IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 16, Issue 1 Ser. V (Jan. - Feb. 2019), PP 01-11
www.iosrjournals.org

Project Failure Factors Affecting Building Project Success in Nigeria: Design and Construction Phase

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Abstract: *Some studies attempt to explore the project failure factors (PFFs) believed to affect project success. However, this specific area of PFFs remains unclear, and efforts to reach an agreement on the project failure factors have been rather limited. The main objective of this research study is to identify the PFFs that affect building project success and determine their relative importance in the stages of building process. A thorough literature review was carried out to generate a set of factors that affect project success. A questionnaire survey, based on 28 identified factors was conducted to collect data from three groups of respondents: professionals in construction industry, contractors and clients. Out of 310 questionnaires distributed, 193 were returned, representing 62.2% response rate. Using the mean score, relative importance index, and mean score average method, the most PFFs were identified. Spearman's rank correlation was used to analyse the agreement of survey respondents on those most PFFs. A one-way analysis of variance was then performed to determine whether the mean scores among the various groups of respondents were statistically significant. The survey findings revealed that the top 5 most important PFFs in the design and construction phase of building process are as follows: Unclear scope and goals, culture or ethical misalignment, poor monitoring and tracking, design errors, and poor management of expectations. An understanding of PFFs would help all interested stakeholders in the construction industry to improve building project success. And finally, the results of this study would help construction professionals and other practitioners in the industry take proactive measures for effective building project management.*
Keywords: *Building Project Success, Construction Phase, Design Phase, Nigeria, Project Failure Factors.*

Date of Submission: 13-02-2019 Date of acceptance:28-02-2019

I. Introduction

Building construction industry is known to be dynamic and complex in nature because of the increase in client's expectations, technology advancement and development process. Building projects are naturally complex because of the extensive nonconformity of project sites, high pressure demand in construction time and cost, increase in complexity on construction methods [1], and the industry involved with erection, repair and demolition of buildings [2]. In Nigeria, building projects are highly increasing and presently the industry is facing a lot of challenges which has direct impact on the project success. Construction business is large in size and also important in the role it plays in the economy [3], its activity is an essential part of a country's infrastructure and industrial development and as such care must be taken to ensure a healthy growth of the economy [4]. In addition, [5] opined that construction industry is the center of any other activity due to the fact that any other business needs a shelter and a location which will be provided by the industry.

The design and construction phase of a building project plays a major role towards achieving a successful project. Poor or faulty design removes the possibility of having construction projects success, because functionality is misplaced and it could also lead to early decay and sometimes, structural collapse [6]. Success in design and construction of a project is highly dependent on several issues with a variety of factors. Project Failure Factors (PFFs) have not really received much attention in the past literature. Knowledge of PFFs in a construction projects will help in guiding the participants towards achieving success. This study explores the failure factors that are critical to the design and construction phase of a building project. PFFs can be defined as those factors that predict the failure of a project and can also be a means to improve the effectiveness of a project. [7] defined failure in a construction project as disappointment in either one or the combination of cost, time, quality, and management. According to [8] success of a project starts from identifying and investigating the factors which may affect performance of the project by minimizing the factors in large number for the success of the project.

Based on the review of pass literatures on PFFs, it seems that less work has been done in addressing project failure factors affecting the building project success at the design and construction phases of building process. Hence, in order to bridge the gap of this knowledge, the research aims at providing a better understanding of the project failure factors that affects building project success at the design and construction phases of building process with the view to improve performance in achieving success by managing the failure factors. To achieve the above aim the study addresses the following objectives:

a) To identify the project failure factors that affects construction project success at the design and construction phases of building process.
b) To determine and assess the project failure factors that affects building project success at the design and construction phases in the study area.

The following hypotheses were tested:

a) H_0: There is an insignificant degree of agreement in ranking of the perceived project failure factors between different parties of the respondents.
b) H_0: There is a difference between the mean scores of the three groups of the respondents on the most perceived project failure factor.

Basically, there are five stages of building process and they are as follows: Pre-design, Design, Pre-construction, Construction and Post construction stages [9]. As stated by [5] the participants in the construction process should familiarize with the stages of the process, as the project team works together in coordination seeking successful completion of the project. However, the main discussion in this paper focused only on the design and construction phases.

