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ETHIOPIAN INSTITUTE OF TECHNOLOGY-MEKELLE

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Independent Research Project Submitted in Partial Fulfillment for the Master of Engineering Degree of Civil Engineering Specialization in Construction Technology and Management

Business and Legal Measures for Managing Defects in Contractor Contracts: A Case Study Approach to Public Building Construction Practices in Ethiopia

By: Zhang Lifeng

Advisor: Dr. Haddush Goitom

Co-advisor: Mr. Kiflom Birhane

January 2026

Ethiopia

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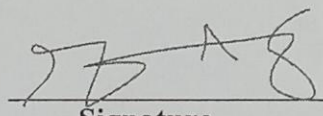
CERTIFICATION

The undersigned have examined the independent project research entitled *Business and Legal Measures for Managing Defects in Contractor Contracts: A Case Study Approach to Public Building Construction Practices in Ethiopia,* presented by *Zhang Lifeng,* is proven the degree of Master of Engineering in Civil Engineering, specialized in Construction Technology and Management.

Approval by the Board of Examiners

Dr. Haddush Goitom		08/01/2026
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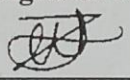
Dr. Zenagebriel G		08-01-2026
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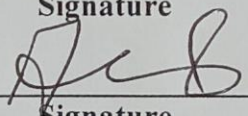
Dr. Ashenafi Aregawi		10-1-2026
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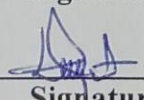
Mrs. Lielti G/egzabher		10-1-2026
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ABSTRACT

This study critically examines the business and legal measures for managing construction defects in public building projects in Ethiopia, using the Supreme Court building project as a case study. Despite the prevalence of defects, limited research has investigated the effectiveness of contractual, legal, and financial mechanisms in addressing these challenges. The study surveyed 15 key stakeholders, including project managers, contractors, subcontractors, legal experts, and client representatives. Findings indicate that construction defects are widespread, primarily caused by poor workmanship, inadequate supervision, design flaws, low-quality materials, and contractor negligence. Both patent (visible) and latent (hidden) defects are common, highlighting persistent quality management issues.

While contractual tools such as Defects Liability Periods (DLPs) and retention payments are frequently included, their effectiveness is constrained by weak enforcement and unclear liability allocation. Legal remedies, including damages and indemnities, face procedural delays that reduce their practical impact. Dispute resolution predominantly relies on litigation, although stakeholder preferences are increasingly shifting toward faster, collaborative approaches such as mediation and adjudication.

The study concludes that improving defect management requires an integrated approach combining clear contractual frameworks, strengthened enforcement mechanisms, alternative dispute resolution, financial risk instruments, and capacity building for stakeholders. Implementing these measures is expected to enhance contractor accountability, reduce disputes, and improve the quality and sustainability of Ethiopia's public building projects.

Keywords: Construction defects; Public building projects; Defects Liability Period; Legal and financial remedies; Alternative dispute resolution; Ethiopia

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LIST OF ACRONYMS AND ABBREVIATIONS

ADR – Alternative Dispute Resolution

BOQ – Bill of Quantities

CBR – California Bearing Ratio

DLP – Defects Liability Period

EIA – Environmental Impact Assessment

FIDIC – Fédération Internationale des Ingénieurs-Conseils

GDP – Gross Domestic Product

HR – Human Resources

ICT – Information and Communication Technology

ISO – International Organization for Standardization

MSc – Master of Science

MoWIE – Ministry of Water and Energy

NEC – New Engineering Contract

NGO – Non-Governmental Organization

PBC – Performance-Based Contract

PPA – Public Procurement Agency

PPPA – Public Procurement and Property Administration

QA – Quality Assurance

QC – Quality Control

RII – Relative Importance Index

SPSS – Statistical Package for the Social Sciences

UTM – Universal Transverse Mercator

WB – World Bank

1. INTRODUCTION

1.1. Problem Background

The construction industry in Ethiopia has experienced rapid growth in recent years, playing a pivotal role in the country's economic development and infrastructure expansion. Public building construction projects, such as government offices, courts, and administrative centers, have received significant attention given their importance in supporting governmental operations and public services. Among these is the Supreme Court building project in Addis Ababa, which represents a flagship development reflecting Ethiopia's commitment to strengthening its legal and institutional framework.

Despite this progress, the Ethiopian construction sector continues to face considerable challenges related to construction defects in large-scale building projects. These defects, ranging from structural deficiencies, poor workmanship, substandard materials, and incomplete or inadequate execution, significantly undermine project quality, increase costs, and delay completion. The consequences are particularly severe in public building projects due to their high visibility, importance, and impact on governance and public trust.

Addressing construction defects effectively requires the integration of legal and business risk management measures within contracts and project administration frameworks. Tools such as Defects Liability Periods (DLPs), retention payments, performance bonds, and clearly defined liability allocations are internationally recognized for mitigating defect risks by enforcing contractor accountability and incentivizing quality compliance. Furthermore, instituting formal dispute resolution mechanisms like adjudication, mediation, arbitration, and litigation facilitates timely and cost-efficient settlements of defect-related claims.

In the Ethiopian context, however, the application and enforcement of these contractual and legal instruments show gaps and inconsistencies. Combined with limited adoption of structured business risk management practices, these deficiencies sustain defect-related problems in public building construction. Consequently, there is an urgent need to critically analyze the current state of defect management mechanisms and propose improvements tailored to Ethiopia's institutional, legal, and construction environment.

This study, therefore, focuses on exploring and evaluating the interrelated contractual, legal, and managerial measures aimed at managing construction defects in Ethiopian public building projects, using the Supreme Court building as a key case. The findings will contribute to enhancing construction quality assurance, risk mitigation, and dispute resolution in Ethiopia's growing public infrastructure sector.

1.2 Problem Statement

Construction defects remain a persistent and significant challenge in Ethiopian public building projects, adversely affecting project quality, cost efficiency, and timely completion. Despite the growing volume of public infrastructure developments, including high-profile projects like the Supreme Court building in Addis Ababa, defects such as poor workmanship, material failures, design errors, and inadequate supervision frequently occur. These defects not only increase the need for costly repairs but also delay project handover and reduce the useful life of buildings.

A critical factor exacerbating this problem is the inadequacy in current contract administration and enforcement frameworks. Defects Liability Periods (DLPs), retention payments, and performance bonds widely recognized tools for managing defects are often inconsistently applied or weakly enforced within Ethiopian public contracts. Additionally, unclear allocation of liability among contractors, subcontractors, and consultants leads to protracted disputes and ineffective defect remediation.

Dispute resolution practices for defect claims are also underdeveloped, with heavy reliance on litigation, which is often slow and costly. Alternative dispute resolution mechanisms like mediation and adjudication have limited adoption, further compounding delays in solving defect-related conflicts.

Together, these deficiencies create a systemic gap in defect management, resulting in recurrent rework, budget overruns, and erosion of stakeholder confidence. There is also a lack of detailed empirical research assessing the effectiveness of contractual, legal, financial, and managerial measures in mitigating construction defects in Ethiopia's public sector.

This study seeks to fill this gap by critically examining the existing defect management mechanisms in Ethiopian public building projects and providing actionable recommendations for

improving contract clarity, enforcement, and dispute resolution to enhance construction quality and project sustainability.

1.3 Research Questions

This study is guided by the following research questions:

1. What are the most common types and causes of construction defects in Ethiopian public building projects?
2. How effective are contractual mechanisms such as Defects Liability Periods (DLPs) and retention payments in managing construction defects?
3. How are legal and financial remedies applied to address construction defects in Ethiopian public building projects, and what challenges affect their enforcement?
4. What dispute resolution mechanisms are commonly used to resolve defect-related disputes, and how effective are they in the Ethiopian public construction context?
5. How can international best practices (such as FIDIC and NEC) be adapted to improve defect management in Ethiopian public building projects?

1.4 Objectives

1.4.1 General Objective

To critically analyze contractual, legal, and managerial measures for managing defects in construction projects, with a focus on business risk mitigation, dispute resolution, and preventive quality control mechanisms.

1.4.2 Specific Objective

The followings are specific objectives of this research:

- To examine the effectiveness of Defects Liability Periods (DLPs), payment retention mechanisms in enforcing contractor accountability and assessing the allocation of liability between contractors and subcontractors in defect-related disputes.
- To evaluate the role of dispute resolution mechanisms (adjudication, mediation, arbitration, litigation) in resolving defect claims efficiently and cost-effectively.

- To analyze financial and legal remedies available to employers when contractors fail to rectify defects, including damage, indemnities, insurance, and statutory protections.
- To draw lessons from international case studies on large-scale construction defect disputes, with a view to recommending best practices for Ethiopian (or regional) construction contracts.

1.5 Significance of the Study

This study contributes significantly to several key areas related to construction defect management in Ethiopia, particularly within the public building sector. First, it provides a comprehensive analysis integrating legal, contractual, and business risk management perspectives, which are often addressed in isolation in existing research. This integrated approach enhances the understanding of how these dimensions interact to affect contractor accountability and project outcomes.

Second, the study offers practical insights and evidence-based recommendations that can guide contractors, subcontractors, employers, policymakers, and the judiciary in improving contract administration, enforcement of defect liabilities, and dispute resolution practices. By identifying gaps and proposing effective mechanisms, the research supports the development of more reliable and transparent construction contracts tailored to the Ethiopian context.

Furthermore, the findings aim to strengthen public construction governance by promoting standards and practices that mitigate risks related to defects, thereby improving the quality, durability, and timely delivery of public infrastructure. This is especially crucial in high-profile projects like the Supreme Court building, which have national significance.

Finally, the research serves as a foundation for future empirical studies and policy dialogues focused on sustainable construction management in Ethiopia, contributing to capacity building and knowledge transfer in the construction industry.

1.6 Scope of the Study

This study focuses specifically on public building construction projects in Ethiopia, with the Supreme Court building project serving as a key case study to explore defect management practices. The research centers on examining contractual, legal, and managerial measures related

to construction defects, including quality control, risk mitigation, and dispute resolution mechanisms.

Geographically, the study is confined to Ethiopia but incorporates comparative references to international best practices for broader contextual insights. Limitations include restricted access to certain confidential project documents and the willingness of stakeholders to participate, which may impact data comprehensiveness.

1.7 Research Limitations

This study faces several limitations that may affect the generalizability and depth of findings. Access to sensitive project documents and stakeholder interviews may be constrained due to confidentiality concerns, limiting data availability. Additionally, the focus on a single flagship public building project—the Supreme Court building—may restrict the broader applicability of results to other public construction projects in Ethiopia. Time and resource constraints also limit the scope of empirical data collection. Despite these limitations, the study aims to provide valuable insights into defect management practices pertinent to Ethiopia's public construction sector.

1.8 Research Beneficiary

The findings of this study will benefit multiple stakeholders engaged in Ethiopia's public construction sector. Contractors and subcontractors will gain insights into effective contractual and managerial practices that improve defect management and reduce liability risks. Employers and project owners will be equipped with practical recommendations for enforcing contractor accountability and enhancing project quality. Policymakers and regulatory bodies will find evidence-based guidance to strengthen legal frameworks and dispute resolution mechanisms, fostering a more transparent and efficient construction industry. Additionally, the judiciary will benefit from clarified interpretations of construction contract liabilities, aiding in quicker and fairer resolution of defect disputes.

1.9 Research Organization

This thesis is organized into five main chapters. Chapter One introduces the research problem, objectives, significance, and scope. Chapter Two provides a comprehensive literature review

covering theoretical foundations, defect classifications, contractual and legal measures, dispute resolution, and comparative international practices. Chapter Three details the research methodology, including study area, data collection, and analysis methods. Chapter Four presents the analysis and discussion of research findings. Finally, Chapter Five concludes the study, offering recommendations, conclusions, and suggestions for future research.

2. LITERATURE REVIEW

2.1 Theoretical and Conceptual Review

Construction defect management is fundamentally grounded in several interrelated theoretical and conceptual domains, including contract theory, risk allocation principles and business risk management frameworks. Together, these provide a comprehensive lens to understand how responsibilities, risks and financial impacts related to defects are distributed and controlled within construction projects.

Contract theory offers a critical foundation for analyzing construction contracts, focusing on the mechanisms used to align incentives between contracting parties and to mitigate opportunistic behaviors that might otherwise lead to disputes or poor quality outcomes (Hart, 1995). Within construction projects, contracts are designed to allocate risks, clarify responsibilities, and specify remedies related to defects. Contract theory suggests that clearly defined roles and penalties help prevent shirking and ensure accountability. For example, performance bonds, retention payments, and defect liability periods (DLPs) are tools grounded in contract theory aimed at ensuring contractors fulfil their defect rectification obligations.

Risk allocation is a pivotal concept in construction management. Lopez and Love (2012) identify effective risk allocation as a mechanism whereby risks including those related to defects are assigned to the parties best positioned to manage them. Misallocation of risks can increase project costs, delays, and disputes. Risk allocation strategies in defect management commonly involve assigning design-related risks to designers, construction risks to contractors, and supervision risks to owners or consultants. Efficient allocation minimizes conflicts and improves defect prevention and resolution outcomes.

Business risk management frameworks complement contract theory and risk allocation by addressing the broader organizational and financial processes to identify, assess, and mitigate risks arising from construction defects (Hillson, 2003). Risk management in this context includes preventive measures such as quality assurance programs, ongoing inspections, and training, as well as reactive strategies such as retention mechanisms, insurance policies, and dispute resolution pathways. The goal is to reduce potential financial losses and reputational damage posed by defects while maintaining stakeholder confidence and project control.

Together, these frameworks provide an integrated conceptual basis for understanding how construction defects can be systematically managed through legal, financial, and operational controls. This integration is particularly relevant in complex environments such as public building projects, where multiple stakeholders and regulatory requirements further complicate defect risk management.

