ASSESSMENT OF FACTORS INFLUENCING REWORK OCCURRENCE IN BUILDING CONSTRUCTION PROJECT

BY

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BEING A RESEARCH PROJECT SUBMITTED TO THE DEPERTMENT OF QUANTITY SURVEYING INSTITUTE OF ENVIRONMENT STUDIES KWARA STATE POLYTECHNIC, ILORIN.

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CERTIFICATION

This is to certify that project titled **ASSESSMENT OF FACTORS INFLUENCING REWORK OCCURRENCE IN BUILDING CONSTRUCTION PROJECT** was carried out by **AJANI BARAKAT AMOKE** with matriculation number **HND/23/QTS/FT/0021** of the Department of Quantity Surveying, Institute of Environmental Studies, Kwara State Polytechnic, Ilorin, for Award of Higher National Diploma (HND) in Quantity Surveying.

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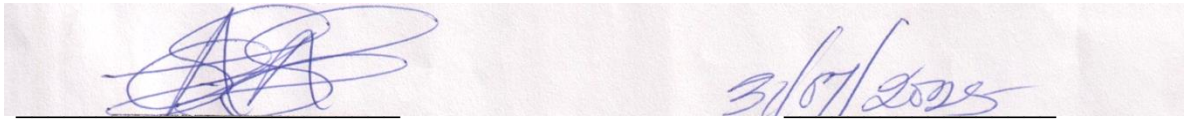

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DEDICATION

This project is dedicated to Almighty Allah, the beneficent and the merciful. The giver of knowledge and understanding who gave me the ability and strength towards the completion of my project work. I would also like to dedicate this to my parents (MR AND MRS AJANI) and also to my relatives.

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ABSTRACT

Rework is the act of carrying out a work for the second time due to defect. It remains a chronic problem in the construction industry because of human imperfection. It is a menace in the Nigerian construction industry as it contributes to cost and overruns in project. It leads to clients' and contractors' dissatisfaction. The aim of this research is to study factors causing rework occurrence in ongoing building project and elements that can be influenced by it. It is criteria-based research. The targeted population constituted 25 ongoing building projects, precisely commercial buildings. Data collection was carried out with the use of structured questionnaire and checklist for archival data. Data presentation was done using frequency table and bar charts while data were analyzed using relative importance index and T-test. The result of the analysis showed that the level of occurrence of rework in building elements varies. It was discovered that the main factors causing rework are poor workmanship, defective materials and incompetent supervision and elements mostly affected are Blockwork, Roof and plastering. Conclusively, the level of rework is one of the key determinants to project performance. Construction team all have crucial roles to play to the success of any project. Construction organizations should re-examine the way they conduct their operations, become technically oriented and become prevention-focused to help strive for better organizational management.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The construction industry is almost as old as nature itself and unlike many manufacturing industries, is concerned mostly with one-off project. The construction is a sector that is sensitive to change in both fiscal and monetary disturbance. The construction industry is very important in the economic development of any nation especially in an expanding economy like Nigeria (Ibironke, 2018). An efficient construction sector is a pre-requisite to effective national development since building, civil and industrial engineering works are usually a major contribution to Gross Fixed Capital Formation, Gross Domestic Product and National Employment. The growth of construction industry in Nigeria in the past two decades indicates its success in greatly contributing to the country's Gross National Product, which was 1.72 in Year 2017 (Federal bureau of statistics). This industry sector is the second most important for absorbing human resources after the food.

The importance of the construction industry is not limited to the different measures of economics development alone slumps or upsurges in its activities have a high multiplier effect on almost every phase in the social and economic structure of the nation. It has been concluded that the high cost of house ownership in Nigeria and other housing problems of the lower income groups are result of the detect in the construction industry (Ibironke 2014). There is no gainsaying that the tin problem of cost and time overruns may not yet be over as they still characterize construction projects in most parts of the world especially in developing countries like Nigeria" (Ogunsemi 2022). In Nigeria cost and time overruns are common occurrences in the construction industry and these have continued unabated (Odeyinka 2015). Thus, us no exception as in the case of rework as rework contributes to time and cost overruns (Love 2017a). Earlier studies have shown that rework cost vary between 3 and 15 per cent of projects contract value (Burati 2019). In addition, rethinking construction 1998 in Aminudin (2016) stated that; up to 30% of construction is rework labour is used at 40% - 60% of potential efficiency and at least 10% of material are wasted. It as posited that rework costs could be significantly higher than figures reported in the previous literature (Love and Smith 2016).

Construction Industry Institute (CII) (2013) viewed rework as activities that have to be done more than once, or activities which remove work previously executed as part of the project regardless of source, where no change order has been issued and no change of scope has been identified by the owner. Rework can occur from errors, omissions, failures, damage, and change orders throughout the design and construction interface process (Love, 2015).

Rework is a significant factor that contributes negatively to the construction process and directly leads to client dissatisfaction, reduces profitability and in extreme conditions, leads to acrimonious relationship between participants which either be settled through a recourse to law court or arbitration (Love, 2015a, b). However, a reduction in rework can significantly improve the overall project performance (Love et al., 2015; Low and Yeo, 2016). Love et al. (2016) concluded that causes of rework in various countries differ as the situation and contract culture are not the same and therefore, the costs of rework between countries should not be considered authoritative, but merely indicative, as levels and interpretations of quality will differ between each country. Local practices, industry culture, and contractual agreements contribute immensely to the incidence and cost of rework in any situation and environment (Love et al., 2016).

1.2 Statement of the Problems

Rework is a significant factor that has a negative impact (direct and indirect) on the performance for both of the project or organization and leads to reduced productivity, lower profits, extra costs and time, and client's dissatisfaction (Love, 2015a, 2018b). Additionally, rework has been defined as a waste of the time and cost of doing specific tasks again, which cannot be eliminated but may be avoid (Oyewobi et al., 2017).

When construction products do not meet the requirements or expectations, work often has to be redone. Rework occurs in various phases of the construction process or in various divisions of a company. Rework can occur on the construction site due to bad materials management amongst other reasons. Rework is a problematic issue in construction project; it has contributed to latent conditions in organizational and project system.

Lack of clear understanding; limited research on the specific factors contributing to rework in building construction projects, particularly in the local context. inadequate design and planning; design errors, incomplete plans, and inadequate project planning can lead to rework, highlighting

the need for improved design and planning processes; poor communication and coordination: breakdowns in communication and coordination among project stakeholders can result in errors, omissions, and rework; insufficient training and skills: lack of training and skills among construction personnel can contribute to rework, emphasizing the need for workforce development and training programs; project complexity: complex projects with multiple stakeholders, tight schedules, and limited budgets increase the likelihood of rework.

Knowing and understanding rework causes can provide the basis to stimulate learning within the project environment especially when litigation proceedings have been enacted. It is against this backdrop that this research intends to examine the causes, sources and effects of reworks on project performance, thereby contributing to the enhancement of the attainment of value for money.

1.3 Research Questions

1. What are the factors influencing the occurrence of reworks in building construction project in Kwara State?
2. What are the effects of these factors on building delivery?
3. What are the measures for the reduction of rework in building construction projects in Kwara State?
4. What are the ways to reduce rework on the cost and time during building construction projects in Kwara State?

1.4 Aim and Objectives of the Study

1.4.1 Aim of the study

The aim of this study is to determine the underlying factors that influence rework occurrence during building construction and the impact on overall project performance.

1.4.2 Objectives of the Study

So, to achieve this, the research study objectives have been summarized as follows:

1. To identify and evaluate the factors influencing the occurrence of reworks in building construction projects in Kwara State

2. To measure the effects of these factors on building delivery
3. To devise measures for the reduction of rework in building construction projects in Kwara State.
4. To analyze the ways to reduce rework on the cost and time during building construction projects in Kwara State.