II. Review of Current and Relevant Literature

2.1 Design Phase

The second phase of building development is design. Transitional phase of an architect/engineer services in which the design moves from the schematic stage to the contract document stage. In this phase of building process, the design team which comprises the architect, structural engineers, mechanical engineers, electrical engineers and other specialty consultants produces design solution documents to crystallize the design concept and describe it in terms of contract documents for a building project. And these documents include architectural, structural, mechanical, and electrical drawings and other project components working drawing [10]. In addition, the design team also prepares a statement of the probable project cost.

2.2 Construction Phase

In this phase, the project team translates design into construction planning and implementation. In addition to finalizing a construction schedule, this phase includes site setup, movement of materials, labour coordination and actual building construction. In other words, it is the physical realization process of a building project which involved interpretation of the contract documents and implementation. According to [10] construction phase is where the main contactor team up with the architect who acts as client to ensure conformity to construction drawings, specifications, and standards. In this phase, any unforeseen issues encountered may require revisiting earlier stages in the process, particularly predesign and procurement, so that adjustments can be made before the structure and materials are in place.

2.3 Project Failure Factors

The term “project failure factor” has not really been discussed as in the case of critical success factors. As stated by [5] “Success” and “failure” are two sides of the same coin, the understanding and exploration of failure helps in recognizing and defining success. The construction industry is known for its chronic problems of fragmentation, low productivity, time and cost over-runs; poor safety, inferior working conditions, and insufficient quality which ultimately leads to project failure and poor construction images [5]. [7] lamented that there are significant issues and challenges in modern construction projects for both project owners and contractors to deliver construction projects successfully due to increasing complexity in design. Construction industries are suffering from issues like projects are not being completed as per the planned time duration and the project failure factors in the project are the main reason of project failure [8]. For a construction company to increase the probabilities of a project success, it is very necessary for the firm to have an understanding of the project failure factors (PFFs), so as to carefully and thoroughly manage the factors. The study of [6] revealed that, in Nigeria the rate of project failure, manifesting as abandonment or uncompleted projects, structural collapse, cost overshoots and client dissatisfaction in both public facilities and private projects, is indeed high.

“Learning from failure is an important concept for all engineering professions. All engineers should be failure literate. Failure literacy aware the engineers of all the things that can risk the construction project success. The key to successful projects is to learn from past project failures and to put those lessons learned into action” [5].

Study on causes of project failure is one of the focal points of most researchers in construction projects which include [8], [5], [11], [12], [13], [14] [10], and [15]. Table 2.3.1 summarised some of the current literature on factors that affects construction projects success at the design and construction stage of building process.

Table 2.3.1: Project Failure Factors identified in literature.

		SOURCES (AUTHORS, YEAR)						
S/No.	**Project Failure Factors (PFFs)**	[6]	[8]	[5]	[11]	[12]	[13]	[14]
1	Poor Preparation				X	X		
2	Inadequate Documentation and Tracking				X			
3	Time priorities		X		X	X		X
4	Inaccurate cost estimation		X	X	X	X		
5	Lack of financial capacity			X		X		X
6	Delays in payment			X		X		X
7	Inefficient resources allocation			X				
8	Shortage of material		X				X	
9	Substandard material				X			
10	Failure to define parameters and enforce them				X	X		
11	Lack of technical experience	X		X		X		X
12	Poor workmanship		X	X			X	
13	Shortage of Labor &Technical Personnel						X	X
14	Poor design	X	X	X		X	X	
15	Frequent design changes			X				
16	Design errors			X				
17	Inexperienced project managers	X			X	X		X
18	Poor Construction Methods					X	X	X
19	Culture or Ethical Misalignment	X		X	X			
20	Poor planning and scheduling			X		X	X	
21	Unclear scope and goals	X		X				X
22	Poor communication at every level of management			X	X	X		
23	Bureaucracy and corruption	X		X				
24	Poor monitoring and tracking			X				
25	Poor site management			X			X	
26	Poor management of expectations			X		X		
27	Subcontractor failure		X	X		X		X
28	Inclement weather	X	X	X		X		

2.4 Construction Project Success

Mostly, the criteria to measure construction project success are time, cost and quality and they play a major role in the building industry. According to [16] measuring the success or performance of any construction project is a very multifaceted process because modern construction projects are generally multidisciplinary in nature which involved participation of designers, contractors, subcontractors, specialists, construction managers, and consultants. Success in a construction project is the achievement of much better results than the expected or normally obtained in terms of cost, schedule, quality, and safety [7]. As stated by [2] the success of construction project depends on technology, process, people, procurement, legal issues, and management knowledge which must be given equal consideration. And this means that, there is a need for a firm or company that involved in building projects to come out with effective strategies on how to guide the project until it become success at the end of the project. Most importantly, adequate attention should be devoted to the client's need for the project to be successful. According to [6] the client's level of satisfaction is a very strong index of project failure or success. In explaining further, [2] opined that, the success of any construction project is connected to two important features, which are the service quality in construction delivered by contractors and the project owner's expectations.

