked that traditional project performance control is usually generic (e.g., cost control techniques). It relies on manual data collection, which means that it is done at low frequency (normally once a month) and quite some time after the occurrence of a controlled event (i.e., not in real time). Moreover, manual data collection normally gives low-quality data. Yng *et al*.[4] remarked that architectural, engineering, and construction firms may face difficulties managing construction projects performance in China because they are unfamiliar with this new operating environment.

Du *et al*.[5] stated that international construction projects performance is affected by more complex and dynamic factors than domestic projects, frequently being exposed to serious external uncertainties such as political, economic, social, and cultural risks, as well as internal risks from within the project. Samir and Shaban[6] listed some specific factors and actions as communication system, procurement method, economic environment, and client's experience as factors that affect the success of a construction project. Salminen[7] indicated one important area of success factors for construction projects as work behavior and leadership, while management systems are indicated as slightly important for project success. Samir and Shaban[2,6]stated that measuring the performance of any construction project is a very complex process because modern construction projects are generally multidisciplinary in nature and they involve participation of designers, contractors, subcontractors, specialists, construction managers, and consultants. The number of participants in a project increases proportionally as the size of the project increases and so the objectives or goals of all participants in a project cannot be

Address for correspondence: Zakari Mustapha, Department of Building Technology, Cape Coast Technical University, Cape Coast, Ghana, West Africa. E-mail: mustapha.zakari@cctu.edu.gh

the same. Hence, to measure performance of a project without specifying the criteria for judging performance holds no meaning. Therefore, the study sought to determine construction practices that influence the success of projects.

LITERATURE REVIEW

Project management is one of the many criteria on which project performance is contingent and it is also arguably the most significant as people formulating the processes and systems who deliver the projects.[8] Peter *et al*.[9] examined project time-cost performance relationships using project scope factors for 161 construction projects that were completed in various Australian states. It was noticed that gross floor area and the number of floors in the building were the key determinants of time performance in projects. Cost was a poor predictor of time performance and customers could consider time as a resource and encouraged the contractor to improve the time performance.[6] Moreover, factors such as time, cost, quality, client satisfaction, client changes, business performance, and safety would enable measurement of project and organizational performance throughout the construction industry.[6] Performance measurement was defined by Ronie[1] as a comparison between the desired and the actual performances. For example, when a deviation is detected, the construction manager analyzes the reasons based on unrealistic target setting (i.e., planning) and causes originating from the actual construction (in many cases, the causes for deviation originate from both sources). Ronie[1] argued that performance measurement is needed to control current projects and update the historic database. Such updates enable better planning of future projects in terms of costs, schedules, labor allocation, etc. Sui and Tai[8] further stated that measurement of project performance can no longer be restricted to the traditional criteria, which consists of time, cost, and quality, but also project management and products. However, Iyer and Jha[2] were of the opinion that several factors such as project manager's competence; top management support; project manager's coordinating and leadership skill; monitoring and feedback by the participants; decision-making; coordination among project participants; owners' competence; and social condition, economical condition, and climatic condition affect cost performance. Coordination among project participants as indicated by Ling *et al.*[4] was the most significant of all the factors and having maximum influence on cost performance of projects.

Ugwu and Haupt[3] argued that an adequate understanding and knowledge of performance are desirable for archiving managerial goals, such as improvement of institutional transformations, efficient decision-making in design, specification, and construction at various project-level interfaces, using appropriate decision support tools. Sui and Tai[8] identified the importance of working environment variables for the performance of a project manager in both private and public sectors based on job condition, project characteristic, and organizational related categories. The result revealed that working hours, physical condition of project, complexity, material and supplies, project size, duration, and time availability were viewed differently in terms of importance by the contractors. A study by Samir and Shaban[6] ranked team relationship as the most important variable affecting the performance of a project manager. The findings further showed that project manager's experiences did not have much effect on how they perceived their working environment. Ugwu and Haupt[3] remarked that both early contractor involvement and early supplier involvement would minimize constructability-related performance problems including costs associated with delays, claims, wastages, and rework. Ling *et al*.[4] argued that most of the important practices relating to scope management were controlling the quality of the contract document, quality of response to perceived variations, and extent of changes to the contract.

