JIMMA UNIVERSITY
JIMMA INSTITUTE OF TECHNOLOGY
SCHOOL OF GRADUATE STUDIES
FACULTY OF CIVIL AND ENVIRONMENTAL ENGINEERING
CONSTRUCTION ENGINEERING AND MANAGEMENT CHAIR

FACTORS INFLUENCING QUALITY ASSURANCE IN BUILDING CONSTRUCTION PROJECTS: A CASE OF URBAN INTITUTIONAL AND INFRASTRUCTURES DEVELOPMENT PROGRAM IN MIZAN AMAN TOWN

A Thesis submitted to the School of Graduate Studies, Jimma University, Jimma Institute of Technology, Faculty of Civil and Environmental Engineering in Partial Fulfillment of the Requirements for the Degree Master of Science in Construction Engineering and Management

Mitiku Mathewos Moges

January 2024
Jimma, Ethiopia

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Advisor: Dr. Bien Maunahan (Ph.D.) _____

Co-Advisor: Engr. Bontu Woyessa _____

January 2024
Jimma, Ethiopia

APPROVAL SHEET

DECLARATION

I declare that this research entitled **"***Factors Influencing Quality Assurance on Construction Projects: A Case of Urban institutional and infrastructure development Projects in Mizan Aman Town"* is my original work and has not been submitted as a requirement for the award of any degree in Jimma University or anywhere else.

Mitiku Mathewos Moges _____ _____

NAME SIGNATURE DATE

As research Adviser, I hereby certify that I have read and evaluated this thesis paper prepared under my guidance, by Mitiku Mathewos Moges entitled *"FACTORS INFLUENCING QUALITY ASSURANCE ON CONSTRUCTION PROJECTS: A CASE OF URABN INSTITUTIONAL AND DEVELOPMENT PROGRAM PROJECTS IN MIZAN AMAN TOWN"* and recommend and would be accepted as a fulfilling requirement for the Degree Master of Science in Construction Engineering and Management.

Advisor: Dr. Bien Maunahan (Ph.D.) _____ _____

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ABSTRACT

The building industry, essential to economic growth, struggles to maintain quality. The Urban institutional and infrastructure development (UIIDP) of Mizan Aman Town has struggled to ensure quality in its construction projects, resulting in higher costs and poor performance. Quality discrepancies have caused construction project delays, cost overruns, and poor work under UIIDP, requiring greater defect reduction and maintenance costs. These obstacles obstruct project management and program success. The study identified and examined the factors that affect quality assurance in UIIDP construction projects and ways to improve quality control.

Investigated project factor correlations using explanatory descriptive research, surveyed UIIDP clients, consultants, and contractors, evaluated quality assurance variables using RII scores, and used correlation analysis to investigate variable relationships. The research presented important factors that hinder quality assurance, which were classified as material-related, technical-related, and management-related. The principal obstacles were inappropriate contractor selection, incomplete drawings, and substandard materials. Poor quality of building construction projects resulted in escalated modification expenses, reduced end-user satisfaction, and disputes among stakeholders. In order to guarantee quality, it was imperative to implement strategic site supervision, engage contractors with extensive experience, and furnish detailed specifications.

The study reviled that Contractor selection, technical specifications, and material quality must be focused on improving UIIDP construction project quality assurance. This study emphasizes the significance of comprehensive evaluation, stakeholder participation, and planning to address poor quality in UIIDP. Use detailed material quality assessments, technical standards, and contractor selection criteria to improve quality assurance in future UIIDP projects. Quality assurance could also be enhanced through specialized training and stakeholder participation. The study bridges conceptual building principles and their visible application in the unique socio-economic and environmental conditions of Mizan Aman Town.

KEYWORDS: *Quality assurance, Construction projects, Management factors, Technical related factors, Material related factors*

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ABBREVIATION

GDP	Gross Domestic Product
ISO	International Organization for Standardization
IDP	Infrastructure Development Program
ISO	International Organization for Standardization
Jit	Jimma institute of Technology
PPI	Project Performance Indicators
QA	Quality Assurance
QMS	Quality Management System
QPMS	Quality performance management system
RII	Relative Importance Index
TQM	Total Quality Management
UIIDP	Urban Institutional and Infrastructures Development Program
VE	Value Engineering

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The construction industry plays a critical role in the economic development of nations, contributing significantly to the GDP and wealth invested in fixed assets in many developing countries (Abdul R.R., 2011; Abdul Karim et al., 2005). However, compared to industrialized countries, developing the construction industry in emerging nations lags behind other sectors (Yimam, 2011). The complexity of the construction industry arises from the involvement of multiple stakeholders, including owners, contractors, consultants, regulators, and suppliers (Ghoddousi et al., 2012). Additionally, each construction project is unique, varying in size, budget, material, location, weather conditions, and manpower (Budawara, 2009).

The objective of every construction project is to be completed on schedule, within budget, and meeting specified quality standards in a safe and secure environment. However, research indicates that about 20% of construction projects fail to achieve these objectives due to excessive scheduling, delays, or cost overruns, jeopardizing project success (Archibald, 2012; Thomas, 2012).

Despite the vital role of the construction industry in the development of developing nations and its substantial economic contribution, the sector's performance remains subpar. Projects in developing countries often experience significant schedule and expense overruns, fail to yield planned results, or are abandoned before or after completion (Idoko, 2008). Furthermore, compared to other industries in developing countries and their counterparts in developed countries, the construction industry in developing nations significantly lags (Ofori, 2006; Jekale, 2004).

The quality of construction projects is a critical factor influencing the development of the construction sector (Priyad & Naveen, 2020). It significantly impacts the industry's overall success (Thiyagarajan, 2016). Construction quality is influenced by various factors, including the organization's characteristics, working practices, labor force

expertise, and the quality of materials and equipment used (Shejul, Bonde, & Konnur, 2019).

The Urban Infrastructure and Institutional Development Project (UIIDP) aims to enhance urban governance, strategic planning, citizen participation, public-private dialogue, and urban infrastructure and services funding (World Bank, n.d.). The UIIDP supports the World Bank's objectives of eradicating extreme poverty and fostering shared prosperity by promoting functional and productive urban centers (World Bank, 2010.).

This study examines various factors that affect the quality assurance of building construction projects under the UIIDP in Mizan Aman town. By understanding these factors and proposing improvement measures, this research enhances the quality assurance of construction projects in the area.

1.2 Statement of the Problem

The construction industry, vital to economic expansion, continues to face difficulties maintaining quality standards. Mizan Aman Town's Urban Infrastructure, Institutional, and Infrastructure Development Program (UIIDP) has encountered significant obstacles in ensuring quality assurance during its construction projects, leading to high costs and subpar performance. Quality discrepancies have caused construction project delays, cost overruns, and poor performance under UIIDP, necessitating increased maintenance and defect reduction expenses. These challenges obstruct effective project management and the program's overall achievement. This research aimed to investigate and identify the factors that affect quality assurance in construction projects UIIDP, analyze the consequences of these factors, and propose techniques to enhance quality control.

1.3 Research Questions

1. What are the key factors hindering quality assurance within building construction projects under UIIDP in Mizan Aman Town?
2. What are the impacts of poor quality on the performance of building construction projects under UIIDP in Mizan Aman Town?

3. What measures aim to assure quality within building construction projects operating under UIIDP in Mizan Aman Town?

1.4 Objectives of the Study

1.4.1 General Objective

The main objective of this research is to assess the factors that influence quality assurance in building construction projects under UIIDP in Mizan Aman town.

1.4.2 Specific Objectives

1. To investigate the key factors hindering quality assurance within building construction projects under UIIDP in Mizan Aman Town.
2. To examine the impacts of poor quality on the performance of building construction projects under UIIDP in Mizan Aman Town.
3. To identify measures aimed at assuring quality within building construction projects operating under UIIDP in Mizan Aman Town.

1.5 Scope of the Study

The study only aimed to analyze factors that affect quality assurance in construction projects under UIIDP in Mizan Aman. Analyzing factors that create frequent challenges in quality assurance, analyzing the effect of quality discrepancies on construction project performance under UIIDP in Mizan Aman town, and identifying measures to assure quality in construction projects under UIIDP in Mizan Aman town are the specific objectives that the study strived to address.

1.6 Significance of the Study

The findings of this research will help clients, consultants, and contractors understand the factors affecting quality assurance in construction projects under UIIDP in Mizan Aman town. It will enable stockholders to develop strategies that can help them ensure quality and improve the performance of the construction projects. Beyond that, the study's findings will be significant for academicians as a background for further studies.

1.7 Limitations of the Study

In this research, technical and material-related factors were only included due to the difficulty of controlling and managing external factors such as political, economic, natural environment, advance of technology, and third parties.

CHAPTER 2

LITERATURE REVIEW

2.1 Definitions

2.1.1 Quality

There may be different meanings of quality to several different people. Some may signify it as customer satisfaction, others understand it as acquiescence with contractual requirements, yet others equate it to attainment of prescribed standards (Chung, 1999). In structures, more deformities and disappointments emerge from deficiencies in the treatment of items in plan and development than from deficiencies in the items themselves (Atkinson, 2005). In their work, Harris et al., (2006) expressed that Quality Administration has seen a progress from responding to the result of site generation exercises to turning into a key business capacity representing the reason of being development organizations. Except if a development organization can ensure its customers a quality item, it can't contend adequately in the cutting-edge development advertise. Quality is one of the points 9 of institutionalization. The nature of an item or a total structure or different developments is the totality of its credits that empower it to play out an expressed errand or to satisfy a given need agreeably for a satisfactory timeframe. For a structure and common designing work, a palatable item, albeit fundamental in itself, isn't individually adequate. It must be fused in the plan and development in a right way. It is likewise characterized by the American Culture for Quality (ASQ) is an abstract term for which, everybody has their key definition. Nevertheless, the non-repetitive nature of construction projects results in unique products thus making it a bit problematic to define quality in construction by completely relying on definitions developed by the assembling or administrations industry.

American Culture of Structural Architects (ASCE) have well-characterized quality as the satisfaction of undertaking obligations in the conveyance of items and administrations in a way that meets or surpasses the expressed prerequisites and desires for the proprietor, plan proficient, and constructor. Obligations allude to the errands that a member is relied upon to perform to achieve the undertaking exercises as

indicated by authoritative understanding and material laws and authorizing necessities, codes, winning industry benchmarks, and administrative rules.