III. Research Method

The list of perceived factors that affects construction project success was used to design a questionnaire which served as the research instrument to achieve the aim of the study. The questionnaire survey was used to examine the degree of importance of each of the 28 project failure factors that affects building project success. Three groups of stakeholders in the Nigerian construction industry were approached to participate in this research, which include Professionals in building industry, Contractors and Clients.

A Pilot study was conducted for the instrument to show the accuracy and extensiveness of the instrument before distributing it to the respondents. As a result of the pilot test, the questionnaire was updated with the input of the professionals, ignoring some of the variables that are idle, adding suggestions from professionals in the built environment and reorganizing questions to achieve a standard questionnaire which gives better result for the study.

The reliability of multiple Likert scale questions was measured using Cronbach's alpha. Using Statistical Package for Social Science version 23 (SPSS), the Cronbach's alpha (α) value obtained was 0.871, which shows a high level of internal consistency for the scale with this specific sample and was considered reliable.

3.1 Research Area

The research was carried out in Lagos, which is economically an important city in Nigeria. Lagos State has a high volume of building construction activities as well as a large concentration of building and engineering contractors of various categories and sizes. The choice of Lagos was also as a result of the numerous records of collapsed building in the state.

3.2 Data Collection

Precisely, snowball sampling technique also known as referral sampling which is a non-probability sampling method [17], was used for the referral network, and the technique is useful in approaching population that is not readily available or present in a very small number [18]. The respondents were asked to rate failure factors that affect a building project success by indicating on a scale from 1 to 5. Table 3.2.1 shows the five-point Likert rating scale values assigned to different options used in the questionnaire.

Table 3.2.1: Ordinal scales for data measurement.

Likert Scale	Weights
Least Important (LI)	1
Slightly Important (SI)	2
Moderately Important (MI)	3
Very Important (VI)	4
Utmost Important (UI)	5

A total of 310 questionnaires were sent out to three groups of respondents – Professionals in building industry, Contractors and Clients. Table 3.2.2 shows breakdown of the survey responses. According to Table 3.2.2, out of 310 questionnaires distributed, 193 were adequately completed and returned, representing a response rate of 62.2%.

Table 3.2.2: Questionnaire Responses

S/No	Respondent Groups	Distributed Questionnaire	Returned Questionnaire	Response Rate (%)	Proportion (%)
1	Professionals in Building Industry	150	105	70	54.4
2	Contractors	80	46	57.5	23.8
3	Clients	80	42	52.5	21.8
4	Total	310	193	62.2	100

3.3 Method of Analysis

3.3.1 Mean Score (MS)

Mean score (MS) method with the Likert scale rating was used to evaluate project failure factors (PFFs) which was also used in the study of [14] to evaluate the factors affecting the success of construction projects in Gaza strip. The study adopted the method to analyse the data collected from the questionnaire survey. Statistical Package for Social Science version 23 (SPSS) was used to calculate the mean score.

3.3.2 Relative Importance Index (RII)

The Relative Importance Index (RII), was used to determine the respondents' perception of the relative ranking of the project failure factors. In order to achieve this, weights for each factor were computed by adding up the weights by the various respondents. The Relative Importance Index is computed as described by [19], [20], and [21] using the following equation:

$$\text{Relative Importance Index (RII)} = \frac{\Sigma w}{(A \times N)} \qquad \text{equation (1)}$$

where w = weights allocated by each respondent in a range of 1 to 5 on the Likert scale, A is the highest weight = 5, and N = the total number of respondents (sample size). The Relative Importance Index (RII) calculated for all factors were ranked in their order of magnitude.

3.3.3 Mean Score Average (MSA)

In order to determine the most PFFs, the "mean score average" (MSA) of mean score (MS), and rankings over the 28 project failure factors was evaluated. The mean score average (MSA) was obtained through the calculation of the combined three MS (that is, the average total mean score of the three groups of respondents). And this was achieved using Statistical Package for Social Science version 23 (SPSS).