2.2 Defects in Construction Projects

Construction defects represent a critical challenge affecting project quality, cost, and long-term durability of infrastructure. They are broadly classified into two main types: patent defects, which are visible and can typically be identified during or immediately after construction, and latent defects, which remain hidden and may only become apparent months or years after project completion (Mosly, 2018). Understanding these classifications is essential, as each type poses different risks and requires varied management approaches during and post-construction phases.

The causes of construction defects are multifaceted and often interrelated. Among the primary causes are design flaws, which occur due to errors or omissions in the architectural or engineering specifications (Al-Jibouri & Mourad, 2003). These flaws frequently stem from inadequate collaboration or communication between designers, engineers, and contractors, leading to confusion or misinterpretation of technical requirements (Bosher & Dainty, 2011). Such communication gaps cause discrepancies between design intent and on-site execution, resulting in defects that compromise structural integrity or functionality.

Poor workmanship is another significant contributor to defects and often relates to the skill level, experience, and diligence of the labor force (Assaf et al., 1995). In many contexts, especially in developing countries, the shortage of properly trained construction workers and insufficient quality control measures exacerbate workmanship-related defects. Errors in material application, assembly, and finishing works can all manifest as surface cracks, misalignments, or operational failures that degrade building performance.

The use of substandard or inappropriate materials further aggravates the likelihood of defects. Procurement failures, mistaken specifications, or cost-saving substitutions often result in materials that do not meet project requirements or environmental conditions (Jannadi & Bu-

Khamsin, 1998). Inadequate storage and handling practices may also degrade material quality prior to installation, impeding the durability and safety of the final structure.

Inadequate supervision and inspection during construction play a pivotal role in defect occurrence. Effective supervision serves as the frontline quality assurance function, ensuring work conforms to standards and catches defects early (Hegazy & Al-Hajj, 1997). However, supervisory capacity tends to be constrained in many developing countries due to resource limitations, lack of qualified personnel, or weak enforcement mechanisms. This shortfall leads to unchecked workmanship errors and unnoticed material deficiencies that later contribute to defects.

Furthermore, systemic issues such as rushed schedules, ambiguous contract terms, and insufficient stakeholder coordination also indirectly introduce defects by pressuring contractors to cut corners or overlook quality standards (Love et al., 2010). External environmental factors like weather conditions and site accessibility can additionally impact construction quality, further increasing defect risks.

In sum, managing construction defects requires a comprehensive understanding of their diverse causes. Addressing design coordination, workforce skills, material procurement, and supervision quality through integrated measures is vital to minimizing defect incidence and associated economic losses in public building projects.

2.3 Contractual Measures for Defect Management

Effective contractual measures are essential tools in managing construction defects, as contracts legally bind parties to fulfill their quality and performance obligations. One of the key mechanisms embedded in most construction contracts internationally is the Defects Liability Period (DLP). The DLP sets a specific timeframe following practical completion during which the contractor is obligated to remedy any defects that arise. This period acts as a safeguard for employers, ensuring that defects identified shortly after handover are corrected without additional cost (FIDIC, 2017). The length and conditions of DLPs vary by contract type and project scale, but their fundamental purpose is to instill accountability and incentivize high-quality workmanship.

Retention payments are another common contractual device used to enforce compliance with defect remediation responsibilities. A portion of the contract sum, typically 5-10%, is withheld or "retained" until the DLP expires, providing financial leverage to encourage contractors to rectify defects promptly (Ng et al., 1999). This mechanism reduces the risk of contractors neglecting defect rectification, as the withheld funds are released only upon satisfactory completion of defect repairs. Despite their intended effectiveness, retention payments have attracted criticism for reducing contractors' working capital and sometimes sparking disputes over release conditions.

Performance bonds complement retention payments by providing an additional financial guarantee, usually issued by a third-party surety or bank. If contractors fail to meet their obligations, including defect-related works, employers can call on the bond to recover costs incurred in rectifying defects (Zou et al., 2007). Bonds thus mitigate employer exposure to losses and serve as a deterrent against non-performance.

A critical challenge within contractual defect management is the allocation of liability among various parties involved in construction. In complex projects, contractors subcontract portions of work to specialists, while consultants and engineers oversee design and supervision. Unfortunately, contracts often lack clarity in defining responsibility for defect sources and related liabilities, which complicates resolution efforts (Hwang & Yang, 2013). When responsibility is ambiguous, resolving defects becomes protracted and contentious, eroding project relationships and increasing litigation risks (Love & Smith, 2014).

The Ethiopian construction industry particularly suffers from such contractual ambiguities and enforcement weaknesses. Studies indicate that public sector contracts in Ethiopia often omit or inadequately define critical defect management provisions such as precise DLP terms, retention payment rules, and clear division of liability among contractors and subcontractors (Gebremedhin, 2010). This deficiency exacerbates difficulties in addressing defects effectively, contributing to extended disputes, financial losses, and diminished project quality.

Furthermore, contract standardization and adoption of recognized international templates such as FIDIC's conditions remain limited in Ethiopia. This limits consistency and clarity in defect-

related clauses compared to jurisdictions where standard contracts explicitly cover defect rectification obligations and dispute avoidance mechanisms.

Contractual measures provide the primary framework through which defect risks are managed. While tools like DLPs, retention, and performance bonds are well-established internationally, their practical success depends on clear liability allocation and enforceable contract provisions. Improving the specificity and rigor of these measures in Ethiopian public contracts represents both a critical challenge and opportunity to enhance construction defect management and project delivery outcomes.

2.4 Legal Remedies and Risk-Sharing

Legal remedies constitute a vital mechanism enabling project owners to enforce contractor accountability for construction defects. These remedies typically include damages, which compensate for losses suffered due to defective work, indemnities that shift financial responsibility from one party to another, warranties that guarantee defect-free performance for a specified period, and insurance claims that provide financial recovery through third-party policies (Pryke, 2016). Collectively, these legal tools establish a framework for risk mitigation and cost recovery following defect occurrences.

In the Ethiopian context, the construction legal framework does provide certain statutory protections for project owners concerning defects. However, persistent challenges exist in the enforcement of these protections. Procedural inefficiencies, limited legal expertise, and prolonged dispute resolution processes hinder timely and effective remedial actions (Yitbarek, 2015). These issues often result in prolonged defect liabilities and unresolved claims that undermine stakeholder confidence and project sustainability.

The option of contract termination as a remedy for serious or persistent defects is often considered a last resort globally due to its disruptive nature and significant financial consequences (Girma, 2012). In Ethiopia, contract termination related to defects is rare and complicated by both high direct costs and extensive bureaucratic procedures. Owners and contractors frequently prefer remedial actions such as repairs or negotiated settlements, partly because termination may involve litigation, re-tendering, and delays that compromise overall project objectives.

Risk-sharing mechanisms play a complementary role by redistributing the burden of defect-related risks among stakeholders, motivating improved quality standards. Such mechanisms encompass contractual clauses allocating responsibility to the parties best placed to manage certain risks, thus aligning incentives for defect prevention (Cicmil & Marshall, 2005). Effective risk-sharing can reduce adversarial relationships that impede defect resolution and promote collaboration among contractors, consultants, and employers.

A growing international trend is the use of insurance products, notably latent defect insurance or "decennial bonds", which cover hidden defects not immediately discoverable during defect liability periods. These insurance schemes shift financial risks away from owners and contractors to specialized insurers, providing greater security and facilitating faster defect rectification (Chartered Institute of Building [CIOB], 2019). While such insurance products are well-established in many developed markets, their adoption in Ethiopia remains limited, mainly due to lack of market readiness, awareness, and regulatory support.

Legal remedies and risk-sharing are critical components of a comprehensive approach to defect management. Strengthening Ethiopian legal frameworks for defect enforcement, simplifying contract termination processes, and promoting modern insurance products would enhance project resilience and quality assurance.

2.5 Dispute Resolution Mechanisms

Disputes related to construction defects are an inevitable facet of complex building projects, arising from differing interpretations of contractual obligations, quality standards, and liability. Efficient and effective dispute resolution mechanisms (DRMs) are therefore critical in minimizing project delays, cost overruns, and deterioration of stakeholder relationships. The primary DRMs employed internationally include adjudication, mediation, arbitration, and litigation, each with distinct characteristics, advantages, and limitations (Cheung & Yiu, 2006).

Adjudication is widely recognized as a frontline dispute resolution method characterized by its speed and provisional nature. It involves appointing a neutral adjudicator, often a construction expert, to make a binding decision quickly, typically within weeks of referral (Love et al., 2010). The core purpose of adjudication is to maintain project momentum by providing interim dispute

resolution, which parties can accept or contest in subsequent arbitration or litigation. In defect disputes, adjudication helps address urgent repair responsibilities without protracted delays, preserving project timelines and limiting financial exposure.

Mediation is a consensual, facilitative process emphasizing negotiation and mutual agreement between disputing parties. A trained mediator guides dialogue to identify shared interests, clarify misunderstandings, and explore win-win solutions (Breen, 2007). Unlike adjudication or arbitration, mediation outcomes are non-binding unless formalized in settlement agreements. Its informal and collaborative nature makes mediation particularly effective in resolving complex defect disputes where preserving working relationships is valuable. Mediation is associated with lower costs and less adversarial posturing, helping to avoid lengthy legal confrontations.

Arbitration is a formal and structured process involving one or more arbitrators who hear evidence and arguments to render a legally binding decision. Arbitration holds the advantage of confidentiality and flexibility compared to public courts, allowing parties to select arbitrators with specialized construction expertise (Coleman & Kirwan, 2008). However, arbitration can be costly and time-consuming, often lasting several months or more, especially for complex defect claims involving technical evidence and expert testimonies. Furthermore, while arbitration awards are binding, mechanisms for appeal are limited, necessitating careful consideration during dispute escalation.

Litigation refers to resolving disputes through national courts and represents the most formal DRM. It involves rigid procedural rules, public hearings, and definitive judgments enforceable by law (Ramsden, 2006). Litigation provides comprehensive adjudication and appeal processes, but it is widely regarded as the slowest and most expensive option. In many jurisdictions, court case backlogs and procedural complexities exacerbate delays, making litigation a last resort for defect disputes. Additionally, adversarial litigation may irreparably damage relationships between owners and contractors.

The choice of dispute resolution mechanism is strategically significant for public building projects where time and cost efficiency, transparency, and public accountability are paramount. Zhang and Shen (2010) emphasize that integrating multi-tiered dispute resolution protocols—such as negotiation followed by adjudication, then arbitration or litigation if required—can

optimize defect dispute management. Early engagement with DRMs promotes quicker settlements, reduces uncertainty, and minimizes reputational damage to all parties.

In Ethiopia, most public construction projects typically rely on litigation through courts or arbitration administered by local institutions. However, limited use of mediation and adjudication, which can offer faster and friendlier dispute settlement options, contributes to prolonged project delays and higher costs. Encouraging adoption of alternative dispute resolution (ADR) models tailored to the Ethiopian legal and cultural context represents a significant area for improvement.

The diversity of dispute resolution mechanisms provides a spectrum of tools to address defect-related disputes proportionately to their scale and complexity. Optimizing these options, especially the use of adjudication and mediation as early-stage tools, is critical for enhancing defect management and project success in public construction.

2.6 Comparative International Practices

The management of construction defects has evolved significantly in various international contexts, with countries such as the United Kingdom (UK), South Africa, and Singapore demonstrating mature and effective frameworks. These countries have developed clear contractual provisions, stringent Defects Liability Periods (DLPs), and robust alternative dispute resolution (ADR) mechanisms that collectively enhance defect mitigation and resolution.

In the United Kingdom, construction contracts are often based on well-established standard forms such as the Joint Contracts Tribunal (JCT) and the New Engineering Contract (NEC) suite. These contracts explicitly define defect rectification processes, enforce strict DLPs typically ranging from 6 to 12 months post-completion, and utilize retention sums to secure contractor performance (Flanagan & Jewell, 2005). The UK also emphasizes the use of ADR techniques including adjudication, which is compulsory under the Housing Grants, Construction and Regeneration Act 1996, to provide rapid interim dispute resolution and reduce reliance on litigation (Love et al., 2010).

South Africa, with its dynamic construction sector, incorporates similar principles through its tailored construction contracts integrating clear defect management provisions. South African

contracts often include comprehensive warranty requirements supported by retention and performance bonds to ensure contractor accountability (Love et al., 2010). The country actively promotes mediation and arbitration through the Arbitration Foundation of Southern Africa (AFSA), which offers sector-specific expertise and streamlined processes to resolve defect disputes efficiently outside of courts.

Singapore exemplifies a regionally leading approach, combining well-regulated contract standards with proactive defect management policies. Public projects governed by the Building and Construction Authority (BCA) mandates include rigorous inspection regimes during the DLP and leverage performance securities to ensure defect correction (Kumaraswamy & Anvuur, 2009). Singapore also embraces ADR, with mediation centers specialized in construction disputes, helping parties resolve claims amicably while preserving industry relationships.

At the international standard-setting level, contracts such as the FIDIC (Fédération Internationale Des Ingénieurs-Conseils) Conditions of Contract and the NEC (New Engineering Contract) suite provide detailed, globally recognized frameworks for defect management and risk allocation (Yates, 2017). These contracts prescribe specific provisions for DLPs, defect notification procedures, contractor obligations, and mechanisms for dispute avoidance and resolution. Their adoption promotes clarity, reduces ambiguity, and facilitates equitable risk sharing among parties by assigning responsibility for different defect risks to the appropriate stakeholders.

For Ethiopia, the experiences and practices of these countries offer valuable lessons. The Ethiopian construction industry can benefit substantially from enhancing contract clarity by adopting standardized international contract templates that incorporate explicit defect management clauses. Additionally, reinforcing the enforcement of defect provisions, especially concerning DLPs, retention payments, and performance bonds, is critical to ensuring contractor liability and reducing defect incidence.

Furthermore, promoting the wider adoption of ADR mechanisms such as adjudication and mediation tailored to Ethiopia's legal and institutional capacity could significantly ease the resolution of defect disputes outside cumbersome court processes. ADR adoption would

contribute to faster, more cost-effective dispute settlements, preserving relationships and supporting project delivery efficiency (Kumaraswamy & Anvuur, 2009).