1.5 Scope and Limitations of the study

The scope of this research is limited to investigate the essential factors that lead to rework occurrence in some selected ongoing building and proffering solutions on how to reduce building project rework cost in Kwara state.

The present study is about the current situation in Kwara State, there are different factors which may cause rework occurrence, the research is limited to some ongoing building project in Kwara State.

A limitation confronted the researcher while collecting relevant data for writing the project prominent among the obstacles are; time and financial constraint.

1.6 Significance of the Study

The study investigates factors influencing rework occurrence on building project, understanding these factors is helpful for the construction professionals who work on the initial's phases of construction planning in order to efficiently deliver the project plan. It will help construction manager to better account for these factors in time and cost control of the building project.

The research work will enhance the stakeholders come up with policy that will encourage and motivate contractors in reducing rework occurrence and thereby increasing their cost and overrun. Knowledge of these factors will also enlighten those in the academic of the need to consider the factors as part of their curriculum.

1.7 Definition of Terms

1.7.1 Rework

It makes changes to something so that it can be used again or is more suitable for a particular use.

1.7.2 Occurrence

Occurrence reporting requirement which will require specific people responsible for the safety of higher-risk buildings to capture and report certain fire and structural safety issues called 'safety occurrences' to the Building Safety Regulator.

1.7.3 Building construction project

A building construction project that is under development, renovation or demolition, and is temporary in nature and has restricted public access.

1.7.4 Project Cost

This is amount to be paid or spent to obtaining or implementing a project.

1.7.5 Project Time

This is the measured or measurable period during which an project process, or condition exists or continues.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature pertaining to rework, covering, inter alia, the previous studies on rework pertaining to the Kwara State construction industry, the nature of rework and rework as a waste of time and cost. This section will also discuss the pervasiveness of rework and factors influencing rework occurrence and their causes, the cost of rework and impact on building projects.

2.2 Concept of Rework

Rework in construction projects is defined as Activities in the field that have to be done more than once in the field, or activities that remove work previously installed as part of the project regardless of source, where no change order has been issued and no change of scope has been identified by the owner (Jason and James, 2018).

Building project time overrun is defined as an addition of time further than the agreed contractual time at the tender stage. Rework can lead to a considerable addition of a project's time and cost overrun, especially during the construction stage. The effect of delays or time overruns for the contractor included increased costs, reduced profit margin, and battered reputation (Eze and Idiake, 2015).

The nature of rework can be determined by referring to the definition, interpretations and classification. Love (2015a) argued that rework has various definitions and interpretations within construction management literature. Synonymous terms for rework include “quality deviations”, “nonconformance”, “defects”, and “quality failures” (Burati, Farrington and Ledbetter, reviewed 2019; Abdul-Rahman, reviewed 2019; Josephson and Hammarlund, reviewed 2018; Barber, Graves, Hall, Sheath and Tomkins, 2015). Similarly, ‘field rework’ is defined as any activities that have to be done more than once or activities that remove work previously installed as part of a project (CII, 2016a). In the sense of conformance, there are two main definitions of rework (Love, 2020a; Fayek, Dissanayake and Campero, 2021).

2.3 Factors Influencing the Occurrence of Rework

Rework is expected to occur in all construction projects. Factors influencing its occurrence include the nature of the works, the procurement method, the complexity of the project, human resource capability, leadership and communication and engineering and reviews**.**

2.3.1 Nature of the Works

Construction works involve building, civil or specialist works. Building works include, for instance, the construction of residential houses, commercial premises and offices. Civil works include the construction of roads, bridges and infrastructural installations (Ndihokubwayo, 2018).

Palaneeswaran (2016) indicated that there are more rework occurrences in building works than in civil works due to different interface-related management issues such as the lack of coordination between building contractors and building services, as well as poor communication between design team and construction team.

According to Love and Wyatt (2019), construction projects involving refurbishment and renovations are prone to considerably higher rework costs than new build projects because of the degree of uncertainty and complexity associated with the building work undertaken.

2.3.2 Procurement and Tendering Method

Those involved in the procurement of buildings invariably do not realize the extent of rework that actually occurs (Love, Mandal and Li, 2019a). Love et. al., (2019a) conceded that there is an escalating need to improve the quality of operations throughout the procurement process in order to reduce the occurrence of rework. The type of procurement method may then influence the extent of rework that might occur in a project. For instance, non-traditional methods are subject to higher rework levels than traditional methods, especially when errors, omissions, or changes occur (Love, 2017a). Traditional methods can provide clients with cost certainty, whereas non-traditional methods are often used when the pressure of early completion is imposed on the project (Holt, Proverbs and Love, 2018). Maizon (2016) concluded that one of the principal reasons for the construction industry's poor performance is the inappropriateness of the procurement systems selected for construction projects.

2.3.3 Complexity of the project

NEDO (2018) and Naoum and Mustapha (2014) indicated that facility types are linked to the concept of complexity and thus have influence on project performance. Baccarini (2016) declared that project complexity consists of many varied interrelated parts. Ireland (2017) stated that complexity involves an item having two or more components or two or more variables. Love, Li and Mandal (2019) stated that in construction projects, activities are typically divided into functional areas performed by different disciplines such as architects, engineers, and contractors and that therefore operate independently. Customarily, each indiscipline makes decisions without considering the impact on others. Love and Irani (2022) maintained that these functional disciplines often develop their own objectives, goals and value systems. So, each discipline has become dedicated to the optimization of its own function with little regard to its effects on the performance of the project as whole with which they are involved.

2.3.4 Human Resource Capability

Fayek, Dissanayake and Campero (2014) identified four possible causes of rework due to human resource capability: excessive overtime, insufficient skills levels, inadequate supervision and job planning and unclear instructions to workers. Similarly, The Business Roundtable (2018) found that lack of adequate planning; scheduling, materials management, quality control and quality assurance were critical problems during construction. Alwi, Hampson and Mohamed (2014) stated that inadequate supervision, inexperienced supervisors and lack of skilled labour are the major causes of rework. Therefore, experienced and well-trained supervisors have an important role in minimizing the amount of rework due to construction defects. Apart from this, construction environments are characterized by problems related to production, general quality of work, design changes, material quality and availability and capacity utilization (Akintoye, 2015). Moreover, Hampson (2017) stated that a major challenge facing today's construction project managers is encouraging innovation throughout the project process to ensure that all problems are easy to identify. Alwi et al. (2021) stated in a study to determine the effect of quality supervision on rework that the quality of site supervision has a major influence on the overall performance and efficiency of construction projects.

2.3.5 Leadership and Communication

Hwang, Thomas, Haas and Caldas (2019) maintained that poor leadership and communication and ineffective decision-making cause rework. Love, Edward, Irani and Walker (2019) stated that the underlying contributors of rework due to poor leadership are strategic decisions taken by top management or key decision-makers who stimulate the conditions for the adoption of inappropriate structures, processes, practices and technologies for projects.

Fayek et al. (2014) identified the following possible causes pertaining to leadership and communication: ineffective management of project team, lack of safety and quality assurance and control commitment, poor communication and lack of operation persons' buy-in. Alwi et al. (2015) affirmed that quality management principles and tools are not strongly embedded in conventional construction management practice. As a result, rework, on many cases, is accepted as an inevitable feature of the construction process increasing the likelihood of project time and cost overruns, and ultimately leading to client dissatisfaction.