Methodology

This section gives a detail description of how the data were collected and analyzed. Data collection was done through survey in two ways: Personal hand delivering of questionnaires to respondents and electronic means using WhatsApp social media platform. The use of the electronic platform was to boost the response rate to give credence to the study. Snowball sampling technique was initially used to reach most of the respondents for the study. Respondents who fall within range of professionals were first identified and they recommended others to participate in the study. The professionals include clients, consultant (representatives of consultants) contractors or their representatives, quantity surveyors, civil engineers, architects, site supervisors, project managers, and clerk of works and were personally known to the researcher and they recommend professionals in the same category and industry around the country. A total of 175 professionals constituted the sample size for the study and questionnaires were issued to them. The questionnaire was selected for data collection because it is the most widely used method of data collection technique for conducting surveys.[10] This included closed-ended questions which were subdivided into three parts. The first part of the questionnaire contained personal information about the respondents, the second part was on the factors affecting the success of construction projects, and the third part was on the practices affecting the success of construction projects.

A total of 10 factors were identified and confirmed through literature review. All the factors were rated on a 5-point Likert scale where, 1 = very low important, 2 = low important, 3 = medium important, 4 = strongly important, and 5 = very strongly important. The data were analyzed using the Statistical Package for the Social Sciences 21st version. Personal data of respondents were analyzed, followed by the research questions. Ranked test was used to determine significant differences among the various variables. Both exploratory factor analysis and the confirmatory factor analysis were used for the data collected. Factor extraction and the factor rotation were first conducted on the variables to identify non-observable and non-measurable latent variables. Extracted factors were rotated to obtain more meaningful, interpretable factors which involved estimating the number of common factors by rank analysis and calculating their coefficients and factor loadings. To extract the latent factors analysis for the 10 identified factors, the items were subjected to principal component with varimax rotation. The factors were extracted based on the content of the items with factor loadings exceeding 0.40. The greater the loading, the higher the variable's status as a pure measure of the factor. This led to the use of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO of higher than 0.040 and a Bartlett's test of sphericity being statistically significant at 0.05 support the factorability of the data set. This implies that the factor analysis is suitable for extracting the latent factors of the factors affecting the success of construction projects. The succeeding section presents the findings.

Findings

This section presents the results and discussions based on the data analysis. Table 1 shows 10 identified factors through the literature review. The result recorded a mean range of 3.213–4.201 and a standard deviation range of 0.532–0.817. Some factors that had impact on the success of construction projects had average mean of 3.50 making them significant. "Time factors" were ranked the highest among the factors with a mean of 4.201 and a standard deviation of 0.899. The next key factor was "people factors" which was ranked second with a mean of 4.052 and a standard deviation of 0.951. "Health and safety factors" were ranked third with a mean of 3.994 and standard deviation of 0.294. "Environmental factors" were ranked the least among all the factors, placing 10th on the ranked table with a mean of 3.213 and a standard deviation of 0.977.

Table 1: Factors affecting the success of construction projects

Factors	M	SD	N	R
Cost	3.799	0.819	175	7
Time	4.201	0.899	175	1
Quality	3.937	0.861	175	5
Productivity	3.920	0.883	175	6
Client satisfaction	3.431	0.793	175	9
Regulations and community satisfaction	3.753	0.907	175	8
People	4.052	0.951	175	2
Health and safety	3.994	0.294	175	3
Innovation/educational	3.971	0.658	175	4
Environmental	3.213	0.977	175	10

M: Mean, SD: Standard deviation, N: Number of occurrence, R: Ranking

Table 2 shows that failure to correct bad behaviors that result in accidents was ranked the highest practice that affects the cost of construction projects with a mean of 4.017 and a standard deviation of 0.906. Construction delays were, however, ranked second with a mean of 3.640 and a standard deviation of 0.671. Continuous changes in client's requirement were the least ranked practice with a mean of 3.320 and a standard deviation of 1.067.

Table 3 shows the practices recorded a mean range of 3.606–4.040 and a standard deviation range of 0.532–0.817. Even though all the factors were agreed to be practices that affect time of construction projects, the researcher ranked the means to find out which one the respondents think is key. Delays in

Table 2: Practices that affect cost of projects

Variables	M	SD	N	R
Delays	3.640	0.671	175	2
Incomplete design at the start stage of the project leading to series of variation	3.451	0.574	175	5
Continuous changes in client requirement	3.320	1.067	175	6
Inefficient use of materials leading to excessive wastage	3.486	1.016	175	4
Mistakes and errors leading to rework	3.634	1.141	175	3
Failure to correct bad behaviors that result in accidents	4.017	0.906	175	1