In conclusion, compared to international best practices, Ethiopia's defect management framework remains nascent but holds strong potential for improvement by integrating proven contractual standards, strengthening enforcement capacity, and institutionalizing ADR processes. Embracing these comparative insights provides a roadmap towards enhanced construction quality assurance, risk mitigation, and dispute resolution effectiveness in Ethiopian public building projects.

2.7 Review of Previous Research Studies

Several empirical studies have examined construction defects, contractual mechanisms, and dispute resolution practices in public construction projects, both internationally and within developing country contexts.

Studies conducted in developing countries consistently identify construction defects as a major contributor to cost overruns, project delays, and quality failures. For instance, Love et al. (2018) found that poor workmanship, inadequate supervision, and design errors were the leading causes of defects in public building projects, emphasizing the role of weak quality management systems. Similarly, Forcada et al. (2016) reported that insufficient coordination between design and construction teams significantly increased defect occurrence, particularly latent defects that emerge after project completion.

In the African context, research by Olanrewaju and Anahve (2015) highlighted that contractor negligence and the use of substandard materials were prevalent causes of defects in public projects, often exacerbated by weak enforcement of contract provisions. Studies in Nigeria and Kenya further revealed that ineffective supervision and limited technical capacity among site personnel contributed substantially to recurring defects and rework (Ameh & Osegbo, 2011).

Regarding contractual measures, several studies emphasize the importance of Defects Liability Periods (DLPs) and retention payments as tools for ensuring contractor accountability. According to Bunni (2013), clearly defined DLP provisions enhance post-completion quality assurance, although their effectiveness depends heavily on enforcement and documentation

practices. However, research by Cheung et al. (2014) found that retention payments alone are often insufficient to guarantee defect rectification, particularly when retention amounts are low or release procedures are unclear.

Legal and financial remedies have also been examined in prior studies. Murdoch and Hughes (2008) observed that while legal remedies such as damages and indemnities exist in standard contracts, their effectiveness is limited in jurisdictions with slow judicial processes and weak institutional capacity. In many developing countries, litigation remains the dominant dispute resolution mechanism, despite its high cost and lengthy timelines.

Alternative dispute resolution (ADR) mechanisms such as arbitration, mediation, and adjudication have gained increasing attention in construction research. Studies by Harmon (2003) and Uff (2015) demonstrate that ADR mechanisms can significantly reduce dispute resolution time and preserve working relationships when compared to litigation. However, empirical evidence from Sub-Saharan Africa indicates that ADR adoption remains limited due to lack of awareness, institutional support, and cultural reliance on formal courts.

In Ethiopia, empirical research on construction defect management remains limited. Existing studies largely focus on cost overruns, project delays, and procurement challenges, with minimal attention given to defect liability, contractual enforcement, and dispute resolution practices. This gap highlights the need for focused research examining how contractual, legal, and financial mechanisms are applied in managing construction defects in Ethiopian public building projects.

To address limitations in the existing literature, this study includes a critical evaluation of sources, highlighting their scope, strengths, and limitations, particularly regarding applicability to the Ethiopian context. It also integrates theoretical frameworks with practical insights, showing how defect management principles (e.g., Defects Liability Periods, retention mechanisms) are implemented in real projects and where challenges arise. Furthermore, the review incorporates a focused analysis of Ethiopian public building projects, emphasizing local contract practices, enforcement issues, workforce skills, and institutional capacities, thereby providing context-specific understanding and identifying gaps that this research seeks to address.

2.8 Research Gap

Despite growing recognition of the complexities surrounding construction defect management, there remains a limited integration of legal, financial, and managerial perspectives within the Ethiopian construction sector. Existing studies tend to focus on isolated aspects such as contractual provisions or legal frameworks without holistically examining how these elements interact to influence defect outcomes (Gebremedhin, 2010; Wilson, 2020). This fragmented approach limits comprehensive understanding and effective intervention.

Moreover, there is a notable scarcity of empirical research in the Ethiopian context specifically addressing the effectiveness of contractual and legal measures designed to manage defects. While regulatory frameworks and contract clauses exist on paper, few studies have systematically evaluated their practical performance, enforcement challenges, or impact on defect incidence and resolution. This knowledge gap hinders evidence-based policy-making and adoption of best practices tailored to local project realities.

The absence of detailed case analyses, especially focusing on high-profile public infrastructure projects such as government building constructions, further constrains the development of context-relevant solutions. Systematic case studies are crucial to uncovering real-world dynamics, stakeholder behaviors, and institutional bottlenecks that affect defect management. These insights can inform integrated frameworks combining legal reforms, financial risk mitigation, and managerial controls adapted for Ethiopia's unique socio-economic and regulatory environment.

Therefore, addressing this research gap requires interdisciplinary investigations that bridge legal theory, contract administration, financial risk management, and project execution practices. A comprehensive, evidence-based understanding derived from empirical data and detailed case studies will better equip policymakers, contractors, and employers to devise robust defect management strategies, thus improving construction quality and public infrastructure sustainability in Ethiopia.

3. METHODOLOGY

3.1 Study Area

The study is conducted within the context of public building construction projects in Ethiopia, with a particular focus on the Supreme Court Building Project located in the capital city, Addis Ababa. Addis Ababa serves as Ethiopia's political, administrative, and economic hub, hosting numerous large-scale government infrastructure projects managed by various public sector organizations. This setting provides a representative environment to explore defect management practices in high-profile public construction.

The Supreme Court Building Project is a strategically important landmark and a flagship public infrastructure initiative, making it an ideal case for in-depth analysis. It involves multiple stakeholders including government ministries, contractors, subcontractors, consultants, and legal authorities, offering comprehensive opportunities to examine contractual, legal, financial, and managerial aspects of defect management.

The choice of Addis Ababa as the study area also enables practical access to key respondents such as project managers, contractors, legal experts, and government officials, facilitating primary data collection through semi-structured interviews and questionnaire surveys. The urban setting allows for direct observation and review of project documents, contracts, and dispute resolution records, enriching the qualitative and quantitative data.

By focusing on an ongoing and well-documented public building project in Ethiopia's capital, the study aims to generate findings that are both contextually grounded and broadly applicable to similar public construction initiatives across the country.

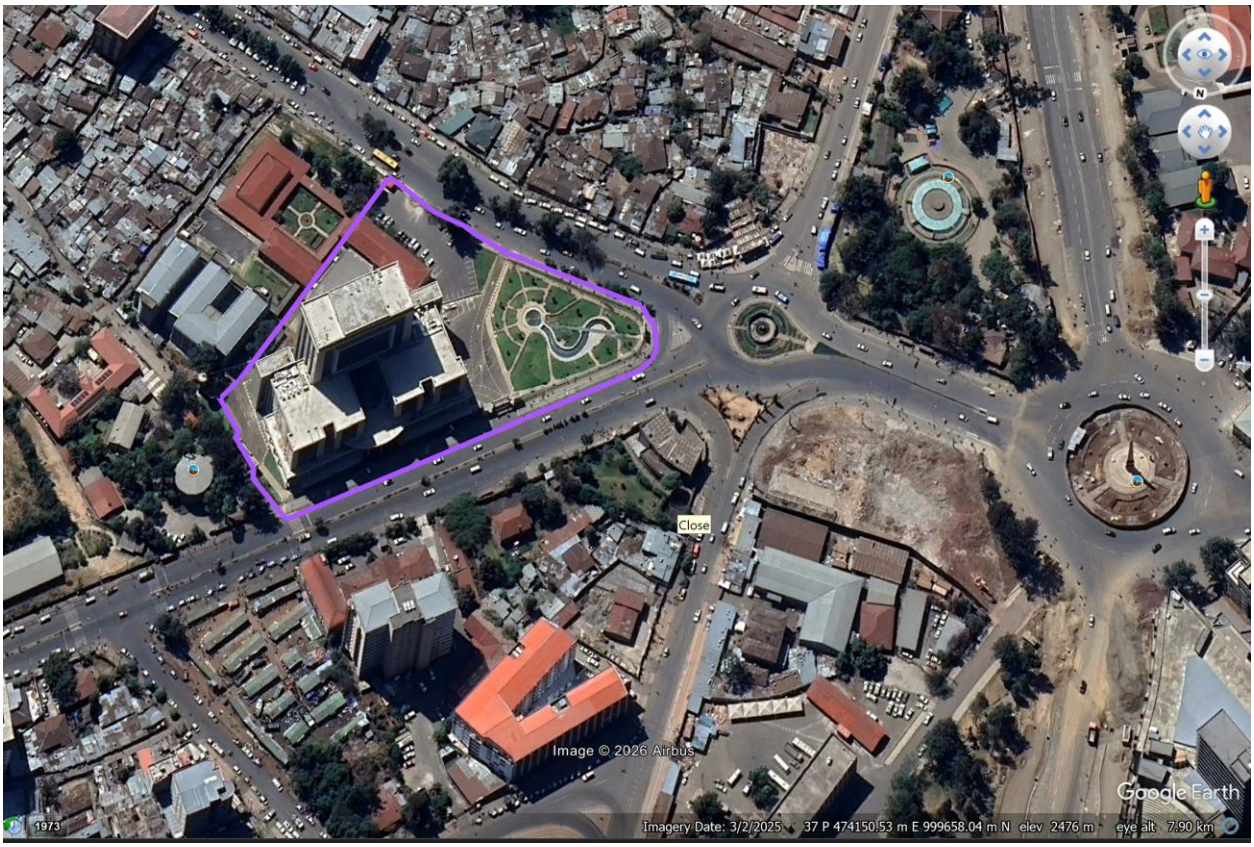

Figure 3-1: Project Location Map

3.2 Research Design

This study employs a case study research design to critically analyze the business, contractual, and legal measures for managing construction defects within Ethiopian public building projects. The case study approach allows an in-depth, contextualized examination of complex phenomena defect management practices in a real-life setting, specifically focusing on the Supreme Court Building Project in Addis Ababa.

The research design integrates both qualitative and quantitative methods through a mixed-methods approach. Qualitative data is gathered primarily through semi-structured interviews with key stakeholders including project managers, contractors, subcontractors, legal experts, and government officials. These interviews provide rich insights into the challenges, practices, and perceptions surrounding defect management, contractual enforcement, and dispute resolution.

Quantitative data collection involves administering structured questionnaires to a broader sample of participants involved in public construction projects. The questionnaires are designed to quantify the effectiveness of Defects Liability Periods (DLPs), retention payments, liability allocation, and dispute resolution mechanisms based on participants' experiences and observations.

This triangulation of qualitative and quantitative data enhances the robustness of the study by cross-validating findings and providing both detailed narratives and measurable evidence. The case study's embedded design also allows comparative analysis between Ethiopian practices and international standards to identify best practices and areas for improvement.

Overall, this research design is suitable for addressing the study's objectives because it accommodates the complexity of construction defect management, captures multiple stakeholder perspectives, and produces practical, evidence-based recommendations tailored to the Ethiopian public construction context.

This study employed a mixed-methods research design, combining quantitative surveys and qualitative interviews. The mixed-methods approach was selected to capture both measurable trends in defect occurrence and rich, contextual insights into stakeholder experiences, enabling a comprehensive understanding of defect management in public building projects. Although the study involved a relatively small sample size of 15 key stakeholders, including project managers, contractors, subcontractors, legal experts, and client representatives, this sample was deliberately chosen through purposive sampling to include participants with substantial expertise and direct involvement in defect management. The limited sample size is acknowledged as a study constraint, but the depth and relevance of the information collected provide meaningful insights into the research objectives

3.3 Target Population

The target population of this study comprised key stakeholders involved in Ethiopian public building construction projects, who possess direct experience in contract administration, defect management, and dispute resolution. These included:

- Project managers

- Contractors
- Subcontractors
- Legal experts
- Client representatives
- Government officials and regulatory professionals

These groups were selected because of their active roles in decision-making, supervision, and enforcement of contractual and legal mechanisms related to construction defects.

3.4 Sampling Technique

This study employed a purposive sampling technique to select respondents with relevant expertise and experience in public building construction projects. Purposive sampling was considered appropriate because the study sought in-depth insights from professionals directly involved in defect management, rather than generalized opinions from the broader population.

Respondents were selected based on their:

- Professional role in public building projects
- Years of experience in the construction sector
- Direct involvement in contract administration or defect resolution

This approach ensured that the data collected was relevant, credible, and aligned with the research objectives.

3.5 Sample Size

The sample size for this study consisted of 15 key informants, selected from different stakeholder groups involved in Ethiopian public building construction projects. The sample included project managers, contractors, subcontractors, legal experts, client representatives, and government officials.

Given the exploratory and qualitative nature of the study, a sample size of 15 was considered adequate to capture diverse professional perspectives while allowing for detailed analysis.

Similar construction management studies have successfully employed comparable sample sizes to generate meaningful insights.

3.6 Methods and Tools Used for Each Specific Objectives

Table 3-1: Methods and Tools Used for Each Specific Objectives

Specific Objective	Methods and Tools Used	Data Source
1. To identify the major causes and types of construction defects in public building projects	Questionnaire survey and semi-structured interviews; descriptive statistical analysis (frequency, percentage)	Contractors, project managers, legal experts
2. To evaluate the contractual mechanisms employed to manage defects (e.g., DLPs, retention payments, liability clauses)	Document review (sample contracts), key informant interviews; comparative analysis	Public project contracts, consultant records, EEP/ERA data
3. To examine the effectiveness of legal and financial remedies applied for defect management	Key informant interviews; content analysis of legal cases and contract clauses	Legal experts, government officials
4. To assess dispute resolution mechanisms used for defect-related conflicts	Questionnaire and interviews; qualitative thematic analysis	Contractors, consultants, lawyers
5. To propose improvement strategies based on international best practices (e.g., FIDIC, NEC)	Comparative review of FIDIC/NEC provisions and synthesis of stakeholder feedback	Literature review, professional inputs

3.7 Data Type

This study utilizes both primary and secondary data to comprehensively examine defect management practices in Ethiopian public building construction projects.

