

Factors Affecting Quality of Building Construction Projects in Informal Settlements within Nairobi City County, Kenya

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Abstract: - Construction industry plays a major role in the development and achievement of society's goals, contributing to about 10% of the Gross National Product (GNP) in industrialized countries and, it constitute 60-70% of the national wealth and about 20% of the annual wealth creation in less developed countries. Despite of the weight given to the construction industry, quality of construction projects has been questioned as indicated by widespread collapse of building structures in Kenya. This study sought to find out factors contributing to the quality of construction projects with the focus on the effects of technical factors and economic factors. A descriptive research design was adopted. The target population of 412 completed and ongoing projects was used, which had a workforce of 1678, from which a sample of 30% (503) was selected. Primary data was collected using questionnaire. Statistical Package for Social Statistics V 22.0 was used to analyses the data. Descriptive statistics indicated study variables were very important as shown by high values of mean and the opinions of respondents had low variations as shown by low values of standard deviation. The study findings indicate that technical factors and quality of the construction projects are positively and significantly relate ($r=0.145$, $p=0.005$) and economic factors and quality of construction projects are positively and significantly related ($r=0.076$, $p=0.001$). The study concludes that technical and economic factors contribute to the quality of construction projects in informal settlement and should be given weight they deserve. The study recommends that the government should ensure there is documentation and enforcement of the policies, systems, processes and procedures to help the construction practitioners manage construction work effectively.

Key words: Quality projects, construction project, economic factors, technical factors, Informal settlement.

I. INTRODUCTION

The Construction industry contributes significantly in the development and achievement of society's goals. Kenya facts and figures report (2014) indicate that construction industry contribute significantly to the GDP, indicated in percentage for the years 2010 to 2013 as 3.8%, 4.1%, 4.2% and 4.4% respectively. In addition construction industry contribute to the growth of the economy, indicate for the year 2010 to 2013 as 2.7%, 3.4%, 3.7% and 4.1% respectively.

Quality of building construction can be viewed from different perspective. Jurbe (2014) indicated that clients perspective of

quality in building construction involve "pleasing to look at, free from defects on completion, fit for the purpose, supported by worthwhile guarantees, satisfactory durability and customer delight". Jergeas et al. (2000) and Cheung et al (2015) defined performance of construction projects in terms of standard of quality, health and safety and cost efficient. Construction delay is generally acknowledged as the most common costly, complex and risky problem encountered in construction projects which affect the quality of such projects (Kharas et al 2014); on the other side Kenny (2007) study showed that some buildings construction take shorter time than expected to complete the projects which compromise on the structural strength. The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgment (Brennan, 2002). Challenges and problems faced by the construction industry in most countries that leads to the delivery of projects of poor quality standards include weak capacity, corruption and embezzlement, finance related issues like budget and funding, procuring design quality, material quality, planning challenges, cultural, human resources and construction performance issues (Tounga, 2015).

Because of the significant contribution of the sector to the Kenyan economy, the government of Kenya has come up with different measures (such as building inspection authority and regulations) to ensure quality of building construction projects. Canningham (2013) indicated that there is a high profiles building failures, which has strengthened the public concern expressed in different reports such as Egan Report's findings which indicated that 30% of building failing to meet the expectations of their owners. Faridi and El-Sayegh (2006) study indicated that shortage of skills of manpower, poor supervision and poor site management, unstable leadership, shortage and breakdown of equipment among others contribute to construction delays in most developed countries. Hanson et al (2003) examined causes of client dissatisfaction in building construction industry and found that conflict, poor workmanship and incompetence of contractors to be among the factors which negatively impacted on project quality.

More than half of the buildings being put up across the country (Kenya) are not safe for occupation (Nyakiongora,

2015). Out of 7,835 building construction sites visited by NCA, only 4,500 are registered, meaning a third of the buildings (about 5,000) coming up are not approved for quality (www.stadardmedia.com). According to Nyakiongora (2015), 84 per cent of people doing the construction of projects across the country are not trained. He added that about 52 per cent of the buildings in Nairobi have a problem and in year 2014, there were 17 buildings that collapsed across the country, among them residential houses. It is in light of the above aspect that the researcher finds a need to carry out a research on the social-economic and technical influence on the quality of building construction projects in informal settlements in Nairobi City County.