2.2.2 Quality Assurance

According to (Ethiopia Standards Agency) Standard is a document created by consensus and approved by recognized body that offers, for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at achieving the highest degree of order in a given context.

According to Napiah (2012), quality assurance is the systematic process of creating a formal structure, organization, and operational procedures to maintain specified quality throughout the project life cycle. Because of the risk taken quality control is important in engineering and the construction sector for any project. The performance of the project will be impacted by numerous external circumstances, increasing the risk of not finishing it on schedule. A built-in quality assurance system is essential to avoid any inefficiency that can lead to the delivery of subpar goods and services to clients (Bubshai, A. A. 1999 and Al-Atiq, T. H. 1999).

2.2 Cost of Quality

There are two distinct views on what constitutes the cost of quality; these are the cost incurred in ensuring that quality is achieved (prevention cost and appraisal cost) and the cost incurred and or the loss of revenue due to poor quality of work (deviation cost). Quality related expense is officially characterized as: "Cost in guaranteeing and guaranteeing quality just as misfortune acquired when the quality isn't accomplished (English Standard BS4778).

Deviation expenses are those subsequent from not meeting the necessities. As per Arditi and Gunyadin, (1997) some deviation expenses are acquired on the undertaking site because of scrap, revamp, disappointment investigation, re-review, provider blunder, or value decrease because of resistance. Other deviation expenses are brought about once the proprietor claims the built office. These incorporate expenses for modification of protests, fix costs, costs for taking care of and supplanting rejected material, workmanship or gear costs for adjusting blunders, and suit costs. Different expenses of

value incorporate the loss of income because of postponement and non-conformance, lawful and medicinal expenses because of mishaps among others.

2.3 Quality Standards

Reports used to characterize satisfactory conditions or practices and to give a gauge to guaranteeing that conditions or practices meet the adequate criteria is known as principles. By and large norms characterize least criteria; world class quality is, by definition, past the standard degree of execution. Norms can be composed or unwritten, willful or obligatory (Pyzdek, 1999). The term gauges were additionally characterized as a kind of perspective base that is required to pass judgment on the sufficiency of a quality framework. He further iterated that a "quality framework needs to cover every one of the exercises prompting the completed item. Contingent upon the extent of activity of the association, these exercises incorporate arranging, structure, improvement, acquiring, generation, review, stockpiling, conveyance, and after-deals (Chung,1999).

2.3.1 Importance of Standards

There several importance of standards which helps in the contribution of quality requirement expected. Some of these standards were explained below as IDPd by Pyzdek, (1999) on the importance of quality standards:

- Standards instruct - They put forward standards or objectives for the direction of producers and clients the same. They are priceless to the producer who wishes to enter another field and to the credulous buyer who needs to purchase another item.
- Principles disentangle - They decrease the quantity of sizes, the assortment of procedure, the measure of stock, and the administrative work that to a great extent represents the overhead expenses of making and selling.
- Standards moderate - By making conceivable enormous scale generation of standard plans, they empower better tooling, increasingly cautious structure, and progressively exact controls, and along these lines lessen the creation of inadequate and surplus pieces. Guidelines likewise advantage the client through lower costs.
- Standards give a base whereupon to confirm - They fill in as corridor signs of value which are of limitless incentive to the sponsor who focuses to

demonstrated qualities, and to the purchaser who sees the licensed trademark, nameplate, or mark.

2.3.2 International Organization for Standardization (ISO)

ISO is the world's biggest engineer and distributer of Worldwide Norms. The Geneva based Universal Association for Institutionalization originally distributed a progression of gauges in 1987. They are in charge of a progression of universal norms managing item structure, creation, conveyance, administration and testing. An organization enrolled as conforming to ISO models hosts exhibited to a licensed third gathering (an affirmed outside reviewer) that its procedures have been recorded and that the organization is efficiently evaluating and being examined that they are following the arrangements and techniques important to deliver amazing items. ISO guidelines are coordinated towards improving an association's creation forms.

The ISO 9000 was presented in the late 1980s and its ubiquity proceeds with today. The arrangement contains two fundamental sorts of standard: those tending to quality confirmation and those tending to quality administration. The quality confirmation guidelines are intended for legally binding and evaluations purposes and are ISO 9001, ISO 9002, and ISO 9003. The quality administration standard is ISO 9004 and is intended to give direction to organizations creating and executing quality frameworks.

2.4 Quality Management

The constant quest for approaches to counteract deformities is known as the management of quality. This is worried about forestalling issues by making the frames of mind and condition that make avoidance conceivable. Quality administration incorporates quality control and quality confirmation, just as the extra ideas of value strategy, quality arranging and quality improvement. Quality administration in development suggests keeping up the nature of development works at the required standard in order to get clients' fulfillment for long haul aggressiveness and business survival. Ozaki (2013) distinguished a three-overlay significance of value the board in development to incorporate taking care of business on schedule; guaranteeing that the essential attributes of the last task fall inside the required determinations; and taking care of business inside spending plan, this is now and then alluded to as the quality set of three. It includes proceeded with assessment of the exercises of arranging, structure, advancement of plans and particulars, publicizing and granting of agreements,

development, and upkeep, and the connections of these exercises. Advantages of value the board incorporate higher consumer loyalty and profitability (Akinola etal., 2012). Quality administration includes affirmations that the structure or item will fulfill the expressed or suggested necessities for which it was embraced.

2.4.1 Quality Assurance

The American society for Quality (ASQ) characterizes quality affirmation as "all the arranged and methodical exercises actualized inside the quality framework that can be shown to give certainty an item or administration will satisfy necessities for quality. In the event that structures are to be without inconvenience, more consideration should be given to applying quality confirmation standards to plan and site-work, including venture choice and detail, and to supervision of the taking care of and assurance on location (Atkinson, 2005). As per Ferguson and Clayton (1998) Quality Assurance (QA) is a program covering exercises important to give quality in the work to meet the venture necessities. Quality Assurance includes setting up venture related arrangements, methodology, models, preparing, rules, and framework important to deliver quality. The structure proficient and constructor are in charge of building up a suitable program for each undertaking. (QA) gives insurance against quality issues through early alerts of issue ahead. Such early admonitions assume a significant job in the avoidance of both interior and outside issues. Quality affirmation covers all exercises from plan, improvement, creation/development, 19 establishment, and adjusting to documentation, and furthermore incorporates guidelines of the nature of crude materials, congregations, items, and parts; administrations identified with generation; and the board, generation, and examination forms, (Rumane, 2011).

2.4.2 Quality Control

Gryna (2001), clarifies 'Quality Control' as a procedure through which a business looks to guarantee that item quality is kept up or improved and fabricating blunders are diminished or dispensed with. Gryna (2001) additionally alluded to quality control as the procedure utilized to reliably fulfill guidelines. The control procedure includes watching genuine exhibitions, contrasting it and a few benchmarks, and afterward making a move whenever watched execution is essentially not the same as the standard. Quality Control in construction as characterized by Rumane (2011) is checking of executed or introduced attempts to affirm that works have been performed or executed as indicated, utilizing determined/endorsed materials, establishment techniques and

determined references, codes, principles to meet expected use. A lot of differing approaches, means and procedures can be incorporated into both quality control and also the developmental stages. These approaches are mainly used to invent a concept, stimulate a preparation process, detect the cause, foster appraisal whilst generating a high level of diversity in circumstances for continual quality advancement. A major aspect of quality control is the establishment of well-defined controls. These controls help standardize both production and reactions to quality issues. Limiting room for error by specifying which production activities are to be completed by which personnel, reduces the chance that employees will be involved in tasks for which they do not have adequate training.

2.5 The Necessity of Quality Assurance in Construction Industry

Quality does not refer only to the architectural appearance of a building or construction element, but affects also its various performances: physical properties, lifespan, and integration with other materials as well as the degree of reaching needs along the construction process 13 (Rumane, 2011). There are several compelling reasons why stakeholders must assure quality during construction.

Public health and safety: An inadequately built structure can bomb when exposed to real stacks a lot littler than configuration stacks and can be a danger to open wellbeing. Public health and safety is ensured when construction projects conform to stipulated codes and standards. Information has demonstrated that an absence of value in development tasks prompted disappointments and episodes. In 2007-2008, no under 37 deadly mishaps were brought about by low quality materials on development ventures; in 2009, 306 passing were because of 257 episodes suggesting quality and wellbeing disappointments. Among these occasions, 49 structures fallen as a result of ill-advised materials and procedure concerns (Chen and Luo, 2014).

Maintenance costs and operating efficiency: are legitimately relative to development quality. By and large where there is low quality in development, calamitous disappointment isn't the outcome; rather, there is an expansion of upkeep fix expenses to the proprietor (Treadwell 1971). Its specific to specify that monetary advantages are subject to quality control, implying that financial achievement is influenced when there is no quality control. Over the long haul, the all-out expense of development and lifetime upkeep of all structure industry things is short of what it would have been

without quality control and that expanded protection and support would discredit any reserve funds because of the exclusion of value control (Treadwell, 1971). The usage of value practices prompts an increasingly powerful utilization of expense and assets on a building site in light of the fact that less modify is vital. This eventually prompts effective venture conveyance by guaranteeing quality is accomplished while working inside the task spending plan and degree.

Architectural Appearance (aesthetics) is the clearest indication of value control. (Treadwell, 1971). Low quality control can bring about failures in uncovered structural cement due to poor union, splits showing up in dividers, curves resembling "square shapes", paint stripping off completed surfaces, among others. In open work extends the venture appearance will be the main factor in guaranteeing the overall population that they have gotten their cash's value and the property can be utilized without representing any superfluous risk to the general population. Lastly, quality is needed for competitiveness and survival of an organization, which is one of the key reasons why quality is needed in the execution of construction

2.6 Factors that Influence Quality Assurance in Construction

2.6.1 Human control

The effect of humans in construction cuts across every aspect of the construction process. From funding, designing, drafting of contracts, operating machinery and pouring of concrete, humans are present and therefore play a vital role in ensuring quality is achieved. The general quality and individual capacity of human will decide the consequences of every single quality action. Along these lines, human is considered as both the controlled targets and controlling inspiration of other quality exercises (Cao Ying, 2010). The substance of human control includes the general nature of association and person's learning, capacity, physical condition, mental IDP, quality awareness, conduct, idea of authoritative order, and expert morals.

2.6.2 Materials Control

Another major and essential component of construction is materials. These could be raw materials, finished products, semi-finished products, components and parts. Material quality has a direct impact on construction quality. The main actions taken to control the quality of materials include material procurement, material inspection and testing and proper storage, (Cao Ying, 2010).