Likewise Jaafari, (2019) asserted that one of the most perplexing issues facing organizations in the construction industry is their inability to become quality focused. As a result substandard products and services often emanate, which inadvertently result in rework. The inability of supervisors to plan work, communicate with workers, and direct activities adequately is fundamentally linked to increasing amount and cost of rework. These abilities can be improved by formal training (The Business Roundtable). Clients and their project team members must communicate and work harmoniously if projects are to be delivered on or ahead of time (Walker, 1994). Love, Mandal and Li (2019) concluded that poor communication leads to higher rework.

2.3.6 Engineering and reviews

Love and Li (2020) revealed that errors and omissions appear to be major contributing factors to rework. The Building Research Establishment in the UK (BRE 2015,) found that errors in buildings had 50% of their origin in the design stage and 40% in the construction stage. Lopez, Love, Edwards and Davis (2015) identified the following factors that cause design error in their study entitled "Design error classification, causation and prevention in construction engineering": loss of biorhythm, adverse behaviour, inadequate training of design consultants and competitive fees, and ineffective utilisation of computer-aided automation. In addition,

inadequate quality assurance, ineffective coordination and poor integration of the design team were also identified.

A cited example in the research undertaken by Love and Li (2016) divulged that the architect's documentation for the ceilings and partitions package contained dimensional errors and missing information, and thus affected the set-out of the internal walls. During construction, rework arose out of this incomplete and erroneous information. Every time a change was made in design, it had to be reworked by the design team, which in turn affected their fee (Love and Li, 2017). The other source of construction changes was direct from the architects, as they wanted to improve the functionality and aesthetics of the building (Love and Li, 2017).

Moreover, Coles (2020) noted that the use of inexperienced and under-qualified staff lacking technical knowledge could also lead to errors and omissions in contract documentation being made. Lopez et al. (2015) argued that insufficient knowledge simply masks a more complicated problem inherent with design firms. In many cases, design firms use inexperienced staff so as to maximize their fees as well instigate "time boxing" practices, a practice which occurs when fixed durations are allocated to undertake tasks, irrespective of how complete (or incomplete) the design documentation or design task is, often to meet tight project schedules (Love, Edwards and Irani, 2018).

2.3.7 Construction planning and schedule

Mastenbroek (2015) stated that the work preparation before the design and construction stage is imperative. Love (2019) argued that the occurrence of rework can usually be put down to poor planning or devoting of insufficient time to the planning and design before commencing construction. Similarly, Hwang, Thomas, Haas and Caldas (2019) identified inadequate pre-project planning as a contributing factor to rework. For instance, changes due to improper planning contribute significantly to rework cost as opined by Josephson, Larsson and Li (2020), costs which could be as high as 34%, wrong information (15%) and bad planning method (15%). Mastenbroek (2015) stated that a change in construction methods can lead to rework on site as well as numerous indirect consequences such as stress.

According to Alwi, Hampson and Mohamed (2015), project managers acknowledge that in some cases, the causes might be interrelated or lead to one another. For example, an

inexperienced supervisor who makes a mistake in choosing the suitable construction method will certainly affect the construction process. Therefore, several construction methods should be considered and compared by analyzing aspects of each such as costs, reliability, availability of knowledge and equipment and applicability (Mastenbroek, 2014).

2.4 The effects of factors influencing the occurrence of reworks in building construction projects.

The occurrence of rework clearly has an adverse impact on project performance. Palaneeswaran (2016) maintained that rework has both direct and indirect impact on project performance. For instance, in poorly managed projects, the gross impacts of rework (that is, both direct and indirect) could be equal to or even exceed the anticipated mark up or profit margin levels. Also, in some cases there will be some carry forward ripple effects on different aspects such as stress, motivation, relationships and reputation. The author identified the following direct impact of rework on project management transactions: additional time to rework, additional costs for covering rework occurrences, additional materials for rework and subsequent wastage handling, and additional labour for rework and related extensions of supervising manpower.

Love (2020) concluded that rework can seriously affect an individual, an organization and a project's performance indirectly. At the individual level, stress, fatigue, absenteeism, de-motivation, and poor morale were found to be the primary indirect effects of rework. In fact, when an individual is subjected to prolonged work hours because of errors, changes or omissions, fatigue and stress are likely to emerge, increasing the likelihood of even further rework occurring (Abdul-Hamid and Madnick, 2021; Love, Mandal, Smith and Li, 2020).

At the organization level, Love (2020b) identified reduced profit, diminished professional image, inter-organizational conflict, loss of future work and poor morale as indirect effects of rework. At the project level, work inactivity such as waiting time, idle time, travelling time and end-user dissatisfaction were identified as indirect consequences of rework.

Love (2020b) identified physiological and psychological consequences associated with undertaking rework. For example, increased stress due to the additional financial burden and the loss of profit, as well as having to re-do something again, can have demotivating consequences.

Chan and Kumaraswamy (2017) and Love (2020a) suggested that rework can adversely affect the performance and productivity of design and construction organizations. Additionally, it is a major factor contributing to time and cost overruns on construction projects. According Buratiet. Al., (2020), rework specifically in the form of changes can have an effect on the aesthetics and functional aspects of the building, the scope as well as the nature of work, and its operational aspects. Rework adversely impacts construction project performance in terms of cost overruns, time overruns, quality degradation and professional relations.

2.4.1 Cost Overruns

Azhar, Farooqui and Ahmed (2018) declared that cost overrun is a very frequent phenomenon and is associated with almost all projects within the construction industry. Cost has its proven importance as the prime factor for project success. Most of the significant factors affecting project costs are qualitative, such as client priority on construction time, contractor's planning capability, procurement methods and market conditions including the level of construction activity (Elchaig, Boussabinaine, and Ballal, 2015). Unfortunately, many construction projects incur cost overruns as a result of rework. Love (2017a) stated that rework is an occurrence that consultants do try hard to avoid because it leads to potentially high to cost increases. Cost overrun can be defined simply as situations in which the final cost of the project exceeds the original estimates (Avots, 2023). Endut, Akintoye and Kelly (2015) stated that cost overruns are major problems in project development and yet are regular features in the construction industry especially for developing country. This makes projects costly for the parties involved in construction, especially for contractors and clients.

2.4.2 Time Overrun

Endut, Akintoye and Kelly (2015) defined construction project time overrun as an extension of time beyond the agreed contractual time during the tender. Rework can lead to a significant extension of a project's time overrun. During the construction phase, rework extends project delivery and cost. According to Endut et al. (2015) the impact of project time overrun or delays for contractors include increased costs, reduced profit margin and battered reputation. Furthermore, clients are also affected by additional charges and professional fees and reduced incomes resulting from delayed occupancy. As part of the factors responsible for delays in

construction completion, Ng, Mak, Skitmore, Ka, and Varnam (2014) noted that most contractors assume that duration set by the client is realistic and prepare their bid accordingly. Love (2017a) affirmed that the occurrence of rework will invariably result in the contractors re-evaluating their project schedules, as delays have the potential to lead to the incurring of liquidated damages.

2.4.3 Quality Degradation

According to Construction Quality in South Africa (CQSA) (2017), value to clients is a very complex and often a subjective issue, but it is recognized that quality of construction is a key component of perceived value to clients. As noted by FIDIC, lack of quality in construction is manifested in poor or non-sustainable workmanship and unsafe structures, and in delays, cost overruns and disputes in construction contracts. Mastenbroek (2015) stated that rework often means that parts of a structure have to be scrapped and new material needed to rebuild, a result of compromise with quality which leads to wastage of resources.

