

“A Study of Factors Affecting Quality of Construction Project”

Surabhi Anant Patil, Dr Anita Nag, Prof. H.B. Dahake

*Master of technology in construction engineering and management
Department of civil engineering, G.H. raisoni university, amravati,*

Submitted: 20-06-2022

Revised: 29-06-2022

Accepted: 01-07-2022

DECLARATION

I certify that

- The work contained in the dissertation is original and has been done by myself under the general supervision of my supervisor.
- I have followed the guide lines provided by the Institute in writing the dissertation.
- I have conformed to the norms and guidelines given in the Ethical Code of Conduct of the Institute.
- Whenever I have used materials (data, theoretical analysis, and text) from other sources, I have given due credit to them by citing them in the text of the dissertation and giving their details in the references.
- Whenever I have quoted written materials from other sources, I have put them under quotation marks and given due credit to the sources by citing them and giving required details in the references.
- The dissertation has been subjected to plagiarism check using a professional software and found to be within the limits specified by the University.
- The work has not been submitted to any other Institute for any degree or diploma

ACKNOWLEDGEMENT

I would like to acknowledge my deep sense of gratitude to Dr Anita Nag Dissertation Guide and Head of Department of Construction Engineering & Management G H Raisoni University, Amravati for his guidance and encouragement. He gladly accepted all the pains in going through my work again and again and gave me opportunity to learn essential research skills. This dissertation would not have been possible without his insightful and critical suggestions, his active participation in constructing right models and a very supportive attitude. I will always remain grateful to him for giving right direction to my research study.

I express my sincere thanks to the Hon. Vice Chancellor, Dean Student Affairs, Dean Academics, for providing the necessary facilities for carrying out the research work and for

providing me with their timely suggestions. I express my sincere thanks, to Dean, School of Engineering and Technology. I express my sincere thanks to all the staff members of G H Raisoni University and my classmates who have provided their valuable time, support and cooperation during the research work.

Last but not least, I would like to acknowledge the support of my parents and my siblings for their continuing support and encouragement.

ABSTRACT

The project helps future projects to reduce construction errors, minimize repairs and improve safety. Customer satisfaction is known as a quality dimension in construction and as an important factor that represents the success of a project. Customer satisfaction can also be seen as a means to expand the building process and a tool for mutual learning. It is the job of the construction industry to offer customers facilities that meet their needs and expectations. One of the principles of logistics is a management philosophy that effectively determines the needs of customers. By ensuring operational quality at every stage of the construction process, care must be taken to ensure that the quality of the end product satisfies the end customer.

Keywords- SPSS statistic, data analysis, relative importance index and methods etc.

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Construction industry plays a major role in development and achievement of the goals of society; it's considered as one of the largest industries. Generally, construction works are increasing rapidly to meet the growing needs of the population and to keep up with global development. To progress in terms of construction, project construction must be studied carefully and prepared well in order to get the best results, and to

help in moving in the right direction to establish the future goals. Quality of projects can be defined as: "meet customer expectations" or "meet customer specifications". For a user, quality is a satisfaction with the appearance, performance and reliability of the project for a certain price range. In the area of project management, the scheme, costs and quality are also referred to as the iron triangle. This results in a half-hearted attempt to achieve quality at project locations. The quality problems in construction are different and varied. The build quality is based on the characteristics of the organization, the working method and the contractor follows the drawings and specifications under defined budgets, fitness for work, quality of materials and applied equipment. This industry is often visited with incidental delays and disruptions, resulting in time and cost overruns. These delays and disruptions are sources of potential risks that are being investigated in current studies in ways to manage, such as technical, social, economic, legal, financial, moderate, architectural and commercial.

The construction sector is known as a time-consuming and material-exhausting industry, due to the complexity and volatility caused by divergent needs, wishes and preferences. No investor would invest in a project that seems to last forever, with an indefinite cost or budget. So there is a direct co-relationship between time and costs of the project. The importance of customer / customer satisfaction has been investigated by many researchers in the construction sector. Therefore, customer satisfaction is a fundamental problem for construction participants who must constantly try to improve their performance if they want to survive in the presence of the concept of globalization of construction services. Customer requirements are changing rapidly in response to changing organizational and market requirements. New procedures and solutions are needed to meet the growing demands and high standards. Researchers worldwide indicate that most projects do not realize their mission within the set time and costs United Kingdom (UK) in 2010; statistics found that 52% of projects had cost overruns of more than 10%, while 45% of projects had time overruns of more than 25%. The same study showed that similar studies in India have shown that 56% of projects had cost overruns of more than 20%, while 49% had overruns of more than 1 to 160 months. Projects were initiated by kings and other leaders to set up monumental projects to build a name for themselves and their future generations. Old structures had no time limit or cost reduction.

Moreover, the development of the construction sector in developing countries is far behind other industries in those countries compared to developed countries. The nature of the sector is considered very complex because it involves many stakeholders such as owners, contractors, consultants, supervisors and suppliers. Each construction project is unique and that is due to its nature based on size, budget, material, location, weather conditions and manpower. The goal of all construction projects, however, is to build projects on time, within budget, with the indicated quality standards and within a healthy and safe environment. Research has shown that 20% of these construction projects do not reach their goal due to over-programming, delays or cost overruns that can endanger any construction project. The construction project became more difficult to achieve the project objectives; previous studies have shown and proved that the failure of a project is mainly related to the problems and the failure of the performance. There are many reasons and factors that characterize this problem and appear in different directions, many projects that have been finished with poor performance due to many evidence reasons such as: customer obstacles, non-availability of materials, road closure, design changes and drawing, extra work, waiting for the decision, handing over, order of changes, changes in quantity quantities and delay in receiving drawings. Setting up and achieving acceptable quality levels in construction projects has long been a problem, the failure of a construction project is mainly related to the problems and the failure of performance. Moreover, there are many reasons and factors that attribute such a problem. In developed countries, quality problems occur in large construction projects for a variety of reasons, such as: incompetent designers / contractors, poor estimation and change management, social and technological problems, site-related problems and inappropriate techniques and tools. A control system is an important element to identify factors that influence the project effort. It is clear that there is a need for growth in the construction sector in India to match the developed economy. The amount of research that is already being conducted to investigate quality defects and their causes in construction projects. Previous studies have paid attention to factors that influence the performance of construction projects, but those studies have paid little attention to the quality of construction projects in the province, causing a lack of gaps in the existing literature. This study will tackle the above gap by tackling the quality of construction projects. This study therefore looked for the factors

that influence the quality of construction projects in the province.

1.2 Purpose of the study

The aim of the study is to investigate factors that influence the quality of construction projects in Maharashtra. It is very necessary to know which factors are important for the quality of the construction and how much the quality is influenced by factors. This study is more useful for creating quality awareness for construction companies.

1.3 Objectives of the study

The aims and objectives of this research project are to:

- To identify and evaluate various factors affecting the quality of construction projects.
- To analyze the factors and ranking the factors according to relative importance.
- To give suggestions and recommendations to improve the performance of the industry.

1.4 Significance of the study

The research is important because it wants to shed more light on factors that influence the quality of construction projects. The study is intended for applicability by various users or stakeholders, such as government agencies, architects, quantity investigator, project managers, contractors, general public, building management authority, financial institutions, students, and professional bodies. This information would enable stakeholders to make informed decisions when investing in projects, and highlight the ailments that affect the quality of construction projects. This study can also help contractors to understand the behavior of the material market in order to accurately bid for tenders. This is of great importance for contractors, because they can lock themselves in properly and thus avoid the effects that can affect them.

The project helps future projects to reduce construction errors, minimize repairs and improve safety. Customer satisfaction is known as a quality dimension in construction and as an important factor that represents the success of a project. Customer satisfaction can also be seen as a means to expand the building process and a tool for mutual learning. It is the job of the construction industry to offer customers facilities that meet their needs and expectations. One of the principles of logistics is a management philosophy that effectively determines the needs of customers. By ensuring operational quality at every stage of the construction process, care must be taken to ensure

that the quality of the end product satisfies the end customer.

CHAPTER 2

LITERATURE REVIEW

“Factors Affecting the Performance of Construction Projects in the Gaza Strip” By Adnan Enshassi, Sherif Mohamed, Saleh Abushaban

Construction projects located in the Gaza Strip, Palestine suffer from many problems and complex issues. Consequently, the objective of this paper is to identify the factors affecting the performance of local construction projects; and to elicit perceptions of their relative importance. A comprehensive literature review was deployed to generate a set of factors believed to affect project performance. A total of 120 questionnaires were distributed to 3 key groups of project participants; namely owners, consultants and contractors. The survey findings indicate that all 3 groups agree that the most important factors affecting project performance are: delays because of borders/roads closure leading to materials shortage; unavailability of resources; low level of project leadership skills; escalation of material prices; unavailability of highly experienced and qualified personnel; and poor quality of available equipment and raw materials. Based on these findings, the paper recommends that: 1) project owners must work collaboratively with contractors and facilitate regular payments in order to overcome delays, disputes and claims; 2) project participants should actively have their input in the process of decision-making; and 3) continuous coordination and relationship between project participants are required through the project life cycle in order to solve problems and develop project performance.

“Analysis of Delays in Construction Projects” By Aedwin Regi Varghese, Shibi Varghese

Time, quality and economy constitute the three main factors in a construction project, of which time plays a significant role in construction. Delay in any task or operation is a time overrun which influences the completion of the work. The common problems in civil engineering projects all around the world are mainly due to delay in construction. These problems occur frequently during project duration leading to disputes and litigation. Thus it's essential to study and analyse causes of construction delays. This study is based on a list of construction delay causes retrieved from literature reviews. The feedback of construction experts was obtained through interviews. Subsequently, a questionnaire survey was prepared. The questionnaire survey was distributed to

construction experts who represent consultants, and contractor's organizations. A case study is analysed and compared to the most important delay causes in the research. Statistical analysis is carried out to test delay causes, obtained from the survey.

