ST. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Assessment of Safety and Health Management Practices in Building Construction: The Case of Arada and Lideta Sub City Projects

BY

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Jan, 2025

ADDIS ABABA, ETHIOPIA

ASSESSMENT OF SAFETY AND HEALTH MANAGEMENT PRACTICES IN BUILDING CONSTRUCTION: THE CASE OF ARADA AND LIDETA SUB CITY PROJECTS

A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN PROJECT MANAGEMENT

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DECLARATION

I, the undersigned, hereby declare that the thesis entitled *"Assessment of Safety and Health Management Practices in Building Construction: The Case of Arada and Lideta Sub City Projects in Addis Ababa"* is my original work, submitted in partial fulfillment of the requirements for the Master's Degree in Project Management at St. Mary's University, Addis Ababa. I confirm that it has not been submitted for the award of any other degree or diploma at any other university or institution.

The study was conducted independently under the guidance and supervision of the research advisor. All sources of materials used in the study have been duly acknowledged and appropriately cited.

Signature:

Name: Ismael Yimam Aragaw

Date: Jan/2025

ADVISOR's APPROVAL

This is to certify that the thesis entitled: "*"Assessment of Safety and Health Management Practices in Building Construction: The Case of Arada and Lideta Sub City Projects in Addis Ababa"*," submitted in partial fulfillment of the requirements for the degree of Master of Science in Project Management, is a record of original research carried out by Ismael Yimam Aragaw, under my supervision. No part of the thesis has been submitted for any other degree or diploma. The assistance and support received during the course of this investigation have been duly acknowledged. Therefore, I recommend it for acceptance as fulfilling the thesis requirements.

Name of Supervisor/Advisor	Signature	Date
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This is to certify that the thesis prepared by Ismael Yimam Aragaw, entitled "Assessment of Safety and Health Management Practices in Building Construction: The Case of Arada and Lideta Sub-City Projects in Addis Ababa," and submitted in partial fulfillment of the requirements for the Master's degree in Project Management, complies with the university's regulations and meets the standards for originality and quality.

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Dean, Graduate Studies **Signature** **Date**

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ACRONYMS

AR   -   Augmented Reality

BBS   -   Behavior Based Safety

BIM   -   Building Information Modeling

ILO   -   International Labour Organization

IOT   -   Internal Of Things

ISO   -   International Organization for Standardization

OHSAS   -   Occupational Health and Safety Assessment Series

OSH   -   Occupational Safety and Health

OSHA   -   Occupational Safety and Health Act

PPE   -   Personal Protective Equipment

SME   -   Small and Medium Sized Enterprises

SMS   -   Safety Management Systems

SPSS   -   Statistical Package for Social Science

TSM   -   Total Safety Management

UAV   -   Unmanned Aerial Vehicles

VR   -   Virtual Reality

WHO   -   World Health Organization

ABSTRACT

This study evaluates Safety and Health Management Practices in Building Construction Projects, focusing on Lideta and Arada sub-cities of Addis Ababa. The research identifies key challenges, assesses the effectiveness of current practices, and offers recommendations to improve workplace safety. Using a quantitative approach, data were collected through structured questionnaires distributed to 85 participants into 10 ongoing building constructions, including project managers, safety engineers, site engineers, foreman, residential engineers, and daily laborers. Descriptive statistics were employed to analyze the data and identify significant trends. The findings highlight major deficiencies in safety culture, management commitment, and regulatory enforcement. Issues such as irregular safety inspections, inadequate emergency preparedness, and limited worker participation in safety programs were prevalent. Resource constraints, including insufficient personal protective equipment (PPE) and inadequate training programs further exacerbate risks on construction sites. The study concludes that systemic reforms are essential to align safety and health practices with international standards. Key recommendations include fostering a strong safety culture, enhancing regulatory enforcement, implementing comprehensive training programs, and ensuring consistent resource allocation. Addressing these challenges is crucial for reducing workplace hazards and improving the efficiency and sustainability of construction projects in Addis Ababa.

Key Terms - Building Construction Projects, Health Management Practices, Safety Management Practices, Health, and Safety

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The construction industry worldwide is recognized for its inherent risks and hazards, making safety and health management practices essential for safeguarding workers and ensuring project success (Choudhry, Fang, & Mohamed, 2007). Numerous studies have highlighted the importance of effective safety and health management in construction projects, identifying key factors influencing safety performance, such as safety culture, risk management practices, and training and education initiatives (Fernández-Muñiz, Montes-Peón, & Vázquez-Ordás, 2007; Ghodrati et al., 2019).

In a study by Hinze and Thurman (2014), the integration of safety into project management processes was examined in the construction industry. They found that while safety is often considered a priority, its integration into project management practices is often limited, leading to inefficiencies and safety gaps. Similarly, Lingard et al. (2018) explored the challenges of integrating health and safety with project management in the Australian construction industry. They identified barriers such as conflicting priorities, lack of collaboration between safety and project teams, and inadequate communication channels.

In Ethiopia, the construction industry is a significant contributor to economic growth, particularly in urban centers like Addis Ababa. However, the rapid expansion of construction activities has raised concerns about safety and health management practices, especially in densely populated areas such as Arada and Lideta Sub Cities. Previous research in Ethiopia, such as the study by Adugna and Aklilu (2018), has highlighted challenges such as lack of awareness among construction workers, poor infrastructure for safety training, and the prevalence of the informal economy in the construction sector.

The assessment of safety and health management practices in building construction projects in Arada and Lideta Sub Cities is crucial due to the significant construction activities taking place

in these areas. With numerous ongoing projects based on Government initiatives, including high-rise buildings, residential complexes, and commercial developments, ensuring proper safety measures is imperative to prevent accidents, injuries, and fatalities among construction workers.

Therefore, this study aims to assess safety and health management practices in building construction projects in Arada and Lideta Sub Cities in Addis Ababa. By examining factors such as safety culture, risk management practices, and training and education initiatives, the study seeks to identify strengths, weaknesses, and areas for improvement in safety and health management within these projects. The findings of this research contributes to enhancing safety standards, promoting worker welfare, and informing policy interventions to improve safety outcomes in the Ethiopian construction industry.

1.2 Statement of the problem

Globally, research has consistently emphasized the critical role of safety and health management practices in construction projects. Studies such as those by Hinze and Thurman (2014) and Lingard et al. (2018) have highlighted the necessity of integrating safety protocols into project management processes. However, achieving this integration is often hindered by several challenges, including conflicting priorities between productivity and safety, insufficient collaboration between safety officers and project teams, and inadequate communication mechanisms. These issues underscore the complex nature of embedding robust safety practices into a fast-paced and often high-risk industry like construction.

In Ethiopia, the construction sector is a cornerstone of economic development, particularly in urban hubs such as Addis Ababa. The rapid pace of urbanization, driven by the demand for residential, commercial, and infrastructure projects, has amplified the challenges associated with ensuring occupational health and safety. Research by Adugna and Aklilu (2018) reveals that construction workers in Ethiopia face significant hazards due to limited awareness of safety protocols, inadequate infrastructure for safety training, and the dominance of informal labor arrangements, which often bypass regulatory oversight.

The sub-cities of Arada and Lideta in Addis Ababa epitomize these challenges, given their role as key sites for building construction projects. These areas, characterized by dense urban development and diverse construction activities, expose workers and the surrounding

communities to numerous safety risks. However, the specific health and safety management practices employed in these sub-cities remain underexplored, despite the growing recognition of their importance globally. The lack of localized research limits the ability to address unique challenges, leaving critical gaps in knowledge and practice.

This study aims to assess the safety and health management practices employed in building construction projects in Arada and Lideta sub-cities. By identifying the strengths and weaknesses of current practices, uncovering challenges faced by stakeholders, and providing actionable recommendations, the study seeks to contribute to the broader discourse on improving workplace safety in Ethiopia's construction sector. Additionally, the research will address key questions such as the extent of compliance with safety regulations, the availability and usage of personal protective equipment, and the role of training and communication in fostering a safety culture.

The findings of this study are expected to not only enhance the understanding of safety and health management practices in Arada and Lideta sub-cities but also serve as a basis for informed decision-making among policymakers, construction firms, and other stakeholders. Ultimately, this research aims to support the creation of safer construction environments that prioritize worker well-being and align with international standards.

1.3 Research questions
This research intends to answer the following research questions

1. What is the current safety culture within building construction projects in Arada and Lideta Sub Cities?

2. What are the key challenges and barriers hindering the implementation of safety and health management practices in Arada and Lideta Sub Cities building construction projects?