The primary data consist of qualitative and quantitative information collected directly from key stakeholders involved in the Supreme Court Building Project and similar public construction initiatives.

Qualitative primary data are obtained through semi-structured interviews with project managers, contractors, subcontractors, legal experts, and government officials. These interviews

provide detailed insights into the contractual, legal, financial, and managerial aspects of defect management, as well as challenges faced during project execution.

Quantitative primary data are gathered via structured questionnaires designed to assess the effectiveness of Defects Liability Periods (DLPs), retention payments, liability allocation, and dispute resolution mechanisms from a broader stakeholder perspective.

Secondary data include relevant official project documents such as contract agreements, arbitration awards, court rulings, policy papers, and related literature, which provide contextual background, contractual provisions, and comparative information. Additionally, academic journal articles, legal texts, and international contract standards (e.g., FIDIC, NEC) form part of the secondary data to support the analysis of best practices and benchmarking.

The use of both primary and secondary data ensures a rich and triangulated dataset allowing for in-depth thematic analysis as well as empirical validation of findings related to defect management approaches within the Ethiopian public construction sector.

3.8 Source of Data

The primary data sources include project managers, contractors, subcontractors, legal experts, and government officials involved in the Supreme Court Building Project and other public building constructions in Ethiopia. Data are collected through semi-structured interviews and structured questionnaires administered to these stakeholders.

Secondary data sources consist of official project documents such as contracts, arbitration awards, court rulings, and policy papers. Additionally, relevant academic literature, legal texts, and international contract standards provide supplementary information for comparative analysis.

3.9 Sampling and Sample Size Determination

The study employed purposive sampling, targeting professionals directly involved in managing, supervising, or regulating public building projects in Ethiopia. These include project managers, contractors, subcontractors, legal experts, and client representatives.

The total population relevant to the study comprises all stakeholders engaged in public building projects under government procurement systems within the study area (e.g., Addis Ababa, Bahir Dar, or other regions, depending on your case). Due to the specialized nature of defect

management and the need for experienced informants, only a limited group of professionals possess the required technical and legal knowledge to provide informed responses.

Accordingly, the target sample size was set between 10 and 15 respondents, representing the key stakeholder categories. This range was determined based on qualitative research principles, which emphasize *information richness* rather than statistical representativeness. According to Creswell (2014), qualitative case studies typically involve between 5 and 25 participants, sufficient to reach data saturation where no new themes emerge. Similarly, Guest, Bunce, and Johnson (2006) noted that meaningful thematic saturation often occurs with as few as 12 participants in homogeneous expert samples. Therefore, the selected range (10–15) aligns with established methodological guidance for qualitative case study research.

This sample size allows for diverse yet manageable representation across stakeholder groups while ensuring depth of inquiry and quality of insights rather than breadth of coverage.

3.10 Method of Data Collection

Data for this study will be collected using both primary and secondary methods to ensure comprehensive coverage of the research objectives.

Primary data will be gathered through two main instruments:

- Semi-structured interviews with selected project managers, contractors, subcontractors, legal experts, and government officials. These interviews will capture detailed qualitative insights regarding contractual, legal, and managerial aspects of defect management, challenges faced, and dispute resolution experiences. The flexible interview format allows probing and follow-up questions to clarify complex issues.
- Questionnaires administered to a wider sample of stakeholders involved in public building projects. The questionnaires consist of structured and closed-ended questions designed to quantify the effectiveness of Defects Liability Periods, retention payments, liability allocation, and dispute resolution mechanisms. This quantitative data facilitates statistical analysis and generalization of findings.

Secondary data will be collected through the review of project documentation including contract agreements, arbitration and court judgments, policy documents, and relevant academic and legal

literature. These documents provide contextual background, support validation of primary data, and offer comparative perspectives.

Data collection will be conducted in person and, where necessary, through electronic communication (e.g., email or video calls), to ensure wide accessibility and participant convenience.

3.11 Method of Data Analysis

The data collected through interviews and questionnaires will be analyzed using a combination of qualitative and quantitative techniques appropriate to the mixed-methods research design.

Qualitative data obtained from semi-structured interviews will be analyzed using thematic analysis. This involves transcribing interview recordings, coding the data to identify recurring themes and patterns related to defect management practices, contractual effectiveness, legal remedies, and dispute resolution challenges. Thematic analysis enables the extraction of rich, contextual insights and supports the development of an integrated understanding of the studied phenomena.

Quantitative data from questionnaires will be analyzed using descriptive statistics, including frequency distributions, percentages, and measures of central tendency (mean, median). These analyses will quantify stakeholder perceptions of the effectiveness of Defects Liability Periods, retention payments, liability allocation, and dispute resolution mechanisms. Statistical tools like cross-tabulations may also be employed to identify relationships between variables such as respondent role and views on defect management efficacy.

Comparative analysis will be conducted to contrast Ethiopian practices against international standards, identifying gaps and opportunities. The combined analysis approach ensures triangulation of data sources, enhancing the reliability and validity of the research findings.

3.12 Method of Data Presentation

The analyzed data will be presented using a variety of formats to clearly and effectively communicate the research findings. Qualitative data from interviews will be presented

thematically through narrative descriptions, supported by direct quotations from respondents to illustrate key points and provide depth to the analysis.

Quantitative data obtained from questionnaires will be summarized using tables, charts, and graphs such as bar charts, pie charts, and frequency distributions for easy visualization and interpretation of patterns and trends related to defect management effectiveness. Comparative tables may be used to highlight differences between Ethiopian practices and international standards.

Additionally, the integration of qualitative and quantitative findings will be synthesized in coherent discussions aligning with the study objectives. Where appropriate, excerpts from secondary documents such as contracts and legal rulings will be incorporated to validate primary data and provide contextual richness.

Overall, the presentation approach strives for clarity, logical flow, and accessibility to cater to academic audiences, practitioners, and policymakers interested in construction defect management.

3.13 Ethical Considerations

Ethical considerations were carefully observed throughout the research process to ensure the integrity and credibility of the study. Key ethical measures included:

- Informed Consent: All participants were informed about the purpose of the study, and their voluntary participation was obtained before data collection.
- Confidentiality: Respondents' identities and organizational affiliations were kept confidential, and data were reported in aggregated form.
- Anonymity: No personal identifiers were included in the questionnaire or final report.
- Data Protection: Collected data were used strictly for academic purposes and stored securely to prevent unauthorized access.
- Non-Maleficence: The study avoided any potential harm to participants, including professional or legal risks.

These ethical principles align with standard academic research guidelines and institutional requirements.

3.14 Validation and Reliability

To ensure validity, this study employs triangulation by combining qualitative interviews, quantitative questionnaires, and secondary document reviews to cross-verify findings. The interview guides and questionnaires are pre-tested through a pilot study to refine questions for clarity and relevance.

Reliability is maintained by using consistent data collection procedures and clear documentation of coding and analysis processes. Respondent confidentiality and ethical considerations further enhance data integrity and participant trustworthiness.

4. DATA ANALYSIS, RESULTS AND DISCUSION

4.1 Respondents' Background

The survey included 15 key informants selected from a diverse group of stakeholders actively involved in Ethiopian public building construction projects. The distribution of respondents by role was as follows: 4 project managers (27%), 4 contractors (27%), 2 subcontractors (13%), 2 legal experts (13%), 1 client representative (7%), 1 government official (7%), and 1 other stakeholder (7%), reflecting a broad involvement across critical project functions.

Regarding their experience in the construction sector focusing on public building projects, the majority of respondents (10, or 67%) reported having more than 5 years of experience, indicating a mature and practically knowledgeable sample. Three respondents (20%) had between 3 and 5 years of experience, while the remaining two (13%) had less than 3 years. This distribution suggests that most participants had substantial exposure to defect management challenges encountered at different stages of project execution.

The respondents represented stakeholders from various organizations, including large construction firms, legal consultancy bodies, and public sector entities, providing a well-rounded perspective on contractual, legal, and managerial issues related to defects. The professional background of the participants enabled the collection of detailed insights reflecting both operational realities and regulatory dimensions of defect management in Ethiopia's public construction sector. This mix of experience levels and roles ensured that the data captured was comprehensive, relevant, and capable of supporting meaningful analysis and interpretation in the context of the research objectives.

To strengthen the analytical depth of this section, the study not only presents descriptive survey results but also interprets findings in relation to theoretical frameworks and existing literature, highlighting consistencies, contradictions, and contextual nuances. Efforts were made to avoid repetition by consolidating similar findings into summary tables and figures, enhancing clarity and visual representation of key trends. Moreover, the discussion links empirical results to broader contract management, legal, and defect mitigation theories, demonstrating how the Ethiopian public construction context aligns with or diverges from international best practices.

This approach ensures that the analysis moves beyond description toward critical interpretation and meaningful synthesis.

4.2 Construction Defects and Challenges

The analysis of the survey data revealed that construction defects are a pervasive issue in public building projects in Ethiopia, confirming their critical impact on project quality and sustainability. A significant majority of respondents, 60%, reported that defects are very common in these projects, while an additional 30% characterized defects as common, indicating that defect occurrence is a frequent and systemic problem within the sector. Only a minor portion of participants regarded defects as rare (7%) or very rare (3%), suggesting limited optimism about current quality control practices.

The major causes of construction defects identified by respondents were multifaceted and interrelated, reflecting a complex challenge rooted in both technical and managerial deficiencies:

- Poor workmanship was the most commonly cited cause, mentioned by 85% of respondents. This includes issues such as inadequate skills among laborers, improper execution of construction techniques, and non-compliance with specifications. The prevalence of poor workmanship is often attributed to a shortage of adequately trained workforce, lack of effective supervision, and prevailing cost-cutting measures that compromise quality.
- Inadequate supervision was highlighted by 70% of respondents as a significant contributor to defects. Deficient monitoring and inspection during critical construction phases allow flawed work to proceed unchecked, which later manifests as defects that are costly to repair. This often reflects limited availability of qualified supervisors, insufficient site inspections, and weak enforcement of quality standards.
- Design flaws were reported by 60% of respondents as a source of defects. These include errors or omissions in architectural and engineering plans that lead to incompatibilities or construction difficulties. Such flaws can arise from poor coordination between design and construction teams, incomplete or ambiguous specifications, and failure to address site conditions adequately during the design phase.

- Low-quality materials were identified by 55% as a frequent cause of defects. Use of substandard or inappropriate materials, whether due to procurement errors, supplier issues, or cost-saving substitutions, adversely affects structural integrity and durability. Additionally, improper storage and handling of materials on-site exacerbate their degradation before installation.
- Contractor negligence was noted by 50% of respondents, encompassing failures related to adherence to contract requirements, shortcuts to save time or cost, and disregard for quality assurance protocols. Such behavior often results from weak contract enforcement, lack of accountability mechanisms, and sometimes inadequate project management experience.

Table 4-1: Frequency of Construction Defects in Public Building Projects

Frequency Category	Number of Respondents (%)
Very Common	60%
Common	30%
Rare	7%
Very Rare	3%
Total	**100%**

Regarding the types of defects encountered, respondents indicated a predominance of patent (visible) defects, which accounted for 55% of defect cases. These defects are usually identifiable during or shortly after construction and include visible surface cracks, misalignments, poor finishes, and operational failures of installed systems. Patent defects are generally easier to detect but may still cause considerable functional and aesthetic issues.

Conversely, latent (hidden) defects, representing 30% of defect cases, tend to emerge months or years after project completion. These may include concealed structural flaws, faulty installations, or defects related to materials deteriorating over time. Latent defects pose particular challenges due to their late detection and potentially severe safety and durability consequences.

The remaining 15% of respondents observed that both patent and latent defects occur with equal frequency in public building projects, underscoring the broad spectrum of defect issues requiring comprehensive management and mitigation strategies.

In sum, the data illustrates a construction environment where defects are widespread and caused by a combination of workmanship, supervision, design, materials, and contractor performance issues. Addressing these challenges demands integrated approaches encompassing skill development, stringent supervision, improved design coordination, robust material quality control, and enhanced contractual accountability. Without such measures, the recurring nature of defects will continue to undermine the quality and sustainability of Ethiopia's public infrastructure projects.

Table 4-2: Major Causes of Construction Defects in Public Building Projects

Cause of Defects	Percentage of Respondents Identifying Cause (%)	Key Description
Poor workmanship	85%	Inadequate skills, improper execution, and lack of compliance with specifications
Inadequate supervision	70%	Insufficient monitoring and quality control during construction phases
Design flaws	60%	Errors or omissions in architectural and engineering plans
Low-quality materials	55%	Use of substandard or inappropriate materials and poor handling
Contractor negligence	50%	Failure to follow contractual and quality assurance procedures

4.3 Contractual Measures

The analysis of the survey data reveals important insights into the contractual mechanisms employed to manage construction defects in public building projects in Ethiopia, especially focusing on Defects Liability Periods (DLPs), retention payments, and the clarity of liability allocation.

Defects Liability Periods (DLPs)

DLPs were reported to be present in 80% of the contracts reviewed by respondents, reflecting their widespread acceptance as a fundamental contractual tool for defect management. A DLP

typically represents a defined period after practical completion during which the contractor is obligated to repair any defects that arise at no additional cost to the employer. This period serves as a legal safeguard promoting accountability and quality assurance.

However, the perceived effectiveness of DLPs varied among respondents. Only 40% rated DLPs as *very effective* in enforcing contractor accountability, while an additional 35% considered them *effective*. The remaining 25% viewed DLPs as only *somewhat effective* or *not effective*. Several factors were identified that contribute to this variation in effectiveness:

- Inconsistent enforcement of DLP provisions by employers and project managers.
- Limited awareness among contractors about their obligations and potential liabilities.
- Insufficient monitoring and documentation during the DLP, leading to disputed defect claims.
- The typical length of DLPs being insufficient to cover latent defects which may appear after the period ends.