"Assessment of Factors Causing Delay on Building Construction Projects in Enugu, Nigeria" By Agu. N. N1 and Ibe, B. O.

The study was to investigate factors responsible for the delay on building construction projects in Enugu State. Delay means non-completion of project within the specified duration agreed upon in the contract. Some building construction projects in Enugu State construction experienced wide range of delays. The aim of the research study is to develop a delay analysis system for assessing and reducing the impact of delay in Nigeria construction projects in Enugu. The method used primary and secondary data. Primary data were obtained using different Participatory Research Approaches (PRA) including, in-depth interview, focus group discussions and questionnaires. The results revealed the factors that contributed to the causes of delays in building construction project in Enugu State are delay in revising and approving design documents, delays in sub-contractor's work, poor communication and coordination, change orders by owner during construction and inadequate contractor's work. Furthermore, delay in approving major changes in the scope of work, shortage of labours; ineffective planning and schedule in execution of project are among the factors with sequence. It is recommended that site management and supervision, effective strategic planning, clear information and communication channels, collaborative working construction and proper project planning and scheduling will reduce the delays on building construction projects in Enugu State in particular and Nigeria at large.

"Critical Factors Affecting Quality Performance in Construction Projects" by Anita Rauzana, Saiful Husin, Dwi Andri Usni

The purpose of this study was to identify factors that most influence quality performance in construction projects in Banda Aceh, in terms of labour, tools, costs, and materials. The data collected in this study were primary data and secondary data, with the target respondents was contractor companies that involved in the implementation of construction work in the city of Banda Aceh. Based on the results of the questionnaire survey and data processing analysis, it was obtained 8 quality performance factors that are very influential on the construction project, namely changes in scope and work items at the

owner's request, factor of lack of material quality, improvement of project plan drawing, poor quality of equipment, factor of lack of work experience, factors of uncertain weather conditions, lack of work discipline, factors of lack of workforce expertise. Based on the experience of the author in carrying out this research, there are several things that the author would like to suggest for the development of future research towards a better direction, namely: More in-depth research can be done by adding other quality performance factors from various references, increasing the number of respondents, because the more respondents, the closer to the true value of the research data, and the need to conduct further research for each of the different regions, so that the value of the differences in each region can be seen.

"The Critical Success Factors Affecting the Performance of Construction Industry" by Anoop T., S.S. Asadi, A.V.S. Prasad

The purpose of this study was to develop a performance evaluation framework for assessing performance amongst construction projects in developing countries. Based on the review, performance indicator variables and the variables that influence project success were identified and discussed with the experts in the area of construction management. The variables were refined and a survey instrument was designed. This was subsequently administered to clients, consultants and contractors who had been involved in the construction projects was established through regression and the correlation. The work of project success and critical success factors is often considered as one of the vital ways to improve the effectiveness of project delivery. Successful construction projects greatly depend on how the project has been managed and controlled. The critical success factors are more useful in decision making support. The major objective of this study was to identify, categorize, and prioritize a general set of critical success factors for construction sectors of various backgrounds.

"Evaluating the factors affecting Quality of Residential projects in Construction Industry" By Ashish Mutha, Dr. Anil Ghadge

In this paper, in order to rank the factors affecting Quality, all the sub factors were analyzed individually by calculating their degree of importance. The Main factors that affect quality were ranked according to importance index. With respect to the degree of importance of the main factors Design, Financial and Labor related factors are the top three most critical factors having significant impact on the Quality of a residential

project. The present research is focused on evaluating the overall quality of project by considering various aspects such as Organization structure, Site layout, Material management system and Execution of work. The present study is an essential first step towards highlighting the major issues that need attention to improve the quality of building construction projects. Findings of this study demonstrate that there are several factors influencing quality in construction project but all are not equally significant and therefore they are categorized according to their degree of importance. Highly important factors can be taken care by top level management while least important factors can be controlled by middle managerial level in order to achieve quality of construction project. More efforts are still needed to investigate ways to formulate management systems (policies and procedures) to handle each factor individually.

“Factors Affecting Quality of Construction Projects in Swaziland” By Ayodeji Oke

Quality of projects is one of the traditional and global measures of project performance. For construction projects, the goal and desire of clients, contractors and consultants is to ensure that projects are delivered according to acceptable and agreed standards. In this study, various factors affecting performance quality of construction projects were examined with a view to suggesting improvement measures. Using various variables from relevant literature as the basis, data were obtained through the use of questionnaire administered on contractors, architects, engineers, quantity surveyors as well as project and construction managers. It was discovered that major factors affecting performance quality of construction projects in the study area are related to the use of unskilled and incompetent trade contractors. More so, there is poor on-site supervision and lack of commitment by supervising team shouldered with the responsibilities of ensuring compliance to approved standard. Other issues are related to poor planning and scheduling as well as inadequate knowledge, training and skills of construction workmen. To minimize the impact of these factors and improve performance quality of construction projects, proper and modern construction equipment, techniques and methods should be adopted by construction firms, there should be proper site management and supervision to ensure conformance with drawings and specification and adequate project duration should be allocated and stated in the contract documents.

“Critical Factors Influencing Quality Performance in Construction Projects” By Chinchu Mary Jose, Ambili S

In this paper, Factor analysis was performed separately on 45 success attributes and 21 failures attributes. Initially, the extracted factors were all orthogonal to each other in nature, were not amenable to interpretation. Therefore, an oblique rotation of the reference axes, called varimax rotation was performed and derived factors and their corresponding loadings were obtained. The reliability of the factor model was also checked with the communalities of each variable. Communalities of all the variables are found to be much greater than 0.3 that signifies that the factor model is reliable for the study. Owing to the higher level of variance showed by the factors extracted and the reliability of the factor analysis exhibited by the communality, the factor results were relied upon.

“Critical Success Factors for Different Project Objectives”, By Chua D. K. H. (Member ASCE), Y. C. Kog and P. K. Loh

The identification of key factors for construction project success enables appropriate allocation of limited resources. Most of the related past work have identified critical success factors for construction projects. The present study seeks to distinguish these factors according to the project objectives of budget, schedule, and quality. The analytic hierarchy process is adopted to determine the relative importance of success related factors. A hierarchical model for construction project success is presented. Sixty-seven success-related factors are considered. These factors are grouped under four main project aspects, namely, project characteristics, contractual arrangements, project participants, and interactive processes in the hierarchical model for project success. A questionnaire was developed to facilitate systematic data collection in this study. Experts with an overall average of 20 years of experience in the construction industry were invited to participate in the survey. Critical success factors addressing budget performance, schedule performance, quality performance, and overall project success are identified. Some pertinent findings of the study are discussed. Comparisons with findings of previous studies using neural network approach are also presented.

“A Study on Factors Influencing Quality of Construction Projects” By Davidkumar C, Kathirvel P

Construction industry is blended with uncertainty risk in many projects. The vital part of the project is to complete within the estimated times, cost with expected quality is the predominant goals of the project management. However, in reality a number of attributes of

various types and a variety of constraints involve from time to time which have to be managed successfully by overcoming various obstacles. Completion of the construction project involves several factors and attributes of various types contribute to their extent of impact on the project. These factors were identified by consultations with experts and practising engineers apart from reviewing literatures and carrying out a pilot study. Questionnaire was designed for the experiment and administered on selected construction professionals of varying capacities. The obtained responses were factored.

Using the data, statistical model has been constructed. The model was analysed using SPSS and the outcome such as frequency, mean variations and deviations and other statistical parameters were obtained. The variations mean and deviations were considered and represented in the bar chart and pie charts for the possible interpretation of the results quantitatively. It was evident from the results of analysis that the resource management and supportive management of the project play a key role in making the successful completion of the project. In next level factors such as the technical competence, financial management and management efficiency were found dominant as per the analysis. However, the factors related to social and environmental and safety were given least importance by the respondents. This study is limited by the number of respondents; however the same has been carried out on a larger experiment with large number of respondents to get the outcome more accurate. The detailed analysis, interpretations and the summary of the findings were discussed and elaborated in this article.

“A Study on Critical Factors affecting the Quality Performance of Construction” By Femina W., D.Jackson

In this paper, factors affecting the quality of construction were identified from the questionnaire survey and ranked by the degree of importance on contractors and consultants view have been done in the study. The goal of high quality is common to all countries. This common goal must compete with other national goals amid the massive national forces (e.g. political, economic, and social) which determine national priorities. The current study outlines the major factors influencing the construction industry. The study shows that Site Staff (both contractor and consultant staff) is found to be very important and is ranked first. The skills and experience of the contractor and supervision staff showed the highest score among the sub-factors influencing quality.

The contractor’s involvement in supervision is important especially if work is subcontracted. The contractor’s procedure of selecting subcontractors and the cooperation between the subcontractors and the contractor are among the major factors influencing quality. Lack of information and overlapping activities, which are common on construction sites, may result in rework, high costs, and low quality performance.