3. What is the adequacy of training and education initiatives aimed at promoting safety and health among construction workers in Arada and Lideta Sub Cities construction projects?

4. What are the primary safety and health risks inherent in Arada and Lideta Sub Cities building construction projects?

1.4 Study Objectives

The research has the following general and specific objectives:

1.4.1 General objectives:

The general objective of this study will assess the safety and health management practice in building construction of Arada and Lideta sub city projects.

1.4.2 Specific Objectives

1. To assess the prevailing safety culture within construction projects in Arada and Lideta Sub Cities in Addis Ababa.
2. To assess the adequacy of training and education programs promoting safety and health among construction workers in Arada and Lideta Sub Cities.
3. To identify strengths, weaknesses, and areas for improvement in safety and health management practices within construction projects in Arada and Lideta Sub Cities in Addis Ababa.

1.5 Significance of the Study

This study plays a crucial role in enhancing construction worker safety and well-being by identifying areas for improvement in safety and health management practices, ultimately reducing the incidence of accidents and injuries. Additionally, it highlights the broader implications for public safety, as construction activities in urban areas like Arada and Lideta Sub Cities affect nearby residents and pedestrians. By improving safety practices, the study helps mitigate risks to public safety and contributes to the livability of urban communities.

The study's findings also inform the development of industry standards and regulations related to construction safety, contributing to the creation of stronger regulatory frameworks. Policymakers and government agencies use the insights from the study to guide policy interventions, prioritize areas for improvement, and allocate resources effectively.

Moreover, this research adds to the existing body of knowledge on safety and health management practices in construction, particularly in the context of urban development in Ethiopia. The findings serve as a foundation for future research, advancing the understanding of effective strategies to promote safety and well-being in construction projects.

1.6 Scope of the study

*Geographical Scope***:** The study focuses on construction projects located within Arada and Lideta Sub Cities in Addis Ababa, Ethiopia. These urban areas are selected due to their significant construction activities and the need to address safety and health management practices in densely populated urban settings.

*Construction Projects***:** The study includes a range of building construction projects within Arada and Lideta Sub Cities, such as high-rise buildings, residential complexes, commercial developments, and infrastructure projects. The selection of projects will aim to capture a diverse range of construction activities and contexts.

Safety and Health Management Practices: The study assesses various aspects of safety and health management practices within construction projects, including safety culture, risk management processes, and training and education initiatives. Specific areas of focus may include management commitment to safety, hazard identification and assessment, implementation of control measures, safety training programs, and communication channels for safety-related information.

Stakeholder Perspectives: The study considers the perspectives of various stakeholders involved in construction projects, including construction workers, project managers, safety officers, government agencies, and regulatory bodies. Understanding the perspectives and experiences of different stakeholders will provide a comprehensive view of safety and health management practices in building construction.

Time Frame: The study will be conducted over a specified time frame, which may include data collection, analysis, and reporting phases. The duration of the study will be determined based on the St, Mary's University research timeline and resources available for data collection and analysis.

*Limitations***:** It is important to acknowledge certain limitations within the scope of the study, such as resource constraints, access to construction sites, and potential challenges in data collection.

1.7 Limitations of the Study

The study faced challenges including sampling bias due to potential inadequacies in representing the broader population of construction projects or workers in Arada and Lideta Sub Cities, data collection difficulties stemming from the dynamic nature of construction environments, resource constraints limiting the study's scope and depth, external factors such as government policies or economic conditions impacting the study, and language and cultural barriers potentially affecting communication and data quality.

1.8 Organization of the Study

The research report has comprised five chapters:

Chapter 1: Introduction – This section provides the background of the study, problem statement, research questions, general and specific objectives, significance of the study, scope and limitations of the study, organization of the paper, and definition of key terms.

Chapter 2: Review of Related Literature – This chapter presents an empirical review of previous findings on health and safety management practices by various researchers, alongside a theoretical review providing definitions and brief descriptions of relevant topic areas, as well as the theoretical framework of the study. This section aids in understanding the study's terminology.

Chapter 3: Research Methodology – Here, the research design, targeted population, sample size, data collection methods and tools, data analysis techniques, and validity and reliability testing procedures are outlined.

Chapter 4: Data Presentation, Analysis, and Interpretation – This chapter details the collected data, analysis, and interpreted results.

Chapter 5: Main findings, Conclusion and Recommendations – This section summarizes the findings, presents the researcher's suggestions for safety and health management practices in building construction projects in Arada and Lideta sub-cities, and provides insights for future endeavors.

1.9 Definition of key terms

*Safety***:** Refers to the condition of being protected from harm, risk, or danger, particularly in environments where hazards are present, such as workplaces, homes, or public spaces. It involves measures taken to prevent accidents, injuries, or damage by controlling and minimizing potential risks (NIOSH, 2019).

*Health***:** Is commonly defined as a state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity. It encompasses various dimensions, including the ability to perform daily activities, maintain relationships, and cope with stress and challenges (WHO, 1948).

*Safety Management Practices***:** Refers to the systematic approaches, procedures, and strategies implemented by organizations to ensure the safety and well-being of employees, minimize risks, and prevent accidents or injuries. These practices typically involve the identification and assessment of hazards, the establishment of safety protocols, employee training, and continuous monitoring and improvement of safety measures (Hassan, M., & Othman, A. 2021).

*Health Management Practices***:** Refers to the strategies, policies, and activities designed to promote and maintain the physical and mental health of individuals or populations within an organization or community. These practices include health promotion, disease prevention, health education, monitoring and managing health risks, and providing access to necessary healthcare services (WHO, 2019).

*Building Construction Projects***:** Refers to the process of planning, designing, and constructing buildings or structures, including residential, commercial, or industrial facilities. These projects involve various stages such as site preparation, foundation laying, structural development, installation of systems (e.g., electrical, plumbing), and finishing, all aimed at creating functional and safe environments for occupancy or use (Jarkas, A. M., & Bitar, C. G. 2012).

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Historical Evolution of Safety and Health Management Practices in the Construction Industry

The evolution of safety and health management practices in the construction industry reflects a dynamic interplay of social, economic, technological, and regulatory factors over time.

Early Safety Practices in Construction

The origins of safety management in construction can be traced back to ancient civilizations, where rudimentary measures were implemented to protect workers from hazards such as falls, collapses, and structural failures (Gambatese & Hinze, 1998). Early safety practices relied on simple techniques such as scaffolding, bracing, and manual labor to mitigate risks associated with construction activities (Hinze & Thurman, 2018). However, safety considerations were often secondary to productivity and cost concerns, resulting in high rates of accidents and fatalities in the absence of comprehensive safety regulations (Hale & Hovden, 1998).

Industrialization and Regulation

The advent of industrialization in the 19th century brought about significant changes in construction methods, technology, and workforce dynamics. Mass production techniques, mechanized equipment, and standardized building materials revolutionized the construction industry but also introduced new safety challenges (Dainty et al., 2001). In response to mounting concerns over worker safety, governments began to enact legislation and regulatory frameworks to protect workers' rights and promote safer working conditions (Hinze et al., 2013). The Factory Acts in the United Kingdom and the Occupational Safety and Health Act (OSHA) in the United States were among the landmark legislations that established the legal framework for occupational safety and health in construction (Hasle et al., 2009).

Emergence of Safety Management Systems

The late 20th century marked a significant shift towards proactive safety management approaches in construction, emphasizing systematic risk assessment, hazard control, and worker participation in safety decision-making. Recent studies continue to underscore the importance of these principles, with advancements in technology and data-driven approaches further enhancing the effectiveness of safety management systems and fostering a strong safety culture (Haslam et al., 2022; Lingard et al., 2014). Safety management systems, such as the Occupational Health and Safety Assessment Series (OHSAS) and the International Organization for Standardization (ISO) standards, provided frameworks for organizations to integrate safety into their management systems and improve safety performance (Gunduz et al., 2018).

Technological Advancements and Best Practices

Advancements in technology have played a significant role in enhancing safety and health management practices in construction. Innovations such as Building Information Modeling (BIM), drones, and wearable sensors have enabled real-time monitoring of construction activities, identification of safety hazards, and simulation of safety scenarios (Teizer et al., 2018). Best practices in safety management, such as Behavior-Based Safety (BBS), Total Safety Management (TSM), and Lean Construction, have also emerged as effective approaches for promoting safety excellence and continuous improvement in the construction industry (Hinze & Thurman, 2018).