2.4.4 Battered Professional Relations

Love and Edwards (2014b) maintained that one of the resultant ripple impacts of rework is damaged reputation and goodwill. Endut, Akintoye and Kelly (2015) affirmed that one impact of project time overrun or delays for contractors includes battered reputation. A cited example is a study undertaken by Love (2020b) to examine the indirect consequences of rework in construction. The contractor found it difficult to organize many of the subcontractors to return to site to rectify defective and incomplete work, as most were working on other projects. Consequently, some work such as re-installing general purpose outlets, sanitary appliances, re-installing locks to doors, and painting had to be undertaken after purchasers had moved into their units. Many of the purchasers considered this an inconvenience and consequently blamed the contractor for the incomplete and poor-quality work. In this respect, the intangible costs to the contractor’s image are greater than may at first be appreciated.

2.4.5 Deviations in Construction

Deviations that are related to the construction phase of the project and consist of those activities and tasks that take place at the project site during the construction interface. A

construction change could be seen as a change in the method of construction and construction changes are usually made to enhance the constructability of the project. Deviations in construction could be seen as construction errors are the result of erroneous construction methods or procedures. Construction omissions are those deviations that occur due to the omission of some construction activity or task (Burati, Farrington and Ledbetter, 2021).

2.4.6 Concept of Quality Cost

Quality could be referred to as conformance to established requirement; therefore, any rework occurred from this requirement that affects with a severity sufficient enough to consider options on the projects to either accept or taken corrective action could also be seen as non-conformance (Burati, Farrington and Ledbetter, 2018).

Quality cost of construction work or design comprises of all costs incurred by client/contractor because the project refuses to meet the users' requirement (Davis, Ledbetter and Burati, 2019). Rounce (2018) captured quality cost in the design process as the cost of writing procedures and obtaining quality assurance certification". In broad term, quality cost to a client is the total expenditure incurred in given client best value for money both in term of functionality of the design and aesthetic value of the project.

2.5 The Reduction of Rework in Building Construction Projects in Kwara State.

Rework costs are determined from the point where rework is identified to that time when rework is completed and the activity has returned to the condition or state it was in original. The duration of the cost tracking includes the length of the standby/relocation time once rework is identified, the time required to carry out the rework, and the time required to gear up to carry on with the original scope of the activity (Fayek, Dissanayake and Compero, 2013).

Koskela (2015) described the construction process as a combination of value-adding activities and non-value-adding activities. Value-adding is to change the form, fit or function of a product in order to satisfy the customer (Allen, 2020). For instance, in the purchase of a constructed facility, Seibert, Seppanen, Kunz and Paulson (2016) stated that the buyer or owner values those components that are in place when the owner or end-user occupies the building. The activities essential to place these components are therefore clearly value adding. Value-adding activities

are only part of the work completed during a construction operation. Maximizing the fraction of all activities that are value-adding increases the overall effectiveness in adding value during a construction operation (Seibert et al., 2016).

On the other hand, Alarcon (2014), Koskela (2014) and Love, Mandel, and Li (2014) stated that all those activities that produce costs, direct or indirect, and take time, resources or require storage but do not add value or progress to the product can be called non value adding activities or waste. For instance, when rework ensues, numerous non value-adding activities with associated costs are likely to arise, activities which include idle plant and labour during the waiting time, demolitions, time taken by the designer to understand the required change and redesign, and cost and time for litigation in case misunderstanding arises between the contractor and the client or client's consultant (Ndihokubwayo, 2018). According to Alarcon (2014), Koskela (2020) and Love, Mandel, and Li (2017) waste categories are measured as a function of their costs, including opportunity costs. Furthermore, other types of waste are related to the efficiency of process, equipment or personnel. Ekanayake and Ofori (2020) classified construction waste into three main categories: materials, labour and machinery waste. However, any effort in terms of labour, materials and machinery which is directed towards the construction of a part or element of a building and which has to be done again due to non-conformity to the design constitutes a waste, which is also seen as rework.

The occurrence of rework related factors could be managed to minimize redoing the component of the work. However, Kendall (2022), opine there is no framework for controlling rework occurrence. Nevertheless, constructability review, adult supervision required, communication, collaboration and coordination and trained employee are tools for minimizing rework

2.5.1 Constructability Review

A constructability review is a process used to determine how buildable a construction project is based on the plans, specifications, and site conditions. The goal of a constructability review is to determine how easily and efficiently a project can be built by applying real-world construction knowledge to the design documents.

Constructability reviews require an in-depth review of the plans and specs and should be easy to understand and interpret. Any ambiguity, missing items, or contradictions in the plans should be

addressed. Geotechnical reports and site conditions should be carefully reviewed to avoid any surprises down the road. Pay close attention to foundation elements, structural components, and building materials and components specified (Saidu, 2016a).

Building Information Modeling (BIM) and Virtual design and construction (VDC) software are great tools to use while performing constructability reviews for clash detection between building components and better visualization of the project. Identifying possible issues early allows the design team to make the necessary adjustments to the plans and specs to avoid rework once construction is underway (Haron, 2014).

2.5.2 Adult Supervision Required

One of the best ways to prevent costly rework is to have a capable and knowledgeable construction manager overseeing the jobsite. The construction manager should be monitoring the day-to-day activities on the site and working with foremen and subcontractors to inspect the work in progress and completed tasks. The construction manager cannot be everywhere all the time, but they should frequently walk the jobsite throughout the day to identify issues early and prevent costly rework (Simpeh, 2016).

The construction manager also needs to work closely with the project manager to ensure that the project is staying on budget and schedule. Make sure all subcontractors are prequalified and are able to perform their work correctly. If working with newer materials or building components make sure you consult with the manufacturer or distributor to ensure that workers are trained on the proper techniques for installation (James, 2015).

On larger projects, drones and cameras are a great way to monitor construction activity and ensure everything is running smoothly on your construction project. 3D laser scanning technology is also growing in popularity on construction sites. These scans can then be compared against BIM models, 3D drawings, schedule, and estimates to inspect the quality of the work performed and to determine how much progress has been made each day (Simpeh, et al., 2015).

2.5.3 Communication, Collaboration, and Coordination

There are lots of players and stakeholders involved on a construction project. You got your owner and design teams as well as the general contractor, multiple trade contractors, suppliers,

service providers, building inspectors, etc. For a construction project to run smoothly, all of these parties need to be kept informed on how the project is progressing (Wasfy, 2015).

Cloud-based project management software and mobile apps are a great way to keep everyone in the loop. Daily reports, change orders, updated plans, and as-builts can all be easily and updated in real time to ensure everyone has the most up-to-date and current information on the project.

If rework is required, make sure you are communicating and collaborating with all the affected parties to work together and devise a plan and adjust the construction schedule. General contractors should coordinate with subs and suppliers when rework needs to be done and keep them updated when work is falling behind or getting ahead of schedule so they can adjust their schedules as needed. Make sure to alert subcontractors performing subsequent work when rework is required to avoid a chain reaction of rework (Simpeh, 2014).

2.5.4 Trained Employee

The skilled labor shortage that was caused by the Great Recession is still impacting the construction industry in some areas of the country. Many firms are working with less experienced workers but that's not an excuse for poor quality work. Workers need to be properly trained on how to perform their tasks safely and correctly (Love, 2014).

With greener workers, additional supervision may be needed to ensure they are performing tasks to your quality standards. Consider pairing them with a more experienced worker to act as a mentor to oversee their work and provide on-site training and supervision. The more time and money you invest in training your workers will result in a more efficient and confident workforce. A well-trained workforce is key to improving jobsite productivity and quality of work (Marosszeky, 2016).

Rework in construction may be inevitable, but with proper planning and oversight it can be prevented or mitigated so it doesn't have negative impact on your productivity and profitability (James and Jason 2015).