II. LITERATURE REVIEW

Theoretical Review

Diffusion on Innovation (DOI) Theory

The study was anchored on diffusion on innovation (DOI) theory (Roger, 1962). The main emphasis of DOI theory is how, why, and at what rate new ideas and technology spread through cultures, operating at the individual and firm level. DOI theory sees innovations as being communicated through certain channels over time and within a particular social system (Roger, 1962). Individuals are seen as possessing different degrees of willingness to adopt innovations, and thus it is generally observed that the portion of the population adopting an innovation is approximately normally distributed over time. Breaking this normal distribution into segments leads to the segregation of individuals into the following five categories of individual innovativeness (from earliest to latest adopters): innovators, early adopters, early majority, late majority, laggards. Those projects that are late adopters of technology tend to have trouble securing the support and participation of the stakeholders (Nyandika and Ngugi, 2014). Based on DOI theory at firm level (Nyandika and Ngugi, 2014), stated that innovativeness is related to such independent variables as individual (leader) characteristics, internal organizational structural characteristics, and external characteristics of the organization. Individual characteristics describe the leader attitude toward change. When the leader is flexible and ready to accept change, the stakeholders' opinions are put into practice since the leader does not value his/her opinions above those of the stakeholders'. Internal characteristics of organizational structure includes observations according to Tabish & Jha (2012) whereby: "centralization is the degree to which power and control in a system are concentrated in the hands of a relatively few individuals"; "complexity is the degree to which an organization's members possess a relatively high level of knowledge and expertise"; "formalization is the degree to which an organization emphasizes its members' following rules and procedures"; "interconnectedness is the degree to which the units in a social system are linked by interpersonal networks"; "organizational slack is the degree to which uncommitted resources are available to an organization";

"size is the number of employees of the organization". This organization of a firm based on the DOI theory highlights the aspects that instigate support from stakeholders through effective management in order to realize end results.

Empirical Review

Quality of Building Construction Projects

A project may be completed on time and within budget, but unless it achieves the specified quality or performance criteria it will be considered to be a disappointment or even an outright failure (Cunningham, 2013). According to Ashworth (2004) project performance can be associated with five attributes including: appearance, quality, function, durability and maintenance. He adds that "these are matters addressed in the specification, which must be adequate and must be constructed by experienced contractors under competent supervision". He noted that inadequate design and/ or incorrect specification leads to poor performance. The quality of the building will express the clients' ambitions for a prestigious development (Cunningham, 2013). Clamp et al. (2008) noted that it is essential to use high quality materials in construction projects or where planning conditions have been imposed. Cunningham (2013) noted that project should be effective for the purposes for which it is intended. A well designed project will impact upon the satisfaction, comfort and wellbeing of its occupants and if it is a commercial building, upon their productivity and performance where the quality should be the overriding consideration'.

Contribution of Technical Aspects on Quality of construction projects

The building designers aim to produce an effective and attractive spatial and structural solution to the client's brief. This should provide sufficient, well planned accommodation, using appropriate materials, components, equipment, fittings and furnishings to enable the building to perform effectively and efficiently (Cunningham, 2013). Ideally a technical perform should generate a sense of delight amongst its users and the public at large. Ashton (2004) indicated that specifications of building construction projects must be developed by a technical expertise/ a contractor who has enough experience and under supervision of competent personnel. According to Clamp et al (2008) high standards of craftsmanship is required on alterations and extensions to listed or historic buildings. With increasing higher users requirements, environmental awareness and limited resources on one side, and high competition for construction business market place on the other side, contractors have to be capable of continuously improving their performance (Samson and Lema, 2005).

Technology is an aspect of the environment that should be considered in developing strategic plans. Oladapo and Olotuah, (2007) maintained that the appropriate construction technology can be measured by the availability of locally made plant and equipment, skilled manpower resources,

extent of local material resources and the degree of utilization of such local construction resources. The lack of technology know-how and the shortage of managerial manpower are considered to be one of the major problems and constraints facing the nation (Samson and Lema, 2005). Cheung et al (2015) stated that most of the developing countries still remain a net importer of technical manpower and technology necessary for construction work. Architects with high qualifications and experience have high demand for clients seeking approval of the building construction projects.