“Critical Success Factors Influencing Construction Project Performance for Different Objectives: Operation and Maintenance Phase” By Homthong Samart, Wutthipong Mounnoi

Many studies attempt to explore the critical success factors (CSFs) believed to influence project performance. However, this particular area of CSFs remains unclear, and efforts to reach an agreement on the CSFs have been rather limited. The primary objective of this study is to identify the CSFs that influence construction project performance, and determine the irrelative importance for different objectives across five stages in the project life cycle. A thorough literature review was deployed to generate a set of factors. A questionnaire survey, based on 179 identified factors, grouped into nine major factor categories, was conducted to collect data from three groups of respondents: client representatives, consultants, and contractors. Out of 164 questionnaires distributed, 93 were returned. Using the mean score, relative importance index, and weighted average method, the top 10 critical factors for each category were identified. Spearman’s rank correlation was used to analyze the agreement of survey respondents on those categorized factors. 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 indicate that the most CSFs in each category in the operation and maintenance phase are as follows: competence of project participants (time), relationship among project participants, effective quality assurance system in the organization(quality), interrelation between the employee and supervisor (health and safety), regular maintenance of equipment for the project (environment), competent supervisors (productivity), quality of works to match standards (risk management), positive attitude of employees (human resources), and durability of the completed work (client satisfaction). An understanding of CSFs would help all interested parties in the construction industry to improve project performance. Moreover, the results of this study would help construction professionals and

practitioners take proactive measures for effective project management.

"Study and Analysis of Factors Affecting the Performance of the Construction Projects" by Melba Alias, Dhanya R, Ganapathy Ramasamy

In this study, factors affecting the performance of construction projects in the regions of Chennai, Kerala and Bangalore will be analyzed. Performance indicators are used to measure performance in construction projects. Then these indicators will be used for benchmarking purposes, and will be a key element of any organizations step in achieving best practice so as to conquer the performance problem. However, this study aims at identifying the factors which are affecting the performance of construction projects and the analysis of the factors using the SPSS Software and finding the means and ranking them accordingly.

"An Assessment of the Factors Causing Delays on Building Construction Projects in Uganda" By Muhwezi L., J. Acai, G. Otim

Building construction projects in Uganda's construction industry are experiencing a wide spread of delays. The purpose of this study was to assess the factors causing delays and their effects on building construction projects in Uganda. Eighty-one (81) project delay attributes were identified through detailed literature review. Structured interviews and questionnaire survey were conducted across stakeholders that included among others; consultants, contractors and clients on four selected building projects to gather their views on causes of delay in delivery of projects. This research categorized the causes of delay under four main groups of consultant related, contractor related, client related and external related and then assessed their impacts on delay using relative importance index (RII) as a basis for analysis. The most significant factors of construction delays were identified as: (1) delay in assessing changes in the scope of work by the consultant; (2) financial indiscipline/dishonesty by the contractor; (3) inadequate contractor's experience; (4) design errors made by designers; (5) inadequate site investigation by the consultant. Identification of the causes of potential delay factors that are likely to affect the timely delivery of projects can help to avoid extra costs through claims and disputes that arise among parties when delays are experienced.

"Factors Affecting Success of Construction Project" By Nipin Joseph Babu

The construction industry is dynamic in nature due to the increasing uncertainties in technology, budgets, and development processes. Nowadays, building projects are becoming much more complex and difficult. The project team is

facing unprecedented changes. The study of project success and the critical success factors are considered to be a means to improve the effectiveness of project. However, the concept of project success has remained ambiguously defined in the mind of the construction professionals. Various attempts were made by different researchers to determine CSFs in construction. A number of variables influencing project success have been proposed. Some variables are common to more than one list, but there is no general agreement on the variables. This Project examines the success factors and determines which success factor is more critical in a successful completion of a project.

From literature review and past studies, it was obtained that there were different directions and methodologies used in order to achieve the required target, goals and objectives. A structured questionnaire survey approach is considered to study the impact of various attributes and factors affecting success. The relative importance index method (RII) is used here to determine owners, consultants and contractor's perceptions. In this study 63 factors affecting the success of construction projects are selected. These factors are grouped into 10 groups with the help of different literature reviews.

"An Assessment of Major Factors Affecting Construction, Project Cost in Nigeria" By Oladipo Francis Olukyode, Fatuki Adeola Mathew, Aluko Adewale Taiwo

Maintaining steady cost projection on construction projects had been until recently an issue of serious concern, both to the clients and project contractors. Cost deviation from initial cost plan, had been prevalent on construction sites. The factors responsible for this problem can thus not be ruled out. This study therefore assesses the major factors affecting construction project cost with a view to enhancing construction project procurement and delivery. Related literature was reviewed to aid the direction of this study. Data were obtained through the administration of questionnaires to construction professionals. Data obtained from questionnaires were analyzed using percentage distribution table and mean score bar chart.

The research established that cost of materials and additional works have the highest relative important index and are the most important factor affecting cost of construction in Nigeria. Likewise, fluctuation of prices of materials also has a very significant effect on the cost of construction. It can be observed from the finding that the most

effective method of minimizing cost of construction in Nigeria is by ensuring adequate site supervision to minimize poor quality workmanship and idle times, hiring and motivating experienced and qualified workforce to improve productivity allowing sufficient time for feasibility studies and providing comprehensive information required for easier interpretation of drawings and setting out of the works.

“A Study of Risk Factors Affecting Building Construction Projects” By Patel Kishan, Dr. Rajiv Bhatt

The risk management technique should be applied into any construction project at the initial stage of the project to get maximum benefit of the technique. Hence, there is thriving need to have a well-documented procedure which should be a one stop solution to all hazards that are likely to occur during project lifecycle. This study was carried out particularly to identify construction project risk and outcome is a list of 47 number of risk factors under the category of design, physical, logistics, legal, environmental, management, cultural, financial, construction and political. Based on above factors analysis future study can be carried out to understand criticality of each factor. That kind of study will help the construction industry to work on certain important and most critical factors so that risk can be properly managed.

“Factors Affecting the Performance of Construction Projects: A Survey of Construction Projects in the Coastal Region of Kenya” By Peter Orero Nyangwara, Evelyn Datche

Project performance is a critical issue for the construction industry. Project deliverables such as timely completion and client satisfaction are often used as yardsticks to determine success. Construction projects in the Coastal region of Kenya suffer from many problems and complex issues in performance some of which includes cost, time and safety. As such this research evaluated firstly evaluate the factors affecting the performance of construction projects in order to assist owners, consultants and contractors to overcome performance problem and to improve performance of their construction projects secondly to determine the influence to which the external environment affects performance of construction projects thirdly to identify the most significant project procedures that affect performance of projects and lastly to evaluate project management actions project performance.

The most important factors agreed by the owners, consultants and contractors were: average delay because of closures and materials shortage;

availability of resources as planned through project duration; leadership skills for project manager; escalation of material prices; availability of personals with high experience and qualification; and quality of equipment and raw materials in project. The practices concerning with the Project performance such as time, cost, project owner satisfaction and people were analysed in order to know the main practical problems of projects performance in the coastal region of Kenya and then to formulate recommendations to improve performance of construction projects in the coastal region of Kenya.

“Study on Factors Influencing Construction Process Performance” By Priyanga V. D., Ambika M.E.

Construction industry has complexity in its nature to do a successful project because it contains large number of parties as clients, contractors, consultants, stakeholders, shareholders, regulators and others. Various researches have tried to determine the factors that are responsible for a successful project. Performance processes are initiating, planning, executing, monitoring, controlling and closing. Some of those factors which affect the construction process performance such as cost, duration, quality, productivity, client satisfaction, health and safety and environmental factors are considered in this project. These factors are identified from literature survey and a questionnaire was prepared and given to site engineers working in various construction companies. SPSS software will be used for statistical analysis of the data acquired from the companies. Statistical analysis is done for ranking and selection of major factors contributing the construction process performance. Thus the study aims on identifying the factors which influence and enhance the process performance.

“Analysis of the Success Factors Influencing in Construction Project” By Rajasekaran A. G., Dr. P. Valli

This paper aims at investigating factors influencing success in construction project. The objectives are identifying success factors existing in projects and also to examine the important index of these success factors in construction project. This study was conducted in detailed manner through questionnaire and collecting the response from construction experts. There are seventeen factors identified as project success factors and based on this questionnaire are framed for survey. Detailed questionnaires are floated to Engineers, Site Engineers, Contractors and the responses are collected. It gives a background of the successful

factors. Problems a constraint of the construction projects are also analyzed.

“Ranking of Key Quality Factors in the Indian Construction Industry” By Shanmugapriya S., K. Subramanian

The findings of this study revealed that the top five factors influencing quality in the Indian construction industry based on the ranking of factors by RII are conformance to codes and standards, quality documentation, satisfying customer’s needs, updating the knowledge by the leader and better planning and managing human resources. The performance in the Indian construction industry can be increased by studying and improving the factors that affect the quality significantly. The surveyed clients, contractors and consultants ranked “Conformance to codes and standards” as the most important factor influencing quality in Indian construction projects. The top ranked factor “Conformance to codes and standards” in the process category is ranked first in its effect, among all the investigated factors which indicates the significant influence of this factor on quality in construction projects. The second ranked factor “Quality documentation” in the partnership and resources category is ranked two in its effect, among all the investigated factors. From client, contractor and consultant perspective, effective quality documentation enhances the quality assurance system and serves as the basis for future references. The third ranked factor “Satisfying customer’s needs” in the process category is ranked three in its effect among all the investigated factors.

“A Study on Factors Influencing Quality of Construction Projects” By Teena Joy

The construction industry plays a vital role in the economy. The need for achieving quality of the finished product in the building construction is very important. Quality is an essential element for sustainability and customer satisfaction. Quality in its simplest form can be defined as ‘meeting the customer expectations’, or ‘compliance with customer specification’. This study is intended to provide clients, project managers, designers, and contractors with necessary information needed to better manage the quality of a construction building projects by identify the factors that affect process quality of construction projects and to rank them by degree of importance. Certain construction companies identified and a questionnaire survey was carried out there. Then the data from the company was collected. The ranking of the factors is done by using Relative Importance Index. Using that data, the major factors that affecting the quality have to be identified. Then from the results suitable

suggestions was given to the companies for improving their product quality.