3.3.4 Testing Hypothesis

To measure any agreement in ranking of the project failure factors between different parties, a nonparametric test was used, which is Spearman's rank correlation. In this study, the Spearman's rank correlation was used as in the work of [22]. The Spearman's rank correlation coefficient for any two sets of rankings is calculated using the following formula as described by [23].
Spearman's Rank Correlation coefficient between two parties = (R_s)

$$(R_s) = \frac{1 - 6\Sigma D^2}{N(N^2 - 1)} \qquad \text{equation (2)}$$

where D = difference between ranks assigned to variable for each project failure factor, and N = number of pairs of rank. The correlation coefficient ranges from -1.0 to +1.0. By inspection, conclusion can be made whether the correlation is positive, negative, high or low, a 0.70 correlation can be positive and high but not perfect just as a 0.30 correlation can be positive and low [23]. To determine the strength of the relationship between the variables, t-statistics was computed. To test the rank of the correlation coefficient, a t-test at a 95% confidence interval of the null hypothesis (H_0), was used.

Significant testing for the hypothesis is as follows:
H_0: There is an insignificant degree of agreement in ranking of the perceived project failure factors between different parties of the respondents.
H_1: There is a significant statistical degree of agreement in ranking of the perceived project failure factors between different parties of the respondents.

The t-statistics is described in the equation (3) below.

$$t = R_s \sqrt{\frac{N - 2}{1 - R_s^2}} \qquad \text{equation (3)}$$

Degrees of freedom = N – 2 equation (4)

Secondly, analysis of variance (ANOVA) was used to further investigate the data in order to determine whether there is a significant difference between the mean scores of the three groups of respondents on the most project failure factors. The ANOVA test is as follows:
H_0: There is a difference between the mean scores of the three groups of the respondents on the most perceived project failure factors.
H_1: There is no difference between the mean scores of the three groups of the respondents on the most perceived project failure factors.

IV. Results and Discussion

4.1 Demographic Analysis

Table 4.1 below provide the background information of research respondents. As shown in table 4.1, 30.1% of the respondents were between 36 and 40 years old, 23.8% were between 41 and 45 years old, and 24.3% were 46 years old and above. It is also seen that half of the participants (50.8%) have high educational qualification. And these include B.Sc., M.Sc. and Ph.D. Other participants were HND, OND, and probably Secondary School Certificate. In addition, most of the respondents had been in the construction industry from 5 years to 25 years, meaning that the competency of the respondents was adequate for participating in the research survey. According to table 4.1, more than half of the participants (68.4%) held senior managerial position, which include managing director and project manager. Other participants were consultant architect, consultant builder, consultant quantity surveying, consultant mechanical and electrical engineer, project engineer and consultant structural engineer. Furthermore, the majority of respondents (69.4%) had worked mostly in the private sector.

Table 4.1: Demographic Analysis

Background Information	Frequency	Percentage (%)	Cumulative (%)
Age Bracket			
Less than 30years	11	5.7	5.7
30 – 35years	31	16.1	21.8
36 – 40years	58	30.1	51.8
41 – 45years	46	23.8	75.6
46 – 50years	29	15.0	90.7
51years and above	18	9.3	100.0

Total	193	100.0	
Educational Qualification			
OND	19	9.8	9.8
HND	70	36.3	46.1
BSC	68	35.2	81.3
MSC	26	13.5	94.8
PHD	4	2.1	96.9
Others	6	3.1	100.0
Total	193	100.0	
Years of Working Experience			
Less than 5years	13	6.7	6.7
5 – 10years	43	22.3	29.0
11 – 15years	50	25.9	54.9
16 – 20years	34	17.6	72.5
21 – 25years	36	18.7	91.2
26 – 30years	14	7.3	98.4
31years and above	3	1.6	100.0
Total	193	100.0	
Job Title			
Managing Director	59	30.6	30.6
Project Manager	73	37.8	68.4
Consultant Architect	7	3.6	72.0
Consultant Builder	14	7.3	79.3
Consultant Quantity Surveying	10	5.2	84.5
Consultant Mechanical & Electrical Engineer	6	3.1	87.6
Project Engineer	19	9.8	97.4
Consultant Structural Engineer	4	2.1	99.5
Others	1	0.5	100.0
Total	193	100.0	
Type of Business Organization			
Public Sector	59	30.6	30.6
Private Sector	134	69.4	100.0
Total	193	100.0	