Contribution of Economic Aspects on Quality of construction projects

Balancing quality and cost for projects calls upon economic analysis (Cunningham, 2013). Clients with commercial building must make economic sense, however, Ashworth (2004) reported that architects, quite naturally, are reluctant to drop quality standards and compromise their 'brand' to reduce costs and which make it difficult for the quantity surveyor to control costs in these circumstances. A study done by Cunningham (2013) indicated that most clients would prefer building design which is economic in order to award a contract. Such designs are not always the ones which would give the quality required.

The materials specified and the proposed construction details will have an important bearing on the cost of the building project (Cunningham, 2013). Buildings which incorporate

high quality and/or innovative features are invariably more expensive than those which are purely functional. The choice of the material and hence the cost, may be influenced by factors other than aesthetic qualities (Cunningham, 2013). Therefore the materials should be appropriate for their use and within specification to avoid wasteful and to ensure quality buildings. Nevertheless, the ability to attract labour and to source materials in the locality is an important factor in ensuring that unnecessary travelling and transport costs are not incurred in carrying out the work. Seeley (1996) notes that contractors need to consider whether management, labour and plant resource requirements can be met from within the contractors own organization or whether it will be necessary to recruit specifically for the project. A challenging task for any project manager is to ensure that a project is financially viable within a fluctuating economic environment (Odeh and Battaineh (2002) and since periodic economic cycles significantly affect the activities of the construction industry, accurate forecasting of economic trends both local and global is important (Oladapo and Olotuah, 2007).

Conceptual Framework

Conceptual framework is a detailed description of the phenomenon under study accompanied by a graphical or visuals depiction of the major variables of the study (Kothari, 2004). The conceptual framework below shows the relationship between the dependent and independent variables.

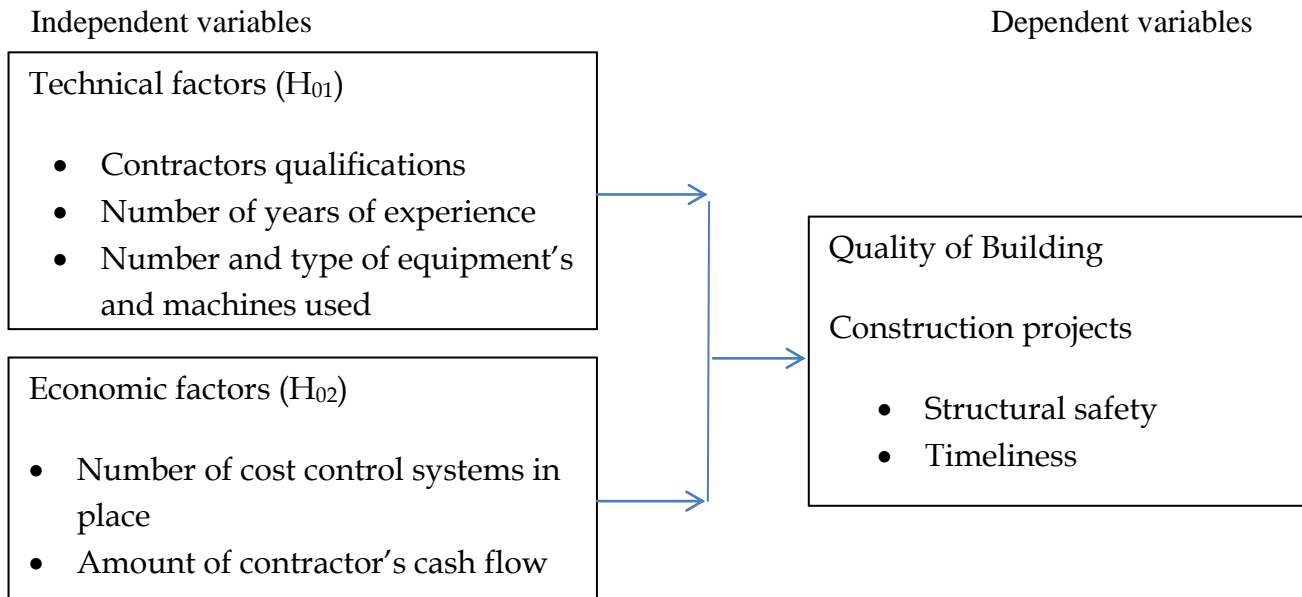


Figure 2.1 Conceptual Framework

Research Hypothesis

The following hypotheses were used to test the relationships depicted in the study objectives:

H₀₁: Technical factors has not contributed to the quality of construction project in informal settlement in Kenya

H₀₂: Economic factors has not contributed to the quality of construction project in informal settlement in Kenya

III. METHODOLOGY OF THE STUDY

Positivism is a philosophy of science that seeks facts of social phenomena with little regard for the subjective status of an individual (Hargrove, 2004). The study was anchored on positivist philosophy which advocates for an objective interpretation of reality using hard data from surveys that are structured, formal and have a specific and detailed plan. The study employed a descriptive research design which enables the development of relationships between variables and the development of generalization of principles and theories that have universal validity. The sampling frame was derived from the ministry of works for the building constructions in informal settlements in Nairobi City County from the year (2011 to 2015) which formed a target population of 412 building construction projects.

Table 3.1 Target Population

Informal Settlements in Nairobi City County	Number of Buildings	Percentages (%)
Lang'ata	53	12.8
Makandara	78	18.6
Pumwani	36	8.6
Kasarani	45	10.7
Kibera	32	7.6
Embakasi	60	14.5
Dagoreti	46	11.1
Central	62	15.0
Total	412	100

Source: Ministry of Works Report (2017)

Purposive sampling was used to select informal settlements as the study site. The key informants were building clients, contractors, community representatives (area chief and sub-chief) as well as technical and inspectorial employees of building construction department.

It was assumed that each building within the targeted area has one client and one contractor. This means that the respondents will comprise of 18 technical employees, 12 building inspectors, 412 building clients/ owners, 412 building contractors and 824 community representatives. This gives a total of 1678 possible respondents for this study. Stratified simple random technique will be used to select 30 percent of the target group (Patton, 2002) to give a sample size of 503.

Questionnaire was used to obtain the primary data and it was distributed through drop and pick method. Piloting was carried out using ten respondents who did not participate in the final study to test validity and reliability of the instrument. Reliability tests in SPSS Version 22 used the Cronbach's alpha and gave a value which was greater than 0.7 as shown in table 3.2 which indicated the instrument was reliable according to Mugenda and Mugenda (2013).

Table 3.2: Reliability Test Results

Variable	No. of Items	α = Alpha	Comment
Technical factors	6	0.823	Acceptable
Economic Factors	6	0.789	Acceptable
Quality of construction project	6	0.823	Acceptable

The data obtained during piloting was also used for diagnostic test for normality test and multicollinearity test. Normality test was done using Kolmogorov-Smirnov test since the sample size (503) is large. The p-value of 0.55 was obtained indicating distribution was normally distributed. Multicollinearity was determined using Variance Inflation Factors (VIF) and tolerance. For tolerance, all the values obtained were greater than 0.1 while all the values of VIF were less than 10 indicators of lack of multicollinearity between explanatory variables.

The descriptive statistics including frequencies, percentages, mean and standard deviation were used and inferential statistics including correlation and regression were used to test the hypothesis. Pearson Correlation analysis was used to show the strength of the relationship between independent variables (economic and technical factors) and dependent variable (quality of building construction projects); while multiple linear regression models indicated the nature of the relationship between the study variables (Kothari, 2007); t-statistic was used to determine the relative importance of each independent variable in influencing quality of building construction projects. The f-test was used to measure the significance of the whole model. The study will employ 5% level of significance.

The general empirical model used in the study was:

$$QCP = \beta_0 + \beta_1 TF + \beta_2 EF + \varepsilon$$

Where:

QCP = Quality of Construction Projects

TF = Technical factors

EF = Economic factors

β_0 = The constant term for each project (fixed effects)

$(\beta_1 = 1,2)$ = coefficients used to measure the sensitivity of the dependent variables (Y) to a unit change in the corresponding independent variable.

ε = Composite error term (the residual error of the regression).

Ethical consideration including informed consents, confidentiality of information and use of anonymity was obtained prior to collecting the data. Permit was also obtained from National Commission of Science Technology and Innovation (NACOSTI).