Challenges and Future Directions

Despite significant progress, the construction industry continues to face challenges in managing safety and health effectively. Issues such as subcontractor management, cultural diversity, and resistance to change pose obstacles to the implementation of safety management practices (Lingard & Holmes, 2020). Addressing these challenges requires a multifaceted approach that integrates technological innovations, regulatory compliance, and organizational culture change initiatives (Salazar et al., 2019). Embracing emerging trends such as sustainable construction, digitalization, and collaborative procurement models offers opportunities to enhance safety and health management practices and create safer working environments for construction workers (Man & Zhang, 2019).

To sum up, the historical evolution of safety and health management practices in the construction industry reflects a gradual transition from reactive measures to proactive strategies aimed at preventing accidents and promoting worker well-being. By understanding the lessons learned from the past and embracing innovative approaches, stakeholders can continue to advance safety and health management practices and foster a culture of safety excellence in construction.

2.1.2 Definition of Health, Safety, and Health and Safety Management practices

Health and safety management practices are integral components of organizational strategies aimed at safeguarding the well-being of employees and stakeholders. This literature review provides an overview of the definitions of health, safety, and health management practices, highlighting key concepts and frameworks proposed by scholars and practitioners in various industries.

Health

The concept of health encompasses physical, mental, and social well-being, emphasizing the interplay between individual and environmental factors (World Health Organization, 1948). Recent frameworks align with the biopsychosocial model, which integrates biological, psychological, and social dimensions of health, highlighting the dynamic interconnection of these determinants in shaping overall well-being (Smith et al., 2021). Holistic definitions of health underscore the importance of addressing social inequalities, environmental factors, and lifestyle choices to promote overall wellness (Huber *et al*., 2011).

Safety

Safety refers to the absence of hazards or risks that may cause harm or injury to individuals or property (Hale & Hovden, 1998). The traditional view of safety focuses on preventing accidents and minimizing occupational hazards in the workplace (Reason, 1990). However, contemporary perspectives emphasize the proactive identification and mitigation of risks through systematic risk management approaches (Hinze & Thurman, 2018). Safety culture, organizational leadership, and employee engagement are critical determinants of safety performance in organizations (Zohar, 1980).

Health Management Practices

Health management practices encompass strategies and interventions aimed at promoting health and wellness within organizations (Chen et al., 2015). These practices may include health education programs, wellness initiatives, and occupational health services designed to prevent illness, promote healthy behaviors, and improve overall quality of life among employees (Goetzel et al., 2014). Integrating health management into organizational policies and culture fosters a supportive environment for employee well-being and enhances organizational performance (Linnan & Cluff, 2006).

Safety Management Practices

Safety management practices involve the systematic identification, assessment, and control of hazards to prevent accidents and injuries in the workplace (Hinze et al., 2013). Key components of safety management include hazard identification, risk assessment, safety training, and implementation of control measures (Hallowell et al., 2010). Effective safety management relies on leadership commitment, employee involvement, and continuous improvement efforts to create a culture of safety excellence (Geller, 2001).

Health, safety, and health management practices are fundamental aspects of organizational management aimed at protecting the well-being of individuals and promoting a culture of well-being within organizations. By understanding the diverse definitions and frameworks proposed in the literature, organizations could develop comprehensive strategies to integrate health and safety principles into their operations, ultimately enhancing employee health, safety, and organizational performance.

2.1.3 The Importance of Safety Culture in Construction Projects

Safety culture encompasses shared values, beliefs, norms, and attitudes regarding safety within an organization (Zohar, 1980). It reflects the collective commitment to safety, from top management to frontline workers, and influences decision-making processes, communication patterns, and organizational practices (Guldenmund, 2000). A positive safety culture fosters a proactive approach to safety management, where safety is prioritized as an integral part of daily operations (Cooper *et al.,* 2000).

Determinants of Safety Culture

Several factors contribute to the development and maintenance of safety culture in construction projects. Leadership commitment and involvement are crucial, as visible support from management reinforces the importance of safety and sets the tone for the organization (Hinze & Thurman, 2018). Effective communication channels, including open dialogue and feedback mechanisms, facilitate the exchange of safety-related information and promote a culture of transparency (Abdul-Rahman & Wang, 2019). Employee involvement and empowerment empower workers to participate in safety initiatives, contributing to a sense of ownership and accountability for safety outcomes (Guo *et al*., 2020).

Impact on Safety Performance

A strong safety culture has been linked to improved safety performance and reduced accident rates in construction projects. Organizations with a positive safety culture demonstrate higher levels of safety compliance, increased hazard reporting, and greater adherence to safety protocols (Gunduz et al., 2018). By fostering a culture of continuous improvement, where lessons learned from near misses and incidents are used to inform future practices, safety culture contributes to the prevention of accidents and the promotion of a safer work environment (Gyekye *et al.,* 2017).

Challenges and Strategies for Enhancing Safety Culture

Despite its importance, developing and sustaining a positive safety culture in construction projects can be challenging. Factors such as time pressures, budget constraints, and conflicting priorities may undermine safety efforts and hinder cultural change (Hinze et al., 2013). Strategies for enhancing safety culture include leadership development programs, safety-training initiatives, and regular safety audits to assess the effectiveness of existing practices (Zhang et al., 2019). Emphasizing the integration of safety into all aspects of project planning and execution, from design to completion, reinforces the organizational commitment to safety and fosters a culture of collective responsibility (Khanzode et al., 2019).

Safety culture plays a critical role in ensuring the well-being of workers and the success of construction projects. By understanding the determinants of safety culture and its impact on

safety performance, organizations can implement strategies to cultivate a positive safety culture and create safer working environments for all stakeholders.

2.1.4 Effectiveness of Safety Training and Education Programs for Construction Workers

Safety training and education programs are essential components of construction safety management, aimed at equipping workers with the knowledge, skills, and attitudes necessary to identify hazards and mitigate risks in the workplace.

Effectiveness of Safety Training Programs

Safety training programs play a crucial role in enhancing safety awareness and reducing accident rates in construction projects. Research suggests that well-designed training interventions can improve safety knowledge, increase hazard recognition abilities, and promote safe work practices among construction workers (Sacks et al., 2018). Effective safety training programs incorporate a variety of instructional methods, such as classroom lectures, hands-on demonstrations, and interactive simulations, to engage learners and reinforce key safety concepts (Zhou et al., 2020). Moreover, tailoring training content to specific job roles and hazards encountered on construction sites enhances relevance and applicability, leading to greater retention and transfer of knowledge (Khanzode et al., 2019).

Impact of Safety Education Programs

Safety education programs focus on fostering a culture of safety within organizations by promoting a deeper understanding of safety principles and encouraging proactive safety behaviors among construction workers. Studies have shown that comprehensive safety education initiatives, which address not only technical skills but also attitudes, beliefs, and values related to safety, can lead to long-lasting improvements in safety performance (Choudhry *et al.,* 2014). By instilling a sense of personal responsibility and empowerment, safety education programs empower workers to actively participate in safety initiatives, identify potential hazards, and take appropriate preventive measures (Lingard *et al.,* 2016). Furthermore, integrating safety education into apprenticeship programs and vocational training courses ensures that future generations of

construction workers are adequately prepared to navigate the hazards of the job (Lingard & Holmes, 2020).

Challenges and Strategies for Enhancing Effectiveness

Despite their potential benefits, safety training and education programs face several challenges that may hinder their effectiveness. Limited resources, time constraints, and language barriers can impede access to training opportunities and undermine the quality of instruction (Breslin et al., 2013). Additionally, the transient nature of the construction workforce poses challenges for ensuring consistent participation and engagement in training initiatives (Gunduz *et al*., 2018). To address these challenges, organizations can implement strategies such as utilizing technology-based training platforms, providing language-specific training materials, and offering flexible scheduling options to accommodate the needs of diverse workforce populations (Hallowell *et al*., 2010). Moreover, fostering a supportive organizational culture that values continuous learning and invests in employee development is essential for sustaining the effectiveness of safety training and education programs over time (Teo *et al*., 2020).

Safety training and education programs are critical mechanisms for promoting a culture of safety and reducing the incidence of accidents in the construction industry. By leveraging evidence-based practices and addressing the unique challenges faced by construction workers, organizations can enhance the effectiveness of training initiatives and create safer working environments for all stakeholders.

2.1.5 Occupational Safety and Health (OSH) Legal Frameworks

Occupational safety and health (OSH) legal frameworks play a critical role in promoting workplace safety, protecting workers' rights, and preventing occupational hazards and illnesses.