Material Procurement

Involves the purchase materials in view of the incorporated thought of building qualities, development necessities, the exhibition and cost of materials. The acquisition ought to be organized ahead of time as indicated by the development plan. It should also be ensured that purchase orders, materials received and invoices match, (Cao Ying, 2010).

Material Inspection and Testing

Involves checking to ensure there is no disparity between purchase orders, and invoices and actual materials received. It also involves a progression of discovery strategies by contrasting the material information with quality benchmarks, to pass judgment on the dependability of value materials, and whether they can be utilized for designing. Testing review is ordinarily utilized (Cao Ying, 2010).

Storage and Usage

Is a critical material control process because the right materials could be procured and dully received but the quality of these materials may deteriorate if not properly stored. Agglomeration of wet cement, corrosion of steel, and mixing of similar materials (nails, reinforcements etc.) of different sizes amongst others are some of the problems related to poor material storage, (Cao Ying, 2010). The contractual worker should likewise make sensible game plan to abstain from overloading bunches of materials on location. Then again, materials ought to be put away with signs for the various classes, and with assessment and supervision on location when being utilized.

In another study, (Abdel-Razeq, 1998a) identified the factors affecting quality assurance. These factors can be summarized in the following sixteen elements:

1. Design and planning during the pre-construction phase.
2. Developing and improving quality assurance and control systems.
3. The financial level and standard of living of employees.
4. The accuracy of cost estimating.
5. Proper classification of contractors, consultants and projects.
6. Employees' consciousness.
7. Training for contractors, owners and consultants.

8. Encouraging ISO 9000.
9. Contractors' technical and managerial efficiency.
10. Maintenance systems during and after construction.
11. Utilization of resources.
12. Specialization in construction work.
13. Co-operation between construction industry and scientific organizations.
14. Participating and co-operating with advanced international organizations.
15. Defining responsibilities between project parties.
16. Encouraging innovation for simpler and more accurate work method

2.7 Factors That Hinders Implementation of Quality Assurance in Construction Industry

The building construction sector is a kind of field of work that usually encounters issues which deals and mostly affects the amount produced. Before the start of any building contract, it is critical to detect potential factors that might negatively harm quality, in so doing these factors can be curbed right away and this foresight activity will certainly lead to contentment on the part of the purchaser when the project comes to an end. Pinpointing these acute elements however, will not entirely prevent the disaster it comes with but rather aid the group of contractors to align their skills to the right measurements and stipulations of the contract and largely limit the probable blunders and miscalculations that comes along with it so that a re-work won't be called upon by consultants.

According to Arditi & Gunaydin, (1998) as quoted by Jha & Iyer, (2006) categorizes among other causes; absence of techniques by administration to yield to sustainable quality progression, inadequate workforce who are trained, lack of visionary leadership; scare and insufficient contributors on the team and shareholders as the basic problems affecting the procedure of quality. Looking at the glitches regarding the rate and worth of construction as studied by Tengan (2014) and similarly; practices that are deceitful and shares; the inability of management to prolong and preserve their concern and obligation; ignorance on the subject of what quality entails, the condition of lack of trust about the plans of leaders, incapability of quantifying the helpfulness of quality maintenance, mismanagement of time, unhealthy cooperation; little or no solidarity

between stylists and contractors unintelligible handling of finances on site uncontrollable amount of waste on the premises past track record of numerous alterations of designs of the outworker which decreases the outcome of quality.

Tengan, (2007) classifies the limited intellect on mechanical and proficient skills and means to get a task done, lackadaisical attitude of employees, the educational factor needed to make the progression process a reality was missing during his studies on the practices on quality assurance of certain chosen firms in the capital of Kumasi located in Ghana. Some identified challenges cover the poor competence of the site manager lapses in communication structures lack of appointment of a site leader inability to organize team members miscalculations in scheduling and control systems unsatisfactory gaps in giving and receiving data. The way in which someone defines quality varies on their perspective; some see it as "conformance to specification. Some see it as "performing to standards or getting value for the money." According to Abbas, Khattak, Hussain, Maqsood, and Ahmad (2015), client pleasure and fulfillment are the only criteria that matter for a construction company. Quality is described by (ISO 8402) as the level of perfection in a market.

(Low and Goh, 1993, quoted in Low and Peh, 1996) already recognized the variables that have an impact on the quality of a construction project. The following are listed in importance order:

1. Poor workmanship by the contractors in completing the works results from low tender prices.
2. The drawings and specifications do not specify clearly the intentions of the designers. Discrepancies are found between different consultant’s drawings, which have resulted in poor co-ordination during construction.
3. The contractors pay more attention to complete the works on schedule and control the costs to within budget than to achieving quality in construction.
4. Poor co-ordination exists between the contractors and the subcontractors as well as the nominated subcontractors.
5. The designers do not consider the “buildability” problems in design. For example, the designers do not consider the use of special construction methods to achieve the tight tolerance caused by site conditions.

6. The contractors cannot plan and control the works. The contractors lack the skills to interpret the design and cannot provide the end products on site in accordance with the design and specifications.
7. The completion period fixed by the client and consultants is not realistic.
8. The design does not satisfy the relevant codes and standards. This has resulted in a large amount of remedial work for the contractors and delay in the completion of projects.
9. The contractors do not know how to establish a quality system to control the works.
10. The materials chosen by the consultants do not satisfy the standards or the Building Control Authority

2.8 Impact of Inadequate quality Assurance on Construction Projects Outcomes

As reviled by different researches inadequate quality assurance process results in poor quality in construction project outcomes. However, despite the various measures to assure the quality of building projects, the rates of poor quality are dominant in the global construction sectors. For example, Palaneeswaran's (2006) study showed that the poor quality cost in Hong Kong could range between 5 and 20% of the original contract value. Research shows that rework originates from design and construction factors. In Iran, Heravi and Jafari (2014) noted that the optimum level of poor quality cost was 7.4% of the total project cost. In Nigeria, the poor-quality cost was 4.5% of the cost of the project (Oyewobi and Ogunsemi, 2010). Although the research did not discuss the causes of rework, it indicated that the causes of rework varied among countries and were related to design and construction activities. Empirical data from a South African study also revealed that the cost of rework to the original contract value was 5.12% (Simpeh *et al.*, 2015). Empirical data involving contractors, consultants, quantity surveying firms and architecture firms revealed that rework accounted for 24.94% of the construction schedule growth in Singapore (Hwang and Yang, 2014).

Palaneeswaran (2006) believes that the direct impacts of quality non-conformance on project management transactions include:

a) Additional time to do rework,

b) Additional costs to cover rework occurrences,
c) Additional materials for rework and handling the subsequent wastage, and
d) Additional labor force for rework and related extensions of supervision manpower.

In the most of researches, direct and monetary impacts of rework have been focused. However, rework has additional indirect consequences and some of them are listed below (Love, 2002).

- End-user dissatisfaction
- Inter-organizational conflicts
- Fatigue
- Stress
- De-motivation
- Work inactivity
- Absenteeism
- Loss of future work
- Poor moral
- Reduced profit
- Damage to professional image

The mentioned factors can greatly influence the companies' present or future well-being but they can hardly be assigned a monetary value.

2.9 Evaluation of Quality Assurance Practices in the Urban institutional and infrastructure development

In most developing countries the infrastructure development programs suffer from many problems like; inadequate infrastructures both in capacity and availability, poor quality infrastructure and mismatch between demand and supply. These are caused by high urbanization, city growth and lack of proper planning strategies and project management. Even though no infrastructure serves all travel demand perfectly, the amount by which it fails to do so can be useful to study existing situation in the infrastructure development programs (Davidson & Davidson, 1998).

Poor quality tends to increase many of the costs in the long run, even if in the short run, cutting quality is a way of saving costs. The World Bank lending experience suggests

that Africa is doing, on average, better than other regions. Indeed, its cost overruns in recent years were roughly 20% vs 22% for the rest of the borrowers—again there are some explanations, including the composition of loans, i.e. works vs. technical assistance. For Africa, as in the rest of the world, cost overruns tend to be the highest for transport and lowest in the telecoms sector (5%). Overall, however it does suggest that when costs overruns exist, they increase costs by about 20%.

The main development challenges in the national quality of infrastructures in Ethiopia include the lack of adequate capacity to provide quality assurance services by the existing public institutions, inability to meet target market standards by industries, and prohibitive costs of compliance with international standards. While basic elements of the NQI system have been put in place in Ethiopia since its reform undertaken previously, the service delivery capacity of the NQI institutions is inadequate to support the competitiveness of industries. The NQI institutions lack capacity in human resources, the facility to ensure accurate measurement, well-equipped laboratories to meet industries' demands, as well as coordination and collaboration with regulatory bodies to implement quality assurance services (The World Bank, 2002).

There are not many studies undertaken to analyze the infrastructures development program in Ethiopia. However, some published sources were found which analyze the infrastructure some major cites by the World Bank (The World Bank, 2002). Once again, The World Bank, in collaboration with Ethiopian Ministry of Urban Development and Construction, 2004/2006), has clearly noted that the current infrastructures are inefficient with respect to quality and measures should be taken for improvement in capacity, efficiency, etc.

2.10 Best Practices for Quality Assurance in Infrastructure Development Programs

The National Cooperative Highway Research Program (NCHRP) identifies the following best practices in assuring and controlling quality in Infrastructure Development Programs (IDP);

Using Checklists, Manuals and Standards

All IDP DOTs, not just those with successful QC/QA programs, use checklists, process manuals, and standard details and drawings. However, successful IDP uses these tools for communication, training, and regular re-evaluation of the processes. One IDP described the practice of "review training" for engineers who are performing QC reviews on plans. This training concentrates on teaching reviewers the best ways to identify errors or omissions, how to use manuals and checklists, and how to successfully convey comments back to the designer.

Establishing Separate QA Division

Some IDPs have instituted separate divisions or bureaus specifically for QA. These divisions provide centralized points of contact on quality and provide a group of experienced individuals that can maintain and re-evaluate quality processes that are documented within manuals.

One other practice found in several successful IDP is the use of title blocks on plan sheets that clearly define the designer and the reviewers, as well as include sign-offs for when reviews are completed. This easily implemented, simple method ensures that designers and reviewers take responsibility for the quality of the plans.

Scoping and Environmental

Successful IDPs include all parties involved in design and construction early on in the process. Several of the IDP the team visited include environmental, right-of-way, utilities, designers, any other relevant agencies, and even construction, in the scoping process. Continued involvement throughout the full design phase of all players involved is important and includes scheduled meetings at key points in the design, during construction, and for post construction feedback.