M: Mean, SD: Standard deviation, N: Number of occurrence, R: Ranking

Table 3: Practices that affect time of projects

Variables	M	SD	N	R
Delays in handing over site to the contractor	4.040	0.833	175	1
Time needed to rectify defects	3.606	1.077	175	6
Delays due to closure of site	3.880	0.846	175	4
Delays arising as a result of material shortage	4.029	0.861	175	2
Delay in payment to the contractor	3.983	1.127	175	3
Time needed to implement variation orders	3.800	0.871	175	5

M: Mean, SD: Standard deviation, N: Number of occurrence, R: Ranking handing over site to the contractor were ranked the highest practice by clients that affect the time of construction projects with a mean of 4.04 and a standard deviation of 0.833. This was followed by delays arising as a result of material shortage. The practice recorded a mean of 4.029 and a standard deviation of 0.861. Delays in payment to the contractor were ranked third and registered a mean of 3.983 and a standard deviation of 1.127. The least practice on the ranked league was time needed to rectify defects. This recorded a mean of 3.606 and a standard deviation of 1.077.

Table 4 shows a mean range of 3.514–4.057 for practices that affect quality. The average mean score was above the agreed average mean of 3.50 making it significant. Inefficient quality control system was ranked the first practice that affects the quality of construction projects. This scored a mean of 4.057 and a standard deviation of 1.054. The use of outmoded techniques for work came second with a mean of 3.949 standard deviation of 0.745. The quality of training given to workers was found not to be a critical factor as the results suggest.

Table 4: Practices that affect quality of projects

Variables	M	SD	N	R
The quality of training giving to the workers	3.366	0.892	175	15
Lack of skilled labor	3.554	0.828	175	11
Lack of sensitization on the use of materials	3.514	0.857	175	13
Lack of sensitization on the use of equipment	3.560	0.648	175	10
Lack of organizational quality assessment system	3.606	0.677	175	8
Lack of quality assurance system	3.914	0.896	175	4
Use of low-quality materials for work	3.566	1.162	175	9
Inefficient quality control system	4.057	1.054	175	1
Lack of organizational quality culture	3.949	0.745	175	2
Non adherence to specification	3.646	1.072	175	7
Lack of skill to differentiate between original product and false ones	3.794	0.936	175	6
The quest for cheap product as substitutes	3.806	0.882	175	5
Failure to identify the right sources of material	3.931	1.054	175	3
The use of wrong personnel/ skilled labor for works	3.400	1.045	175	14
Use of wrong quality equipment for execution of works	3.526	1.022	175	12

M: Mean, SD: Standard deviation, N: Number of occurrence, R: Ranking

Table 5 shows the mean range of the factors was 3.480–3.977 which is above to the agreed average mean of 3.50. The result in Table 5 ranks the occurrence of accidents which dampens the morale of other workers as the highest practice among the practices with a mean of 3.977 and a standard deviation of 0.788. The use of outmoded techniques for work came second with a mean of 3.931 and a standard deviation of 0.395. Lack of incentives for workers took the last spot with a mean of 3.240 and a standard deviation of 1.755.

Other factors that affect success of construction project are client satisfaction, individuals, community satisfaction, and health and safety, with their mean range of 3.663–4.457. Whiles, innovation and learning practices of projects had a mean range of 3.406 to 3.783. The standard deviations these factors range from 0.508 to of 0.852 respectively.

Table 6 shows the KMO of 0.658 and a Bartlett's test of sphericity (df) being statistically significant at 0.05 support the factorability of the data set. Meaning, factor analysis is suitable for extracting the latent factors of factors affecting the success of construction projects.

Table 7 shows the KMO of all the "factors affecting the success of construction projects" ranging from 0.527 to 0.754 and Chi-square ranging from 182.210 to 3632.977 with a Bartlett's test of sphericity (df) being statistically significant at 0.05.

Table 5: Practices that affect productivity of projects

Variables	M	SD	N	R
Poor labor relationship that affects production	3.377	1.177	175	10
Absenteeism by workers	3.480	1.124	175	9
Improper training of workers on site	3.771	1.284	175	6
Frequent shortage of materials	3.749	1.298	175	7
Lack of incentives for workers	3.240	1.755	175	11
Difficulty in interpreting drawings due to the complexity of design	3.800	0.429	175	3
Using of outmoded techniques for work	3.931	0.395	175	2
Plant breakdown	3.589	0.579	175	8
The occurrence of accidents which dampens the moral of other workers	3.977	0.788	175	1
Strive among colleague workers	3.789	0.603	175	4
The use of improper tools	3.783	0.903	175	5

M: Mean, SD: Standard deviation, N: Number of occurrence, R: Ranking

Table 6: KMO and Bartlett's test for factors affecting the success of construction projects