2.5.5 Deviations in Construction

Deviations that are related to the construction phase of the project and consist of those activities and tasks that take place at the project site during the construction interface. A construction change could be seen as a change in the method of construction and construction changes are usually made to enhance the constructability of the project. Deviations in construction could be seen as construction errors are the result of erroneous construction methods or procedures. Construction omissions are those deviations that occur due to the omission of some construction activity or task (Burati, Farrington and Ledbetter, 2020).

2.5.6 Plan, Prepare, Schedule

Once you have hopefully, completed your constructability review, it is time to start planning and scheduling the work on your project. Make sure you have the workforce and equipment needed perform the work, create a site plan, and work with your vendors to make sure the materials you need are available to be delivered when you need them. Any substitution of materials needs to be approved by the owner and design team before procurement and installation (Oyewobi, 2014).

General contractors should work with subcontractors and service providers to schedule out the timeline of the project and when each task is expected to be completed. Identify which tasks can be performed concurrently with other activities on the jobsite and which need to be completed sequentially.

Look for potential risks and problems that might come up. Identify areas where rework is most likely to occur and craft a backup plan to adjust your schedule of work to minimize the effect it has on your costs and project timeline. When unexpected rework pops up, you want to mitigate the damage quickly and make the necessary adjustments to keep your project on schedule (Oke 2014).

2.6 Ways to Reduce Rework on The Cost and Time During Building Construction Projects in Kwara State.

The influence of rework can have both positive and negative effects on various aspects of a project or process. Rework refers to the act of repeating or revising work that has already been completed, typically due to errors, defects, or changes in requirements. (Lacazzate et al 2011).

Here are some key considerations regarding the influence of rework:

2.6.1 Time and Schedule

Rework can significantly impact project timelines and schedules. When rework is required, it takes additional time to rectify errors or make changes, which can delay the completion of the overall project. This can result in missed deadlines, increased project duration, and potential financial implications. (Lacazzete and mesut, 2017)

2.6.2 Cost

Rework often leads to additional costs. The time and effort spent on redoing work, including materials, labor, and other resources, can increase project expenses. Moreover, the longer a project takes to complete, the more it may cost in terms of overhead, maintenance, or opportunity costs. (Fernades et. al., 2016)

2.6.3 Quality

Rework can have a positive influence on the quality of a project or process. When errors or defects are identified and addressed through rework, it helps improve the final outcome. Rework allows for fixing mistakes, enhancing product performance, and ensuring compliance with quality standards. However, excessive rework may indicate deeper issues in the planning, design, or execution phases, which can have a negative impact on quality. (Martinelli et. al., 2017)

2.6.4 Productivity and Efficiency

Excessive rework can reduce overall productivity and efficiency. Constantly repeating work consumes resources and diverts attention from other important tasks. It can lead to frustration and demotivation among team members, affecting their performance and hindering progress. Therefore, minimizing rework through effective planning, quality control, and clear communication is crucial to maintain productivity and efficiency. (Andrew et. al., 2015)

2.6.5 Customer Satisfaction

Rework can influence customer satisfaction. On one hand, addressing errors or defects through rework improves the final product or service, which can enhance customer satisfaction. On the other hand, excessive rework can lead to delays in delivering the desired outcome, potentially disappointing customers. (Abdulqodri 2017) Balancing the need for rework with timely delivery is essential to maintain customer satisfaction.

2.7 Cost of Rework

2.7.1 Overview of cost of rework

Love (2014b) stressed that there is a lack of uniformity in the way in which rework cost data have been collected because of the various interpretations as to what constitutes rework. Arguably, the measurement of rework costs in itself does not result in improvement; it merely provides the starting point for establishing new knowledge (Love and Holt, 2020). Love (2022b) suggested that design and construction organizations must implement a quality management system, supported by a quality cost system, in order to reduce the costs of rework. Only when organizations begin to measure their rework costs carefully will they fully appreciate the economic benefits of achieving high quality. Low and Yeo (2018) advocated that substantial reductions in appraisal costs can be achieved by eliminating the root causes of rework. Likewise, the BRE (2015) stated that 15% savings on total construction costs could be achieved through the elimination of rework, and by spending more time and money on prevention. To improve the performance of construction organizations and reduce costs, Davis et al. (2019), Abdul-Rahman (2019) and Low and Yeo (2018) have stressed the need to measure quality costs.

Love and Li (2020) agreed that prevention and appraisal costs are unavoidable costs that must be incurred by construction companies and consultant firms if their products and services are to be delivered right the first time. The quality cost components are two-fold, namely cost of control and cost of failure control. The cost of control comprises prevention and appraisal cost. Love and Irani (2022) stated that prevention costs involve amounts invested to prevent or reduce errors and defects, whilst appraisal costs include the detection of errors or defects by measuring conformity to the required level of quality. Cost of failure control includes internal and external failure costs. Internal failure costs will be incurred as a result of scraping or reworking defective product or compensation for delays in delivery; on the other hand, external failure costs involves costs of repairs, returns, dealing with complaints and compensation after a product has been delivered to the client (Love and Irani, 2020).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the procedures use in carrying out the field work. It is of great importance for us to understand the major aim of this research work because research is based on the realization of a need in the human society**.** Disputes generally have no positivism and in every sphere of life where it occurs there is a great tendency of a breakdown of law and order. The basic aim of this study is to determine the underlying factors that influence rework occurrence during building construction and the impact on overall project performance. At the end of this study, factors that influence rework occurrence during building with encouraging time, cost and quality implication will be suggested and introduced into the building construction industry.The methodology chapter discusses and explains the research design which will be used to acquire the data to be analyzed. Also, the sampling size and techniques, as well as the data collection procedure which includes the questionnaire design and administering then questionnaire, will be described. In addition, the data analysis techniques, testing of the hypotheses and validity and reliability of the data collection instrument have been outlined.

3.2 Research Design

Qualitative research methods will be chosen to enable the researcher to develop a coherent and comprehensive view of insights into the causes and effect of rework during construction projects from the perspective of the respondents. In this light, the case study and the questionnaire survey approaches will be implemented in this research study. More specifically, the questionnaire survey method provided a tool to gather data over and beyond the physical reach of the researcher.

3.3 Population of the Study

The targeted population for the research is selected professionals (Architects, Quantity Surveyors, Engineers, Builders and Town Planners) working as clients, consultants and contractors, and involved in the building construction of the North-Central part of Nigeria. This

selection was based on the fact that possible audience can easily be granted by professional colleague and team members that are readily available in the construction sites/offices.

3.4 Sample Size

Leedy (2018) argued that sample size is dependent on the degree to which the sample population embodies the qualities and characteristics of the general population. If the population is sufficiently small, a full population may be researched. However, a total of 50 questionnaires will be distributed to the respondents.

3.5 Sampling Techniques

The technique of non-probability sampling will be adopted for this study. In non-probability sampling, there is no way of guaranteeing that each element of the population will be represented in the sample. Furthermore, some members of the population have little or no chance of being sampled (Leedy and Ormrod, 2020). However, Kothari (2015) argued that when using non-probability sampling, the particular units of the population which constitute the sample is purposively chosen on the basis that the small mass selected will be representative of the whole population.

3.6 Method of Data Collection

A questionnaire is an instrument which enables one to gather data beyond his physical reach, without seeing the source from which the data has originated. A questionnaire is, therefore, atotally impersonal probe. Because of the impersonality associated with questionnaires, a questionnaire needs to be governed by certain practical guidelines (Leedy and Ormrod, 2015)

The questions for the survey were formulated according to the research objectives and a model established during the literature study. The first section (section A) of the questionnaire requested information about the profile of respondents.

3.7 Method of Administering Data

The questionnaire will be administered to the respondents by hand and received back through the same procedure.