Historical Evolution of OSH Legal Frameworks

The development of OSH legal frameworks can be traced back to the industrial revolution, when widespread industrialization led to unsafe working conditions and a lack of worker protections (Hughes & Ferrett, 2013). Early initiatives, such as factory acts and mining regulations, aimed to address specific hazards and establish basic standards for workplace safety (Walters, 2005). Over time, the scope and complexity of OSH legislation expanded to encompass a wide range of

industries and hazards, reflecting advances in scientific knowledge, technological innovation, and social awareness of workplace risks (Feldstein, 2008).

International OSH Legal Frameworks

The International Labour Organization (ILO) serves as the primary international body responsible for setting OSH standards and promoting decent work worldwide. The ILO's Occupational Safety and Health Convention, 1981 (No. 155), and its accompanying Recommendation (No. 164) provide a comprehensive framework for ensuring workplace safety and health (ILO, 1981). These instruments emphasize the responsibilities of governments, employers, and workers in creating safe working environments, conducting risk assessments, and providing adequate training and protective measures (ILO, 1981).

In addition to ILO conventions, international standards such as the ISO 45001:2018 Occupational Health and Safety Management Systems provide guidance on establishing, implementing, and maintaining effective OSH management systems (ISO, 2018). These standards emphasize a proactive approach to OSH, incorporating principles of risk assessment, hazard identification, and continuous improvement to enhance workplace safety (ISO, 2018).

Ethiopian OSH Legal Framework

In Ethiopia, the legal framework for OSH is primarily governed by the Labor Proclamation No. 1156/2019 and the Occupational Safety and Health Council of Ministers Regulation No. 456/2019. These legislative instruments establish the rights and obligations of employers, workers, and government authorities in ensuring OSH compliance and enforcement (Government of Ethiopia, 2019).

The Labor Proclamation stipulates provisions related to working conditions, occupational hazards, health surveillance, and compensation for work-related injuries and illnesses (Government of Ethiopia, 2019). It requires employers to provide safe working environments, conduct risk assessments, and implement measures to prevent accidents and occupational diseases (Government of Ethiopia, 2019).

The Occupational Safety and Health Council of Ministers Regulation complements the Labor Proclamation by specifying detailed requirements for OSH management, including the

establishment of OSH committees, the conduct of workplace inspections, and the provision of OSH training (Government of Ethiopia, 2019). It also outlines penalties for non-compliance and establishes mechanisms for monitoring and enforcement of OSH standards (Government of Ethiopia, 2019).

Key Components of OSH Legal Frameworks

OSH legal frameworks typically consist of a combination of legislation, regulations, standards, and enforcement mechanisms designed to promote and enforce workplace safety and health (OSHA, 2020). Key components may include requirements for hazard identification and risk assessment, provisions for employee training and education, mandates for the use of personal protective equipment (PPE), and protocols for incident reporting and investigation (EU-OSHA, 2020). Additionally, OSH legal frameworks may incorporate principles of worker participation and consultation, employer responsibilities, and enforcement procedures to ensure compliance and accountability (NIOSH, 2019).

Effectiveness of OSH Legal Frameworks

The effectiveness of OSH legal frameworks depends on various factors, including the clarity and specificity of regulations, the adequacy of enforcement measures, and the commitment of stakeholders to compliance and continuous improvement (Levinson, 2002). Research suggests that well-designed OSH legislation, coupled with robust enforcement and support services, can lead to improvements in workplace safety culture, reductions in injury rates, and better health outcomes for workers (Lingard et al., 2018). However, challenges such as resource constraints, regulatory complexity, and cultural differences may impede the implementation and effectiveness of OSH legal frameworks in some contexts (Walters, 2005).

Implications for Organizational Compliance and Safety Performance

OSH legal frameworks have significant implications for organizational compliance and safety performance. By establishing clear standards and requirements for workplace safety, OSH legislation helps organizations identify hazards, assess risks, and implement appropriate control measures (Feldstein, 2008). Compliance with OSH regulations not only reduces the likelihood of accidents, injuries, and illnesses but also enhances organizational reputation, reduces legal

liabilities, and improves employee morale and productivity (Hughes & Ferrett, 2013). Furthermore, proactive engagement with OSH legal frameworks can drive continuous improvement initiatives, foster a culture of safety excellence, and create competitive advantages for organizations in the marketplace (OSHA, 2020).

OSH legal frameworks play a crucial role in shaping workplace safety practices, protecting worker health, and promoting organizational responsibility and accountability. By understanding the historical evolution, key components, effectiveness, and implications of OSH legal frameworks, stakeholders can develop strategies to enhance compliance, improve safety performance, and create safer and healthier workplaces for all.

2.1.6 Implementation of Safety Management Systems in Building Construction Projects

Safety management systems (SMS) are comprehensive frameworks designed to proactively identify, assess, and control risks in building construction projects.

Key Components of Safety Management Systems

Safety management systems in building construction projects typically comprise several key components, including risk assessment, hazard identification, safety planning, training and education, communication and consultation, incident reporting and investigation, and continuous improvement (Zohar, 1980). Risk assessment involves identifying potential hazards, evaluating their severity and likelihood, and implementing control measures to mitigate risks (Hinze & Thurman, 2018). Safety planning involves developing policies, procedures, and protocols to manage safety throughout the project lifecycle (Hallowell et al., 2010). Training and education initiatives ensure that workers are equipped with the knowledge and skills necessary to perform their tasks safely (Gyekye et al., 2017). Effective communication and consultation mechanisms facilitate the exchange of safety-related information and promote collaboration among stakeholders (Abdul-Rahman & Wang, 2019). Incident reporting and investigation processes enable organizations to learn from mistakes and implement corrective actions to prevent recurrence (Hinze et al., 2013). Continuous improvement efforts involve monitoring safety performance, analyzing trends, and implementing measures to enhance safety culture and performance (Geller, 2001).

Challenges in Implementing Safety Management Systems

The implementation of safety management systems in building construction projects is not without challenges. Common barriers include resistance to change, lack of management commitment, inadequate resources, cultural barriers, and competing priorities (Gunduz *et al.,* 2018). Additionally, the transient nature of the construction workforce and the complexity of construction projects pose challenges for ensuring consistent implementation and enforcement of safety protocols (Hinze & Thurman, 2018). Moreover, navigating regulatory requirements, contractual obligations, and stakeholder expectations adds another layer of complexity to the implementation process (Lingard & Holmes, 2020).

Best Practices and Strategies for Successful Implementation

Despite these challenges, several best practices and strategies can enhance the successful implementation of safety management systems in building construction projects. Leadership commitment and visible support are critical for fostering a culture of safety and promoting employee engagement (Gyekye et al., 2017). Effective communication channels, including regular safety meetings, toolbox talks, and safety briefings, facilitate the dissemination of safety information and promote a shared understanding of safety goals and expectations (Guo *et al.,* 2020). Investing in training and education programs tailored to the specific needs of the workforce ensures that workers are equipped with the knowledge and skills necessary to perform their tasks safely (Hinze & Thurman, 2018). Implementing robust incident reporting and investigation processes encourages workers to report hazards and incidents without fear of reprisal and enables organizations to identify root causes and implement corrective actions (Hinze *et al.,* 2013). Furthermore, leveraging technology, such as digital safety management platforms, wearable sensors, and real-time monitoring systems, can streamline safety management processes and enhance data-driven decision-making (Teizer *et al.,* 2018).

Impact of Safety Management Systems on Safety Performance

Research suggests that the implementation of safety management systems in building construction projects can lead to improvements in safety performance, including reductions in accident rates, injuries, and fatalities (Gunduz *et al.,* 2018). By integrating safety into all aspects of project planning and execution, from design to completion, organizations can identify and

mitigate risks early in the project lifecycle, preventing accidents and promoting a safer working environment (Hinze & Thurman, 2018). Furthermore, fostering a culture of safety where safety is prioritized as a core value and embraced by all stakeholders contributes to sustained safety performance and organizational success (Zohar, 1980).

2.1.7 Use of Technology and Innovation in Improving Safety Practices in Construction Projects

Technology and innovation have revolutionized safety practices in construction projects, offering new tools and solutions to identify, assess, and mitigate risks.