Successful IDP also found that it was helpful to have IDP-funded positions located at regulatory agencies to help expedite scheduling and reduce external agency bottlenecks in the design process.

Another successful strategy found during the scan was the practice of including "green sheets" or environmental tables within actual plan sets. These sheets (which one IDP

actually prints on green paper) or tables serve as a checklist for the contractor and resident engineer to ensure that all environmental commitments are met on each project.

Implementing Value Engineering

Many successful IDP are using feedback from their VE processes to analyze trends and make changes to their design processes. Some IDPs have been able to involve contractors in their processes, although legal issues make this a bit more complicated. Again, the VE process is not necessarily a best or unique practice; however, what is done with the information and feedback can help to ensure improved quality in future designs.

Proper Consultants Selection and Communication

Successful IDPs ensure the quality of their consultants' projects through thorough selection processes and good communication channels. Successful IDP often require submittal of consultant quality plans before they can be prequalified to perform work for the IDP, and many require project-specific quality plans to be submitted with proposals.

Continuous Construction Reviews and Feedback

Involving key players from construction early on in the design process is a successful strategy in many IDP. Early involvement is important to avoid comments on constructability at the end of product production when it is not practical to make changes. It is also important to look at feedback during the construction process and information provided during post-construction reviews. Several IDPs survey construction administration staff and contractors to solicit feedback on design and plan quality. This information can show trends, such as the causes of the most change orders, and outline needed changes to standard drawings and manuals.

Enhancing Quality in Existing Processes

Successful IDPs look at improving the quality of existing processes, not necessarily adding more processes. Examining existing processes and formalizing them through documentation can help identify unneeded steps and highlight areas where the process can be improved. After improvements are made, performance measures are developed.

One IDP has looked at all of its checklists to determine the optimal number of items that should be included. At the same time, another IDP has developed a series of steps for each discipline to go through to help them document all their processes. These actions help to add focus and efficiency to quality programs.

2.11 Research Gaps

Many previous studies tried to analyze factors that affect quality management in construction in general. Yet, no previous study had been conducted specifically focused on factors influencing quality assurance process in building construction. This study focused on factors that influence quality assurance process in building construction projects

CHAPTER 3

RESEARCH METHODOLOGY

This chapter outlines the research conducted using suitable methodologies, encompassing the research approach, methodology, sampling design, data sources, targeted population data collection, data analysis and presentation, and attainment of objectives. The methods utilized in this investigation are described and organized in this chapter.

3.1 Research Area

This research proposal was conducted in the western part of Ethiopia, Southwest Ethiopia Peoples' Region of Ethiopia, in Bench Sheko Zone in Mizan Aman Town at a distance of 561 Km from Addis Ababa, the capital of Ethiopia. Its astronomical location is 7°0′N N and 35°35' E, and an elevation of 1417m above sea level (from Mizan Aman Town website).

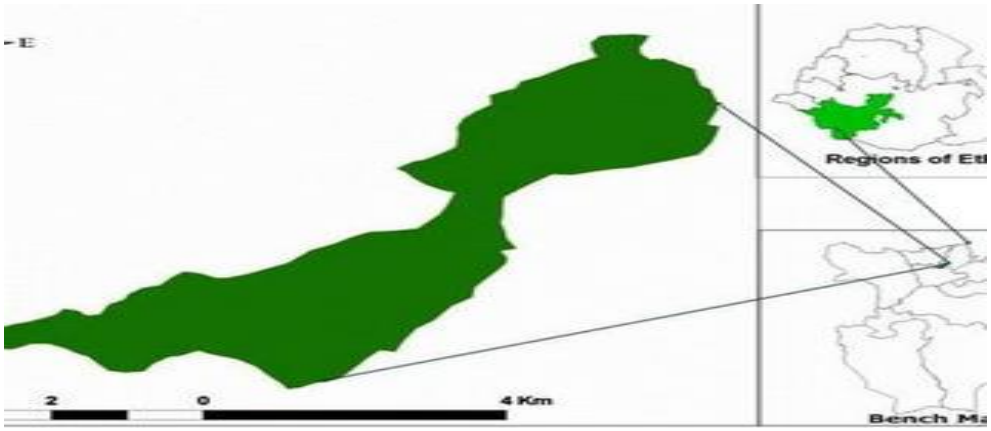

Figure 3. 1 Study Area (Source: Google Maps)

3.2 Research Design

The study's main objective was to analyze factors that affect quality assurance in construction projects under UIIDP Mizan Aman town. Hence, Explanatory and descriptive research was performed as the study established causal relationships between the dependent and independent variables. According to Kumar (2011), Explanatory research attempts to clarify why and how there is a relationship between two aspects of a situation or phenomenon.

3.3 Study Variables

3.3.1 Dependent Variables

The variable that will change due to variations in the independent variable, or it represents the change in the situation studied. Here, the dependent variable is;

- Quality Assurance

3.3.2 Independent Variables

The factor that is measured, manipulated or selected by the researcher to determine its relationship to an observed phenomenon or it is the cause for change in other variables. Here, the independent variables are:

- Management Related Factors
- Technical Related Factors
- Material Related factors

3.4 Sources of Data

3.4.1 Primary Data

The preliminary data were obtained through structured questionnaires.

3.4.2 Secondary Data

The secondary data were collected from published and unpublished documents like thesis, journals, books, and articles. The secondary data were used to get an insight into the problem and as criteria for developing and analyzing the primary data.

3.5 Data Collection Procedure

The data collection process used in this study is a questionnaire survey. A structured close-ended questionnaire was used to collect data from respondents from the client, consultant, and contractor sides. Since respondents were busy doing their tasks, this

data collection method helped the study get a good percentage of valid responses from the respondents in time.

3.5.1 Questionnaire

As IDPd by Mark et al. (2009), a questionnaire is the most widely used method in survey Strategy. The survey provides an effective way to collect responses from a large sample before analyzing. In order to obtain the needed data, a structured questionnaire was used as a data collection tool due to the sample size and the quantitative approach of the study. The respondents were asked to provide their views on the most influencing cause and effect factors using a 5-point Likert scale. The ratings used were: strongly disagree = 1; disagree = 2; Neutral = 3; Agree = 4; and strongly agree = 5.

3.6 Population and Sampling Method

3.6.1 Population

According to Mark (2009), the full set of cases from which a sample is taken is called the population. Clients, contractors, and consultants were important data sources for this study. Since the main objective is to analyze factors that affect quality assurance in construction projects under UIIDP Mizan Aman town, the professionals like project managers, site engineers, supervisors, program coordinators, architects, office engineers, contract administrators, and others were hence in a better position to provide the information required by this study.

3.6.2 Sample and Sampling Techniques

Respondents currently working in the municipality and UIIDP office are engaged in the questionnaire survey representing the client and consultant sides. Professionals currently working in construction organizations engaged in those projects owned by UIIDP are included as respondents on the contractor side. The sample size for this study was determined using the Using Montgomery and Runger 2014 formula (equation 3.1):

$$\frac{Z^2\ p\ (1-p)}{d^2} \ldots\ldots\ldots\ldots\ldots\ldots \text{[Eq 3.1]}$$

where:

N= Required Sample size

Z= Z value (e.g., 1.96 for 95% confidence level)

P = Population proportion (expressed as decimal) (assumed to be 0.51 (51%)

d = d is the margin error with an 87% confidence interval; the estimated sample size will be:

$$N = \frac{Z^2\, p\,(1-p)}{d^2} = \frac{(1.96)^2(0.5)(1-0.5)}{0.13^2} = 58$$

3.7 Data Analysis and Presentation

Data collection tools were adapted after a review of relevant literature and used. Data collection was free from bias, and all collected data were included in the output. Assistances were trained to collect the data carefully.

3.7.1 Data Processing

The relative importance index (RII), shown in equation 3.2, is a statistical method used to determine the ranking of different factors in quantitative research. A 5-point Likert scale was used to analyze the data for ranking barriers caused by cultural differences and their effect.

$$RII = \frac{\sum w}{A*N} = \frac{1*n1+2*n2+3*n3+4*4n+5*5n}{5*N} \ldots\ldots\ldots \quad \text{[Eq.3.2]}$$

where:

w = the weighting given to each factor by the respondents ranging from 1 to 5

A= the highest weight, which is 5 in this case

N= the total number of respondents = 45

The RII value ranges from 0 to 1 (0 not inclusive); the higher the value of RII, the more the causes are. The primary and secondary data collected are entered into Excel and other statistical software. The result is organized and presented in terms of tables.

3.7.2 Data Presentation

In order to obtain background information about the respondents, descriptive statistics were initially applied to their basic data. Graphs, descriptive statistics, frequency tables, and pie charts were utilized to present the findings. Simple statistical analysis involving percentages tables and graphs employing the Relative Importance Index (RII) with ordinal scales was used to analyze the data. The gathered and analyzed data were presented in this study using textual, tabular, and graphical formats.

3.7.3 Correlation Analysis

Correlation is used to test relationships between quantitative variables or categorical variables. In other words, it's a measure of how things are related. A correlation coefficient is a way to put a value to the relationship. (Field, 2009).

$$\alpha = \frac{N*C}{V+(N-1)} \text{.....[Eq. 3.3]}$$

Where:

N = number of items

C = mean covariance between items.

V = mean item variance

Correlation coefficients have a value of between -1 and 1. A "0" means there is no relationship between the variables at all. In contrast, -1 or 1 indicates a perfect negative or positive correlation (negative or positive correlation here refers to the type of graph the relationship will produce). Sig (2-tailed) if the value is less than or equal to 0.05, we can conclude that there is a statistically significant correlation between the variables (Field, 2009).