3.8 Test of Validity and Reliability of Data

The questionnaire will be draft and submit to the supervisor for approval and observation will be incorporation into final draft

3.9 Method of Data Presentation and Analysis

The quantitative data will be collected from questionnaires will be used for frequency distribution methods and descriptive statistic like mean mode and medium.

The data collected were arranged and analyzed using nominal and ratio scale to derive results.

The data collected will be analyzed with descriptive method through the use of mean mode and other descriptive method, while data presentation will be through the use of tables and simple percentage.

3.10Tools for Data Analysis

In order to correctly assess the results that were obtained from scoring of the questionnaires and testing of aim and objectives of this study, the under-listed statistical tools were used:

3.10.1 Percentile Method

Percentage helps in rating a number of variables. Percentage is used to show the size of the respondents who had the same opinions and those with conflicting. It involves obtaining the proportion of response to a particular option by a respondent to the total number of respondents. This would be expressed as percentage. The option having the largest number of responses will be considered as representing the majority upon which the final conclusion to the question is based.

3.10.2 Tables and Ranking

This is a vertical display of the various opinions of respondents in a clear and concise manner that will assist the researcher to rank in order of occurrence.

CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter discussed data collected from the field, its analysis and discussion of findings.

4.2 Data Presentation and Analysis

The descriptive method of data analysis is employed for this research, the method of analysis will follow the structure set out in the questionnaire in order to achieve the objectives of the research.

Table 4.2.1: Distribution of Questionnaires

Types of response	Frequency	Percentage (%)
Number distributed	50	100
Number properly completed and returned	47	94
Number not returned	3	6

Researcher field work, 2025 **N = 47**

From the table above 50 (100%) of respondents are under Number distributed, 47 (94%) respondents are under Number properly completed and returnedand 3 (6%) are under Number not returned.

Table 4.2.2: professional discipline of respondents

Professional	Frequency	Percentage (%)
Architect	6	12.7
Civil Engineer	5	10.6
Quantity Surveyor	19	40.4
Builder	10	21.2
Project Manager	7	14.8
Others	-	-
Total	47	100

Source: Research survey, 2025

From the table above 6 (12.7%) of respondents are under Architect, 5 (10.6%) respondents are under Civil Engineer, 10 (21.2%) are under Builder, 19 (40.4%) respondents are under Quantity Surveyor, while 7 (14.8%) of the respondent are underProject Manager.

Table 4.2.3 Highest Academic Qualification of Respondents

Qualification	Frequency	Percentage (%)
HND	10	20.8
B.sc/B.Tech	10	20.8
PGD	7	14.5
M.sc/ M.Tech	18	37.5
Ph.D	2	4.2
Total	47	100

Source: Research survey, 2025

From the table above 10(28.7%) of respondents have HND qualifications, 10(20.8%) with B.sc/B.Tech, 18(37.5%) with PGD, 9(20.8%) M.Sc/M.tech qualifications, while 2(4.2%) with PhD qualifications.

Table 4.2.4; Working Experience of Respondents in the Construction Industry in Kwara State Polytechnic

Years of experience	Frequency	Percentage (%)
0-5 years	15	31.3
6-10 years	7	14.5
11-15 years	11	25
16 – 20	10	25
20 years and above	4	8.3
Total	47	100

Source: Research survey, 2025

From the table above 15 (31.3%) of the respondents have served in their organization for less than ten years 7(14.5%) of the respondents have served in their organization for less than less than eleven years, 11(25%) of the respondents have served in their organization between eleven and fifteen years, 10(25%) between sixteen and twenty years respectively, while 4(8.3%) have served above thirty-one.

4.3 Analysis of Data Collection on Objectives

4.3.1 What are the variable of the factors influence the occurrence of reworks on building project in Kwara State

Table 4.3.1

S/N	Factors influence the occurrence of rework	Rating					Mean	Remark
		SA	A	N	SD	D		
1	Nature of the work	20	15	7	4	1	3.9	Accepted
2	Procurement and tendering method	19	14	11	2	1	3.7	Accepted
3	Complexity of the project	17	15	8	5	2	3.8	Accepted
4	Human resource capability	19	15	8	3	2	3.5	Accepted
5	Leadership and communication	16	12	10	7	2	3.7	Accepted
6	Engineering and review	19	15	8	3	2	3.5	Accepted
7	Construction planning and schedule	20	15	4	7	1	3.9	Accepted

Researcher field work, 2025 **N = 47**

Table 4.3.1 shows the Factors influencing the occurrence of reworks on building project in Kwara State. The factors include: nature of the work with mean value of 3.9; procurement and tendering method with mean value of 3.7; complexity of the project with mean value of 3.8, human resource capability with mean value of 3.5, leadership and commendation with the mean value of 3.7, engineering and review with mean value of 3.5. construction planning and schedule review with mean value of 3.9. The highest mean values are nature of the work and construction planning and schedule.

4.3.2: what are the measures of reduction in rework on building project in Kwara State?

Table 4.3.2

S/N	Measures of Reduction in Rework	Rating					Mean	Remark
		SA	A	N	SD	D		
1	Constructability review	19	20	6	-	2	4.1	Accepted
2	Adult supervision required	22	15	5	2	3	4.1	Accepted
3	Communication, collaboration and coordination	17	16	8	1	5	3.8	Accepted
4	Trained employee	15	18	6	2	6	3.7	Accepted
5	Deviation in construction	17	19	7	1	3	3.9	Accepted
6	Plan, prepare and schedule	25	10	8	2	2	4.1	Accepted

Researcher field work, 2025 **N = 47**

Table 4.3.2 shows the Measures of reduction in rework on building project in kwara state. The factors include: Constructability review with mean value of 4.1; Adult supervision required with mean value of 4.1; Communication, collaboration and coordination with mean value of 3.8, Trained employee with mean value of 3.7, deviation in construction with the mean value of 3.9, Plan, prepare and schedule with mean value of 4.1. The highest mean Constructability review, adult supervision required and Plan, prepare and schedule with the value of 4.1 mean.

4.3.3: what is the Impact of Rework on Building Construction Projects in Kwara State?

S/N	Impact of Rework on Construction Projects	Rating					Mean	Remark
		SA	A	N	SD	D		
1	Cost overrun	20	19	6	-	2	4.1	Accepted
2	Time overrun	22	15	5	2	3	4.1	Accepted
3	Quality degradation	17	16	8	1	5	3.8	Accepted
4	Battered professional relation	18	15	6	2	6	3.7	Accepted
5	Deviation in construction	17	19	7	1	3	3.9	Accepted
6	Concept of quality cost	25	10	8	2	2	4.1	Accepted

Researcher field work, 2025 **N = 47**

Table 4.3.3 shows the Impact of rework on building construction projects in kwara state. The factors include: cost overrun with mean value of 4.1; time overrun with mean value of 4.1; quality degradation with mean value of 3.8, battered professional relation with mean value of 3.7, deviation in construction with the mean value of 3.9, concept of quality cost with mean value of 4.1. The highest mean values are cost overrun, time overrun and concept of quality cost with the value of 4.1 mean.

4.3.4 What are the Determinations on the Influence of Rework on construction projects in Kwara State

Table 4.3.4

S/N	Determinations on the Influence of Rework on construction projects	Rating					Mean	Remark
		SA	A	N	SD	D		
1	Time and Schedule	16	12	10	7	2	3.7	Accepted
2	Cost	19	14	11	2	1	3.7	Accepted
3	Quality	19	15	8	5	2	3.8	Accepted
4	Productivity and Efficiency	17	15	8	5	2	3.8	Accepted
5	Clients Satisfaction	20	15	7	4	1	3.9	Accepted

Researcher field work, 2025 **N = 47**

Table 4.3.4 shows the Determinations on the influence of rework on construction projects in kwara state. The factors include: Time and Schedule with mean value of 3.7; Cost with mean value of 3.7, Quality with mean value of 3.8, Productivity and Efficiency with the mean value of 3.8, Clients Satisfaction with mean value of 3.9. The highest mean values are Clients Satisfaction.