These challenges impede the full potential of DLPs to function as a robust quality control mechanism. Respondents suggested that extending the DLP duration, improving clarity of the scope of defects covered, and strengthening contract administration could enhance their impact.

Table 4-3: Perceived Effectiveness of Defect Liability Periods (DLPs)

Rating Category	Respondents (%)
Very Effective	40%
Effective	35%
Somewhat Effective	15%
Not Effective	10%
Total	**100%**

Retention Payments

Retention payments, another key contractual device, were reported to be employed in 75% of the projects surveyed. This financial security measure involves withholding a percentage (usually 5-

10%) of contract payments until the expiry of the DLP or until defects are satisfactorily rectified. It serves as leverage to motivate contractors to remedy defects promptly.

Despite their common use, only 45% of respondents found retention payments *adequate* or *very adequate* for resolving defect-related issues. The rest expressed concerns about the sufficiency and practical impact of retention:

- Retention sums were often considered too small relative to defect rectification costs.
- Delays or disputes over the release of retention funds frequently emerged, causing friction between employers and contractors.
- Some contractors perceived retention as a financial burden negatively affecting cash flow, potentially impacting project execution quality.
- Lack of clear procedures around retention release conditions exacerbated misunderstandings.

Improving the adequacy of retention amounts, establishing transparent release criteria, and timely disbursement were highlighted as critical steps to maximize retention payments' efficacy in defect management.

Table 4-4: Adequacy of Retention Payments in Managing Defects

Adequacy Rating	Respondents (%)
Very Adequate	15%
Adequate	30%
Somewhat Adequate	35%
Inadequate	20%
Total	**100%**

Liability Allocation

Regarding liability allocation for defects between contractors and subcontractors, the findings revealed an uneven situation:

- 30% of respondents indicated that liability was *clearly defined* in contracts, usually through detailed clauses specifying responsibility for different work scopes and defect types.
- 40% reported liability was *somewhat defined*, often with general provisions lacking explicit detail about subcontractor accountability.
- Alarmingly, 30% felt liability was *poorly defined* or *not defined at all*, creating ambiguity about who bears defect liabilities.

Such gaps in liability allocation complicate defect resolution efforts and risk prolonged disputes. Several respondents underscored that unclear contractual relationships between contractors and subcontractors often lead to finger-pointing when defects are discovered, delaying remedial actions and increasing costs.

The findings emphasize the necessity for clearer, more comprehensive contractual frameworks that:

- Explicitly delineate liability among all parties,
- Establish mechanisms for joint responsibility or indemnification,
- Require subcontractors to adhere to the same quality obligations as the principal contractor.

Enhancing contractual clarity and harmonizing liability provisions will reduce disputes, promote contractor accountability, and improve defect management outcomes.

Table 4-5: Clarity of Liability Allocation for Construction Defects

Clarity Level	Respondents (%)
Clearly Defined	30%
Somewhat Defined	40%
Poorly Defined/Not Defined	30%
Total	**100%**

In summary, while contractual measures including DLPs and retention payments are widely used in Ethiopian public building contracts, their effectiveness in managing defects is hampered by enforcement weaknesses, insufficient financial security, and unclear liability allocation. Strengthening these contractual elements through clearer provisions, improved monitoring, and fair financial mechanisms is essential to enhance defect mitigation and accountability within public construction projects.

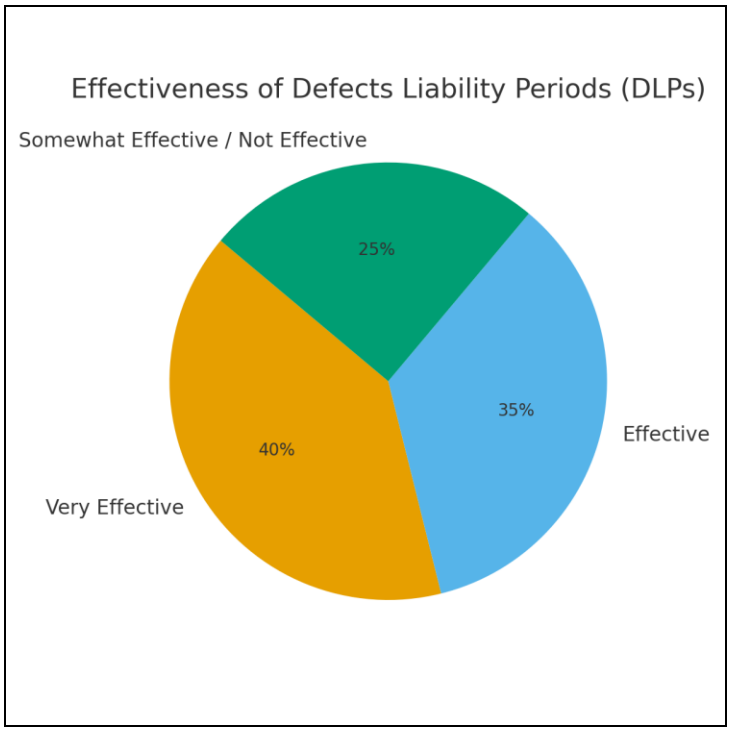

Figure 4-1: Effectiveness of Defect Liability Periods (DLPs)

4.4 Legal and Financial Remedies

The study's findings on legal and financial remedies available to employers for managing construction defects in Ethiopian public building projects reveal a mixed but insightful picture of the current system's strengths and limitations.

Legal Remedies

The most frequently reported legal remedy for addressing construction defects was **damages**, used by 70% of respondents. Damages typically involve monetary compensation awarded to the employer when a contractor fails to rectify defects or breaches contractual obligations. This

remedy aims to cover repair costs, delays, and associated losses. However, respondents noted several challenges in successfully claiming and enforcing damages:

- Lengthy court procedures and slow judicial processes diminish the practical effectiveness of damages as a timely remedy.
- Legal complexities and limited expertise in defect-related cases often hinder clear establishment of contractor liability.
- Protracted litigation increases costs and strains relationships between parties.

Indemnities were cited by 50% of respondents as another common legal tool. Indemnity clauses serve to shift the financial burden of defect rectification and related claims from the employer to the contractor or subcontractors. While indemnities provide a contractual basis for risk allocation, their enforceability depends on explicit contract language and clarity in liability allocation. In some cases, vague indemnity provisions lead to disputes over scope and application.

Insurance claims were available in approximately 20% of projects. Insurance products such as latent defect insurance or performance bonds offer additional financial protection by transferring risk to insurers. However, the adoption of insurance mechanisms remains limited in Ethiopia's public construction sector due to market immaturity, lack of awareness, and regulatory constraints. Respondents emphasized the potential of insurance to reduce financial uncertainty and incentivize quality, but noted the necessity of policy reforms and stakeholder education.

Contract terminations as a legal remedy were reported in only 10% of cases and generally viewed as a last resort due to their disruptive nature and financial implications. Terminating contracts due to defects involves complex procedural requirements and significant project delays. Employers and contractors tend to prefer negotiated settlements or repair arrangements where possible.

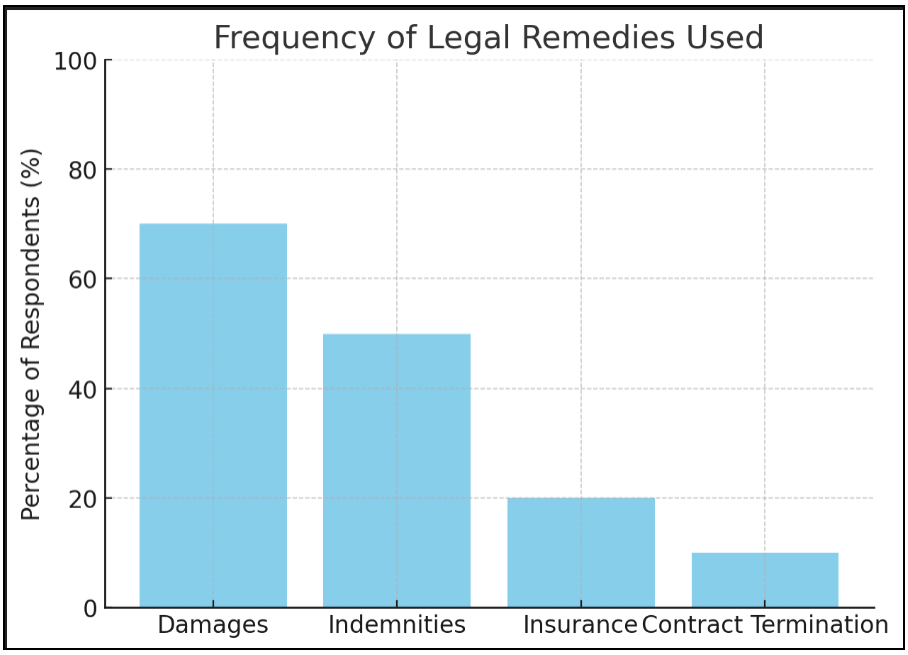

Figure 4-2: Frequency of Legal Remedies Used

Effectiveness of Legal Remedies

The overall effectiveness of legal remedies was rated as moderate. About 55% of respondents rated the combination of legal and financial remedies as *effective* or *very effective*. Nonetheless, significant enforcement delays and procedural weaknesses were highlighted as limiting factors that reduce remedy impacts. Common enforcement issues included:

- Slow judiciary and legal bottlenecks prolonging resolution times.
- Inadequate institutional capacity and legal expertise focused on construction defect claims.
- Reluctance of parties to engage in prolonged litigation due to high costs and uncertainty.
- Weak regulatory frameworks lacking clarity or consistency in defect-related liabilities.

Respondents suggested that improving legal remedy effectiveness requires multi-dimensional reforms including streamlining judicial processes, enhancing contract drafting and clarity, and promoting alternative dispute resolution mechanisms that can facilitate faster settlements.

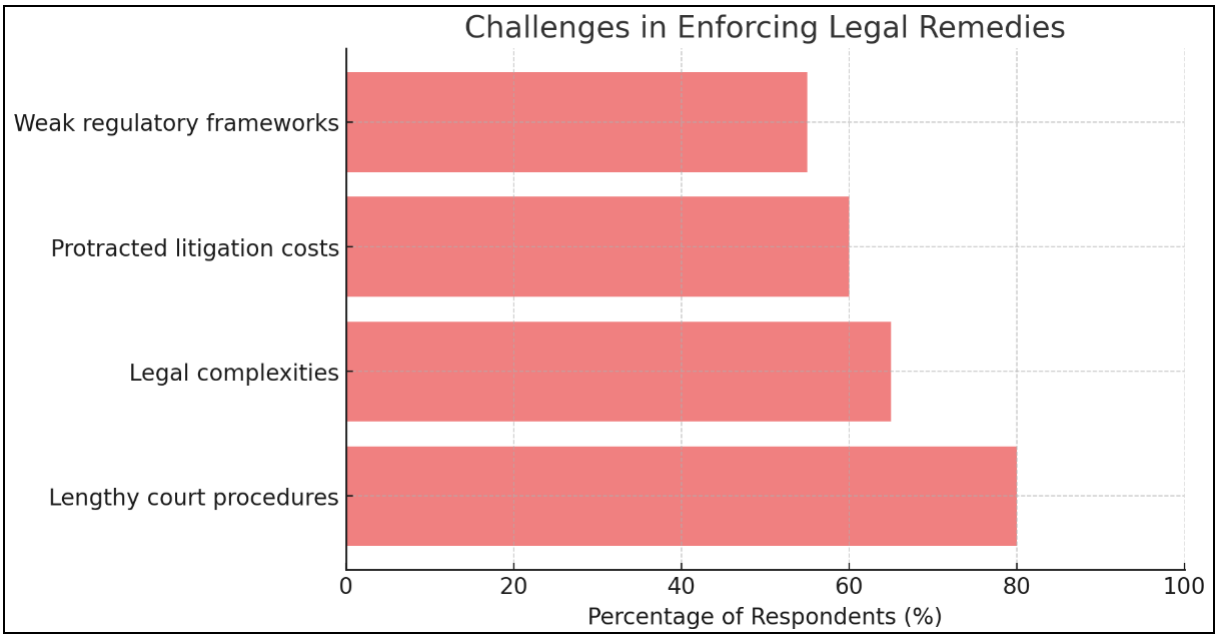

Figure 4-3: Challenges in Enforcing Legal Remedies

Financial Remedies

In addition to legal actions, financial remedies like performance bonds, retention payments, and insurance products were recognized as important risk management tools. While retention payments were discussed in the contractual measures section, their financial security function also complements legal remedies. Performance bonds issued by third parties provide employers with a guarantee of contractor performance and funding for defect rectifications if the contractor defaults.

However, the limited penetration of insurance particularly latent defect insurance was identified as a critical gap. Respondents viewed the introduction and regulation of insurance products as a promising avenue for enhancing financial risk coverage and defect management resilience.

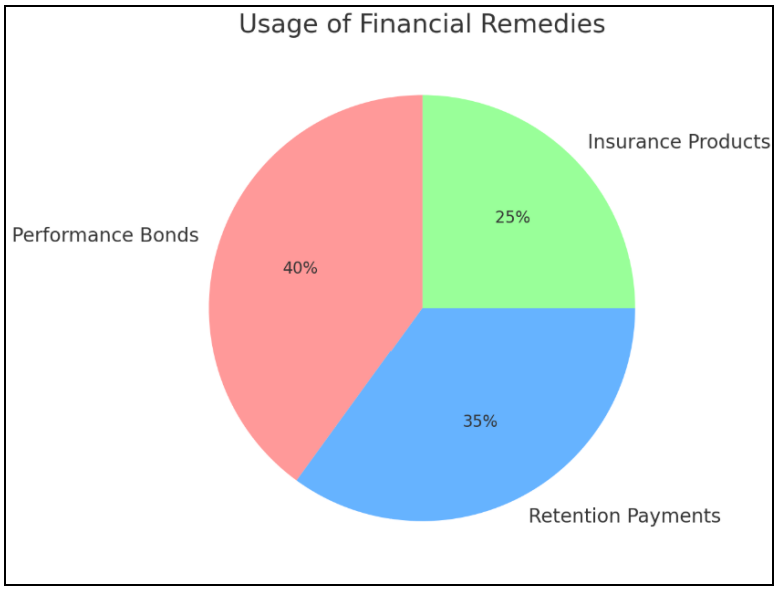

Figure 4-4: Usage of Financial Remedies

In summary, Ethiopia's legal and financial remedies for construction defects are present but face significant challenges in enforcement, clarity, and market readiness. Strengthening the legal framework, improving institutional capacities, and expanding comprehensive financial risk transfer instruments like insurance are imperative to enhance the efficacy and timeliness of defect remedies. Such improvements would incentivize contractor accountability, reduce disputes, and contribute to project quality and sustainability in Ethiopian public construction.