“Factors Affecting Quality Performance of Construction Firms in Ghana: Evidence from Small-Scale Contractors” By Tengan Callistus, Anzagira Lee Felix, Kissi Ernest, Balaara Stephen, and Anzagirache Andrew

The paper has identified fraudulent practices and kickbacks, lack of coordination between designers and contractors and; poor monitoring and feedback as rank as the first three factors that affected the QP of SCC and related to consultants. In addition, lack of training on quality for staff, lack of management leadership and lack of previous experience of contractor were also identified as contractor related factors that affected the performance of SSC as the first three ranked. Hence, addressing the research objectives and drawing on the research findings, with it wider implications for the quality practices in the Ghanaian Construction Industry. It is therefore suggested that policy makers, researchers and practitioners look at improving the human resource base through continuous professional and skill development. Again monitoring systems should be improved at various district offices for the implementation of good construction procedure with the aim of ensuring quality practices. More importantly, design should be reevaluated before the actual construction through pre-construction conference in order to do away with unnecessary alteration to design during construction that will not ensure quality.

“A Review on Assessment of Project-Related Factors for Major Construction Projects” By Utkarsha M. Bendale, Prof. Pankaj P. Bhangale

This paper focuses on the study of literature on project related factors in the context of the Main Construction project. this seen from the literature analysis that the Large Construction project is a project with high complexity with various construction risks, Involvement of large fees, very technical requirements and resource divers. Literature studies show that uncertainty and complexity due to its large size and long duration is usually seen in Large Construction projects that cause delays and cost overruns. This also affects labor productivity. Project related factors are the characteristics of the project which include factors such as project value, size, type, complexity, goals and milestones that can be realized, risks, etc. Project characteristics are important factors and they influence the success of any project. The influence of project types (novelty, technology, speed and complexity), stage in the project life cycle, the maturity of organizational project

management, the level of trust and market value are important attributes for management of each Main project. Therefore, the study of these factors must be given consideration for forecasting the level of performance of the Main Construction project before it starts to get the desired level of quality and achieve the project success.

“Assessment of Influencing Factors in Construction Project Scheduling”, By R. Vidhyasri, R. Sivagamasundari

This study includes the identification of critical factors and the critical group in construction scheduling. A questionnaire survey comprising 53 identified critical factors was conducted with field experts. 210 responses were collected from professionals employed at various projects. The top 5 factors among 53 factors were identified by ranking the factors based on the mean value of the respondents. The most important factor was lack of Inspection of major activities at the time of execution with highest mean value of 3.80. However, the mode value suggests that the different opinions for scheduling issue, in provision on proper designation based on education or in charge of concerned activities are not qualified to handle the project and they are opted by most of responses as high value 4. This study will assist the project planning and scheduling team to identify the activities which have varying impacts of different groups of factors that are governing the successful scheduling and execution of the projects. The quantitative evolution of the impact on the factors helps the management to take the right decision in construction projects. These findings show the different aspects of pros and cons in the project success among the stakeholders to take the right decision.

CHAPTER 3

METHODOLOGY

3.1 Research Design

A research design is a research plan, a road map and a blueprint strategy designed to obtain answers to research questions; it is the heart of every study. The methodology used in this study is the collection of data using the survey method. This work aims to identify the most important factors that have a significant effect on customer satisfaction and other causes needed to solve the problems. The study used face-to-face preliminary interviews with experts from the construction client, the interview was conducted to identify key factors that impact customer satisfaction and require immediate improvement, and other factors not mentioned in the literature. The preliminary

interview is usually conducted by unstructured interviews to get ideas, to feel for what is happening and the reasons why it is going on. Different methods for collecting information from the industry were evaluated from different literature.

The company must be identified after a literature study. The questionnaires must then be prepared and given to contractors and project consultants. The company data must then be collected and analyzed using SPSS software. The ranking of the factors is achieved by using the relative importance index. The data must be used to identify the most important factors that influence quality. For this study, it approved a cross-sectional survey design questionnaire survey, interviewing. Because the research is meant to test the theory instead of generating it, it has chosen a quantitative approach that focuses on describing and drawing conclusions from the findings about the relationships between the performance of construction projects, local factors that influence performance influence, project-related factors, external environmental factors, project procedure factors and project management actions Correlation and regression approaches were used to investigate the relationships between the variables and the extent to which the independent variables explained the effects of project performance. The flow chart shows the methodology used for the research. With the revision of existing literature on previous studies related to the subject, it is the intention in this chapter to outline an appropriate research methodology that can achieve the specific objectives of the research.

The bases for the interviews were implicit questions of a fairly open nature, not to influence the interviewee. A predefined set of questions was used, but was not sent to the project in advance, nor shown during the interview sessions. Instead, the author used the questionnaire as a checklist to ensure that the same topics were covered in each project evaluation. This approach was chosen to enable interviewees to emphasize any problem that they considered most important. The interviews resulted in an extensive list of possible success factors, but also reports of phenomena to avoid and attitudes that should influence the success of the project. The implication is that avoiding this phenomenon and understanding attitudes in reality is an important basis for creating successful projects.

A whole literature review is conducted to identify the factors that affect quality. The methodology of this study is shown in Fig.3.1.



Figure 3.1 Research Methodology

3.2 Factor Identification

According to the methodology followed in this study, a whole literature review is conducted in the area that focuses on the quality of construction projects. The literature review has shown that various factors are responsible for project quality and that their nature varies from project to project. For this, various journals and research papers are referred to the articles published by global journals: ASCE, Science Direct (Elsevier), Springer, etc. After selection of the research documents, they were assessed to identify factors that influence quality. A total of 15 factors have been identified that influence the quality of the construction project. These factors are mentioned below:

- Conformance to codes and standards
- Top Management Support
- Interaction among Participants
- Equipment
- Design
- Communication
- Financial Issues
- Work Execution
- Material
- Selection of Designer
- Selection of Contractor
- On Site Supervision

- Project Size and Complexity
- Management factors
- Contract Documents

Conformance to codes and standards:

This is one of the most important factors for contractors, because this factor is important for the satisfaction of the owner. The owner usually tries to execute a project according to the standard codes. This factor is very important for contractors, because this factor is strongly related to customer's satisfaction.

Top management support:

Top management support is essential for achieving the desired quality. The privilege of top management is to establish all policy issues (including quality policy) and controls. In addition, top management can organize training programs for human resources involved in the construction project and they have a major role to play in identifying the project manager. It is clear that top management can control all key factors and that is why their support is highly desirable for quality compliance.

Interaction among Project Participants:

Every project involves interaction between different project participants. The

participants include the internal participants, such as the contractor's team members, as well as the external team members, such as various subcontractors and suppliers. Most of activities are needed for understanding of the needs of others. There are cases where the quality of the project suffers due to a lack of good interaction between the participants. This fact is more clear when one carries out projects that involve several categories of work; say for example civil works; electricity works; mechanical works; HVAC (heating, ventilation and air conditioning); and building automation, etc. One can appreciate the havoc created for the quality of project activities due to a lack of interaction between project participants. The coordination capacity and the positive attitude of project participants are great assets in such circumstances. A short and informal communication line and regular meetings for building control between project teams further support achieving the desired quality level. Coordination is very important for successful projects. Because the coordination between the departments has failed, this can lead to incorrect implementation or influence the order of work.

Equipment:

To increase work efficiency, it is essential for the construction industry to be aware of the different types of equipment and their specific applications, including initiating and promoting work improvement. Equipment work products have more quality than manual work and the speed of work is higher for equipment than for manual use. So this factor is significant for contractors. The activities in construction projects where the scale is large, work quickly and timely completion of work with quality control are very essential.

Financial Issues:

This is the most important factor that has a major impact on the construction project and on any type of work where the contractor had to plan to make financial payments to eliminate the risk, as this could affect the project. The financial power of the contractor plays a pivotal role in completing the project on time and with the stated performance requirements. Financial problems and a lack of cash flow will adversely affect the progress of the construction.

Communication:

The construction site was sometimes located in rural areas or away from the community. It can be a cause that hampered transportation and caused delays, so it was a limitation that the contact person had to consider.

Material:

The material has an important role in the creation of anything. The good quality material used for construction provides the best quality construction work. Quality materials provide a robust and durable construction. Quality materials are essential to obtain quality results. The use of better quality material provides safety, sustainability, durability, resistance, etc.

3.3 Questionnaire Preparation

The questionnaires are undoubtedly the best known of the research instruments used to collect information from people. Its purpose is to collect the data required from the respondents. The questionnaire will be administered by telephone, mail or personal interview. When designing the questionnaire, the steps mentioned below were followed:

1. Decide the required information:

The first step is to decide what are the things that the respondent must know to fulfill the desired objective.

2. Choose the methods to reach your target respondents:

The following are the methods to reach the target respondents:

- Personal interview
- Mail
- Telephone call

3. Decide the content of the question.

4. Develop the wording of the question:

It provides the respondent with an easy method to indicate his answer: he does not have to think about how to articulate his answer. The answers can be easily classified, which makes the analysis very simple. It allows the respondent to specify the most appropriate response categories for their purpose.