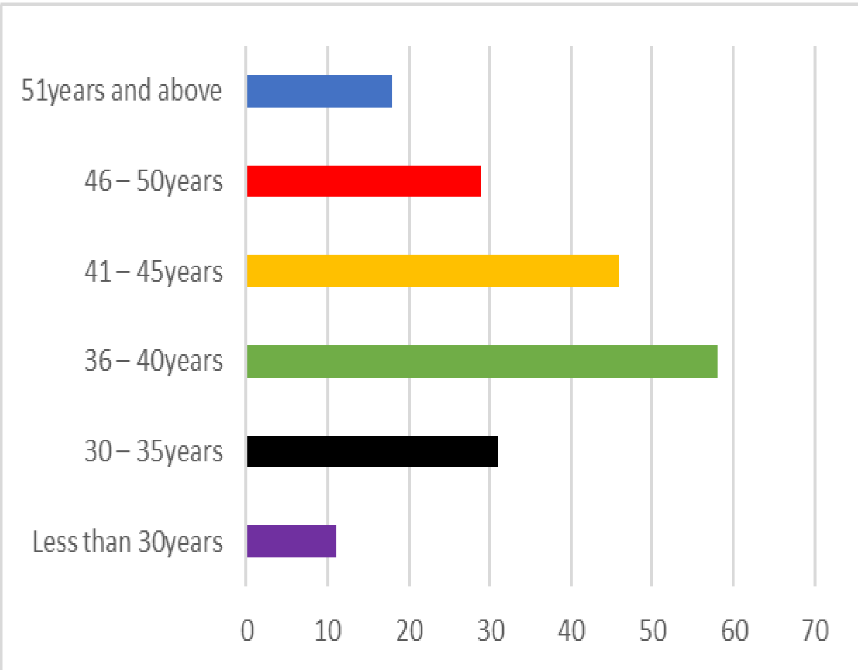

Figure 4.1.1. Respondents Age Bracket.

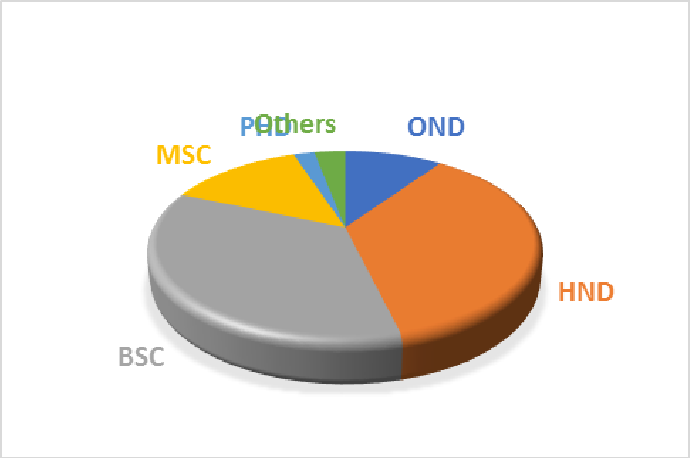

Figure 4.1.2. Respondents Educational Qualification.

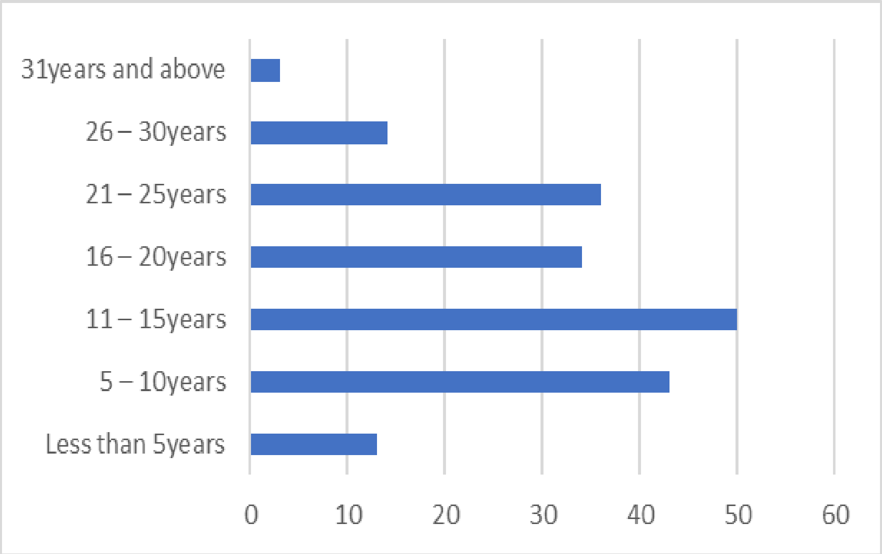

Figure 4.1.3. Respondents Work Experience.