As shown in Table 3.1 below, based on the survey result, the correlation between management-related factors & their effect on creating frequent challenges in quality

assurance is positive and moderately correlated at (R = .538**), (P< 0.01). It shows that an increase in client/owner-related factors would lead to a rise in poor quality or discrepancies in the construction projects. Similarly, the correlation between technical-related factors and their effect in creating frequent challenges in quality assurance is positive and more significant with (R =.677**), (P< 0.01). It shows that an increase in technical-related factors would lead to increase in poor quality or discrepancies in construction projects. Again, from the survey result, the correlation between material-related factors and their effect on creating frequent challenges in quality assurance is positive, and they are again moderately correlated at (R =.522**), (P<0.01). It indicates that an increase in material-related factors would increase the chance of the occurrence of poor quality or discrepancies in the construction projects

Table 3. 1 Correlation Matrix between Dependent and Independent Variables

FACTORS		**Management Related Factors**	**Technical Related Factors**	**Material Related Factors**	**Quality Assurance**
Management Related Factors	Pearson Correlation	1	.678*	0.445	0.583
	Sig. (2-tailed)		0.00	0.00	0.00
	N	45	45	45	45
Technical Related Factors	Pearson Correlation	.687*	1	0.634	0.677
	Sig. (2-tailed)	0.00		0.00	0.00
	N	45	45	45	45
Material Related Factors	Pearson Correlation	0.445	0.634	1	0.522
	Sig. (2-tailed)	0.00	0.00		0.00
	N	45	45	45	45
Quality Assurance	Pearson Correlation	0.583	0.677	0.522	1
	Sig. (2-tailed)	0.00	0.00	0.00	
	N	45	45	45	45

**. Correlation is significant at the 0.01 level (2-tailed) ** Source: own survey result

3.7.4 Reliability and Validity

Validity

The validity, in essence, refers to the appropriateness of the measures used, the accuracy of the analysis of the results, and generalizability of the findings" (Mark et al., 2009: p.202). In order to provide supporting evidence that the researcher measures what it intends to measure, a pilot study conducted a test for content validity. Also, to check the content validity, 15 questionnaires were distributed to experienced professionals in construction projects. After that, the questionnaires were modified based on the received comments and distributed to the targeted populations.

Reliability

The Reliability of the collected data was assessed using a statistical package for social sciences (SPSS). A reliability test is conducted to check whether each item in the scale is free from error of measurement (Kumar, 2011). If a questionnaire is examined at different times and across different populations and produces the same results, the questionnaire is "reliable" (Field, 2009). In this test, Cronbach's alpha values range from 0 (un-reliable) to (reliable), with 0.7 being considered a relatively strong reliability value. Widely used methods when using SPSS for assessing reliability are Cohen's Kappa Coefficient for categorical data and Cronbach's alpha for continuous data (Likert-type scales). Since the data collection was based on a Likert-scale, Cronbach's alpha method was used to check reliability.

Table 3. 2 Reliability Test with Cronbach's Alpha

SN	Independent Variables	Cronbach's Alpha value	Number of Items
1	Management Related Factors	0.786	10
2	Technical Related Factors	0.815	8
3	Material Related Factors	0.812	6
4	Effects of Quality Non-Conformance	0.722	7
5	Measures to Assure Quality	0.905	9

As shown in Table 3.2, all Cronbach's alpha values are highly reliable since they all are greater than 0.7. It indicates that the respondents responsibly completed the questioners.

3.8 Data Quality Assurance

Data was required to analyze factors that affect quality assurance in the case of a construction project under UIIDP in Mizan Aman town; no invalid data was used to generate a solution for the problems solved by the researcher. There are no misleading conclusions, and every data analysis was analyzed using the necessary information and techniques. The final output included both the positive and negative impacts of the case.

In order to keep the data quality, the following measures were taken:

- Took a daily diary in each data collection process and made a daily check after collecting data.
- The equipment used for the study, such as the tape recorder (mobile), was checked before any data was collected
- Training was given to the data collectors regarding the data collecting

3.9 Ethical Considerations

Saunders et al. (2007), as cited in (Konovets, 2008), IDP that any researcher who collects data, analyses, and reports findings might face ethical issues. Therefore, to avoid problems that will be occurred, the data was only collected after ethical clearance was obtained from JiT -Research, Publication, and Graduate Studies & Consultancy Office of JiT. Informed consent was obtained from the organization before proceeding to the data collection. The purpose of the survey is academic and clearly described to the organization. Participation in the survey is voluntary. By any chance, any information cannot be traced back to the respondents or the company; any information concerning the projects was kept confidential, and the questionnaires collected from the organization were only analyzed for the intended purpose.

3.10 Plan for Dissemination of Findings

The study mainly investigates the academic objectives of Jimma University. The results were publicly disseminated and subjected to examination. Furthermore, the final report will be published in an international journal specializing in construction engineering and management after being submitted to the director of postgraduate research and publication at Jimma University, Jimma Institution of Technology. Furthermore, strategies were implemented to effectively tailor the material's distribution to the intended audience's requirements. These strategies encompassed the utilization of diverse dissemination methodologies and Amharic, English, and other suitable languages and informational levels.

CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter discussed the data analysis and findings from 53 questionnaires completed by contractors, consultants, and clients in Mizan Aman town. This study aimed to analyze factors that affect quality assurance in building construction projects in the case of urban institutional and infrastructure development programs in Mizan Aman town. The chapter starts with the respondents' profiles and is supported by demographic data. Furthermore, inferential analyses such as Pearson's correlation were performed.

4.1. Questionnaire Survey Response Rates

Table 4. 1 Questionnaires Survey Response Rates

Name of Organization	No. of Questionnaires Distributed	No. of Questionnaires Returned	% of Returned	Valid Returned	% of Valid Returned
Client	15	15	25.86	14	28
Consultants	22	18	31.03	15	30
Contractors	21	17	29.31	16	32
Total	**58**	**50**	**86.2**	**45**	**90**

According to Saunders et al. (2016), over 80 percent of all questions answered other than by a refusal or no answer is considered a complete response. In this case, respondents were divided into three groups, i.e., clients, consultants, and contractors. Table 4.1 shows a total of 58 questionnaires were distributed to respondents. Of these, 15 were to clients, 22 were to consultants, and 21 to contractors. A valid response of 14, 15, and 16 were returned respectively and used in the analysis, constituting 45 respondents, representing an 90% response rate, considered a good response.

4.2 Demographic Characteristics of Respondents

The purpose of this section was to know the demographic background of respondents. The demographic information used in this research were educational background, job position, and type of organization the respondents represented.

Educational Qualifications

While doing reliable research, the educational qualification of respondents plays a very significant role in determining the quality of the data being analyzed. As shown in Figure 4.1, out of the 45 respondents, 84.44% were BSc degree holders, and the rest 15.56% were MSc holders. It implied that this research had tried to collect information from educationally fit respondents, making the study's result more reliable.

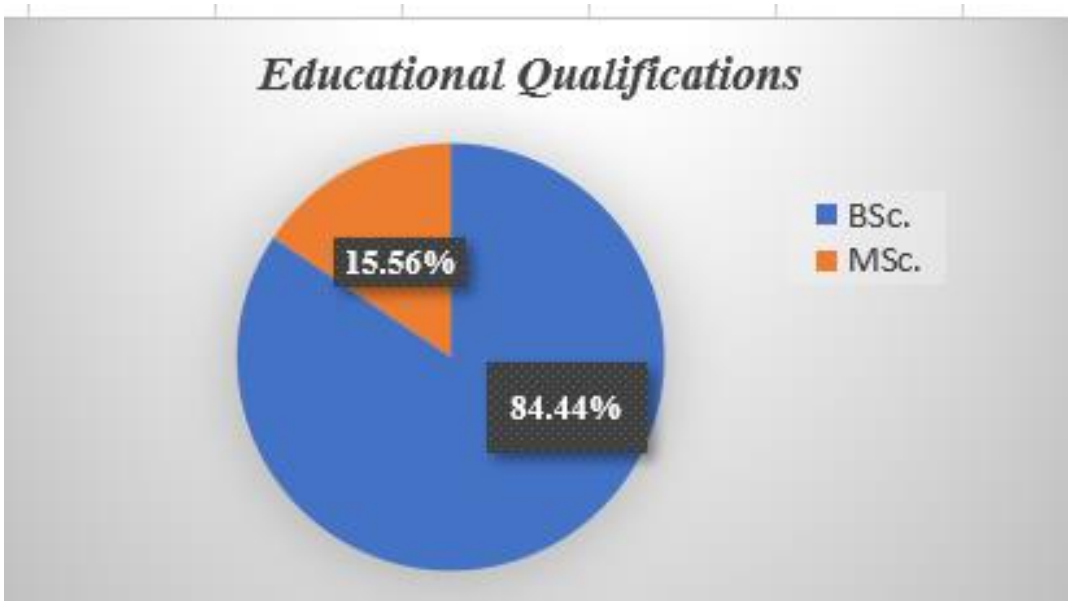

Figure 4. 1 Educational Qualifications

Job Position

As Figure 4.2 below indicates, of all 45 valid questionnaires collected, 17.78% of the respondents were site engineers, 20% were supervisors, 15.56% were office engineers, 8.89% were contract administrators, 6.67% were program coordinators, 4.44% were infrastructure engineers, 8.89% were architects/designers, 6.67% were quantity surveyors and the rest 11.11% of the respondents were working in other positions. It indicates that all the questionnaires were filled out and responded to by professionals working in the construction sector and job positions related to the title study.

Figure 4. 2 Job Position Rates

Years of Experience

Figure 4.3 below indicates the respondents' experience; 24.4% were between 0-5 years, 46.4% were between 5-10 years, 22.2% were between 11-15 years, and 6.7% were above 15 years of experience in the industry. Overall, 75.6% of respondents' experience was between 5 and 15 years, supporting the idea that they participated in implementing projects at operational and design levels. Consequently, it was believed that respondents had some knowledge and understanding of the general topic of quality assurance and awareness of the effect of quality discrepancies on building construction projects in particular. It makes them dependable and credible sources of information, which is vital to realizing the research objectives.

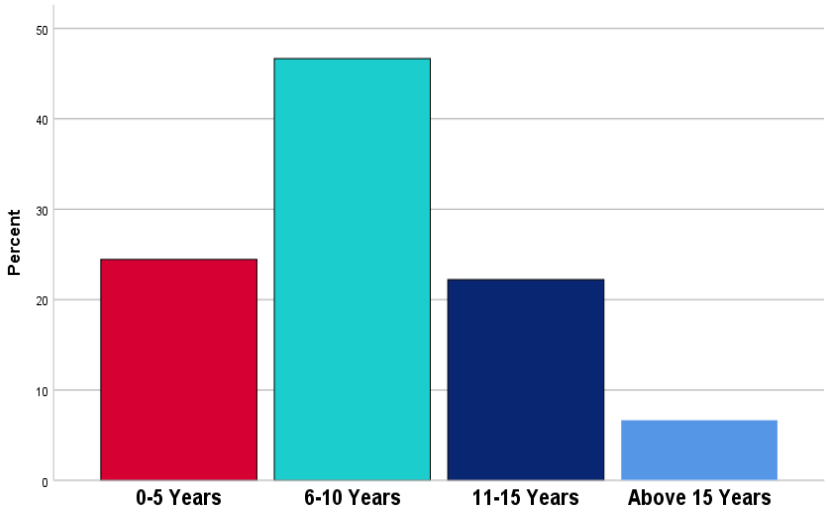

Figure 4. 3 Years of Experience Rates

4.3 Descriptive Analysis Result

A comprehensive literature review was undertaken to identify the factors contributing to recurring challenges with quality assurance, the consequences of quality discrepancies on the performance of construction projects, and strategies intended to guarantee quality in such projects. Following this, structured closed-ended questionnaires were developed and disseminated to the participants following the identified independent variables. The significance of each variable was determined by evaluating and ranking it according to the Relative Importance Index (RII). In order to verify respondent agreement and validate the gathered data, reliability tests, and correlation analyses were conducted.