4.4 Discussion of Findings

From table 4.2.2 above 6 (12.7%) of respondents are under Architect, 5 (10.6%) respondents are under Civil Engineer, 10 (21.2%) are under Builder, 19 (40.4%) respondents are under Quantity Surveyor while 7 (14.8%) of the respondent are under Project Manager. Respondents registered under Quantity Surveyor have the highest value percentage 40.4%.

Table 4.2.3 above 10(28.7%) of respondents have HND qualifications, 10(20.8%) with B.sc/B.Tech, 18(37.5%) with PGD, 18(31.5%) M.Sc/M.tech qualifications, while 2(4.2%) with PhD qualifications. The respondents with M.Sc/M.Tech qualifications have the highest percentage.

Table 4.2.4 above 15 (31.3%) of the respondents have served in their organization for less than ten years 7(14.5%) of the respondents have served in their organization for less than less than eleven years, 11(25%) of the respondents have served in their organization between eleven and fifteen years, 10(25%) between sixteen and twenty years respectively, while 4(8.3%) have served above thirty-one.

Table 4.3.1 shows the Factors influencing the occurrence of reworks on building project in Kwara State. The factors include: nature of the work with mean value of 3.9; procurement and tendering method with mean value of 3.7; complexity of the project with mean value of 3.8, human resource capability with mean value of 3.5, leadership and commendation with the mean value of 3.7, engineering and review with mean value of 3.5. construction planning and schedule review with mean value of 3.9. The highest mean values are nature of the work and construction planning and schedule of 3.9 mean.

Table 4.3.2 shows the Measures of reduction in rework on building project in kwara state. The factors include: Constructability review with mean value of 4.1; Adult supervision required with mean value of 4.1; Communication, collaboration and coordination with mean value of 3.8, Trained employee with mean value of 3.7, deviation in construction with the mean value of 3.9,

Plan, prepare and schedule with mean value of 4.1. The highest mean Constructability review, adult supervision required and Plan, prepare and schedule with the value of 4.1 mean.

Table 4.3.3 shows the Impact of rework on building construction projects in kwara state. The factors include: cost overrun with mean value of 4.1; time overrun with mean value of 4.1; quality degradation with mean value of 3.8, battered professional relation with mean value of 3.7, deviation in construction with the mean value of 3.9, concept of quality cost with mean value of 4.1. The highest mean values are cost overrun, time overrun and concept of quality cost with the value of 4.1 mean.

Table 4.3.4 shows the Determinations on the influence of rework on construction projects in kwara state. The factors include: Time and Schedule with mean value of 3.7; Cost with mean value of 3.7, Quality with mean value of 3.8, Productivity and Efficiency with the mean value of 3.8, Clients Satisfaction with mean value of 3.9. The highest mean values are Clients Satisfaction.

The analysis was done using the descriptive statistical table and data were interpreted by means of frequencies and descriptive statistics. Concerning the causes of rework, it was found that poor communication with design consultants was a major factor that contributed to client-related rework. In the case of design-related rework, the most predominant factor was change made at the request of the client. Relative to site management related-factors, setting out errors were identified as one of the major factors that contributed to rework. It was evident that low labour skill level used by subcontractors resulted in rework on site. The T-test was used to determine if there were differences between the causes of rework and project types. It was evident that the causes of rework do not differ significantly between project types.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.2 Conclusion

During the initial comparative case study, it was evident that changes made at the request of the client and design team contributed to rework. Love, Edwards and Smith (2015) established that variations during the design process are often captured too late because of the sequential communication structure of supply chains, and the lack of coordination and integration between design team members.

This was apparent in the case study, where the lack of coordination among design consultants led to major design-related changes which affected all the design firms involved. This subsequently resulted in changes on site, which affected most of the subcontractors.

5.3 Recommendations

The recommendation on, rework reduction and containment strategies can be developed only if a clear distinction is made between what constitutes rework and what does not. Owners need to effectively manifest their needs and requirements before designs are conducted**.** The following are my recommendation;

1. The need for training of construction Stakeholders on construction rework and other Variables that causes Projects to overshoot The Budget, time and another resource. Consultants need to give special care to the review.
2. Make sure that everyone understands the contractual procedure**.**
3. Owners, contractors, designers, etc. must be aware of the detail provision in the contract document**.**
4. Effort needs to be made to improve skills and knowledge; otherwise, the loss of reputation, delays and disruptions to construction and loss of profit will become products of rework that arises on-site.

REFERENCES

Abdul-Rahman and Burati, Farrington and Ledbetter Memon, A.H. & Endut, A.T. (2020). *Significant factors causing cost overruns in large construction projects in Malaysia. Journal of Applied Sciences, 13(2), pp. 286-293. http:// dx.doi.org/10.3923/jas.2013.286.293.*

Aminudin and Ibironke, C., and Davis, Ledbetter (2019), *The cost of non-conformance during a highway project: A case study. Construction Management and Economics, 13 (1): 23–32.*

Abdulqodri and Adejimi, A. (2017). Poor building maintenance in Nigeria: *Are Architects free from blames. Being paper presented at the ENHIR international conference on "Housing: New challenges and innovations in tomorrow's cities" in Iceland.*

Akintoye, D. A. (2015). Improving the design-construction interface. In: *Proceedings of the sixth Annual Conference of the International Group for Lean Construction, Guaruja- brazil.*

Azhar, Farooqui and Ahmed. (2018). Construction Finance, Birnin kebbi: Timlab Quanticost.

Akintoye., I. and Alwi 2021, W.M.W., (2015a). *A Study of the Relationship between Material Waste and Cost Overruns in the Construction Industry. The 9th CIDB Postgraduate Conference Cape Town, South Africa. Emerging trends in construction organisational practices and project-management knowledge area. Edited Windapo, A.O., 124-134, Feb, 2-4, 2016.*

Alarcon, Koskela and Love, Mandel, and Li Y. (2014). ''*The causes and costs of defects in construction. A study of seven building projects.'' Automation in. Constuction, 8(6), 681–642.*

Eze and Idiake, Zack. (2015); "*The Impact of Rework on Construction & Some Practical Remedies". Navigant Construction Forum.*

Eze and Idiake, (2015).. Poor building maintenance in Nigeria: *Are Architects free from blames. Being paper presented at the ENHIR international conference on "Housing: New challenges and innovations in tomorrow's cities" in Iceland.*

Edwards and Davis R., Love, P. E.D. (2015), Evaluating the direct and indirect costs of rework. *Selected Works, Cape Peninsula University of Technology.ICEC2012-72.*

Fayek, Dissanayake and Campero, D.W.M. (2014) Contributors to Construction Delays. *Construction Management and Economics. 16. 17-29.*

Hwang, Thomas, Haas and Caldas (2019). ''*Quality failures costs in civil engineering projects.'* *International Journal of Quality and Reliability Management. 17(4/5), 479–49*

Irani and Walker W. B. (2019). *Causes of quality deviations in design and construction. Journal of Construction Engineering and Management. 118(1), 34–49*

Josephson, P. E., and Hammarlund, Y. (1999), *The causes and costs of defects in construction: A study of seven building projects, Automation in Construction, 8, (6): 681–687.*