KMO measure of sampling adequacy		0.658
Bartlett's test of sphericity	Approx. Chi-square	1335.123
	Df	45
	Sig.	0.000

KMO: Kaiser-Meyer-Olkin

Table 7: KMO and Bartlett's test for factors affecting the success of construction projects

Factors	KMO	Bartlett's test		
		df	Sig.	Apx. Chi-square
Cost factors	0.527	15	0.000	649.60
Time factors	0.838	15	0.000	741.803
Quality factors	0.701	120	0.000	3632.977
Regulations and community satisfaction	0.679	66	0.000	1565.817
Productivity factors	0.641	10	0.000	182.210
Client satisfaction	0.728	28	0.000	1285.510
Health and safety factors	0.754	91	0.000	3234.170
Community satisfaction	0.728	28	0.000	1285.510
Practices of workers	0.640	28	0.000	569.913

KMO: Kaiser-Meyer-Olkin

All the variables that affect the success of construction projects have their factor loadings ranging from 0.407 to 0.958 and exceed the threshold of 0.40, which indicate that they good representation of their respective factors.

Summary of Findings

This section presents the summary of the findings. Most of the respondents were quantity surveyors and civil engineers. Time, workers, health and safety, innovation/educational, and quality factors were the principal factors affecting the success of construction projects. The findings of Selah (2008) and Love *et al*. (2005) agree with this result. Moreover, factors such as time, cost, quality, client satisfaction, client changes, business performance, and safety would enable measurement of project and organizational performance throughout the construction industry (Samir and Shaban, 2008). It was also revealed that behavioral-related practices affect the cost and success of construction projects than human-related factors and this result is similar to that of Salminen (2005). However, time-related practices were considered the key factors that impact the time success of projects. Community satisfaction, workers practices, and health and safety practices have more effect than other factors. Whiles, human related factors have high impact on the success of construction projects than all other factors.

CONCLUSIONS

The study sought to determine construction practices that influence the success of projects. The principal factors that affect the success of construction projects are time, workers, health and safety, innovation/educational, and quality. Management practices and behavioral-related and time-related practices, respectively, were found to be most destructive practices that greatly influence the success of construction projects. The success of a construction project cannot be achieved if the needed attention is not given to human, management, behavioral, and health and safety related factors. The most critical among all these factors are human and management related factors and should be managed effectively to achieve about 50% of the success of a project.

RECOMMENDATIONS

i. Human-related factors should be given the needed attention they deserve and managers of projects should take keen interest in ensuring that projects are delivered on time
ii. Site supervisors should ensure that awkward behaviors are not entertained and safety of workers is held high
iii. Firms must pursue innovative ways; quality to the client should not be negotiated
iv. Management should put systems and structures in place to ensure that activities on site are carried out in more efficient ways
v. The identified factors and practices will serve as benchmarks and guidelines for stakeholders in the construction industry.

Further Studies

Further studies should be conducted to evaluate the factors that affect some specific public construction projects.

REFERENCES

1. Ronie N. Automated project performance control of construction projects. Autom Constr 2005;14:467-76.
2. Iyer KC, Jha KN. Factors affecting cost performance: Evidence from Indian construction projects. Int J Proj Manag 2005;23:283-95.
3. Ugwu OO, Haupt TC. Key performance indicators and assessment methods for infrastructure sustainability-a South African construction industry perspective. Build Environ 2007;42:665-80.
4. Yng LF, Pheng LS, Qing WS, Hua LH. Key project management practices affecting Singaporean firms project performance in China. Int J Proj Manag 2007;27:59-71.
5. Du YK, Seung HH, Hyoungkwan K, Heedae P. Structuring the prediction model of project performance for international construction projects: A comparative analysis. Exp Syst Appl

2009;36:1961-71.
6. Samir S, Shaban A. Factors Affecting the Performance of Construction Projects in the Gaza Strip. Palestine: Islamic University of Gaza; 2008.
7. Salminen J. Measuring Performance and Determining Success Factors of Construction Sites. Finland: Helsinki University of Technology Construction Economics and Management; 2005.
8. Sui PL, Tai CQ. Environmental factors and work performance of project managers in the construction industry. Int J Proj Manag 2006;24:24-37.
9. Peter EL, Raymond YC, David JE. Time-cost relationships in Australian building construction projects. J Constr Eng Manag 2005;131:187-94.
10. Abdal-Hadi MA. Factors Affecting Accuracy of Pre-tender Cost Estimate in Gaza Strip Unpublished Master Thesis. Gaza: Islamic University; 2010.