4.3.1 Key Factors Hindering Quality Assurance within Building Construction Projects Under UIIDP

The first specific objective of the study is to identify key factors hindering quality assurance in bilding construction projects under the UIIDP program in Mizan Aman town. Accordingly, the study found management-related, technical-related, and material-related factors from different literature and incorporated them in the questionnaire, and the factors ranked following their RII value.

Management Related Factors

A total of 10 technical-related factors were identified and incorporated into the questionnaire. Respondents rated each factor concerning their level of influence in hindering quality assurance in building construction projects in Mizan Aman under UIIDP.

Table 4.2 below illustrates the respondent's insight towards management-related factors. Respondents ranked "Inappropriate method of contractors' selection" at the first level concerning its influence in creating frequent challenges in quality assurance with an RII value of 0.95. It shows that inappropriate methods of contractors' selection and awarding contracts for incapable contractors are the top factors that hinder quality assurance. Based on the responses, "Lack of cooperation between client and contractor's staff" is the second-ranked management-related key factor hindering quality assurance in building construction projects under UIIDP in Mizan Aman town

with an RII value of 0.90. It indicates that there is no effective communication between clients and contractors in executing the infrastructures, and this is supposed to be the second topmost key factor that hinder quality assurance in UIIDP. From the listed management-related factors, "Lack of management commitment" is the third-ranked management-related factor, the main factor hinder quality assurance process on the said construction projects, with an RII value of 0.85.

Table 4. 2 Ranking of Management Related Factors

No	Item	RII	Rank
1	Inappropriate method of contractor selection	0.95	1
2	Lack of cooperation between client and contractor's staff	0.90	2
3	Lack of management commitment	0.85	3
4	Lack of contractor supervision	0.84	4
5	Unclear procedure for accepting performed activities	0.84	5
6	Lack of quality department	0.83	6
7	Lack of systematic schedule	0.82	7
8	Lack of use of a standard contract condition	0.80	8
9	Poor training system	0.79	9
10	Lack of use of a cost control system	0.77	10

.

Generally, the findings highlight critical management-related hinder quality assurance within construction projects under the UIIDP in Mizan Aman Town. Notably, the inadequate method of contractor selection emerged as the primary factor, followed by the lack of cooperation between client and contractor staff and the absence of management commitment. Addressing these key issues is essential to enhance quality assurance processes within the infrastructure development program. These findings suggest a critical need for enhanced scrutiny and improvement in selecting contractors, fostering better collaboration between client and contractor staff, and prioritizing stronger management commitment to mitigate challenges and ensure better quality assurance in construction projects.

Technical Related Factors

A total of eight technical-related factors were identified and incorporated into the questionnaire. Respondents rated each factor concerning their influence in hindering quality assurance in UIIDP construction projects in Mizan Aman town. Table 4.3 presents the rank of each technical-related factor based on their respective RII values.

Table 4. 3 Ranking of Technical Related Factors

No	Item	RII	Rank
1	Incomplete drawing and specification	0.94	1
2	Incorrect construction method	0.88	2
3	Discrepancy to codes and standard	0.83	3
4	Poor performance of quality tools and techniques	0.82	4
5	Incompetent subcontractor	0.79	5
6	Lack of quality control system	0.65	6
7	Inadequate close supervision	0.61	7
8	Design complexity	0.54	8

From the listed technical-related factors in Table 4.3, respondents ranked “Incomplete drawing and specification” in the first place concerning its role in hindering quality assurance in building construction projects under UIIDP in Mizan Aman town with an RII value of 0.94. It indicated that the drawings and specifications brought to the contractors were not complete and unclear, creating a major challenge in assuring quality. The next technical factor that placed second with an RII value of 0.88 is "Incorrect construction method." It shows that contractors fail to incorporate and follow appropriate work methods that could help to assure quality in building construction projects. “Discrepancy to codes and standards” ranked third concerning its effect on creating frequent challenges in ensuring quality, with an RII value of 0.83. It again indicates that there is a failure by stakeholders to follow code and standards, and this has been agreed to be the third topmost technical-related factor that creates a challenge to ensuring quality.

In general, understanding the pivotal role of technical factors in quality assurance within UIIDP construction projects in Mizan Aman Town is paramount. The findings highlight the urgency of addressing incomplete specifications, incorrect construction methods, and noncompliance with codes and standards to ensure improved quality control and project success. The outcomes underscore the pressing need for comprehensive and clear drawings and specifications, adherence to correct construction methods, and strict compliance with established codes and standards, highlighting these as the primary technical factors crucial to address for overcoming challenges in ensuring quality in building construction projects under UIIDP in Mizan Aman town.

Material Related Factors

A total of six technical-related factors were identified and incorporated into the questionnaire. Respondents rated each factor concerning their influence in hindering quality assurance in building construction projects in Mizan Aman town under UIIDP. Table 4.4 presents the rank of each material-related factor based on their respective RII values.

Table 4. 4 Ranking of Material Related Factors

No	Item	RII	Rank
1	Low quality of material	0.92	1
2	Lack of material past report	0.84	2
3	Inadequate material management system	0.81	3
4	Unavailability of good quality construction materials	0.76	4
5	Lack of cooperation between contractors and material suppliers	0.71	5
6	Improper material storage	0.71	6

As shown in Table 4.4, material-related factors are ranked based on their RII value. From material-related factors, "Low quality of material" ranked first in hindering quality assurance process in building construction projects under UIIDP in Mizan Aman town with an RII value of 0.92. It shows that the materials deployed for the

construction projects are inadequate and poor in quality. The other material-related factor ranked second place is "Lack of material past report," with an RII value of 0.84. This result revealed that stakeholders failed to properly record data concerning materials used in the past, hindering quality assure in newly constructed building projects. The study found that an "Inadequate material management system" is the third-ranked material-related factor that hinder quality assurance process in building construction projects under UIIP in Mizan Aman with an RII value of 0.81. It can imply that there is no proper material management practice in UIIDP, and this can create different effects like material wastage and ineffective deployment, which makes the quality assurance process difficult in UIIDP.

The prioritization of material-related factors underscores the critical need for addressing issues related to low-quality materials, improving the documentation of material usage history, and implementing an effective material management system to mitigate challenges and enhance the quality assurance process in building construction projects under UIIDP in Mizan Aman town.

Top Three Overall Ranked Factors

Table 4.5 shows the top three major ranked key factors hindering quality assurance in building construction projects under the UIIDP program in Mizan Aman town.

Table 4. 5 Ranking of Overall Top Three Key Factors

No	Factors	Categories	RII	Overall Rank
1	Inappropriate method of contractor selection	Management Related	0.95	1
2	Incomplete drawing and specification	Technical Related	0.94	2
3	Low quality of material	Material Related	0.92	3

4.3.2 Discussion of Overall Top Three Key Ranked Factors

- Inappropriate Method of Contractor Selection

Of all three categories of causes that hinder quality assurance process, "inappropriate method of contractor selection" is the first and most influential factor that hinder quality assurance. It revealed that there are problems associated with the tendering and bidding processes. Since construction projects under UIIDP are targeted locally found small and micro enterprises and low bidder contract awarding systems, it is very common to see quality discrepancies in the works. These contractors lack the capability and skills to perform the work with the planned quality standards and specifications.

- Incomplete Drawing and Specification

  The second most critical factor that hinder quality assurance process is "incomplete drawing and specifications." It indicates that consultants are not preparing complete drawings and specifications for the construction projects under UIIDP in Mizan Aman town. Without a complete design and specifications, it is difficult for the contractors to meet the required project standards. Quality by itself is conformance to standards and specifications. It is not easy to control quality without a complete design and specification. It is also a source of conflict between the client and contractors, which leads to poor project performance.

- Low Quality of Material

  From the overall managerial, technical, and materials-related factors, low-quality material is ranked third concerning its influence on creating challenges in the quality assurance process. It revealed that materials used by contractors are low in quality, which has been a major challenge in ensuring quality. Whenever poor/common quality materials are used in construction projects, the quality of the deliverables is also poor and defective. It leads to the failure of structures before their expected design period.

4.3.3 Impacts of Poor Quality in Building Construction Projects Under UIIDP

The rank of impacts of Poor quality on the performance of construction projects under UIIDP are presented in Table 4.6. Each of the effects is ranked concerning their RII value.

Table 4. 6 Ranking of Impacts of Poor Quality

No	Item	RII	Rank
1	Increase in direct cost for rework.	0.94	1
2	Decrease end-user satisfaction	0.93	2
3	Creates conflict among stakeholders	0.91	3
4	Material wastage	0.89	4
5	Call-backs during one-year warranty (defects)	0.86	5
6	Crashing a schedule to make up for lost time	0.86	6
7	Reduce contractors' profitability	0.84	7

4.3.4 Discussion of Top Three Ranked Impacts of Poor quality

Among the seven identified impacts of Poor quality on construction projects under UIIDP, the top three ranked impacts are briefly discussed below.

- Increase in Direct Cost for Rework

  This study found that the increase in direct project cost for rework is the first and most critical effect of quality discrepancies on the performance of construction projects under UIIDP in Mizan Aman town, with an RII value of 0.94. It indicates that rework due to poor quality is the main problem caused by quality discrepancies. As it is known, reworks require additional and unplanned budget, time, and resources, which

greatly affects the smooth implementation of construction projects under UIIDP.

- Decrease End User Satisfaction

  The study found the second main impact of Poor quality is a decrease in end-user satisfaction with an RII value of 0.93. One of the main aims of UIIDP is to help the community by providing quality infrastructures to support development. However, as found in this study, the infrastructures faced different quality-related problems, and the program did not meet its intended plan. Due to poor quality in building construction projects, the end users do not receive the required services from the infrastructures.