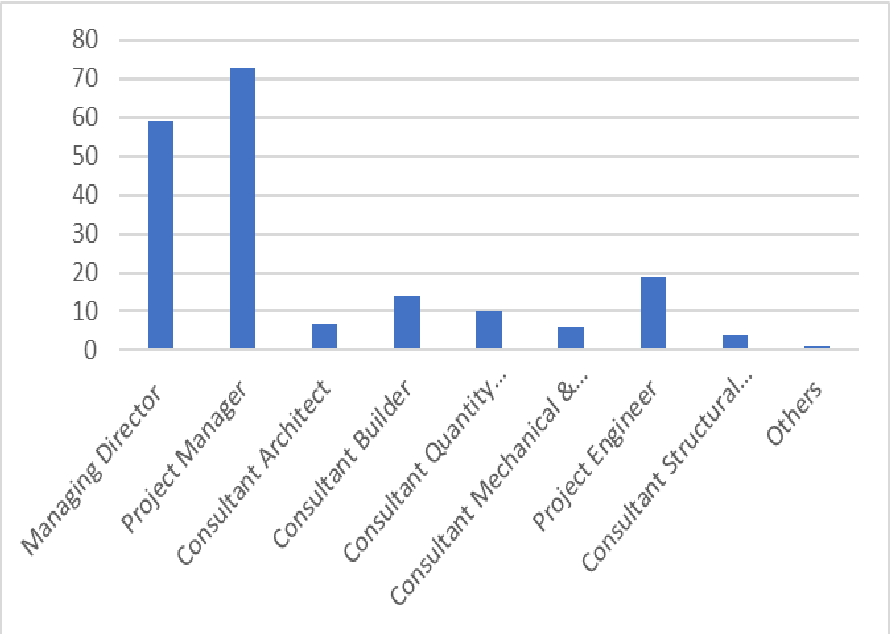

Figure 4.1.4. Respondents Job Title.

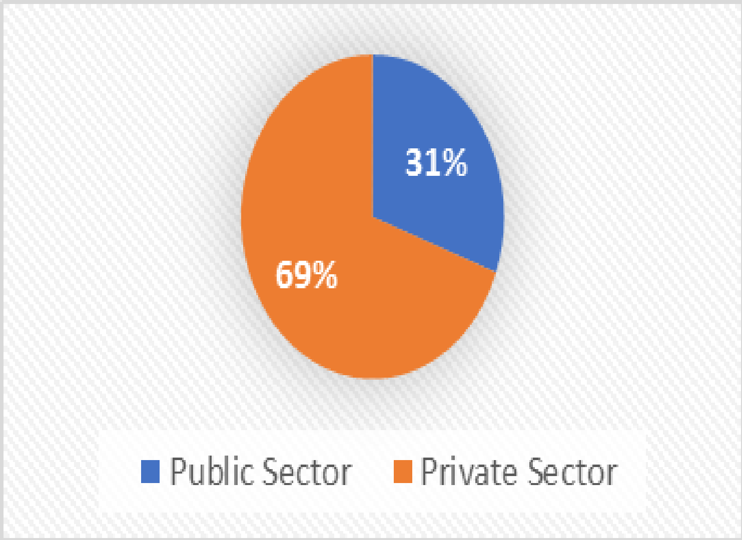

Figure 4.1.5. Respondents Type of Business Organisation.

4.2 Design and Construction Related Project Failure Factors Affecting Building Project Success

Table 4.2 shows the mean scores, relative important indices and ranks of 28 project failure factors during the design and construction phase of building process according to all groups of respondents. Statistical Package for Social Science version 23 (SPSS) and equation (1) are used for this purpose. According to table 4.2, it can be concluded that the agreement on the importance of project failure factors varies among the respondent groups and some failure factors are more significant than others. Unclear scope and goals, culture or ethical misalignment, poor monitoring and tracking, design errors, and poor management of expectations were of interest to survey participants. And these significant factors were ranked as the top five most important project failure factors, with a mean score average relative importance indices of 0.4705, 0.4497, 0.4466, 0.4218, and 0.4218 respectively.