IV. RESULTS OF THE STUDY

The researcher distributed a total of 503 questionnaires from which 460 which formed 91% response rate were returned. On demographic analysis of the responses it was shown that 75% of the respondents were male and 25% were female demonstrating that majority of the respondent were male. Analysis of the respondent age bracket, indicated that majority 39% of the respondents aged from 25 -35 years followed by 26% were aged from 36 – 45 years, 21% were aged above 45 years and finally 14% were aged between 18-25 years. This shows a middle aged workforce at the construction companies. The analysis on the education level of the respondents indicated that majority (42%) of the respondents had Diploma followed by 32% with Bachelor degrees, 18% had Master Degrees, 5% had PhD and finally 3% had done Certificate qualification. This shows a workforce which may lack required technical knowhow required in construction work. The results found that among the respondents 36% had been in employment in construction work for 5-10 years, 32% had worked between 1-5 years, 24% had worked in more than 10 years and finally 8% had worked for less than 1 year. Looking at the trend, it is apparent that there is lack of enough experienced work force working in construction projects.

Descriptive Statistics

SPSS Version 22 was used to calculate descriptive statistics for the study variables. The questions in the questionnaire

used a likert scale of 5 and the findings for the mean and the standard deviation were as in Table 4.1 below:

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev
Technical factors	3.8	1.1
Economic factors	3.6	1.3
Quality of construction projects	3.3	1.2

Table 4.1 shows that the mean for technical factors was 3.8, that for economic factors was 3.6 and that of quality of construction projects was 3.3. These values are very high for a likert scale of five indicating that the study respondents perceived these variables to be very important in the construction projects in informal settlement. The low values of standard deviation which was 1.1, 1.3 and 1.2 respectively showed that respondents' opinion did not depict high variations.

Model Testing

The study used multiple linear regression analysis to test the hypothesis. The tests were done in SPSS at 5% significant level. The hypotheses were of mono-directional in nature hence a one-tailed test was used in order to determine their level of significance.

A regression analysis was done and the results are shown in table 4.2

Table 4.2: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.811a	0.658	0.568	0.49217

Predictors: (Constant), Technical, Economic

The results presented in table 4.2 present the fitness of model used of the regression in explaining the study phenomena. Both technical factors and economic factors were found to be satisfactory variables in explaining quality of construction projects in informal settlement. This is supported by

coefficient of determination (R Square) of 66%. This means that the model may be used to explain 66% of the variations in the dependent variable. Further testing of the model using analysis of variance (ANOVA) was done and the results in table 4.3.

Table 4.3: Analysis of Variance

	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.53	4	1.6325	6.3373	.000
Residual	82.421	320	0.2576		
Total	88.951	324			

As table 4.3 shows Analysis of the Variance (ANOVA) results indicate that the overall model was statistically significant ($p < 0.000$) and very strong F statistic of 6.3373.

The regression coefficients for the individual variables are shown in Table 4.4.

Table 4.4: Regression of Coefficients

	Un standardized coefficients		Standardized Coefficients		t	Sig.
	β	Std. Error	Beta			
(Constant)	1.321	0.387			3.212	0.001
Technical factors	0.145	0.054	0.145		2.943	0.005
Economic factors	0.076	0.044	0.110		2.122	0.001

As the table 4.4 shows, technical factors and quality of construction projects are positively and significantly related ($r=0.145$, $p=0.005$). Also economic factors and quality of construction projects are positively and significantly related ($r=0.076$, $p=0.001$).

From the above results the optimal model may be given as:

$$QCP = 1.321 + 0.145TF + 0.076EF$$

Where:

QCP = Quality of Construction Projects

TF = Technical factors

EF = Economic factors

Hypothesis Results

Technical Factors and Quality of Construction Projects

Hypothesis H_{01} stated that technical factors have not contributed to the quality of construction projects. Results in table 4.4 show that the p-value is $0.005 < 0.05$. This indicates that the null hypothesis is rejected and hence technical factors contribute to the quality of the construction projects in informal settlement in Nairobi County. This finding is consistent with the findings by Clamp et al (2008).

Economic Factors and Quality of Construction Projects

Hypothesis H_{02} stated that Economic factors have not contributed to the quality of construction projects. Results in table 4.4 show that the p-value is $0.001 < 0.05$. This indicates that the null hypothesis was rejected hence economic factors contributes to the quality of construction projects in informal settlement in Nairobi County. This finding is consistent with the findings of the study carried out by Cunningham (2013).