- Creates Conflict Among Stakeholders

  Conflict among stakeholders is the third main impact of Poor quality, with an RII value of 0.91. It revealed that conflicts due to quality discrepancies are common problems in construction projects under UIIDP in Mizan Aman town. Conflicts create unfavorable conditions for stockholders to cooperate and achieve project goals. It leads to a loss of productivity, dissatisfaction, and labor commitment on the work site. Project delay and cost overrun are also commonly observed effects of conflict on construction sites.

4.3.5 Measures to Ensure and Improve Quality

The identified important measures to assure quality under UIIDP are ranked with their relative importance index on the questionnaire survey. Table 4.7, below presents the ranking of the measures below.

Table 4. 7 Measures to Ensure and Improve Quality

No	Item	RII	Rank
1	Appointing highly experienced and capable contractors	0.93	1
2	Proper and structured site supervision	0.89	2
3	Providing complete drawings and specification	0.88	3

4	Improving the contract administration system	0.80	4
5	Proper and up-to-date project planning and scheduling	0.75	5
6	Clear information and communication channel	0.72	6
7	Implementing public procurement codes and directives	0.67	7
8	Use suitable construction methods to suit specific project	0.63	8
9	Efficient and timely supply of materials	0.60	9

4.3.6 Discussion of Top Three Ranked Measures

After identifying and ranking those measures to assure quality, the top most important measures to assure quality under UIIDP are briefly discussed below.

- Appointing Highly Experienced and Capable Contractors

  As this study revealed, appointing highly experienced and capable contractors is the first, most important, and most effective measure to assure quality under UIIDP in Mizan Aman town, with an RII value of 0.93. It shows that the contractors engaged in the work are less experienced and cannot perform under the standards and specifications. As UIIDP targets small and medium enterprises, experience and capability-related issues are common, and the projects' quality is compromised. The result also indicates that most respondents agreed that appointing experienced and capable contractors can improve the quality of the construction projects than the other measures IDPs.

- Proper and Structured Site Supervision

  The second-ranked most important measure to assure quality on construction projects under UIIDP in Mizan Aman town is proper and structured site supervision with an RII value of 0.89. It shows that adequately structured and planned site supervision can help to assure quality of building construction projects under UIIDP. This study proved that timely supervision of works executed and being executed on construction sites is one of the most important ways of quality control

that leads stockholders to identify if there is any quality deviation or not to take the appropriate measures.

- Providing Complete Drawings and Specifications

  The other most important measure ranked third to assure quality by respondents is providing complete drawings and specifications to contractors with an RII value of 0.88. It revealed that providing contractors with clear, complete, precise drawings and specifications could greatly help assure quality under UIIDP in Mizan Aman. It also shows that when complete drawings and specifications are prepared and provided for the contractors, it makes it easier to work according to them and reduces quality deviations in deliverables.

The study's Critical insights reveal the importance of engaging highly experienced contractors, implementing structured site supervision, and providing comprehensive project specifications, emphasizing the urgent need for improved vetting processes and meticulous planning to enhance quality assurance in construction projects under the UIIDP in Mizan Aman town. The study's findings underscore the critical significance of enlisting the services of contractors with extensive experience, establishing systematic site oversight, and furnishing thorough project specifications. The results of this study emphasize the critical importance of implementing complete screening procedures and careful strategizing to elevate the quality assurance guidelines in construction projects funded by the UIIDP in Mizan Aman town. The ultimate goal is to facilitate better project results and increase stakeholder satisfaction.

Although certain findings may correspond to well-established construction principles, this study's distinctive contribution is its analysis of the urban institutional and infrastructure development (UIIDP) projects in Mizan Aman Town. This research further examines the specific difficulties encountered in quality assurance at the local level in the construction industry. It does so by utilizing actual data and insights obtained directly from participants of UIIDP projects. The study bridges conceptual building principles and their visible application in the unique socio-economic and environmental conditions of Mizan Aman Town. The study seeks to address these complex challenges to offer practical recommendations to improve quality assurance

practices. In doing so, it addresses a significant knowledge deficiency within the UIIDP structure.

CHAPTER 5
CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The research emphasized significant concerns that affect quality assurance in UIIDP construction projects. Major identified factor hindering quality assurance included management-related factors, inadequate specifications, and substandard materials. These factors substantially obstructed the quality assurance procedures, compromising the project results.

The poor quality in building construction projects under UIIDP had a negative impact on the execution of the project. Major impacts included escalated revision costs, diminished end-user satisfaction, and stakeholder disputes. The direct correlation between these impacts and poor quality suggests that they significantly impacted the project's success.

Important strategies to improve the quality of construction projects within the Urban Infrastructure and Institutional Development Project (UIIDP) in Mizan Aman Town were identified in the study. Those encompass enhancing the process of selecting contractors, optimizing project specifications, guaranteeing comprehensive site oversight, providing ongoing training, and cultivating stronger stakeholder collaboration. The purpose of these measures is to mitigate discrepancies in UIIDP projects, maintain quality standards, and resolve project challenges.

Hence, this study clarifies the complex issues that affect quality assurance in the context of Urban Infrastructure and Institutional Development Projects (UIIDP) in the municipality of Mizan Aman. By conducting a thorough review of material, technical, and management-related factors, this study uncovered important deficiencies obstructing the achievement of the project. By identifying these obstacles and suggesting workable resolutions, this study provides a framework for strengthening the quality assurance processes in UIIDP projects. The ultimate goal of these projects is to advance sustainable urban development, overcome obstacles, and improve project results, thereby establishing an effective basis for subsequent projects in urban infrastructure development.

5.2 Recommendation

Based on the conclusions drawn from the research findings, here are recommendations that could be derived:

1. **Enhanced Contractor Selecting Processes:** Implement more rigorous and meticulous procedures for selecting and engaging contractors within the UIIDP framework. It involves evaluating and prioritizing contractors based on their experience, capabilities, and adherence to quality standards to ensure improved project performance and outcomes.
2. **Improved Project Specifications:** Emphasize providing contractors with comprehensive and clear project specifications. It involves enhancing communication channels and ensuring all project specifications are detailed, accurate, and easily understandable. Clear and complete specifications can significantly reduce the risk of errors and deviations during project execution.
3. **Diligent Site Supervision:** Strengthen the supervision and monitoring mechanisms during project execution. Structured site supervision is vital in promptly identifying and rectifying potential quality issues, ensuring better quality control and adherence to established standards.
4. **Continuous Training and Skill Development:** Invest in constant training and skill development programs for stakeholders involved in UIIDP construction projects. It includes contractors, project managers, supervisors, and other personnel to ensure they possess the expertise and knowledge to meet quality standards and execute projects efficiently.
5. **Stakeholder Collaboration and Communication:** Foster enhanced collaboration and communication among stakeholders, including clients, contractors, consultants, and project managers. Encourage open dialogue and information-sharing channels to mitigate conflicts, ensure clarity in project requirements, and maintain alignment with quality objectives.

Implementing these recommendations could significantly enhance project outcomes, cost-effectiveness, and adherence to established quality standards within UIIDP construction projects in Mizan Aman town.

REFERENCES

Abas, M., Khattak, S., Hussain, I., Maqsood, S., & Ahmad, I. (2015). Evaluation of Factors affecting the Quality of Construction Projects. 20(02).

Abdel-Razek, R.H. (1998a), "Factors Affecting Construction Quality in Egypt: identification and relative importance", Journal of Engineering Construction and Architectural Management, Vol.5, PP.220-227

Abdul R.R. (2011). Quality Management in Construction. Taylor and Francis group, USA. Brown Andrew and Adams John. (2000). Measuring the effect of project management on construction outputs: a new approach, International Journal of Project Management.

Abdul-Rahman, H. (1993). Capturing the cost of quality failures in civil engineering. International Journal of Quality Reliability Management, 10(3), pp. 20–32

and Controlling, Hoboken, New Jersey: John Wiley and Sons, Inc.

Azlan S. Ali and Ismail Rahmat; 25th September 2009. "The performance measurement

Burati, J.L., Farrington, J.J. and Ledbetter, W.B. (1992). Causes of quality deviations in design and construction. ASCE Journal of Construction Engineering and Management, 118, pp. 34–49

Cao Y. 2010 Quality Control of Construction Projects. Thesis, Savonia University of Applied Sciences, Business and Engineering, Varkaus, China.

Chan A.P and Tam C.M. (2000). Factors Affecting Quality of Building Projects in Hong

Chan D.W.M. and Kumaraswamy M.M. (1995), A study of the factors affecting

Chan D.W.M. and Kumaraswamy M.M. (1997), A comparative study of causes of time

Chan, A.P and Tam, C.M., (2000). "Factors Affecting Quality of Building Projects in Hong

Chua, D.K.H. et al. (1999), Critical success factors for different project objectives, ASCE Journal of Construction Engineering and Management, 125(3), pp.142-150.

Chung (1999), Understanding Quality Assurance in Construction: A Practical Guideline to ISO 9000, E & FN Spon, London.

construction durations in Hong Kong, Journal of Construction and Economics, 13:

D. Arditi & H.M. Gunaydin (1997) International Journal of Project Management,

David Arditi, & H. Murat Gunaydin, (1998) "Factors that affect process quality in the life cycle

Davis, K., Ledbetter, W. B. and Burati, J. L. (1989). Measuring design and construction quality costs. Journal of Construction Engineering and Management, 115, pp. 389– 400

Design & Build and the Traditional Procurement methods in Lagos, Nigeria, South

Design and construction. Journal of Construction Engineering and Management, 118

ed.). New York: Routledge.

Engineering and Management, 135 (3): 187-198.

Hwang, B. G., Thomas, S. R., Haas, C. T., and Caldas, C. H. (2012), Measuring the

Ibiyemi, A.O., Adenuga, A.O., and Odusami, K.T. (2008), Comparative Analysis of

Impact of Rework on Construction Cost Performance, Journal of Construction

K. N. Jha., & K. C. Iyer. (2006) "Critical Factors Affecting Quality Performance in Construction Projects" Total Quality Management, 17(9), 1155-1170.

Kerzen (2014), Project Management: A System Approach to Planning, Scheduling, and Controlling. Tenth edition, New York: John Wiley & Sons, Inc.,

Kerzner, H. (2017). Project Management – A Systems Approach to Planning, Scheduling

KONG", International Journal of Quality and Reliability Management, vol.17, no.4/5, pp.423-441.