"Unclear scope and goals" was ranked first by all survey participants. This failure factor is important for all interested stakeholders, particularly during the design and construction stage of building process, because it defined the project characteristics to be constructed. [5] and [14] have used this factor to evaluate project success. "Culture or ethical misalignment" was ranked second by all survey participants. This failure factor is significant for all stakeholders in the industry because company culture must consist of competence, pro-activeness, and professionalism and if it doesn't, team members will not be motivated to do their best [11]. "Poor monitoring and tracking" was ranked third by all survey participants. This factor is important because monitoring the progress of work and tracking milestones will enable construction firm to know whether the expectations of the project are being achieved and more importantly proper monitoring helps the project manager to identify where more resources are needed to complete the project [11]. "Design errors" was ranked fourth by all survey respondents. This factor is significant for all stakeholders in the building industry because it is critical and can lead to total collapse of a structure. According to [6] faulty design removes the possibility of having construction projects success, because functionality is misplaced and it could also lead to early decay and sometimes, structural collapse. "Poor management of expectations" was ranked fifth by all survey respondents. This failure factor is also significant for all parties because expectations placed on project must be achieved so as to have a successful end. Meaning that, expectations are the needs for the project and management should not micromanage but provide support to enable project manager work with the expectations placed upon them [11]. In addition, "poor preparation" and "time priorities" were ranked 27th and 28th respectively. This result implies that these project failure factors are less likely to affect building project success than other factors, particularly during design and construction stage of building process.

Table 4.2: Mean Score, Relative Importance Index and Rank for Project Failure Factors

Project Failure Factors	Respondents Group											
	Client			Professional			Contractor			Mean Score Average		
	MS	RII	Rank	MS	RII	Rank	MS	RII	Rank	MSA	RII	Rank
Poor Preparation	1.8571	0.3714	19	1.7048	0.3410	26	1.3913	0.2783	28	1.6632	0.3326	27

Inadequate Documentation and Tracking	2.2381	0.4476	9	1.9714	0.3943	14	1.6957	0.3391	19	1.9637	0.3927	14
Time priorities	1.5238	0.3048	27	1.6381	0.3276	28	1.6304	0.3261	23	1.6114	0.3223	28
Inaccurate cost estimation	1.6905	0.3381	25	1.7714	0.3543	23	1.5652	0.3130	24	1.7047	0.3409	24
Lack of financial capacity	1.6667	0.3333	26	1.8095	0.3619	18	1.5652	0.3130	24	1.7202	0.3440	23
Delays in payment	1.5000	0.3000	28	1.8000	0.3600	21	1.6522	0.3304	22	1.6995	0.3399	25
Inefficient resources allocation	1.9048	0.3810	18	1.8190	0.3638	20	1.7391	0.3478	16	1.8187	0.3637	18
Shortage of material	1.7619	0.3524	24	1.7238	0.3448	25	1.4783	0.2957	27	1.6736	0.3347	26
Substandard material	2.3571	0.4714	7	2.0095	0.4019	13	1.7174	0.3435	17	2.0155	0.4031	13
Failure to define parameters and enforce them	2.2143	0.4429	10	2.0381	0.4076	11	1.8696	0.3739	9	2.0363	0.4073	12
Lack of technical experience	2.0714	0.4143	16	1.7905	0.3581	22	1.7609	0.3522	14	1.8446	0.3689	17
Poor workmanship	1.8333	0.3667	20	1.6857	0.3371	27	1.7609	0.3522	14	1.7358	0.3472	22
Shortage of Labor &Technical Personnel	1.7857	0.3571	21	1.8381	0.3676	17	1.6739	0.3348	20	1.7876	0.3575	19
Poor design	2.1429	0.4286	14	1.9429	0.3886	15	1.8043	0.3609	12	1.9534	0.3907	16
Frequent design changes	1.7857	0.3571	21	1.7619	0.3524	24	1.6739	0.3348	20	1.7461	0.3492	21
Design errors	2.4762	0.4952	4	2.0667	0.4133	7	1.8696	0.3739	9	2.1088	0.4218	**4**
Inexperienced project managers	2.6667	0.5333	2	1.8667	0.3733	16	1.5435	0.3087	26	1.9637	0.3927	14
Poor Construction Methods	2.2857	0.4571	8	2.1048	0.4210	4	1.7826	0.3565	13	2.0674	0.4135	8
Culture or Ethical Misalignment	2.3810	0.4762	5	2.2857	0.4571	2	2.0435	0.4087	3	2.2487	0.4497	**2**
Poor planning and scheduling	2.1905	0.4381	12	2.0286	0.4057	12	1.9565	0.3913	6	2.0466	0.4093	10
Unclear scope and goals	2.5238	0.5048	3	2.3429	0.4686	1	2.2174	0.4435	1	2.3523	0.4705	**1**
Poor communication at every level of management	2.0714	0.4143	16	2.0667	0.4133	7	2.0000	0.4000	4	2.0518	0.4104	9
Bureaucracy and corruption	2.2143	0.4429	10	2.1048	0.4210	4	1.8913	0.3783	8	2.0777	0.4155	7
Poor monitoring and tracking	2.7381	0.5476	1	2.1333	0.4267	3	2.0000	0.4000	4	2.2332	0.4466	**3**
Poor site management	2.3810	0.4762	5	2.0476	0.4095	10	1.9130	0.3826	7	2.0881	0.4176	6
Poor management of expectations	2.1905	0.4381	12	2.0667	0.4133	7	2.1304	0.4261	2	2.1088	0.4218	**4**
Subcontractor failure	1.7857	0.3571	21	1.8095	0.3619	18	1.7174	0.3435	17	1.7824	0.3565	20
Inclement weather	2.1190	0.4238	15	2.0952	0.4190	6	1.8696	0.3739	9	2.0466	0.4093	10