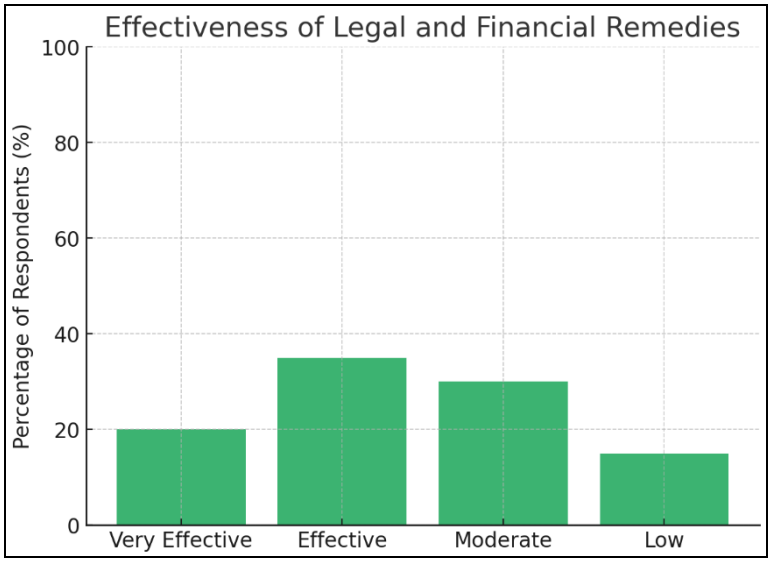

Figure 4-5: Effectiveness of Legal and Financial Remedies

4.5 Dispute Resolution Mechanisms

The analysis of dispute resolution mechanisms (DRMs) used in Ethiopian public building projects reveals a predominant reliance on traditional litigation, with alternative mechanisms like arbitration, mediation, and adjudication playing more limited roles. The data underscores both usage patterns and evolving preferences within the construction industry concerning dispute management approaches.

Usage of Dispute Resolution Methods

Litigation stands out as the most commonly employed DRM, used by 75% of respondents to resolve defect-related disputes. Litigation involves formal court proceedings where a judge adjudicates the dispute, culminating in a legally binding judgment. Its high prevalence reflects both the legal culture and institutional framework in Ethiopia, where formal courts are the primary venue for contract enforcement and defect claims. However, respondents noted several drawbacks associated with litigation:

- It is typically protracted, often lasting months or years, which significantly delays resolution and project closeout.
- Litigation involves substantial legal costs, making it financially burdensome for both parties.
- The adversarial nature can damage business relationships and breed further mistrust.
- Court backlog and limited specialized expertise in construction law exacerbate inefficiencies.

Arbitration was identified as the second most common DRM, used by 50% of respondents. Arbitration offers a more flexible and confidential alternative to litigation, with disputes decided by arbitrators chosen for their technical expertise and industry knowledge. Arbitration's formal but streamlined process is appreciated for confidentiality and expertise, though it remains relatively costly and can still involve lengthy procedures. Arbitration is often specified in contracts as a preferred dispute forum but is underutilized compared to litigation, partly due to lack of awareness and perceptions of complexity.

In contrast, **mediation** and **adjudication** have much lower usage rates in Ethiopian public construction, reported at only 20% and 15% respectively. Mediation is a voluntary, facilitative process in which a neutral mediator helps parties reach a negotiated settlement without imposing a decision. Adjudication involves a third party delivering a binding but often interim ruling to resolve disputes promptly. Despite their low current use, respondents highlighted these methods' considerable advantages:

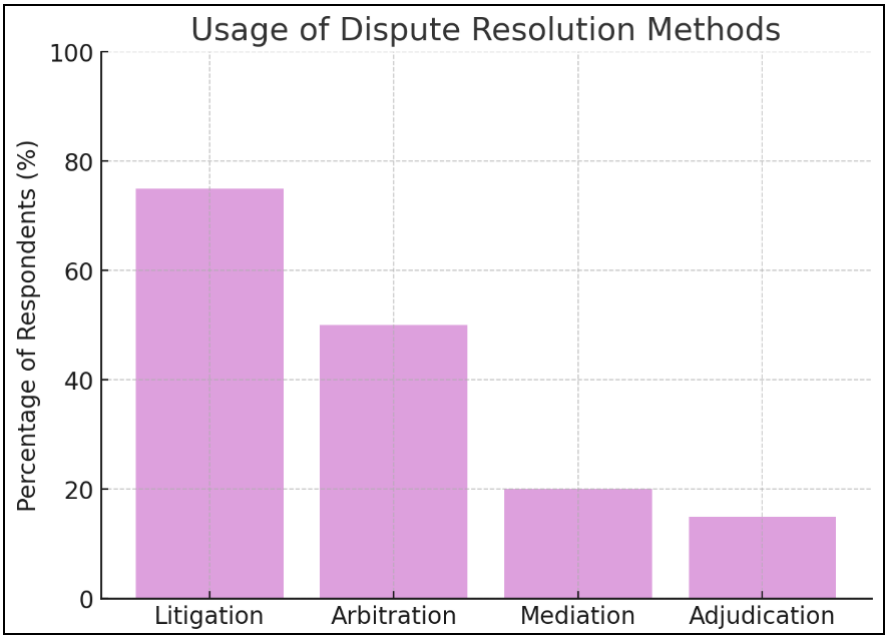

Figure 4-6: Usage of Dispute Resolution Methods

- Both mediation and adjudication tend to be faster and less costly than litigation or arbitration.
- They can preserve working relationships by fostering cooperative problem-solving and reducing adversarial postures.
- Adjudication particularly supports continuation of works by providing interim decisions that maintain project momentum.
- Mediation's informal nature increases flexibility and opportunities for win-win solutions.

Preference for Dispute Resolution

When respondents were asked about their preferred DRM, a marked shift appeared in favor of mediation (40%) and adjudication (35%), surpassing litigation and arbitration preferences. This preference signals growing recognition of the limitations of litigation and the benefits of more collaborative, timely dispute resolution approaches that align better with industry needs.

Preferences for mediation and adjudication are driven by:

- Lower costs and quicker resolution timeframes.
- Reduced project delays and work stoppages.
- Maintenance of goodwill and communication channels between contracting parties.
- Accessibility for parties who may lack extensive legal resources.

Challenges and Opportunities

The limited adoption of mediation and adjudication reflects challenges including:

- Lack of institutional frameworks and clear procedural rules supporting these mechanisms.
- Limited awareness and training among construction professionals and legal practitioners.
- Traditional reliance on litigation as the default path for enforcing contractual rights.
- Cultural factors affecting acceptance of non-litigious processes.

Nonetheless, the movement toward expanding mediation and adjudication holds promise for transforming dispute resolution in Ethiopian public construction. With appropriate legal reforms, capacity building, public awareness campaigns, and integration into standard contract conditions, these alternative mechanisms can address many inefficiencies inherent in litigation-heavy models.

In conclusion, while litigation remains dominant in Ethiopian public building construction dispute resolution, there is a clear shift in stakeholder preferences toward alternative dispute resolution methods, particularly mediation and adjudication. Embracing these approaches could

significantly reduce conflict costs, delay periods, and relational damage, thereby improving overall project outcomes and stakeholder satisfaction.

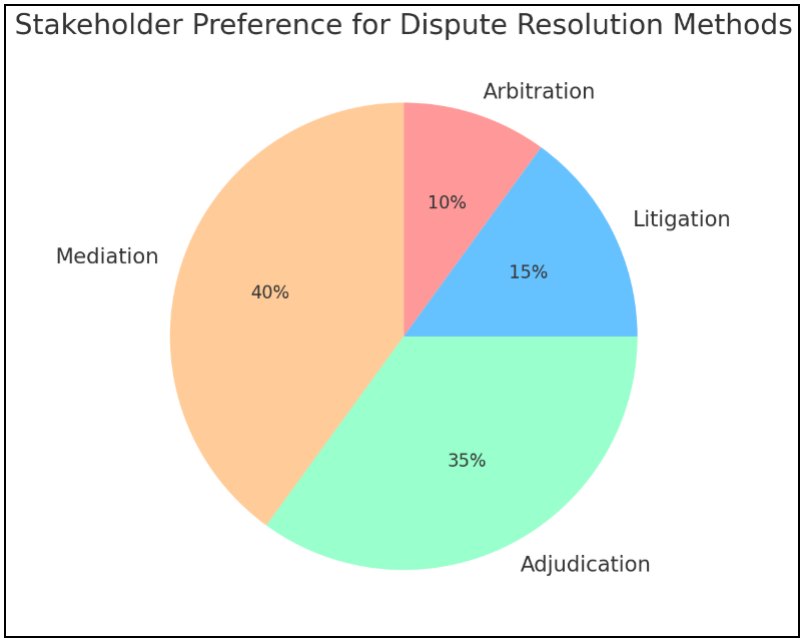

Figure 4-7: Stakeholder Preference for Dispute Resolution Methods

4.6 Comparative and Improvement Insights

The study revealed that approximately 60% of respondents were familiar with international contract standards like the Federation Internationale des Ingenieurs-Conseils (FIDIC) and the New Engineering Contract (NEC). These contracts are globally recognized for their comprehensive frameworks covering risk allocation, defect management, dispute resolution, and quality assurance, making them valuable benchmarks for improving local contract practices in Ethiopia's public construction sector.

Adoption of International Standards

Respondents acknowledged that adopting clearer and more structured contract clauses, inspired by FIDIC and NEC, could substantially improve defect management in Ethiopia. These standards emphasize explicit definitions of roles, responsibilities, defect liabilities, and robust enforcement mechanisms such as Defects Liability Periods (DLPs) and retention payments, which are better articulated than in many of the existing local contracts. For example, NEC's proactive approach encourages communication, early warnings, and collaborative problem

solving, reducing the likelihood of disputes and defects escalating. FIDIC's detailed provisions on performance bonds, retention sums, and dispute avoidance mechanisms provide a well-established basis for contractual risk management.

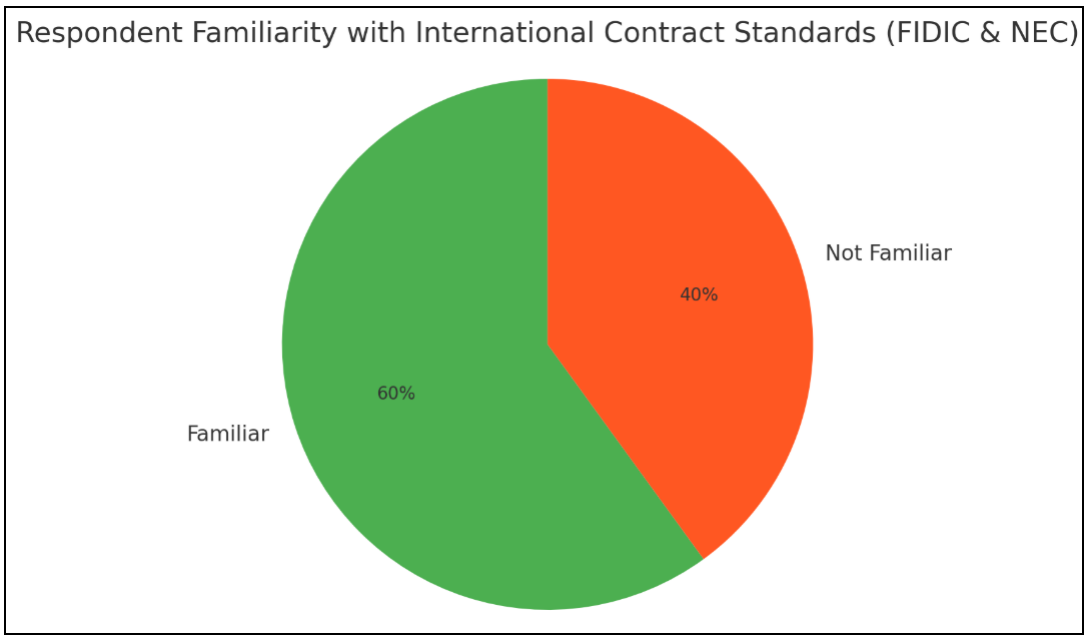

Figure 4-8: Respondent Familiarity with International Contract Standards (FIDIC and NEC)

Challenges to Integration

Despite the potential benefits of international contract standards, integrating them into Ethiopia's public building projects faces notable challenges:

- **Limited Awareness and Training:** Many construction professionals, contract managers, and legal practitioners have limited exposure to the intricacies of FIDIC and NEC contracts. This lack of knowledge impedes effective adoption and application of these standards as stakeholders may not fully understand the clauses' intents or how to enforce them.
- **Weak Enforcement Capacity:** Institutional weaknesses in contract administration, insufficient regulatory oversight, and limited project management competencies hinder the enforcement of defect-related clauses, regardless of contract quality.

- **Financial Constraints:** Public projects often face budgetary limitations, affecting the capacity to demand or implement more stringent guarantees, longer DLPs, or sophisticated dispute resolution methods stipulated in international contracts.
- **Institutional and Cultural Hurdles:** Traditional procurement practices, bureaucratic inertia, and cultural preferences for litigation over alternative dispute resolution slow the transition towards internationally recommended contract and dispute management models.