KONG", International Journal of Quality and Reliability Management, vol.17, no.4/5, pp.423-441.

Krysik, J. L. & Finn, J. (2010). Research for Effective Social Work Practice (2nd

Low, S.P. and Peh, K.W. (1996), "A Framework for Implementing TQM in Construction", The TQM Magazine, Vol. 8, No.5, PP.39-46.

Mugenda, A.G. (2008), Social Science Research Theory and Principles. Nairobi: Applied Research & Training Services.

of Construction in Developing Countries, vol.11, No.1, pp.51-62.

of construction projects managed by ISO-certified contractors in Malaysia"

of project managers in the construction industry, International Journal of project

Ofori, G. (2006) "Construction Industry in Developing Countries: A research Agenda", Journal Overruns in Hong Kong Construction Projects, International Journal of Project

Palaneeswaran, E. (2006). Reducing Rework to Enhance Project. Recent Developments in Hong Kong, pp. 5.1-5.1

Park,Pheng Low Sui and Chuan Quek Tai, (2006), Environmental factors and work performance

Priyad, A., & Naveen, M. (2020). Impact of Quality Control and Management in Constructions. 07(05).

Shejul, N., Bonde, S., & Konnur, B. (2019). Study of Factors Affecting Quality of Construction Project. International Journal for Scientific Research & Development, 07(05), 753-755.

Thiyagarajan, V. (2016). Construction industry plays a vital role in the development of any country. The development of construction industry mainly depends on the quality of construction projects. Quality is one of the critical factors in the success of construction projects. Th. International Journal of Engineering and Technology, 5(2), 60-65.

Truong, V., & Ninh, T. (2017). Several Legal Issues on Construction Contract Termination Journal of Science and Technology in Civil Engineering, 11(6).

Vadivel, S., Doddurani, M., Shobana, S., & Kalidhass, B. (2016). Analyzing the Factors Affecting Quality in Construction. International Journal of Engineering Research & Technology, 4(33), 62-65.

APPENDIXES

Appendix-A: Questionnaire

Jimma University

Jimma Institute of Technology

School of Graduate Studies

Faculty of Civil and Environmental Engineering

Construction Engineering and Management Chair

Dear Respondent,

I am kindly requesting your willingness to participate in this research ***"Factors Influencing Quality Assurance on Building Construction Projects: A Case of Urban Institutional and Infrastructure Development Program in Mizan Aman Town".*** The questioner is designed for partial fulfillment of MSc in construction engineering and management. The research result could be used as an input for clients, contractor and consultants, academician or other interested groups.

It is believed that your participation in this research will contribute in achieving objective of the research. Thus, the quality of your response towards the question item determines the quality of the research result. Therefore, please answer the question as objectively and honestly as possible and according to the instruction contained in body of the questionnaire. Finally, I want to assure you that all information provided in this survey will be treated with strict confidentiality and allowed to serve for the purpose of the research under consideration. If you have any question, please feel free to contact me through the provided addresses.

Thank you in advance for your cooperation!!

Contact Address

Mitiku Mathiwos

Post graduate Student, MSC in Construction Engineering Management

Jimma University Institute of Technology

Tel: 09 74 71 41 54

Part 1: Demographic profile of respondents

1. Type of organization you are working for?

☐ [1] Client
☐ [2] Consultant
☐ [3] Contractor

2. Your educational qualification?

☐ [1] BSc
☐ [2] MSc
☐ [3] PhD

3. How many years of experience do you have in construction industry?

[1] 0-5 years ☐ [3] 11-15 years ☐

[2] 6-10 years ☐ [4] >15 years ☐

1. What is your title/position?

☐ Site engineer
☐ Project manager
☐ Office engineer
☐ Project coordinator
☐ Architect
☐ Infrastructure Engineer
☐ Contract Administrator
☐ Other

PART II: Key Factors Hindering Quality Assurance Process

Factors that hinder quality assurance in construction projects are listed below. From your experience, please express your opinion on which factors that hinder quality assurance in urban institutional and infrastructure development projects in Mizan Aman town? Please put a tick mark **"√"**in the appropriate column according to the degree of rank.

Scales of Agreement

1 = Strongly Disagree

2 = Disagree

3 = Moderately Agree

4 = Agree

5 = Strongly Agree

No	Management Related Factors	Scales of Agreement				
		1	**2**	**3**	**4**	**5**
1	Lack of systematic time schedule					
2	Lack of contractor supervision					
3	Unclear procedure for accepting performed activities					
4	Inappropriate method of contractor selection					
5	Lack of management commitment					
6	Poor training system					
7	Lack of quality department					
8	Lack of using a standard contract condition					
9	Lack of using cost control system					
10	Lack of cooperation between client and contractor's staff					

No	**Technical Related Factors**	**1**	**2**	**3**	**4**	**5**
1	Lack of quality control system					
2	Inadequate close supervision					
3	Incorrect construction method					
4	Incomplete drawing and specification					
5	Incompetent subcontractor					
6	Design complexity					
7	Poor performance of quality tools and techniques					
8	Discrepancy to codes and standard					
No	**Material Related Factors**	**1**	**2**	**3**	**4**	**5**
1	Low quality of material					
2	Unavailability of good quality construction materials					
3	Inadequate material management system					
4	Lack of material past report					
5	Lack of cooperation between contractor and material suppliers					
6	Improper material storage					

PART II: The Impacts of Poor Quality on Building Construction Projects Performance under UIIDP in Mizan Aman Town.

No	Impacts	1	2	3	4	5
1	Material wastage					
2	Crashing a schedule to make-up for lost time					
3	Increase in direct cost for rework					
4	Call-backs during one-year warranty (defects)					
5	Creates conflict among stakeholders					
6	Reduce contractors' profitability					
7	Decrease end user satisfaction					

PART III: Measures aimed to assure quality within construction projects operating under UIIDP in Mizan Aman Town.

No	Measures	1	2	3	4	5
1	Proper and up-to-date project planning and scheduling					
2	Proper and structured site supervision					
3	Use suitable construction methods to suit specific project					
4	Providing complete drawings and specification					
5	Clear information and communication channel					
6	Efficient and timely supply of materials					
7	Implementing public procurement codes and directives					
8	Improving contract administration system					
9	Appointing highly experienced and capable contractors					

Appendix-B: Data Reliability

Management Related Factors

Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded[a]	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.786	10

Technical Related Factors

Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded[a]	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.815	8

Materiel Related Factors

Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded[a]	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.812	6

Impacts of Poor Quality

Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded[a]	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.722	7

Measures amid Assuring Quality

Case Processing Summary

		N	%
Cases	Valid	45	100.0
	Excluded[a]	0	.0
	Total	45	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics	
Cronbach's Alpha	N of Items
.905	9

Appendix-C: Descriptive Statistics

A. Management Related factors

No	Item	N	Mean	Std. Deviation	RII	Rank
1	Lack of systematic time schedule	45	4.1333	0.96766	0.82666	7
2	Lack of contractor supervision	45	4.2444	1.00353	0.84888	4
3	Unclear procedure for accepting performed activities	45	4.2	1.03573	0.84	5
4	Inappropriate method of contractor selection	45	4.7333	0.57997	0.94666	1
5	Lack of management commitment	45	4.2889	0.99138	0.85778	3
6	Poor training system	45	3.9778	1.07638	0.79556	9
7	Lack of quality department	45	4.1778	1.13396	0.83556	6
8	Lack of using a standard contract condition	45	4.0444	1.12726	0.80888	8
9	Lack of using cost control system	45	3.8667	1.14018	0.77334	10
10	Lack of cooperation between client and contractor’s staff	45	4.5111	1.01404	0.90222	2

B. Technical Related Factors

No	Item	N	Mean	Std. Deviation	RII	Rank
1	Lack of quality control system	45	3.2889	0.99138	0.65778	6
2	Inadequate close supervision	45	3.0667	1.116	0.61334	7
3	Incorrect construction method	45	4.4222	0.72265	0.88444	2
4	Incomplete drawing and specification	45	4.7111	0.66134	0.94222	1
5	Incompetent subcontractor	45	3.9778	0.69048	0.79556	5
6	Design complexity	45	2.73333	1.0745	0.54667	8
7	Poor performance of quality tools and techniques	45	4.1333	0.69413	0.82666	4
8	Discrepancy to codes and standard	45	4.1778	0.93636	0.83556	3

C. Material Related Factors

No	Item	N	Mean	Std. Deviation	RII	Rank
1	Low quality of material	45	4.6222	0.64979	0.92444	1
2	Unavailability of good quality construction materials	45	3.8	1.05744	0.76	4
3	Inadequate material management system	45	4.0889	0.87444	0.81778	3
4	Lack of material past report	45	4.2	0.89443	0.84	2
5	Lack of cooperation between contractor and material suppliers	45	3.5778	1.19637	0.71556	5
6	Improper material storage	45	3.5556	1.37437	0.71112	6

D. Impacts of Poor Quality

No	Item	N	Mean	Std. Deviation	RII	Rank
1	Material wastage	45	4.4889	0.66134	0.89778	4
2	Crashing a schedule to make-up for lost time	45	4.3111	0.79264	0.86222	6
3	Increase in direct cost for rework	45	4.6889	0.55687	0.93778	1
4	Call-backs during one-year warranty (defects)	45	4.3333	0.8528	0.86666	5
5	Creates conflict among stakeholders	45	4.5556	0.65905	0.91112	3
6	Reduce contractors' profitability	45	4.2222	0.84984	0.84444	7
7	Decrease end user satisfaction	45	4.6667	0.56408	0.93334	2

E. **Measures to Assure Quality**

No	Item	N	Mean	Std. Deviation	RII	Rank
1	Proper and up-to-date project planning and scheduling	45	3.7778	1.06363	0.75556	5
2	Proper and structured site supervision	45	4.4667	0.78625	0.89334	2
3	Use suitable construction methods to suit specific project	45	3.1778	1.09314	0.63556	8
4	Providing complete drawings and specification	45	4.4222	0.72265	0.88444	3
5	Clear information and communication channel	45	3.6222	1.07215	0.72444	6
6	Efficient and timely supply of materials	45	3.0222	1.03328	0.60444	9
7	Implementing public procurement codes and directives	45	3.378	1.1137	0.6756	7
8	Improving contract administration system	45	4.0444	0.97597	0.80888	4
9	Appointing highly experienced and capable contractors	45	4.6667	0.6396	0.93334	1