Jason, A. R., and James, O. (2018), Measuring and classifying construction field rework: *A pilot study. Research Rep. (May), Construction Owners Association of Alberta (COAA), The University of Alberta, Edmonton, Canada.*

Jason and James, (2018). Some observations on the issues of quality cost in construction. *International Journal of Quality and Reliability Management, 14(5), 464-481*

Jaafari O, and Ofori, G. (2019). Construction materials waste source evaluation. Proceedings: *strategies for a sustainable built environment, Pretoria.*

Koskela, J.B. (2015). Construction related factors influencing the choice of concrete floor systems. *Journal Construction Management and Economics, 20,13-19.*

Love, A., Hall, M., Sheath, D., and Smith, C. (2015), Quality failure costs in civil engineering projects, *International Journal of Quality and Reliability Management, 17 (4/5): 479–492*

Li and Mandal and Ugoje, O. F. (2019) "Assessment of rework cost of selected building projects in *Nigeria", International Journal of Quality & Reliability Management, Vol. 30 Issue: 7, pp.799-810, doi: 10.1108/IJQRM-Jul-2011-0103*

Love and Li B. A. (2020). Exploitation of contract documents for construction project planning and controlling. *Unpublished Master of Science thesis, faculty of Civil Engineering, Universiti Teknologi, Malaysia.construction industry. Journal of Management in Engineering 18(2), 76-83.*

Love, Akintoye, O., Hampson (2017), Determinants of rework in building construction projects, *Engineering, Construction and Architectural Management, 11 (4): 259–274.*

Mastenbroek, E. K and Saidu (2018). An Analysis of The Causes and Impact of Rework In Construction Projects. *A Thesis submitted Cape Peninsula University of Technology, South Africa.*

Ndihokubwayo, Y. and Josephson, P. E. (2018) Sources of Quality Failures in Building. *Proceedings of the European symposium on Management, Quality and Economics in Housing and other Building Sectors, Lisbon, 30 September – 4 October, 671- 9.*

NEDO and Mustapha (2018) Performance Measurement and visual Feedback for Process *Improvements, A Special Invited Lecture Presented in the SMILE-SMC 3rd Dessemination Workshop on 11th February, 2006, Centre for Infrastructure and Construction Industry Development of the University of Hong Kong. Hong Kong, 25 Slides, Available at*: http://smile.hku.hk.

Odeyinka, J. L., and Ledbetter, W. B. (2015), Causes of quality deviations in design and construction. *Journal of Construction Engineering and Management, 118 (1): 34–49.*

Ogunsemi and Idiake J. E. (2020) "Impact of Rework on Building Project and Organization *Performance: A View of Construction Professionals in Nigeria" International Journal of Sustainable Construction Engineering & Technology, Vol. 9 (1),*

Oyewobi, L. O., Ibironke, O. T, Ganiyu, B. O. and Ola-Awo, A. W. (2014a): *Evaluating rework cost- A study of selected building projects in Niger State, Nigeria. Journal of Geography and Regional Planning Vol. 4(3), pp. 147-151, March 2014.*

Palaneeswaran W., and Disa (2016); *A project management quality cost information system for the construction industry, Information and Management, 40 (7): 649-661*.

Sheath and Tomkins B. A. (2015). *Exploitation of contract documents for construction project planning and controlling Unpublished Master of Science thesis, faculty of Civil Engineering, Universiti Teknologi, Malaysia. Andy, K., Andrew B. and Simon A. (n.d). Designing to encourage waste minimisation in the construction industry. Department of Civil and Building Engineering, Loughborough University, Leicestershire, LE113TU,*

Thomas, Haas and Caldas M.A.F (2019). Severity and Impact of Rework*, a Case Study of a Residential Commercial Tower Project in the Eastern Province-KSA. Master Thesis. Dhahran, Saudi Arabia: King Fahd University of Petroleum & Minerals.*

Questionnaire

Department of Surveying,

Institute of Environmental Studies,

Kwara State Polytechnic, Ilorin,

P.M.B 1375, Ilorin Kwara State

Dear Respondents,

REQUEST FOR THE FILLING OF QUESTIONNAIRE ON FACTORS INFLUENCING REWORK OCCURRENCE IN BUILDING CONSTRUCTION PROJECT IN KWARA STATE

I am a final year student of the Department of Quantity Surveying, Kwara State Polytechnic Ilorin, conducting research on the above topic as a requirement for the award of Higher National Diploma (HND) in Quantity Surveying.

I therefore solicit for your assistance to kindly fill the questionnaire presented as objectively as possible. Information provided shall be accorded its due confidentiality and used solely for the purpose of this research work.

Thanks for your unreserved assistance

Yours faithfully,

Ajani Barakat Amoke

HND/23/QTS/FT/0021

SECTION A

INFORMATION ABOUT RESPODENTS

Kindly tick (√) the best option as appropriately below;

1. Gender:

a) Male ( ) b) Female ( )

2. Age:

a) 18-25 b) 26-35 c) 36-45 d) 46 and above

3. Professional discipline of respondents

a) Quantity Surveyor ( ) b) Architect ( ) c) Civil Engineer ( ) d) Builder ( )

e) Project Manager ( ) f) Others (please specify): _____

4. Respondent's Academic Qualification

a) HND ( ) (b) B.Sc/B.Tech ( ) (c) PGD ( ) (d) M.Sc/M.Tech ( ) (e) Ph.D ( )

5. Working experience of respondents in the construction industry

a) 0-5 years ( ) (b) 6-10 years ( ) (c) 11-15 ( ) (d) 16-20 years ( ) (e) over 20 ( )

6. Have you ever been involved in reviving an abandoned public project

a) Supplier ( ) (b) Consulting Firms ( ) (c) Contracting Firms ( )

(d) Manufacturing firm ( )

SECTION B

DATA ON OBJECTIVES

Please tick [√] as appropriately using the following rating: Strongly agree (SA); Agree (A); Neutral (N); Strongly Disagree (SD); and Disagree (D)

1. What are the variables of the factors influencing the occurrence of reworks on building project in Kwara State?

S/N	Factors influence the occurrence of rework	SA	A	N	SD	D
1	Nature of the work					
2	Procurement and tendering method					
3	Complexity of the project					
4	Human resource capability					
5	Leadership and communication					
6	Engineering and review					
7	Construction planning and schedule					

Please tick [√] as appropriately using the following rating: Strongly agree (SA); Agree (A); Neutral (N); Strongly Disagree (SD); and Disagree (D)

2. What are the devise suitable measures of reduction in rework on building project in Kwara State?

S/N	Measures of Reduction in Rework	SA	A	N	SD	D
1	Constructability review					
2	Adult supervision required					
3	Communication, collaboration and coordination					
4	Trained employee					
5	Deviation in construction					
6	Plan, prepare and schedule					

Please tick [√] as appropriately using the following rating: Strongly agree (SA); Agree (A); Neutral (N); Strongly Disagree (SD); and Disagree (D)

3. What are the suitable impacts of rework on construction projects in Kwara State?

S/N	Impact of Rework on Construction Projects	SA	A	N	SD	D
1	Cost overrun					
2	Time overrun					
3	Quality degradation					
4	Battered professional relation					
5	Deviation in construction					
6	Concept of quality cost					

Please tick [√] as appropriately using the following rating: Strongly agree (SA); Agree (A); Neutral (N); Strongly Disagree (SD); and Disagree (D)

4. What are those determinations on the influence of rework on construction projects in Kwara State?

S/N	Determinations on the Influence of Rework on construction projects	SA	A	N	SD	D
1	Time and Schedule					
2	Cost					
3	Quality					
4	Productivity and Efficiency					
5	Customer Satisfaction					