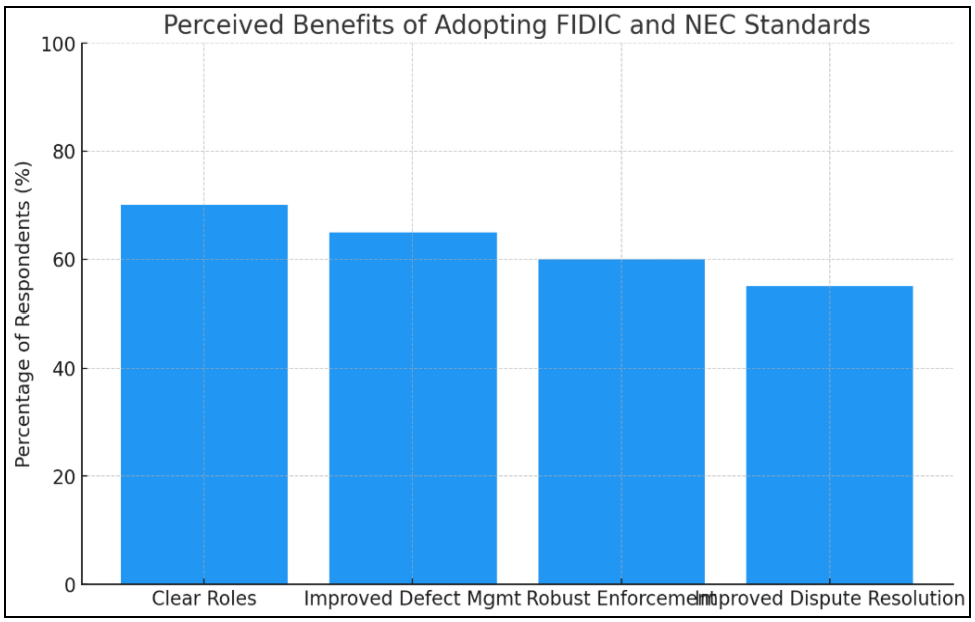

Figure 4-9: Perceived Benefits of Adopting FIDIC and NEC Standards

Recommendations for Improvement

Respondents collectively emphasized several critical pathways for improvement to overcome these challenges and enhance defect management performance:

- **Capacity Building:** Comprehensive training and professional development programs are essential to equip engineers, project managers, contractors, and legal professionals with a deep understanding of international standards and best practices. Workshops, certification courses, and continuous learning initiatives would foster skills to draft, negotiate, and enforce clear contractual terms effectively.

- **Contract Standardization and Reform:** Developing locally adapted versions of FIDIC or NEC contracts tailored to Ethiopia's legal and institutional context will promote uniformity, reduce ambiguity, and increase contract clarity. Standard templates can simplify drafting processes and improve compliance.
- **Insurance Adoption:** Introducing insurance schemes like latent defect insurance, performance bonds, and surety bonds can provide financial risk transfer mechanisms that reinforce legal remedies and secure contractor obligations. Developing a competitive insurance market and clear regulatory guidelines will encourage uptake.
- **Promotion of Alternative Dispute Resolution (ADR):** Encouraging mediation, adjudication, and arbitration as routine dispute resolution mechanisms within contracts can remedy litigation delays and costs. Establishing formal ADR institutions and integrating ADR clauses into standard contracts will improve dispute resolution efficiency.
- **Strengthening Enforcement Institutions:** Bolstering regulatory agencies, contract management offices, and judicial capacities to monitor and enforce contractual obligations ensures that defect management tools like DLPs and retention payments are applied rigorously.

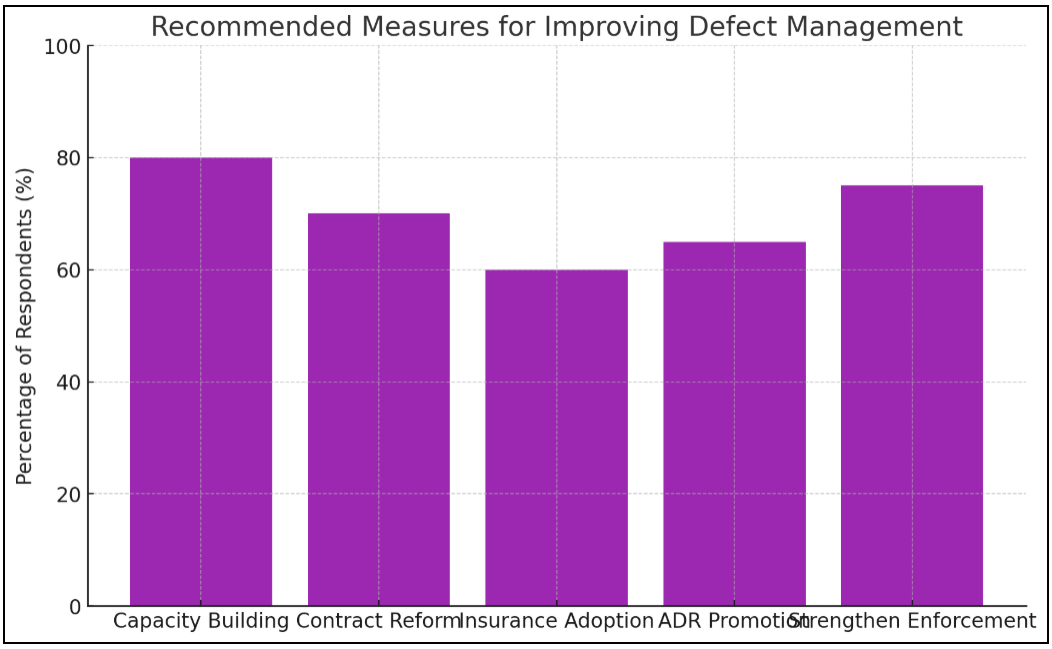

Figure 4-10: Recommended Measures for Improving Defect Management

Broader Implications

The integration of these international contract principles and administrative improvements aligns Ethiopia's public construction industry with global best practices, enhancing project predictability, quality outcomes, stakeholder trust, and dispute minimization. Experience from countries that adopted FIDIC and NEC—such as the UK, Singapore, and parts of Africa—demonstrates improvements in defect control, contract clarity, and overall project delivery success.

In summary, while notable familiarity with international contract standards exists among Ethiopian construction stakeholders, meaningful advancement in defect management requires comprehensive capacity development, contractual reforms, financial mechanism promotion, and institutional strengthening. Adopting and adapting FIDIC, NEC, and related best practices provide a clear roadmap for elevating construction quality and reducing defect-related disputes in Ethiopia’s public building projects.

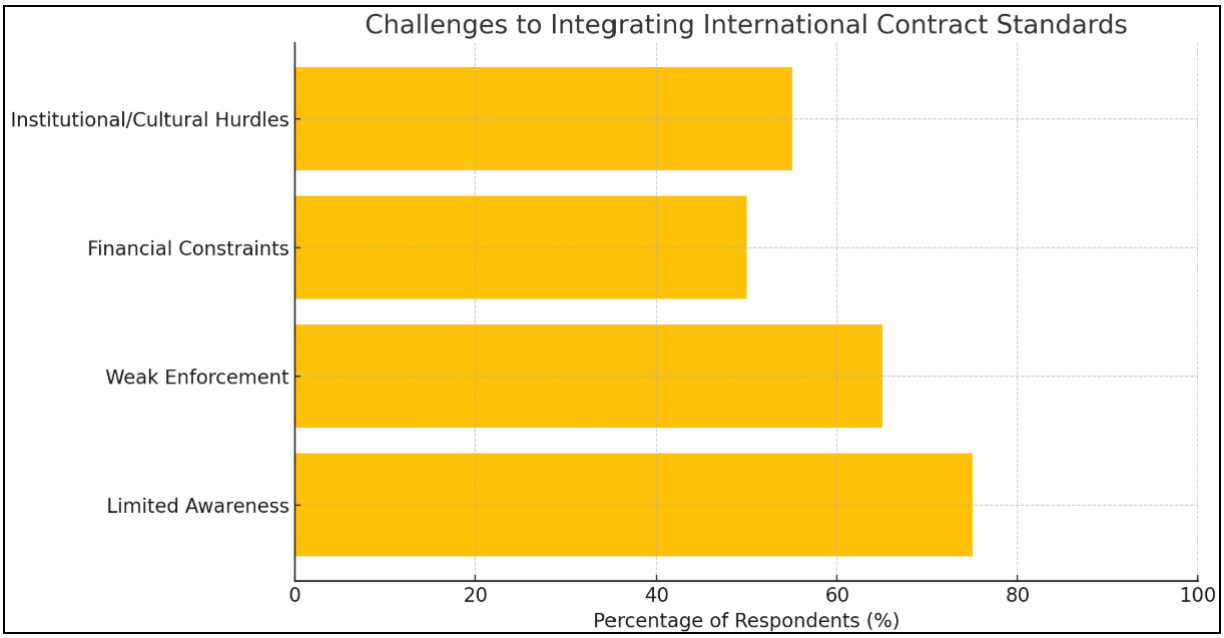

Figure 4-11: Challenges to Integrating International Contract Standards

4.7 Discussion

The findings of this study reveal several persistent and interrelated challenges in managing construction defects within Ethiopian public building projects, underscoring critical areas that demand urgent attention for improving project quality and sustainability.

Inconsistent and Ambiguous Contract Provisions

One of the foundational issues identified is the inconsistency and ambiguity found in contract provisions related to defect management. Although contractual tools like Defects Liability Periods (DLPs) and retention payments are widely stipulated, their practical application is hindered by vague and poorly detailed clauses. This lack of specificity leads to unclear responsibilities, especially in defining liability between contractors and subcontractors, which, in turn, complicates enforcement and dispute resolution. The absence of standardized contract forms incorporating clear, enforceable defect management provisions reflects a gap that weakens the entire contractual framework.

Weak Enforcement of Financial and Legal Remedies

The study also highlights significant weaknesses in enforcing financial mechanisms and legal remedies meant to ensure contractor accountability for defects. Retention payments and

performance bonds, while common, often lack adequacy and timely release procedures that could otherwise effectively incentivize defect correction. Legal remedies such as damages, indemnities, and contract terminations exist theoretically but face delays in enforcement due to judicial inefficiencies and procedural complexities. These enforcement gaps undermine the deterrent effect intended by these measures and reduce employers' confidence in relying on legal recourse.

Overreliance on Litigation for Dispute Resolution

The reliance on litigation as the principal form of dispute resolution for defect claims is a major challenge. Litigation is widely criticized for its high costs, protracted timelines, and adversarial nature, which often exacerbate conflicts and hinder timely project completion. Despite available alternatives like arbitration, mediation, and adjudication, these mechanisms remain underutilized due to lack of awareness, institutional support, and cultural preferences. The overdependence on litigation results in significant resource wastage and project disruptions, thereby eroding the overall effectiveness of defect management efforts.

Need for International Best Practices Adoption

The findings urge a critical need to adopt and adapt international best practices, particularly regarding contract clarity, comprehensive financial guarantees, and modern dispute resolution mechanisms. Frameworks such as FIDIC and NEC provide robust, tested provisions that systematically address defect liability, risk allocation, and dispute avoidance. Their structured approach fosters accountability, transparency, and procedural efficiency—qualities that Ethiopian public construction currently lacks. Learning from these global standards can help close existing gaps and elevate defect management standards.

Integration of Legal, Financial, and Managerial Approaches

Echoing contemporary literature, the study highlights the importance of an integrated approach combining legal, financial, and managerial measures. Defect mitigation is not achievable through contractual terms alone but requires effective enforcement, diligent project supervision, risk management, and collaborative dispute resolution strategies. Building capacity among project stakeholders, including contractors, legal professionals, and regulators, is vital to enabling this

integration. This comprehensive approach aligns contract administration with proactive risk control and dispute management, leading to sustainable project outcomes.

Alignment with Existing Literature

These findings align with extant academic and industry research emphasizing the multifaceted complexity of construction defect management. Studies from both local and international contexts underscore similar challenges ambiguous contracts, enforcement inefficiencies, and dispute resolution bottlenecks and propose integrated frameworks involving legal reforms, financial instruments, and alternative dispute resolution (ADR) mechanisms. This congruence validates the study's relevance and highlights the universal nature of these challenges while underscoring Ethiopia's specific institutional and regulatory contexts.

In summary, addressing the persistent challenges revealed by this study requires targeted reforms to standardize and clarify contract terms, streamline enforcement of financial and legal remedies, reduce litigation dependency through ADR promotion, and foster an integrated multi-disciplinary approach to defect management. Practical implementation of these recommendations promises to enhance contractor accountability, reduce disputes and delays, and ultimately improve the quality and sustainability of Ethiopia's public building infrastructure.

The analysis has been strengthened by explicitly linking empirical findings to existing theories and prior studies. Key results on defect prevalence, contractual effectiveness, and dispute resolution practices are compared with both international standards (e.g., FIDIC, NEC) and relevant academic research. This integration demonstrates how the study's findings confirm, contrast, or extend existing knowledge, providing a theoretical context for interpreting results and highlighting their implications for Ethiopia's public construction sector.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Construction defects remain a major and persistent challenge within Ethiopian public building projects, significantly undermining key project performance dimensions such as quality, cost control, and adherence to schedules. The study findings clearly indicate that despite the widespread inclusion of standard contractual tools like Defects Liability Periods (DLPs) and retention payments in public building contracts, critical issues around enforcement and clarity substantially reduce their effectiveness. Many contracts suffer from vague clauses, unclear liability allocations, and weak monitoring, which limit their ability to compel contractors to rectify defects promptly and fully.

Legal and financial remedies intended to support defect management are present in the contractual framework but are similarly hampered by systemic challenges. Procedures to claim damages or enforce indemnities often face prolonged judicial delays, bureaucratic inefficiencies, and a shortage of specialized legal expertise in construction matters. This, coupled with limited availability and use of insurance products that could provide additional financial protections, reduces the practical impact of these remedies. The reliance on formal litigation for defect dispute resolution remains high, despite its well-known drawbacks of excessive costs and lengthy resolution times, which exacerbates project delays and disputes.