Technological Trends in Construction Safety

Advancements in technology have transformed safety practices in construction projects, with several emerging trends reshaping the industry. Building Information Modeling (BIM) enables the visualization and simulation of construction processes, allowing stakeholders to identify safety hazards and plan for risk mitigation strategies (Teizer *et al*., 2018). Wearable sensors and Internet of Things (IoT) devices collect real-time data on worker movements, environmental conditions, and equipment usage, providing insights into potential safety risks and enabling proactive interventions (Man & Zhang, 2019). Drones and unmanned aerial vehicles (UAVs) facilitate aerial surveys and inspections of construction sites, improving hazard identification and monitoring capabilities (Teizer *et al.,* 2017). Virtual Reality (VR) and Augmented Reality (AR) technologies create immersive training simulations and interactive safety briefings, enhancing worker awareness and preparedness for safety hazards (Cheng *et al*., 2015).

Benefits of Technological Integration

The integration of technology and innovation into safety practices in construction projects offers numerous benefits for stakeholders. Improved Hazard Identification: Advanced sensing technologies and data analytics enable the identification of safety hazards in real-time, allowing for timely interventions to prevent accidents and injuries (Teizer *et al*., 2018). Enhanced Communication and Collaboration: Digital platforms and mobile applications facilitate communication and collaboration among project teams, subcontractors, and stakeholders, promoting a culture of safety and shared responsibility (Hallowell *et al.,* 2010). Increased Efficiency and Productivity: Automation and digitization of safety processes streamline

workflows, reduce administrative burdens, and optimize resource allocation, leading to improved project efficiency and productivity (Man & Zhang, 2019). Enhanced Training and Education: Interactive training simulations and virtual reality environments offer immersive learning experiences, enabling workers to practice safety procedures and emergency responses in a safe and controlled setting (Cheng *et al*., 2015).

Challenges and Limitations

Despite the potential benefits, the adoption of technology and innovation in construction safety practices is not without challenges.

Cost and Investment: The initial investment and ongoing maintenance costs associated with implementing new technologies can be prohibitive for some organizations, particularly small and medium-sized enterprises (SMEs) (Teizer *et al.,* 2018).

Technological Complexity: The complexity of emerging technologies such as BIM, IoT, and VR/AR may require specialized expertise and training, posing challenges for widespread adoption and implementation (Cheng *et al.,* 2015).

Data Privacy and Security: The collection and storage of sensitive data, such as worker biometrics and site surveillance footage, raise concerns about privacy and cybersecurity risks, necessitating robust data protection measures and regulatory compliance (Man & Zhang, 2019).

Resistance to Change: Cultural barriers and resistance to change within organizations may impede the adoption of new technologies, particularly among older or less technologically literate workers (Hallowell et al., 2010).

The use of technology and innovation holds immense potential for transforming safety practices in construction projects, driving improvements in hazard identification, communication, efficiency, and training. By addressing challenges and embracing emerging trends, stakeholders can harness the power of technology to create safer working environments, protect worker health, and achieve sustainable project outcomes.

2.1.8 Challenges and Barriers to Effective Safety and Health Management Practices in Building Construction

Safety and health management in building construction is essential for ensuring the well-being of workers and preventing accidents and injuries on construction sites.

Global Challenges and Barriers

Several challenges and barriers impede the effective implementation of safety and health management practices in building construction worldwide. These include:

1. Lack of Awareness and Training: Many construction workers lack adequate training and awareness of safety procedures and practices, leading to a higher risk of accidents and injuries (Arditi *et al.,* 2018).
2. Poor Safety Culture: In some construction cultures, there is a prevailing attitude that prioritizes productivity over safety, leading to a disregard for safety protocols and procedures (Haslam *et al.,* 2017).
3. Inadequate Regulation and Enforcement: Weak regulatory frameworks and limited enforcement mechanisms contribute to non-compliance with safety standards and guidelines in many countries (Fernández-Muñiz *et al.,* 2007).
4. Subcontractor Management: Complex subcontractor relationships often result in fragmented safety management systems, making it challenging to ensure consistent safety standards across construction projects (Abdul-Rahman & Wang, 2019).
5. Resource Constraints: Limited financial resources, lack of access to safety equipment, and inadequate infrastructure pose significant barriers to implementing effective safety and health management practices in construction (Khanzode et al., 2019).

Challenges in Ethiopia

Ethiopia faces similar challenges to many other countries in implementing effective safety and health management practices in building construction. However, there are some specific issues relevant to the Ethiopian context:

1. Informal Economy: A significant portion of construction work in Ethiopia occurs in the informal economy, where workers may lack formal training, access to safety equipment, and awareness of safety regulations (Adugna & Aklilu, 2018).

2. Limited Capacity and Infrastructure: Ethiopia's construction sector suffers from limited capacity and infrastructure for safety training, enforcement, and monitoring, hampering efforts to improve safety standards (Woldeamanuel et al., 2019).

3. Cultural Factors: Cultural norms and attitudes towards safety may influence behavior on construction sites, with some workers prioritizing productivity over safety due to economic pressures (Adane & Tadesse, 2020).

4. Regulatory Challenges: While Ethiopia has made strides in developing OSH regulations, challenges remain in enforcement, capacity building, and coordination among government agencies (Kassie et al., 2021).

5. Access to Resources: Limited access to safety equipment, personal protective gear, and medical facilities exacerbate safety risks for construction workers in Ethiopia (Tadesse et al., 2021).

Effective safety and health management practices are critical for enhancing worker well-being and reducing accidents in building construction worldwide, including Ethiopia. Recent studies emphasize that overcoming safety challenges necessitates a comprehensive approach, including strong government policies, industry partnerships, and capacity-building programs to foster safer construction environments (Gibb et al., 2020; Ahmed & Hassan, 2021).

2.2 Empirical Review

2.2.1 Summary of Empirical studies

Lucy Fekele, Quezon, and Yolente C. Macarubbo (2016) investigated Health and Safety Practices in Building Construction in Addis Ababa, identifying the top three factors influencing safety and health management in construction as follows: (1) Lack of a clear company Health and Safety policy; (2) Insufficient enforcement of existing building regulations; and (3) Limited safety awareness among the company's top management.

Fasil Argaw (2017) made an assessment of Construction Safety and Health Management in High Rise Buildings in Addis Ababa. The study found that projects undertaken by international

Chinese contractors demonstrate relatively better health and safety management practices compared to those by local grade one contractors, with incidents involving falling objects from height, scaffolding, and ladders contributing significantly to injuries and fatalities. Moreover, the attitudes of owners, along with the roles of government and engineering societies, exert a considerable influence on the performance of health and safety practices within the construction industry.

Tadesse (2018) conducted a study in Addis Ababa examining construction safety among grade one contractors, revealing that failure to meet safety standards results in significant consequences such as material loss, loss of human life, harm to the public and environment, primarily attributed to the use of low-quality materials, lax supervision, inadequate worker safety awareness, and subpar workmanship.

Sipara Alemu (2020) conducted a study in health and safety practices in high-rise real estate construction in Addis Ababa, with issues including absent management systems, policies, personnel, awareness mechanisms, welfare facilities, provision of PPEs, and evaluation techniques, primarily attributed to reasons such as ignorance, lack of government control, and budget constraints, further exacerbated by inadequate supervision focusing more on work than worker safety, emphasizing the need for comprehensive health and safety programs, government involvement, and owner commitment to improve practices.

Fiktor Belachew (2020) conducted an assessment on construction safety and health management in high-rise building in the case of financial institutions in Addis Ababa. The study highlights gender inequity in the construction sector, emphasizing the underrepresentation of females and their potential contribution to safety and health due to their perceived meticulousness. Majority of mature respondents with professional qualifications provide insights into safety and health practices, indicating a presence of safety and health engineers at construction sites and experienced respondents offering valuable information. Major hazards in high-rise construction include falling objects, scaffold accidents, and structural collapses, with most firms having safety policies and equipment but facing challenges like management commitment and enforcement. Major challenges include inadequate training, low enforcement of regulations, lack of top management support, and complex building designs.

This collection of empirical studies sheds light on various aspects of health and safety practices within the construction industry in Addis Ababa, revealing common challenges and potential areas for improvement. The findings collectively underscore the critical importance of clear company policies, effective enforcement of regulations, and heightened safety awareness among management. Moreover, they highlight the impact of external factors such as contractor backgrounds, gender dynamics, and governmental oversight on overall safety outcomes. These insights provide a valuable foundation for this research aimed at enhancing health and safety standards in construction practices, with implications for policy development, industry regulations, and organizational strategies to mitigate risks and promote worker well-being.