5. Sort the questions:

The order to follow is shown below: a) Opening questions b) Flow of questions c) Variety of questions d) Closing question 6. Check the length of the questionnaire: In general, it is better that a questionnaire be as short as possible. A long questionnaire leads to a long interview and this is open to the dangers of boredom on the part of the respondent. 7. Pre-test the questionnaire: Test the questionnaire in a small sample of your subject first; this is possible at least in colleagues or friends. The objective here is to detect any defect in question and correct it before the main survey. 8. Develop the final

survey form: It means that a questionnaire designed among the respondents of the sample selected for the study will be administered. Based on the 15

critical factors identified from the bibliographic survey, the aforementioned questionnaire was prepared. The questionnaire is prepared in the two formats mentioned below:

- Personal interview
- On call

A) Personal Interview

The research is carried out by developing a questionnaire and collecting the response from construction experts. Questionnaires are prepared for the survey based on the identification of the success factors. Detailed questionnaires are forwarded to engineers, site engineers, contractors and the answers are collected. Questionnaire consists of two parts,

Part-A General Information:

It includes name of company, type of project, name of respondent, designation of respondent, gender and work experience.

Part-B Information about Project:

It includes information about quality and factors affecting quality. The questionnaire is designed in such a way that the respondents can rank their answers using three-point scale. The values are represented as follows:

- 1 = Low Impact
- 2 = Some Impact
- 3 = High Impact

B) Telephone call

Telephone call is another way to complete surveys. Questionnaire can be completed on mobile. Contacts from can be have on google

shared with WhatsApp, Gmail etc. And it can be easily answered by respondents.

3.4 Data Collection

Two sets of data were relevant to the effective conduct of this research namely primary and secondary. The primary data which refers to field data was obtained through the use of well-structured questionnaire and interviews developed from the initial identification of likely factors influencing quality of building construction projects. The questionnaires were designed to elicit information on the following: The respondent's role in construction; how long the respondent has been in construction; influence of construction materials on quality of building construction project, extent which availability of funds and labour influence of construction materials on quality of building construction project. The questionnaires and interviews were administered to contractors, clients and constant to gather information on factors influencing quality of building construction project. The survey method adopted for effective collection of relevant data necessary for examine the factor affecting the construction Project was questionnaire.

3.4.1 Company Identification

There are 28 companies which I have taken under questionnaire survey. All these companies are from Aurangabad, Beed, Pune, Raigad, Ahmednagar etc. All those companies are listed below with name of company, name of respondent, type of project and designation of respondents.

Table 3.1 Details about Company and Respondent

Respondent No.	Name of company	Mode of Response	Respondent No.	Name of company	Mode of Response
1	Bitcon India Pvt. Ltd., Bhiwandi	On call	15	Shirale Constructions Pvt. Ltd., Manwat	On call
2	S.A.Sawant construction Pvt. Ltd. Nashik	In person	16	Paridhi Construction Aurangabad	On call

3	Suroj Builtcon Pvt. Ltd. Koregaon Park, Pune	In person	17	Pooja construction Aurangabad	On call
4	Black and Veatch Pune	In Person	18	Samarth Construction Arangabad	On call
5	DS consultants Aurangabad	On call	19	Sai Constructions, Rajiv Gandhi Chowk, Beed	On call
6	Jain Irrigation System, Jalgaon	On call	20	Rajan Constructions Beed	On call
7	M/s Pawar Patil Associates, Shrirampur	On call	21	Seetai Constructions, Beed	In Person
8	Mahajan Consultants, Erandol	On call	22	Ds Consultant and Services, Aurangabad	In Person
9	Poojari Prefab. Pvt. Ltd., Pune	On call	23	Gulmohar Developers Pune	In person
10	AR Constructions Pune	In person	24	Ajwani Infrastructure pvt.ltd Chembur, East Mumbai	On call
11	Mudrik Enterprises, Ahmednagar	On call	25	Eco ridge Developers Beed	On call
12	SA Sawant Constructions Buldhana	In person	26	Wathore Construction Aurangabad	On call
13	Nirmiti Construction, Rajiv Gandhi chowk, Beed	On call	27	R K developers Aurangabad	On call

3.4.2 Weightage given by Respondents:

This data is collected for analysis by using questionnaire survey method. Respondents gave the responses to each question and each factor which affect the quality of construction project. Weightage is given to each factor; this Weightage consists of three parts mentioned below:

1= Low Impact

2= Some impact

3= High Impact

Respondents showed their attitude, opinion towards each factor. Table is given below showing the Weightage given to factors by the respondents of different companies (shown in Table 3.1).

Sr No	Factor	Respondent No.																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Conformance to Codes & Standards	-	-	-	-	-	-	-	-	-	-	-	-	3	3	2	2	2
2	Design	3	3	3	3	2	3	3	3	3	2	3	1	2	3	3	2	3
3	Material	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3
4	Financial Issues	3	3	3	3	3	3	3	2	3	3	3	1	2	3	2	2	3
5	Top Management Support	3	2	3	3	3	3	3	3	3	3	3	1	2	3	3	2	3
6	Interaction among Project Participant	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3
7	On Site Supervision	3	1	3	3	3	3	3	2	3	3	3	1	3	3	3	1	2
8	Equipment	-	-	-	-	2	3	3	3	3	2	3	1	3	3	2	3	3
9	Work Execution	-	-	-	-	3	3	3	3	3	3	3	1	3	3	2	3	1
10	Selection of Designer	3	3	3	3	2	3	3	3	3	3	3	1	3	1	2	3	1
11	Selection of Contractor	-	-	-	-	-	-	-	-	-	-	-	-	3	1	1	2	2
12	Project Size & Complexity	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	2	2
13	Management Factors	-	-	-	-	-	-	-	-	-	-	-	-	2	3	1	1	2
14	Communication	-	-	-	-	-	-	-	-	-	-	-	-	3	1	2	3	1
15	Contract Documents	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	1	2

Sr No	Factor	Respondent No.															
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1	Conformance to Codes & Standards	3	3	3	2	3	3	3	2	3	3	3	3	3	3	-	-
2	Design	3	3	3	2	3	1	3	3	2	2	3	3	3	3	3	2
3	Material	3	3	3	3	3	3	3	3	3	3	3	2	3	3	2	3
4	Financial Issues	3	3	3	3	2	3	3	3	2	3	3	2	2	3	3	2
5	Top Management Support	3	3	2	2	2	2	3	3	2	3	2	3	2	3	2	2
6	Interaction among Project Participant	3	1	2	3	3	3	3	3	3	1	3	3	3	2	2	2
7	On Site Supervision	3	2	3	3	3	3	3	1	3	2	3	2	3	3	2	3
8	Equipment	3	2	3	1	3	3	2	3	3	1	3	3	1	3	3	3
9	Work Execution	3	3	3	2	2	3	3	2	2	3	3	2	2	1	2	3
10	Selection of Designer	1	3	2	3	2	2	3	2	1	3	1	3	1	1	1	3
11	Selection of Contractor	2	3	3	2	2	3	2	2	3	2	2	2	1	3	-	-
12	Project Size & Complexity	2	2	1	2	1	3	1	2	2	1	3	1	1	1	-	-
13	Management Factors	2	2	2	2	2	1	3	2	2	3	3	2	2	1	-	-
14	Communication	1	2	2	3	2	2	2	2	3	3	2	2	2	2	-	-
15	Contract Documents	1	1	1	1	1	1	1	1	1	1	2	2	2	2	-	-

CHAPTER 4

DATA ANALYSIS

Fifteen factors are identified that influence the quality of building projects from the literature. Based on this questionnaire are framed for research. When analyzing the responses of the respondents, the collected data was displayed in frequency tables and percentages to give a true picture of the information generated in the survey. Detailed questionnaires are forwarded to engineers, site engineers, contractors and the answers are collected. Answers are analyzed by the RII (Relative Importance Index) method and SPSS software. It is now officially called "IBM SPSS Statistics". SPSS Statistics (originally Statistical Package for the Social Sciences, later adapted to read Statistical product and Service Solutions) appeared in the first version in 1968 after it was developed by Norman H. Nie, Dale H. Bent and C. Hadley Hull. SPSS is one of the most used tools for statistical analysis in the social sciences. It can be

used by marketing researchers, health researchers, survey companies, government, educational researchers, marketing. Cells in both views can be edited manually, the file structure can be defined, and data can be entered without using the command syntax. This can be sufficient for a small database. The graphical user interface has two views that can be switched by clicking on one of the two tabs at the bottom left of the SPSS Statistics window. There are two views in this program, first is 'Data view' and second is 'Variable view'. Details of column to be used in 'Data view' are to be filled in 'Variable view'.

4.1 Characteristics of Respondents

This includes details about the respondents i.e. Gender, Designation, work experience, Type of Project Involvement etc. In analyzing the responses of general information from the respondents, SPSS (Statistical Package for the Social Sciences) software is used.

A) Gender of Respondents:

This is a part of general information from questionnaire. From questionnaire survey, below table shows that out of 33 respondents, 32 are male respondents and only one is a female respondent.

Pie graph is given below showing the percentage of male respondents and female respondents which is 96.97% and 3.03% respectively.