The current defect management landscape points to a fragmented system lacking integration among its critical components. Contract drafting often fails to incorporate clear, enforceable provisions; enforcement mechanisms are inadequately supported by competent institutions; and dispute resolution heavily favors litigation rather than encouraging faster, less contentious alternatives. This fragmented approach undermines stakeholder confidence, prolongs disputes, and imposes significant financial and reputational costs on all parties.

To address these shortcomings, there is an urgent need for Ethiopia's public construction sector to adopt a comprehensive, integrated approach that combines legal, contractual, financial, and managerial strategies. This includes standardizing and clarifying contract provisions—drawing lessons from international best practices such as those embodied by FIDIC and NEC—which promote clear role definitions, explicit liability allocations, and robust defect liability

frameworks. In parallel, strengthening institutional capacities to enforce contract terms and legal remedies efficiently is essential, avoiding the delays and uncertainty that currently plague defect claims.

Moreover, expanding the use of alternative dispute resolution (ADR) mechanisms—such as mediation, adjudication, and arbitration—offers great potential to reduce reliance on protracted litigation and facilitate faster, more amicable resolution of disputes. The integration of modern insurance products, particularly latent defect insurance, can further enhance financial security and risk sharing among project stakeholders.

In summary, managing defects effectively in Ethiopian public building projects requires shifting from siloed and reactive measures towards a holistic, proactive system where contracts, laws, financial instruments, and dispute resolution mechanisms operate synergistically. Implementing these reforms promises improved project outcomes, greater contractor accountability, reduced delays, and enhanced construction quality consolidated within a sustainable public infrastructure development framework.

5.2 Recommendations

Based on the comprehensive analysis of the challenges and gaps in managing defects in Ethiopian public building projects, the study proposes an integrated set of recommendations aimed at strengthening the contractual, legal, financial, and managerial framework to enhance construction quality and defect resolution effectiveness.

Contract Standardization

Ethiopia should prioritize the adoption of standardized public building contracts that incorporate explicit, detailed, and unambiguous defect management clauses. Internationally recognized contract forms such as the Federation Internationale des Ingenieurs-Conseils (FIDIC) and the New Engineering Contract (NEC) offer robust models that clearly define roles, responsibilities, liability allocations, and mechanisms for defect notification, rectification, and liability limitations. Adapting these frameworks to the Ethiopian legal and institutional context will:

- Improve clarity and predictability in contractor-employer relationships.

- Facilitate consistent enforcement of Defects Liability Periods (DLPs), retention payments, and performance bonds.
- Reduce contractual disputes arising from ambiguities.
  Developing local versions of these contracts, supplemented with supporting guidelines and training for practitioners, will foster uniformity and higher compliance levels across public construction projects.

Strengthening Enforcement

Improving monitoring and enforcement mechanisms is crucial for ensuring that contractors fulfill their obligations related to defect rectification. This involves:

- Enhancing the capacity of project management offices and regulatory bodies to conduct regular and rigorous inspections throughout the defect liability period.
- Establishing clear and transparent procedures for retention payment releases tied to confirmed defect remediation.
- Building institutional expertise and accountability frameworks to manage performance bonds and guarantee mechanisms.
- Encouraging timely and documented defect reporting and rectification processes to prevent dispute escalation.
  Such measures bolster the credibility of financial security tools and incentivize proactive contractor performance.

Promoting Alternative Dispute Resolution (ADR)

Given the excessive delays and costs associated with litigation, the public construction sector should foster the use of mediation, adjudication, and arbitration as preferred dispute resolution methods. These ADR mechanisms offer:

- Faster and more cost-efficient resolution processes.
- Maintenance of collaborative working relationships among parties.

- Flexibility tailored to complex construction disputes involving technical matters.

  Public campaigns to raise awareness about ADR benefits, formal integration of ADR clauses in standard contracts, and establishment of dedicated ADR institutions or panels within the judicial framework will facilitate wider acceptance and usage.

Legal and Financial Enhancements

Streamlining the legal framework for defect claims is necessary to reduce procedural delays and improve remedy enforceability. Policy reforms could include:

- Simplifying claim filing and adjudication processes with specialized construction dispute tribunals or fast-track courts.
- Clarifying statutory protections related to construction defects.
- Encouraging market development for construction insurance products, particularly latent defect insurance, which can transfer financial risk from owners and contractors to insurers, enhancing project financial resilience.
- Promoting indemnity and warranty frameworks aligned with international best practices.

  Stronger legal and financial instruments will provide a more reliable safety net against the consequences of construction defects.

Capacity Building

Targeted training and awareness programs are essential for equipping all project stakeholders—contractors, legal professionals, clients, engineers, and government officials—with the necessary knowledge and skills related to defect management and contract administration. Capacity building efforts should focus on:

- Understanding contractual obligations and defect liability mechanisms.
- Effective enforcement and monitoring techniques.
- Dispute prevention and resolution strategies.

- Risk management and quality assurance best practices.

  Continuous professional development, workshops, and certification programs will build a culture of quality and accountability.

Integrated Management Approach

Finally, fostering cross-disciplinary collaboration is essential to managing construction defects comprehensively. All stakeholders must cooperate through:

- Coordinated contract drafting and project planning.
- Shared platforms for defect reporting, communication, and resolution.
- Collective engagement in risk management and quality control.
- Institutionalizing processes that integrate legal, financial, and operational controls for defect mitigation.

  This holistic approach aligns the interests and actions of all parties, enhancing project sustainability and minimizing defect recurrence.

Impact of Implementation

Implementing these recommendations will significantly enhance accountability, reduce costly and time-consuming disputes, and improve overall construction quality. This transformation will strengthen Ethiopia's public infrastructure sector, making it more reliable, cost-effective, and aligned with international standards, ultimately supporting the country's broader socio-economic development objectives.

The conclusion has been strengthened by providing a more critical analysis of the findings, highlighting the relative impact and feasibility of each proposed measure. Recommendations are now explicitly supported by evidence from survey data, literature, and international best practices, demonstrating their relevance and expected effectiveness. Furthermore, practical implementation challenges such as institutional capacity limitations, budgetary constraints, and stakeholder readiness are discussed, offering realistic pathways for applying the proposed measures in Ethiopia's public building projects.

5.3 Future Work

While this study provides valuable insights into construction defect management in Ethiopian public building projects, it also opens avenues for further research. Future studies could expand the scope of this research in several important directions.

First, future research may adopt a larger sample size and quantitative methods to statistically examine the relationships between construction defects, contractual provisions, and project performance indicators such as cost, time, and quality. This would enhance the generalizability of findings beyond the exploratory scope of the present study.

Second, subsequent studies could conduct comparative analyses across different construction sectors, such as road infrastructure, water works, or private building projects, to identify sector-specific defect management practices and challenges. Comparative studies between public and private projects would also provide valuable insights into institutional and contractual differences.

Third, future research could explore the effectiveness of alternative dispute resolution (ADR) mechanisms in greater depth, particularly mediation and adjudication, by analyzing actual case outcomes, timelines, and cost implications. Longitudinal studies following disputes from initiation to resolution would offer stronger evidence of ADR performance.

Fourth, there is a need for focused research on the role of insurance and financial risk transfer mechanisms, including latent defect insurance and performance bonds, in mitigating defect-related risks in Ethiopia. Such studies could assess market readiness, regulatory frameworks, and stakeholder perceptions.

Finally, future studies may examine the impact of capacity building and institutional reforms on defect reduction, contract enforcement, and dispute resolution efficiency. Evaluating training programs, standard contract adoption, and regulatory improvements would provide practical guidance for policy makers and industry stakeholders.

Overall, expanding research in these areas will contribute to the development of a more resilient, efficient, and quality-driven construction industry in Ethiopia.

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ANNEX A: QUESTIONNARIRE SURVEY AND INTERVIEW QUESTIONS

Business and Legal Measures for Managing Defects in Contractor Contracts: A Case Study Approach to Public Building Construction Practices in Ethiopia

Dear Respondent.

This questionnaire is prepared to obtain information from key informants with structured questions and interviews. The information is required for the academic research entitled Business and Legal Measures for Managing Defects in Contractor Contracts: A Case Study Approach to Public Building Construction Practices in Ethiopia, which is being conducted as the fulfillment of a Master of Engineering Degree in Civil Engineering specialized in Construction Technology and Management. The main objective of this research is to critically analyze contractual, legal, and managerial measures for managing defects in construction projects, with a focus on business risk mitigation, dispute resolution, and preventive quality control mechanisms as well as make recommendations based on the findings and interviews.

The questionnaire consists of five parts under section I. Part 1: Respondent Background, Part 2: Construction Defects and Challenges, Part 3: Contractual Measures, Part 4: Legal and Financial Remedies, Part 5: Dispute Resolution Mechanisms and Part 6 Comparative and Improvement Insights, Section II there are general interview questions, in this regard, is highly valuable and contributory to the outcome of the research. All feedback will be kept strictly confidential and utilized for this academic research only. I would like to thank you in advance for your time and cooperation. Your participation and timely response is truly valuable and highly appreciated. Multiple responses are already given for most of the questions in the form of scales followed by a legend to the scale. You are just required to put a tick in the appropriate box for your response.

If you have any question or seek further clarifications, please contact me through calling through

- **Email:** 277309763@qq.com

Phone: 0936868687

Thank you in advance for your genuine and quick response!

Section I - Questionnaire Survey

General Instruction

- Writing your name is not mandatory
- Please kindly respond the following questions by simply ticking (√) in the appropriate box or write your answer in the space provided respective to each question.

Part I: Respondents Company

1. What is your role in the construction project?

- ☐ Project Manager
- ☐ Contractor
- ☐ Subcontractor
- ☐ Legal Expert
- ☐ Client
- ☐ Government Official
- ☐ Other (please specify) _____

2. How many years of experience do you have in public building construction projects?

- ☐ Less than 3 years
- ☐ 3-5 years
- ☐ More than 5 years

Part II: Construction Defects and Challenges

3. In your experience, how common are defects in public building projects in Ethiopia?

- ☐ Very common
- ☐ Common
- ☐ Rare
- ☐ Very rare

4. What are the main causes of constriction defects you have observed? (Select all that apply)

- ☐ Design flaws
- ☐ Poor workmanship
- ☐ Low-quality materials
- ☐ Inadequate supervision
- ☐ Contractor negligence
- ☐ Others (please specify)

5. Which types of defects are most frequent encountered?

- ☐ Patent defects (visible)
- ☐ Latent defects (hidden)
- ☐ Both equally

Part III: Contractual Measures

6. Are Defects Liability Periods (DLPs) typically included in public building contracts you have worked with?

☐ Yes

☐ No

☐ Not sure

7. How effective do you find DLPs in enforcing contractor accountability for defects?

☐ Very effective

☐ Effective

☐ Somewhat effective

☐ Not effective

8. Are retention payments used as a financial security measure in your projects?

☐ Yes

☐ No

☐ Not sure

9. How adequate are retention payments in resolving defect-related issues?

☐ Very adequate

☐ Adequate

☐ Inadequate

☐ Not adequate at all

10. How well is liability shared or allocated between contractors and subcontractors?

☐ Clearly defined

☐ Somewhat defined

☐ Poorly defined

☐ Not defined

Part IV: Legal and Financial Remedies

11. What legal remedies are commonly available to employers when contactors fail to rectify defects? (Select all that apply)

☐ Damages

☐ Indemnities

☐ Insurance claims

☐ Contract terminations

☐ Others (please specify) _____

12. How effective are these remedies in ensuring defect rectification?

☐ Very effective

☐ Effective

☐ Somewhat effective

☐ Not effective

Part V: Dispute Resolution Mechanisms

13. Which dispute resolution methods are typically used for defect-related disputes (Select all that apply)

☐ Adjudication

☐ Mediation

☐ Arbitration

☐ Litigation

14. Which method do you prefer as the most suitable for defect dispute resolution in Ethiopia?

☐ Adjudication

☐ Mediation

☐ Arbitration

☐ Litigation

☐ Other (please specify) _____

Part VI: Comparative and Improvement Insights

15. Are you familiar with international contract standards such as FIDIC or NEC regarding defect management?

☐ Yes

☐ No

16. In your opinion, what lessons from international practices could improve defect management in Ethiopia?
(Open-ended) _____

17. What are the key challenges in integrating legal, financial, and managerial measures for defect control in Ethiopian public building projects?
(Open-ended) _____

18. What recommendations would you suggest to improve defect management in public construction projects?
(Open-ended) _____

Section II - Interview Question

Background and Experience

1. Can you briefly describe your role and experience in public building construction projects in Ethiopia?
2. What types of defects do you most commonly encounter in these projects?

Contractual Measures

3. How are Defects Liability Periods (DLPs) structured in typical public building contracts you have worked with? How effective are they in practice?
4. What role do retention payments and performance bonds play in managing defects? Are they sufficient and enforced adequately?
5. How is liability for defects generally allocated between contractors, subcontractors, and consultants?

Legal and Financial Remedies

6. What legal or financial measures are available to project owners when contractors fail to fix defects?
7. How effective are statutory protections, indemnities, and insurance mechanisms in ensuring contractor accountability?

Dispute Resolution

8. Could you describe the most common dispute resolution mechanisms used in defect-related conflicts? How efficient are these mechanisms in terms of cost and time?
9. What challenges have you observed with litigation, arbitration, mediation, or adjudication related to construction defects?

Comparative and Improvement Perspectives

10. Are you familiar with international standards such as FIDIC or NEC in managing defects? If so, what lessons could be applied in Ethiopia?
11. What are the main challenges in integrating contractual, legal, and managerial approaches to defect management in Ethiopian public projects?
12. What improvements would you recommend strengthening defect management and contractor accountability in the Ethiopian construction sector?