2.2.2 Integration of Health and Safety with Project Management

The integration of health and safety with project management is crucial for ensuring the well-being of workers and the success of construction projects.

Current Practices and Challenges

Empirical studies have highlighted various practices and challenges in integrating health and safety with project management. For example, research by Hinze and Thurman (2014) examined the integration of safety into project management processes in the construction industry. They found that while safety is considered a priority, its integration into project management practices is often limited, leading to inefficiencies and safety gaps.

Similarly, a study by Lingard et al. (2018) explored the challenges of integrating health and safety with project management in the Australian construction industry. They identified barriers such as conflicting priorities, lack of collaboration between safety and project teams, and inadequate communication channels. These challenges hinder effective coordination and implementation of health and safety measures within project management frameworks.

Strategies and Solutions

Despite the challenges, there are strategies and solutions proposed in the literature to improve the integration of health and safety with project management. For instance, research by Zhang et al. (2016) investigated the role of leadership in promoting safety integration in construction projects. They found that strong leadership commitment to safety, combined with effective

communication and training can facilitate the integration of health and safety into project management processes.

Furthermore, studies by Hallowell et al. (2015) and Hinze et al. (2013) emphasized the importance of incorporating safety performance metrics into project management systems. By measuring safety indicators alongside project progress and performance metrics, project managers can proactively identify safety risks and implement corrective actions to mitigate them.

The integration of health and safety with project management is increasingly recognized as critical for enhancing worker well-being and achieving project success in the construction sector. Recent studies highlight that challenges such as conflicting priorities and poor communication can hinder effective integration. However, adopting strategies such as fostering leadership commitment, establishing clear communication channels, and utilizing safety performance metrics can significantly improve outcomes (Zhou et al., 2021; Ahmed et al., 2022). By addressing these barriers and implementing comprehensive safety-management practices, construction projects can enhance both safety outcomes and operational efficiency.

2.2.3 Management of Health and Safety in Construction Projects in Ethiopia

The management of health and safety in construction projects remains critical for safeguarding worker well-being and minimizing accidents and injuries. In Ethiopia, where the construction industry significantly contributes to economic growth, addressing the challenges and practices of health and safety management is essential for sustainable development. Recent studies emphasize the importance of implementing comprehensive safety protocols, fostering a proactive safety culture, and addressing resource constraints to enhance safety outcomes in Ethiopian construction projects (Kassie et al., 2021; Ahmed & Hassan, 2022). This review examines empirical studies on health and safety management in Ethiopia, highlighting current practices and identifying areas requiring improvement.

Current Practices and Challenges

Several empirical studies have shed light on the prevailing practices and challenges in the management of health and safety in construction projects in Ethiopia. Adugna and Aklilu (2018) conducted a systematic review and identified challenges such as lack of awareness among construction workers, poor infrastructure for safety training, and the prevalence of the informal

economy in the construction sector. These challenges contribute to higher risks of accidents and injuries on construction sites.

Furthermore, Fasil (2017) conducted a survey on occupational safety and health management practices in Addis Ababa's construction projects, revealing shortcomings such as inadequate safety training, lack of access to proper safety equipment, and a poor safety culture characterized by a prioritization of productivity over safety. Similarly, Sipara (2020) emphasized the importance of safety leadership, communication, and training in enhancing safety management practices in Addis Ababa's construction projects.

Regulatory Compliance and Enforcement

The issue of regulatory compliance and enforcement is also a significant aspect of health and safety management in construction projects in Ethiopia. Fiktor (2020) investigated the impact of regulatory compliance on safety management and found gaps in enforcement and monitoring mechanisms, leading to inconsistent adherence to safety standards across construction sites. Kassie et al. (2021) highlighted the gap between OSH policy objectives and on-the-ground practices in the Ethiopian construction industry, emphasizing the need for improved implementation, enforcement, and coordination among stakeholders.

Emerging Trends and Solutions

 Despite the challenges, there are emerging trends and solutions that offer promise for improving the management of health and safety in construction projects in Ethiopia. Ghodrati et al. (2019) explored the use of virtual reality (VR) technology in enhancing safety training and simulation in the construction industry, providing immersive experiences for workers to practice safety procedures and scenarios. Additionally, initiatives such as capacity-building programs, stakeholder collaboration, and regulatory reforms have been proposed to bridge the gap between OSH policy and practice in the Ethiopian construction industry (Kassie et al., 2021).

2.3 Conceptual framework

Independent Variables   **Dependent Variable**
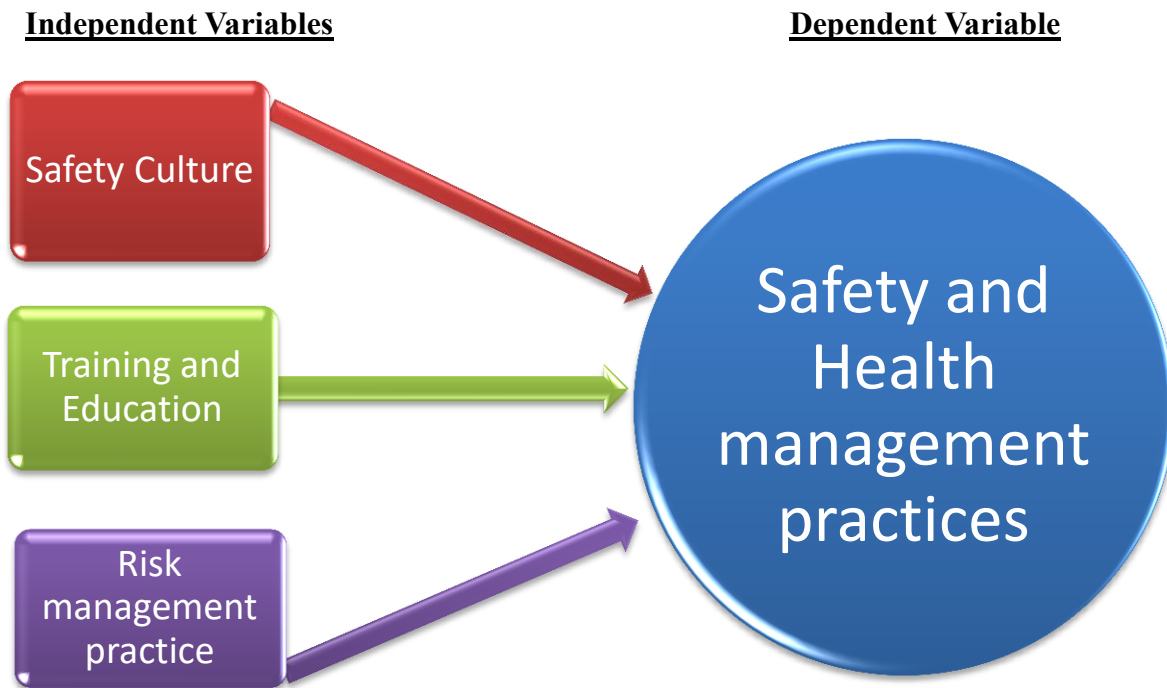
Figure 2.1 Conceptual Framework: Safety and Health Management Practices in Building Construction. (Own source)

- Safety Culture influences the attitudes and behaviors of employees towards safety, thereby affecting the implementation of safety and health management practices.
- Risk Management Practices help identify and mitigate potential hazards and risks, contributing to the effectiveness of safety and health management practices.
- Training and Education provide workers with the necessary knowledge and skills to adhere to safety protocols and procedures, enhancing the overall safety and health management practices.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter provides a comprehensive overview of the research design, elucidating the study variables, delineating the study area and target population, detailing the data collection methods, specifying the type and instrumentation, explicating the data analysis techniques and software employed, and outlining the procedures for assessing reliability and validity.

3.1 Research Design

Research design refers to the overall plan or strategy chosen to guide the conduct of a study, including the methods and procedures used to collect and analyze data (Creswell & Creswell, 2017). This study employed a quantitative approach to systematically evaluate safety and health management practices in construction projects. By utilizing quantitative methods, the study ensured objective measurement and analysis of numerical data to identify patterns and relationships. A descriptive design was applied, facilitating a detailed and precise representation of the conditions and practices observed in the construction industry.

3.2 Description of Study Area and Target Population

Both Arada and Lideta Sub Cities are experiencing rapid urbanization and infrastructure development as a Government initiation, leading to an increase in construction activities and projects. These sub-cities are important hubs of economic activity and urban growth, attracting investment and development projects. However, with the expansion of construction activities comes the need to ensure proper safety and health management practices to protect workers and the public from potential hazards and risks associated with construction work.