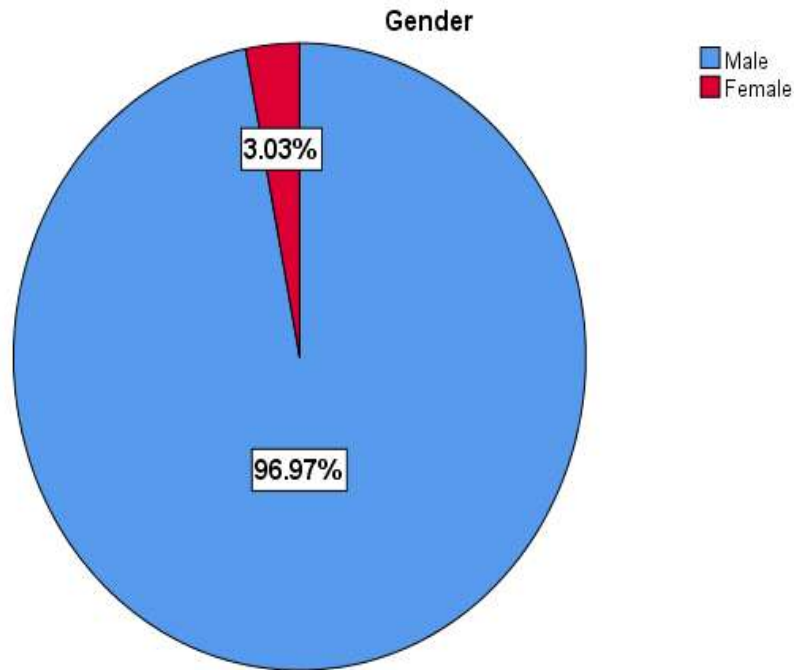


Figure 4.1 Pie Graph of Gender Frequency

B) Job Title:

It includes details about designation of the respondents. From the questionnaire survey, ones observed that there are many respondents with different designation such as site engineer, project

manager, contractor, consultant, design engineer, quality control engineer etc. From the below chart, we can say that questionnaire filled by respondents are mostly site engineers (27.27%), then 24.24% project managers have responded the questionnaire.

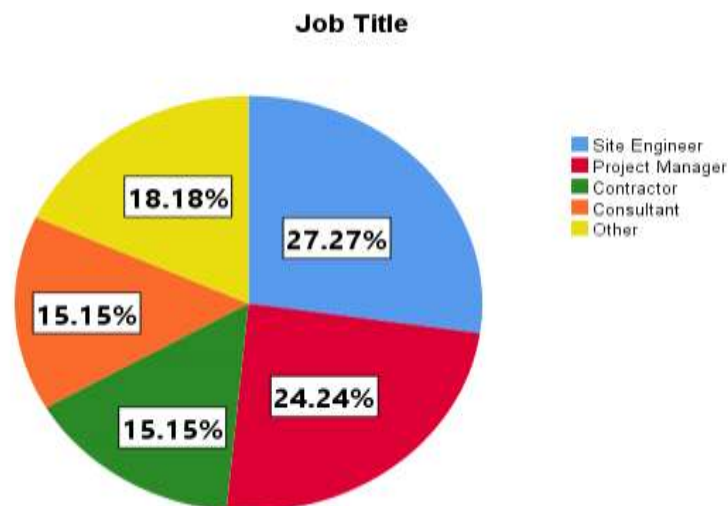


Figure 4.2 Pie Graph of Designation of Respondents

C) Type of Project Involvement:

There are different types of project in which respondents have involvement which are residential project, industrial project, road project etc. Percentage of Residential projects is more. Table 4.2 Frequency of Different types of Projects

From the data collected by using questionnaire survey method, there are 48.48% residential projects, 18.18% industrial projects, 12.12% road projects and 21.21% other projects.

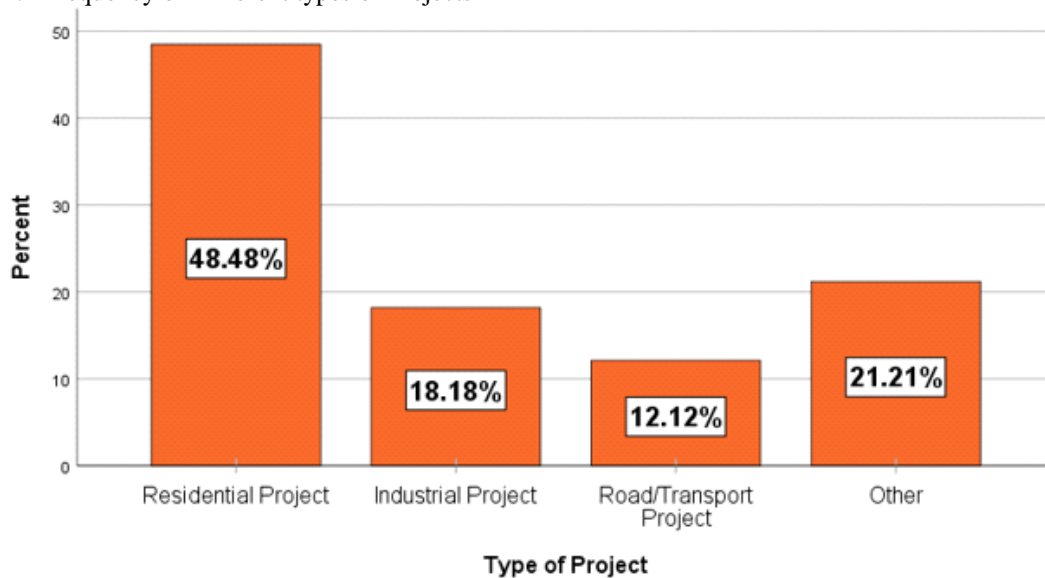


Figure 4.3 Graph showing percentage of different types of project

D) Work Experience of Respondents:

This is a part of general information from questionnaire. Work experience of respondents is grouped into three ranges, i.e. 0-4 yrs., 5-8 yrs. and 9-12yrs. From the work experience, we can say that how much practical or theoretical knowledge they

have. Below grouping say that there are 42.11% respondents have an experience of 0-4 yrs., 52.63% respondents have an experience of 5-8 yrs. and only 5.26% respondents included into 9-12 yrs. experience.



Figure 4.4 Graph of Percentage of Work Experience of Respondents

4.2 Analysis of Responses:

To know about the quality, there are some questions added to the questionnaire as supportive questions. Analysis of these questions is done by using SPSS software.

- High Cost
- Satisfying Customer
- Appearance
- Increased Profit

1) Which of these words best define the quality?

Table 4.3 Total Responses to Question 1
 Table 4.4 Multiple Responses to Question 1

		Responses		Percent of Cases
		N	Percent	
Which of these words best define the qua ^a	High Cost	1	2.8%	3.0%
	Satisfying Custmer	25	69.4%	75.8%
	Appearance	9	25.0%	27.3%
	Increased Profit	1	2.8%	3.0%
Total		36	100.0%	109.1%

2) What is your organization’s perception of quality?

- Elimination of Defects
- A tool to increase profit
- A competitive advantage
- Other

Table 4.5 Total Responses to the Question 2

		Responses		Percent of Cases
		N	Percent	
What is your perception of quality ^a	Elimination of Defects	22	62.9%	66.7%
	A tool to increase profit	2	5.7%	6.1%
	A competitive advantage	7	20.0%	21.2%
	Other	4	11.4%	12.1%
Total		35	100.0%	106.1%

3) What type of knowledge is required on site?

- Technical Knowledge
- Practical Knowledge
- Both

This question is not that much related to project. Better quality of construction may require both practical and theoretical knowledge. Below pie graph shows that according to respondents,

practical knowledge should be more on construction site. 47.37% respondents are saying that practical knowledge is much important than theoretical knowledge. According to 11.53% respondents, theoretical knowledge is important and according to 45.11% respondent, both types of knowledge are required.

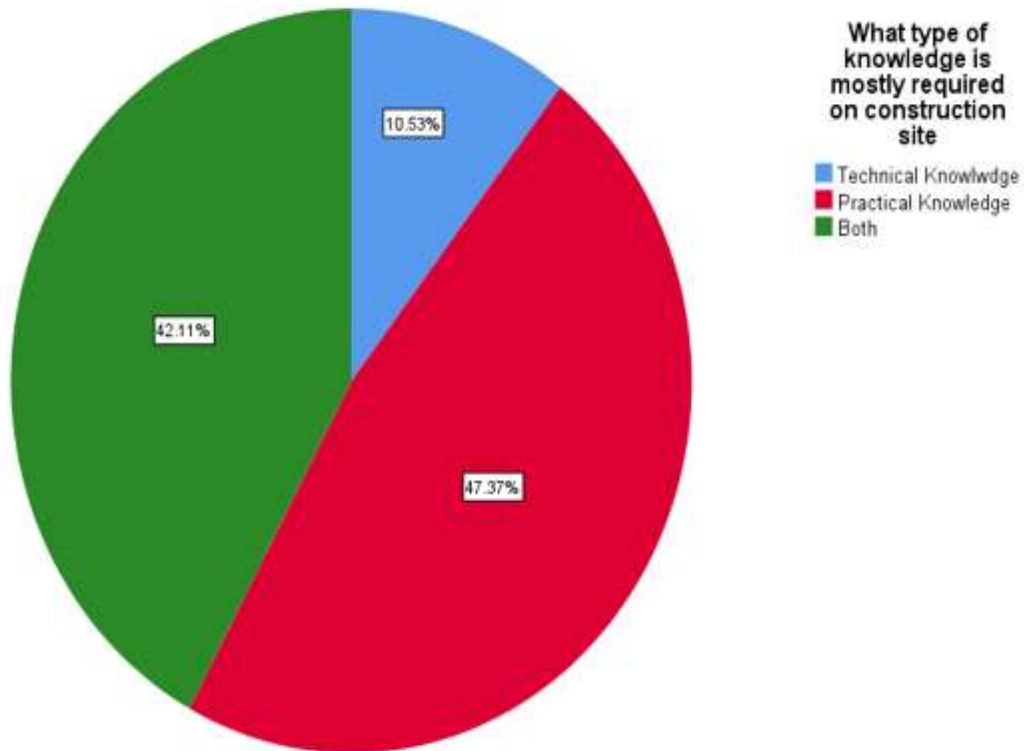


Figure 4.5 Types of Knowledge

4) Method used to solve the problems:

- Assign individual to solve
- To set a multi-disciplinary team for each problem
- A permanent team is available

Table 4.7 Responses of Question 4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Assign individual to solve	4	28.6	28.6	28.6
	Setup a multidisciplinary team for each problem	3	21.4	21.4	50.0
	A permanent team is available	7	50.0	50.0	100.0
Total		14	100.0	100.0	

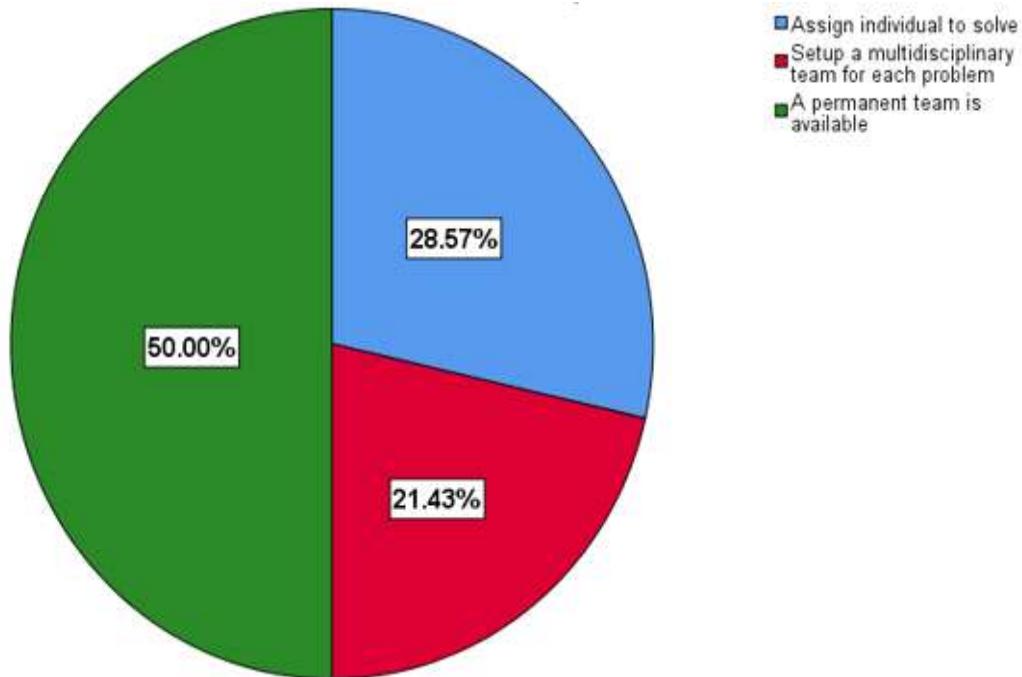


Figure 4.6 Pie Graph of Question 4

5) Method of measuring customer satisfaction:

- Questionnaire Survey
- By number of complaints
- Others

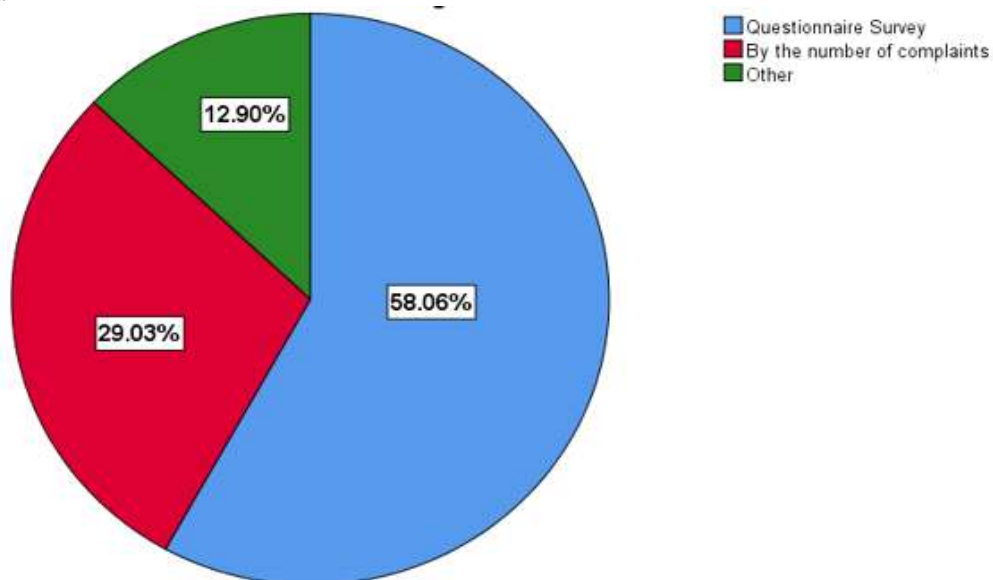


Figure 4.7 Pie Graph of Question 5

4.3 Relative Importance Index (RII)

Questionnaire was designed based on factors. The survey was conducted and the results were analyzed. Weightage is given to each factor by a respondent which is as below:

1=Low Impact

2=Some Impact

3=high Impact

The relative importance index method (RII) is used to determine respondent's perception of the relative importance of the identified quality factors. Using this formula, the major factors that affecting

the quality was identified. The RII was computed as,

$$RII = \frac{\sum w}{AN}$$

Where,
 RII - Relative Importance Index,

W = Weightage given to each factor by the respondents (ranging from 1 to 3)

A = highest weight (i.e. 3)

N = total number of respondents.

Ranking is given to each factor by relative importance index (RII) method. RII of each factor is shown in below table:

Table 4.8 Analysis by RII Method

Sr. No.	Factor	No. Of Responses (N)	A	A×N	ΣW	RII	Rank
1	Conformance to Codes & Standards	15	3	54	40	0.740740	8
2	Design	27	3	81	70	0.864197	3
3	Material	27	3	81	80	0.987654	1
4	Financial Issues	27	3	81	49	0.604938	12
5	Top Management Support	27	3	81	39	0.481484	14
6	Interaction among Project Participant	27	3	81	57	0.703703	10
7	On Site Supervision	27	3	81	67	0.827160	5
8	Equipment	23	3	69	58	0.840579	4
9	Work Execution	23	3	69	60	0.869565	2
10	Selection of Designer	27	3	81	65	0.802469	6
11	Selection of Contractor	14	3	42	33	0.785714	7
12	Project Size & Complexity	14	3	42	24	0.571428	13
13	Management Factors	15	3	45	30	0.666667	11
14	Communication	15	3	45	32	0.711111	9

15	Contract Documents	15	3	45	15	0.438596	15
----	--------------------	----	---	----	----	----------	----

Materials have ranked by the all respondents in the first position with RII equals to 0.9876. This factor is very important to owner's satisfaction. This factor is important for all because this factor is mostly related to client satisfaction. Work Execution in project has been ranked in second position with RII equal to 0.9113. This factor is second most important factor which affects the quality of construction. The Design among participants with RII equal to 0.86419 ranked in the third position. Equipment is also important factor with RII equal to 0.84057 and ranked in fourth position. In fifth position, top management support and on site supervision are ranked with RII 0.82716. Selection of designer is ranked in sixth position with RII equal to 0.80246. Selection of Contractor are having work products more quality for equipment than manual and ranked on seventh position. Then Confirmation to codes and standards and communication will improve the quality of work. They are ranked in eighth and ninth position respectively. This is followed by Interaction among Project participants,

management factors, financial issues, project size and complexity, Top management support and Contract documents up to next 15 positions. The application of new management technologies will improve the quality of work.

4.4 Result

All the questionnaire survey was done from project manager or project engineer, site engineer, contractor of the project at the construction site. The factors which affecting the quality are Design, Communication, Conformance to codes and standards, selection of designer, Interaction among participants, Management factors, Selection of contractor, Top management support, Work execution, Material, Project size and complexity, equipment, financial issues, quality and safety systems, contract documents. Out of 62 questionnaires distributed 33 were returned. The Opinion of professionals in the construction industry is investigated. The table that contain the ranking of Factors is given,

Table 4.9 Ranking of Various Factors

Sr. No.	Factor	No. Of Responses (N)	RII	Rank
1	Conformance to Codes & Standards	15	0.740740	8
2	Design	27	0.864197	3
3	Material	27	0.987654	1
4	Financial Issues	27	0.604938	12
5	Top Management Support	27	0.481484	14
6	Interaction among Project Participant	27	0.703703	10
7	On Site Supervision	27	0.827160	5
8	Equipment	23	0.840579	4
9	Work Execution	23	0.869565	2
10	Selection of Designer	27	0.802469	6
11	Selection of Contractor	14	0.785714	7

12	Project Size & Complexity	14	0.571428	13
13	Management Factors	15	0.666667	11
14	Communication	15	0.711111	9
15	Contract Documents	15	0.438596	15

Table shows the different factors affecting the quality of construction projects and ranking is also given in table which is determined by relative importance index method. The most important factors according to respondents are in sequence: Material, Work Execution, Design, Equipment, On Site Supervision, Selection of Designer, Contractor, Conformance to codes and standards, Communication, Interaction among participants, Design and low important factors are: Financial issue, Contract documents, Project size and complexity, Management factors, etc.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

A questionnaire survey is used to find out the attitude of site engineers, contractors and consultants towards factors affecting quality of construction project. 35 questionnaires were distributed and 27 are returned. The respondents are asked to know their opinion about the quality factors as High impact, Some impact and Low impact. The results show that the most important factor agreed by the contractors, consultants, site engineers, project managers etc. are: Material, Conformance to codes and standards, financial issues, Interaction among participants and Design. From the study, it is concluded that:

- Customer's satisfaction is the best definition of quality.
- Questionnaire survey or getting feedback from customers is a proper method of measuring customer's satisfaction.
- Material, work execution, design, Equipment are the factors having positive contributions to achieve the desired quality level.
- Questionnaire survey shows the attitude of all project participants towards quality & its importance.