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

Technical Factors and Quality of Construction Projects

The first objective of the study was to establish the contribution of technical factors of the quality of construction projects. Regression results revealed that technical factors have a positive and significant effect on quality of construction projects in informal settlement in Nairobi County. This means that increases in technical aspects of the

projects lead to improved quality. This finding is consistent with that of Oladapo and Olotuah (2007).

Economic Factors and Quality of Construction Projects

The second objective of the study was to determine the contribution of the economic factors to the quality of construction projects in informal settlement in Nairobi County. Regression results reveal that economic aspects have positive and significant effects on quality of the projects. This means that improve economic factors leads to improvement in quality of the projects. This finding agrees with that of Nyakiongora (2015).

Conclusion

The overall objective of this study was to establish the contribution of the technical and economic factors to the quality of construction projects in informal settlement in Nairobi County. Based on the findings, the study concludes that technical factors are related to the quality of construction projects. Specifically, contractors qualification, number of the years of experience and the type of the machines and equipment used in construction would significantly determine the quality of the final project. It has been noted that to a large extent there has been project managers who lack competence in technical knowhow and hence do not properly supervise the construction hence leading to compromise on the quality of the products. In addition, as much as current technology has been used, people lack experience in the use of new technology. The study also concludes that economic factors significantly affect the quality of construction projects. Precisely, quality control systems have not been utilized properly such as making sure all the necessary approvals have been sought. Most contractors have been compromising on the quantity and quality of the materials required during construction stage thus bringing threat in the structural safety.

Recommendations

The studies recommend that:

- The government should make sure that the policies informing building construction projects should be reinforced so that to reduce cases of collapsing.
- Academician should do more investigation in relation to performance of building construction projects and give recommendations on how cases of collapsing building can be reduced.

REFERENCES

- [1]. Cheung, O. and Suen, K. (2015). Impact of Environmental Factors on Building Project Performance in Delta State, Nigeria.
- [2]. Cunningham, T. (2013). Factors Affecting the Cost of Building Work. Dublin Institute of Technology
- [3]. Hargrove, J. (2004) positivism, critical inquiry and constructivism: Three theoretical Approaches and their use in studying interdisciplinary Design Education. *Analytical Essay*. DDN 702.
- [4]. Jergeas, G.E., Williamson, E., Skulmoski, G.J., Thomas, J.L., 2000. Stakeholder management on construction projects. *AACE International Transactions* 12, 1–5.
- [5]. Kothari C. (2004) *the Research Target*, 7th Edition, Butterworth Heinemann, New Delhi, India
- [6]. Mugenda, O. M and Mugenda, A.G.(2003). *Research Methods: Qualitative and Qualitative Approaches*. African Centre for Technology Studies, Nairobi, Kenya.
- [7]. Müller, R. & Jugdev, K. (2012). Critical success factors in projects Pinto, Slevin, and Prescott – the elucidation of project success. *International Journal of Managing Projects in Business*, 5(4), 757-775
- [8]. Mutisya, E and Yarime, M. (2011). Understanding the Grassroots Dynamics of Slums in Nairobi: The Dilemma of Kibera Informal Settlements. *International Transaction Journal of Engineering, Management and Applied Science and Technologies*
- [9]. Nyandika, O. F. & Ngugi, K. (2014). Influence of Stakeholders' Participation on Performance of Road Projects at Kenya National Highways Authority. *European Journal of Business Management*, 1 (11), 384-404.
- [10]. Patton, M., (2008). *Qualitative Evaluation and Research Methods*. Sage Publications, Newbury Park California
- [11]. Raceca (2013). *The Major Road Network: Eighth Report of Session 20012-13*. Available at: www.raceca.co.ke Accessed on 7th July 2016).
- [12]. Rogers, E. (1962). *Diffusion of Innovations*, 1st Edition. Simon and Schuster. ISBN 978-0-7432-5823-4.
- [13]. Saunders, M., Lewis, P and Thornhill, A. (2009). *Research Methods for Business Students* (5th Ed.). Harlow: Pearson Education Limited.
- [14]. Tabish, S., & Jha, K. (2012). Success Traits for a Construction Project. *Journal of Construction Engineering & Management*, 138(10), 1131-1138.