The study area provides a relevant and context-specific setting to assess safety and health management practices in building construction projects. By focusing on Arada and Lideta Sub Cities in Addis Ababa, the study aims to capture the dynamics of construction activities in urban settings and contribute to enhancing safety standards and worker welfare in the Ethiopian construction industry.

The target population for the study consists of individuals involved in ongoing building construction projects in both Arada and Lideta Sub Cities in Addis Ababa. Specifically, the target population includes:

1. Project Managers: 10 individuals responsible for overseeing and managing the overall execution of building construction projects.

2. Safety Engineers: 10 individuals tasked with implementing safety protocols, conducting risk assessments, and ensuring compliance with safety regulations on construction sites.

3. Site Engineers: 28 individuals responsible for supervising construction activities, coordinating subcontractors, and ensuring quality control at construction sites.

4. Foremen: 20 individuals who oversee specific tasks and activities on construction sites, such as managing laborers, coordinating materials, and ensuring adherence to project timelines.

5. Residential Engineers: 10 individuals specialized in the design, construction, and maintenance of residential buildings within the construction projects.

6. Daily Laborers: 30 individuals engaged in manual labor tasks on construction sites, including tasks such as excavation, masonry, carpentry, and general construction work.

The selection criteria for the building construction projects ensured a representative sample from both Arada and Lideta Sub Cities, with five ongoing projects selected from each sub-city, totaling 10 projects for the study (108 employees). This approach provided a comprehensive understanding of safety and health management practices across a diverse range of construction projects in Addis Ababa.

3.3 Sampling Technique and Sample Size

The study employs a non-probability convenience sampling method, where samples are chosen from the target population based on their accessibility to the researcher. The selection process occur after participants are briefed on their rights to participate in the study, as well as the procedures, benefits, and purpose of the research, before distributing the questionnaires.

3.3.1 Sample size

The sample size has determined using the mathematical formula, which was developed by Tara Yamane (1967) for calculating sample sizes from a given population.

$n = N/(1+N(e^2)$

Where:

- n = sample size
- N = total population
- e = margin of error

Substituting the given values:

$n = 108/(1+108×0.05)^2)$

$n = 108/(1+108×0.0025)$

$n = 108/(1+0.27)$

$n = 108/1.27$

$n = 85.04$

So, the sample size using the Taro Yamane method for a total population of 108 and a margin of error of 5% is approximately 85.

3.4 Type and Sources of Data

Both primary and secondary sources utilized in this study. Primary sources are obtained directly through self-observations, interviews, and questionnaires, enabling firsthand data collection. Secondary sources, on the other hand, are gathered from various published and unpublished works related to the research topic, providing additional context and insights from existing literature.

3.5 Data Collection Methods

The primary data essential for this research gathered from employees involved in building construction projects using a structured questionnaire. The questionnaires incorporate both closed-ended and open-ended questions to capture quantitative insights into safety and health management practices.

- Closed-ended questions: These questions designed to collect quantitative data on participants' perceptions, attitudes, and experiences regarding safety protocols, hazard identification, compliance with regulations, and incident reporting. Respondents were asked to rate their agreement with statements using a Likert rating scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) and from 1 (High) to 4(Insignificant).
- Open-ended questions: These questions allow participants to provide detailed explanations, examples, and suggestions related to safety and health management practices.

Additionally, secondary data were collected from project safety and health manuals, as well as reports from relevant offices and organizations. These documents provides valuable insights into established safety protocols, incident records, regulatory compliance, and past initiatives aimed at enhancing safety and health in building construction projects.

By combining data collection methods from both primary sources (employees' responses) and secondary sources (project documentation), this study obtain a comprehensive understanding of safety and health management practices within the target construction projects in the Arada and Lideta sub-city areas.

3.6 Data analysis

The data collected for this study were carefully organized and prepared for analysis to ensure accuracy and reliability. Structured questionnaires were administered to participants, and the responses were systematically reviewed, coded, and entered into IBM SPSS 27 (Statistical Package for the Social Sciences) software for quantitative analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize the key findings and identify trends in the responses.

Data quality was ensured through thorough cross-checking during the entry process to minimize errors. Additionally, data were categorized based on thematic areas aligned with the study objectives, facilitating a structured analysis of variables such as safety culture, resource availability, and regulatory compliance. The insights derived from this process provided a clear understanding of the current safety and health management practices in the construction projects under investigation.

3.7 Reliability

In this research, ensuring the reliability of the data collection instruments is paramount to producing valid and consistent results. Reliability refers to the degree to which an instrument consistently measures a construct, providing stable and consistent outcomes over repeated applications. To assess the reliability of the survey instruments used in this study, the Cronbach's alpha test has employed.

Cronbach's alpha is a widely recognized statistical tool for measuring internal consistency reliability. It assesses how closely related a set of items are as a group, providing an index ranging from 0 to 1, where higher values indicate greater reliability (Tavakol & Dennick, 2011). A Cronbach's alpha coefficient of 0.70 or above is generally considered acceptable, indicating that the survey items reliably measure the underlying construct of interest (Nunnally & Bernstein, 1994).

Before distributing the final questionnaire to respondents for data collection, it was reviewed by the research advisor. A pilot survey involving 20 participants was then conducted to test and evaluate the validity and reliability of the questions. Feedback from the pilot survey was incorporated to refine the questionnaire and improve survey techniques.

The generally accepted limit for Cronbach's Alpha is a value greater than 0.7. As indicated in the figure below, all the calculated results exceed this limit, confirming the reliability of the data.

Table 3.1 Cronbach's Alpha Test

Reliability Statistics			
Questionnaire No.	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Section 4	.988	.988	9
Section 5	.728	.736	15

Source: own survey results, 2024

3.8 Validity

In research, validity refers to the extent to which an instrument measures what it is intended to measure, ensuring the accuracy and credibility of the study's findings (Creswell & Creswell,

2018). Before distributing the questionnaires and conducting interviews, the research advisor reviewed and approved the instruments, and feedback was obtained from selected construction professionals. To ensure validity, the researcher incorporated theoretical considerations and evaluated the appropriateness of the measuring instruments used.

3.9 Ethical considerations

The ethical considerations for this research on safety and health management practices in building construction projects are paramount. Informed consent obtained from all participants, ensuring that they understand the purpose of the research, their involvement, and any potential risks or benefits. Participants are assured of confidentiality and anonymity, with their personal information kept secure and only accessible to authorized members of the research team.

Furthermore, the research strives to minimize any potential harm or discomfort to participants. This includes ensuring that survey questions and interview protocols are sensitive and respectful, avoiding any intrusive or offensive inquiries. Additionally, participants will have the option to withdraw from the study at any time without consequence.

Transparency and honesty were upheld throughout the research process, with any conflicts of interest or biases disclosed upfront. Results are reported accurately and objectively, without manipulation or distortion, to maintain the integrity of the findings.

Lastly, the research aim to contribute positively to the field of safety and health management in building construction projects, with the ultimate goal of improving practices and promoting the well-being of workers and stakeholders. By upholding these ethical considerations, the research endeavors to uphold the highest standards of integrity, respect, and responsibility in its pursuit of knowledge and understanding.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATIONS

This chapter focuses on the analysis and interpretation of the data collected for the study. The data analysis is organized and presented in alignment with the study's objectives. The collected data was edited, coded, and entered into SPSS statistical software for analysis. Descriptive statistics were used to analyze the data, the results are presented in charts, tables, with frequency distributions, mean values, and standard deviations computed. A total of 85 questionnaires were distributed to employees working on the selected construction projects, and all 85 were properly completed and returned, resulting in a 100% response rate.