The necessity for achieving quality of the finished product in the building construction is so much important. Quality is an essential parameter for sustainability and customer satisfaction. In construction projects, quality performance is considered as vital for client satisfaction. Finding out of these factors will help to improve the

quality. The data collected from the responses and analyzed by using SPSS software.

5.2 Recommendations

The following recommendations are deduced from this study:

- To achieve better quality work, you adopt a number of programs, such as total quality management, quality assurance, and quality control and quality rounds in the organization.
- To minimize the Quality problems through implementation of project planning, designing and controlling throughout the life cycle of projects is required.
- Design of the construction work should be rechecked by expert at the construction site.
- Proactive steps: - These steps must be carried out before starting the construction work. This consists of a strategic planning, sufficient resources available, a good design process, a good management process for materials and labor, a training program and a quality control committee at the high-rise location.
- Reactive steps: - These steps must be performed after quality issues that occur on the site. This consists of emergency preparedness and responsiveness, monitoring and measurement, awareness and ability, archiving and repair of the defect.
- Understanding of responsibilities by various project participants.
- All participants should give more importance to quality than anything.
- To achieve the client satisfaction Contractors, consultants etc. Should give more importance to the factor, conformance to codes and standards.
- Availability of labors with high experience and qualification helps to complete the projects with a successful and suitable performance.
- Most of the work should be completed by using equipment.
- Proper inspection in the work phase will improve the quality.
- Material should available on time not to delay work or poor quality.

- Co-ordination between all the project parties will lead to strong relationship between them and the client will be more satisfied.
 - Consultants should be more interested with design cost by using multi criteria analysis and choosing the most economic criteria in order to improve their performance and to increase owner's satisfaction.
 - Contractors should handle minimum number of projects that can be performed successfully.
 - Quality materials should be used for better quality construction.
 - It is recommended that a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors.
- 18.All managerial participants should be participated with sensitive and important decision-making.

19.Proper coordination and relationship between participants are required throughout the life cycle of a project to solve problems and develop project performance.

CHAPTER 6

REFERENCES

- [1]. Abdul Rahman, Yazan Alzubi(2015), "Exploring Key Contractor Factors Influencing Client Satisfaction Level in Dealing with Construction Project: An Empirical Study in Jordan", International Journal of Academic Research in Business and Social Sciences, Vol. 5, No. 12 ISSN: 2222-6990.
- [2]. Adnan Enshassi, Sherif Mohamed, Saleh Abushaban (2009) "Factors Affecting the Performance of Construction Projects in the Gaza Strip", Journal of Civil Engineering and Management, 15(3): 269–280.
- [3]. Aedwin Regi Varghese, Shibi Varghese (2015), "Analysis of Delays in Construction Projects", International Journal of Engineering Research and General Science, Volume 3, Issue 6, ISSN 2091-2730
- [4]. Agu. N. N1 and Ibe, B. O. (2016) "Assessment of Factors Causing Delay On Building Construction Projects in Enugu, Nigeria", IJSET - International Journal of Innovative Science, Engineering &Technology, Vol. 3 Issue 6, ISSN (Online) 2348 – 7968
- [5]. Anita Rauzana, Saiful Husin, Dwi Andri Usni, "Critical Factors Affecting Quality Performance in Construction Projects", International Journal of Management and Administrative Sciences (IJMAS), (ISSN: 2225-7225) Vol. 6, No. 3, (13-21).
- [6]. Anoop T., Ss. Asadi, A.V.S. Prasad (2016), "The Critical Success Factors Affecting the Performance of Construction Industry", International Journal of Civil Engineering and Technology (IJCIET), Volume 7, Issue 6, Pp. 669–675.
- [7]. Ashish Mutha, Dr. Anil Ghadges (2018), "Evaluating The Factors Affecting Quality of Residential Projects in Construction Industry", International Journal of Engineering Technology Science and Research, ISSN- 2394 – 3386, Volume 5, Issue 4.
- [8]. Ashokkumar D. (2014), "Study of Quality Management in Construction Industry", International Journal of Innovative Research in Science, Engineering and Technology, Volume 3, Special Issue 1
- [9]. Ayodeji Oke (2017), "Factors Affecting Quality of Construction Projects in Swaziland", The Ninth International Conference On Construction in The 21st Century (CITC-9), Dubai
- [10]. Chinchu Mary Jose1, Ambili S 2, "Critical Factors Influencing Quality Performance in Construction Projects", International Journal of Recent Trends in Engineering and Research, ISSN(Online)-2455 1457.
- [11]. Chua D. K. H. (Member ASCE), Y. C. Kog and P. K. Loh (1999), "Critical Success Factors for Different Project Objectives", J. Constr. Eng. Manage., ASCE, 125(3): 142-150
- [12]. David Kumar. C, Kathirvel. P (2018), "A Study on Factors Influencing Quality of Construction Projects", International Journal of Applied Engineering Research, ISSN 0973-4562, S Volume 13.
- [13]. Femina W., D. Jackson, B. Raj Kumar, "A Study On Critical Factors Affecting the Quality Performance of Construction", International Journal of Latest Trends in Engineering and Technology (IJLTET), ISSN: 2278-621x
- [14]. Homthong Samart, Wutthipong Mounnoi (2016), "Critical Success Factors Influencing Construction Project Performance for Different Objectives: Operation and Maintenance Phase", International Journal of Advances in Mechanical and Civil Engineering, ISSN: 2394-2827, Volume-3, Issue-3.
- [15]. Melba Alias, Dhanya R, Ganapathy Ramasamy (2015), "Study and Analysis of

- Factors Affecting the Performance of the Construction Projects ", International Journal of Science, Engineering and Technology Research (IJSETR), ISSN: 2278 – 7798, Volume 4, Issue 4
- [16]. Muhwezi L., J. Acai, G. Otim (2014), "An Assessment of the Factors Causing Delays On Building Construction Projects in Uganda", International Journal of Construction Engineering and Management
- [17]. Nipin Joseph Babu (2015), "Factors Affecting Success of Construction Project", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) E-ISSN: 2278-1684, P-ISSN: 2320-334X, Volume 12, Issue 2 Ver. V, PP 17-26.
- [18]. Oladipo Francis Olukyode, Fatukiadeola Mathew B, Alukoadeawetaiwo, "An Assessment of Major Factors Affecting Construction, Project Cost in Nigeria", International Journal of Sciences: Basic and Applied Research (IJSBAR), ISSN 2307-4531
- [19]. Oluayemi-Ayibiowu, Bamitale Dorcas1, Aiyewalehinmi, Olumide Elkanah2, Omolayo, Oluwakayode John(2019), "Most Critical Factors Responsible for Poor Project Quality Performance in Building Construction Industry (A Case Study of Three Major Cities in Nigeria)", European International Journal of Science and Technology, Vol. 8 No. 2
- [20]. Patel Kishan1, Dr. Rajiv Bhatt (2014), "A Study of Risk Factors Affecting Building Construction Projects", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 3 Issue 12.
- [21]. Peter Orero Nyangwara*, Evelyn Datche (2015), "Factors Affecting the Performance of Construction Projects: A Survey of Construction Projects in The Coastal Region of Kenya", International Journal of Scientific and Research Publications, ISSN 2250-3153, Volume 5, Issue 10.
- [22]. Priyanga V., D. Ambika M.E. (2014), "Study On Factors Influencing Construction Process Performance", International Journal of Advanced Research in Civil, Structural, Environmental and Infrastructure Engineering and Developing, Volume: 2 Issue: 2, ISSN_NO: 2320-723X
- [23]. Rajasekaran A.G., Dr. P. Valli (2014), "Analysis of The Success Factors Influencing in Construction Project", International Journal of Engineering & Applied Sciences (IJEAS), Vol.6, Issue 3, 21-36
- [24]. Reshma S. Fegade and Prof. P.P. Bhangale(2016), "Assessment of Quality Problems for High Rise Building-Case Study", International Journal of Engineering Sciences & Research Technology, ISSN: 2277-9655.
- [25]. Shanmugapriya S., K. Subramanian (2015), "Ranking of Key Quality Factors in The Indian Construction Industry", International Research Journal of Engineering and Technology (IRJET) E-ISSN: 2395 -0056 Volume: 02 Issue: 07.
- [26]. Teena Joy (2014), "A Study On Factors Influencing Quality of Construction Projects", International Journal of Innovative Research and Development, Vol. 3, Issue 5.
- [27]. Tengan Callistus, Anzagira Lee Felix, Kissi Ernest, Balaara Stephen, Anzagira Che Andrew (2014), "Factors Affecting Quality Performance of Construction Firms in Ghana: Evidence from Small–Scale Contractors", Civil and Environmental Research, ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online) Vol.6, No.5
- [28]. Utkarsha M. Bendale1, Prof. Pankaj P. Bhangale (2018), "A Review on Assessment of Project-Related Factors for Major Construction Projects", International Journal for Research in Applied Science & Engineering Technology (IJRASET), ISSN: 2321-9653, Volume 6 Issue V.
- [29]. Vidhyasri R., R. Sivagamasundari(2018), "Assessment of Influencing Factors in Construction Project Scheduling", International Journal of Applied Engineering Research, ISSN 0973-4562, Volume 13