4.3 Degree of Agreement among the Respondent Groups

Spearman's rank correlation was used in the study to determine whether there was a significant level of agreement among the three groups of the respondents. Equation (2), (3) and (4) were used for this purpose. Table 4.3 shows the degree of agreement between any two groups of the survey participants with respect to the ranking of the 28 project failure factors in the design and construction stage of building process. The results of the computation of Spearman's rank correlation coefficients revealed that there is a strong positive degree of agreement between professionals in construction industry and contractors, between professionals in construction industry and clients and between contractors and clients with a t-statistics of 7.0662 (Rs = 0.8109), 6.1559 (Rs = 0.7701), and 4.0505 (Rs = 0.6220) respectively, and which is greater than the t-critical value (two-tail) at 0.05 significant level. Therefore, there is a significant degree of agreement in ranking of the perceived project failure factors between different parties of the respondents.

Table 4.3: Spearman Rank Correlation Between Respondents for PFFs

Respondents in Pairs	Rs	t-Statistics	t-Critical two-tail	Degree of Freedom	Reject H_0?
Professionals in construction industry and Contractors	0.8109	7.0662	2.056	26	Yes
Professionals in construction industry and Clients	0.7701	6.1559	2.056	26	Yes
Contractors and Clients	0.6220	4.0505	2.056	26	Yes

4.4 Analysis of Variance (ANOVA)

ANOVA test was used to examine the perception of respondents on the most project failure factors (PFFs). A one-way ANOVA test was conducted to determine whether the mean scores among the groups of respondents were statistically significant or not. Table 4.4 shows the results of the ANOVA, analysed using the SPSS 23, for the most important PFFs. The study rejected the null hypothesis (H_0) at a 95% confidence and accept $H_{1,}$ because there is a statistically significant evidence that F-statistics is greater than F-critical value, meaning that there is no difference between the mean scores of the three groups of the respondents on the most perceived project failure factors. Therefore, the study concluded that the three groups of respondents (professionals in construction industry, contractors and clients) share the same opinion on the importance of the most project failure factors (PFFs) that affects building project success during the design and construction stage of building process.

Table 4.4: One-Way ANOVA Test on the Most Important Project Failure Factors

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F critical*
Between Groups	1.274112	2	0.637056	10.46135	9.09E-05	3.109311
Within Groups	4.93259	81	0.060896			
Total	6.206702	83				

V. Conclusion and Recommendation

Success in building project depends on many factors. Identification and documentation of various project failure factors, predominantly in terms of the design and construction stage of building process at the beginning of the project, can actually help interested stakeholders in the construction industry to determine significant factors that should be given special and adequate attention in order to ensure success of building project. Project failure factors can be considered to be a means to improve the effectiveness of building project. This paper provides insight into the project failure factors affecting building project success, concentrating on the design and construction phase in the context of building project management. Finally, Stakeholders in the building industry should be failure literate and project failure literacy aware the parties of all the things that can risk the building project success.

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