4.1 Demographic Characteristics of Respondents

This section presents the demographic characteristics of the study's respondents. The demographic data was analyzed to assess its implications for the data collection instrument, particularly the respondents' ability to understand the requirements of the instrument and provide well-informed responses. The analysis covers demographic factors such as gender, age group, educational qualifications, work experience, employment pattern, respondents' positions, and the location of the projects

4.1.1 Sex composition of Respondents

Sex
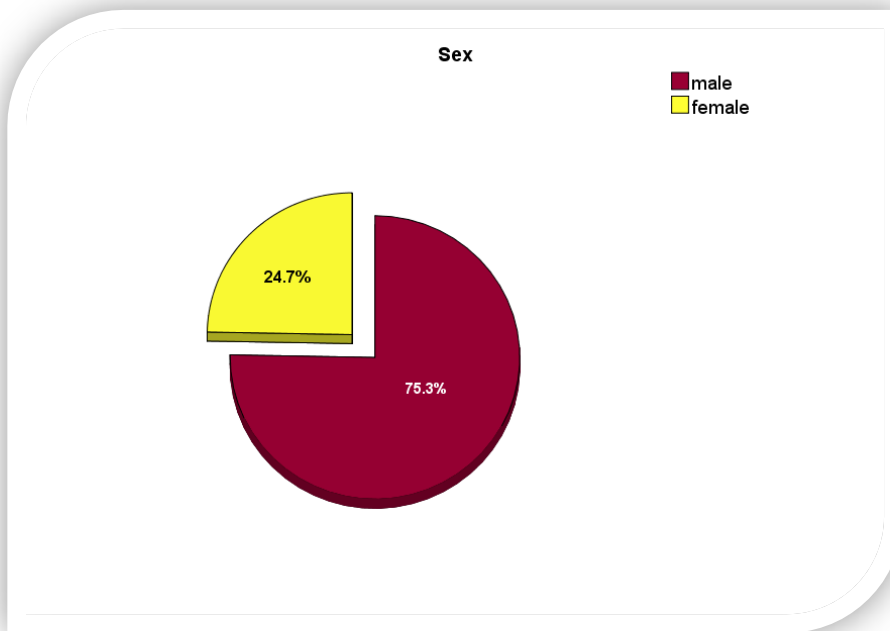
Figure 4.1 Sex composition of Respondents

Source: Questionnaire survey, 2024

The data in figure 4.1 show that 24.7% of the respondents are female, while 75.3% are male. This significant gender imbalance suggests that the construction industry, at least in the context of this study, is male-dominated. The underrepresentation of women could indicate potential barriers to female participation in construction roles, which may be influenced by cultural, social, or industry-specific factors. This gender disparity may also affect the perspectives gathered in the study, as safety and health management practices might be experienced or prioritized differently across genders. Therefore, this data highlights the importance of considering gender-specific needs and challenges in safety and health management in the construction sector.
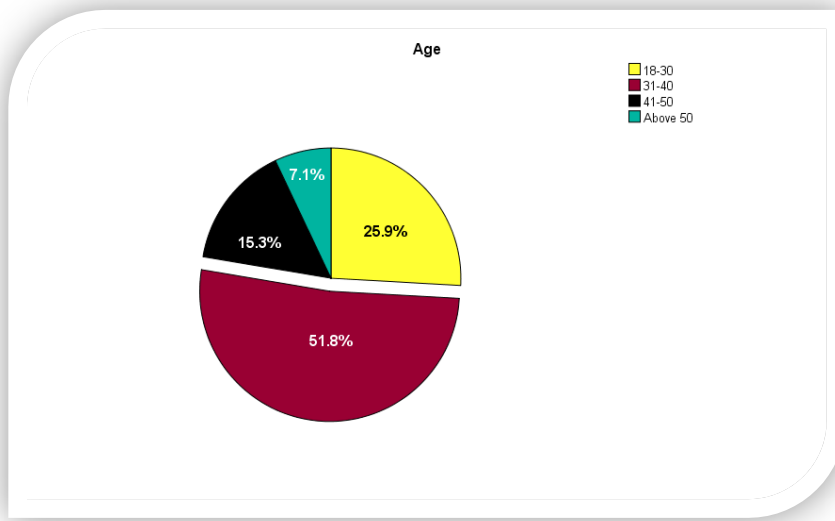
Figure 4.2 Age of the respondents

Source: Questionnaire survey, 2024

The age distribution of respondents indicates that the majority (51.8%) fall within 31-40 age range, followed by 25.9% in the age group of 18-30 , 15.3% in the age group of 41-50 , and only 7.1% are above 50 years old. This suggests that the workforce in the construction projects studied is relatively young to middle-aged, with most workers in their prime working years.

The high percentage of workers in the 31-40 age group may imply that this is the age range where individuals are most experienced and active in their careers, particularly in the demanding field of construction. The lower representation of individuals above 50 could indicate a trend of earlier exit from the physically demanding roles common in construction, or fewer opportunities for older workers.

This age distribution may also affect safety and health management practices. Younger workers may have less experience but more physical stamina, while middle-aged workers might have greater expertise and leadership roles. Understanding these dynamics can help tailor safety training and risk management strategies to different age groups, ensuring all workers' needs and challenges are addressed effectively.

4.1.3 Job Position of the Respondents
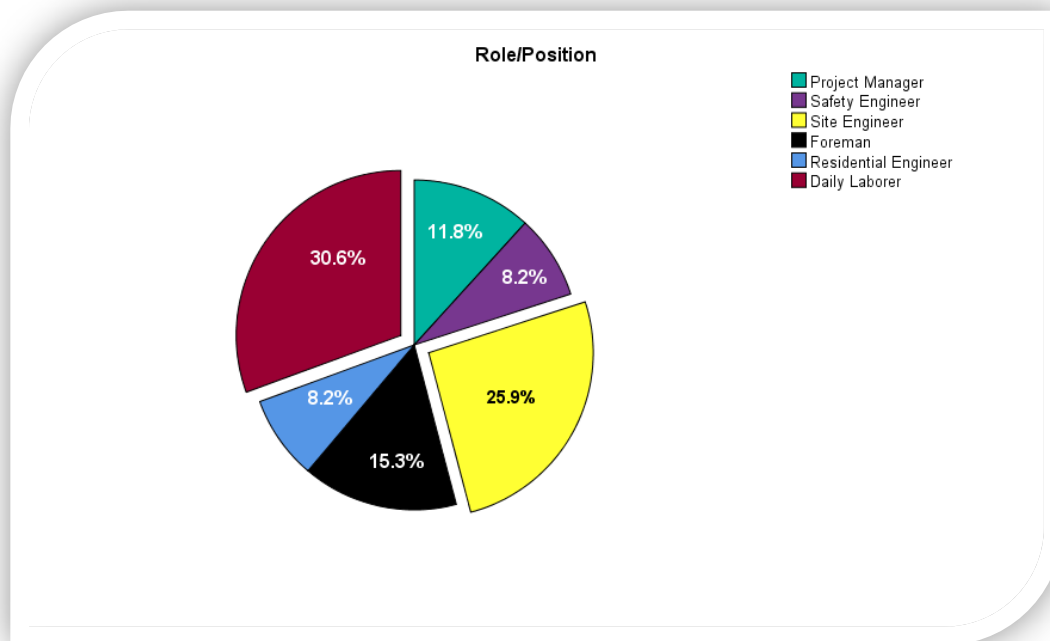
Figure 4.3 Job position of the Respondents

Source: Questionnaire survey, 2024

The data in Figure 4.3 present the distribution of job positions among respondents. Accordingly, about 11.8% are Project Managers, 8.2% are Safety Engineers, 25.9% are Site Engineers, 15.3% are Foremen, 8.2% are Residential Engineers, and the largest group, 30.6%, is Daily Laborers.

This distribution highlights that the majority of respondents hold technical and operational roles, with Daily Laborers and Site Engineers making up over half of the total respondents (30.6% and 25.9%, respectively). Daily Laborers, as the largest group, are likely those most directly exposed to physical risks on-site, which makes their input crucial when assessing safety and health practices. Site Engineers, who play key roles in project execution, also represent a significant portion of the workforce, likely reflecting their involvement in on-site decision-making and risk management.

Figure 4.4 Education status of the Respondents

Source: Questionnaire survey, 2024

The educational status of respondents reveals that 45.9% hold a Bachelor's degree, 23.5% have a Master's degree, and the remaining 30.6% have completed only primary or high school education.

This distribution indicates that the workforce in the construction projects surveyed is educated, with nearly 70% having at least a Bachelor's degree. The significant proportion of respondents with higher education (Bachelor's and Master's degrees) suggests that many individuals in the industry, especially in professional roles like project managers and engineers, are well-educated and likely possess the technical and theoretical knowledge needed for managing complex construction processes, including safety and health practices.

The fact that about 30.6% of respondents with only primary or high school education likely represents individuals in more labor-intensive roles, such as daily laborers or supervisors. This group may have less formal education but greater hands-on experience, which is valuable in identifying practical safety risks in daily operations. However, the lower level of formal

education in this group may also suggest potential challenges in understanding and adhering to technical safety standards or participating in advanced safety training programs.

4.1.5 Work Experience of the Respondents
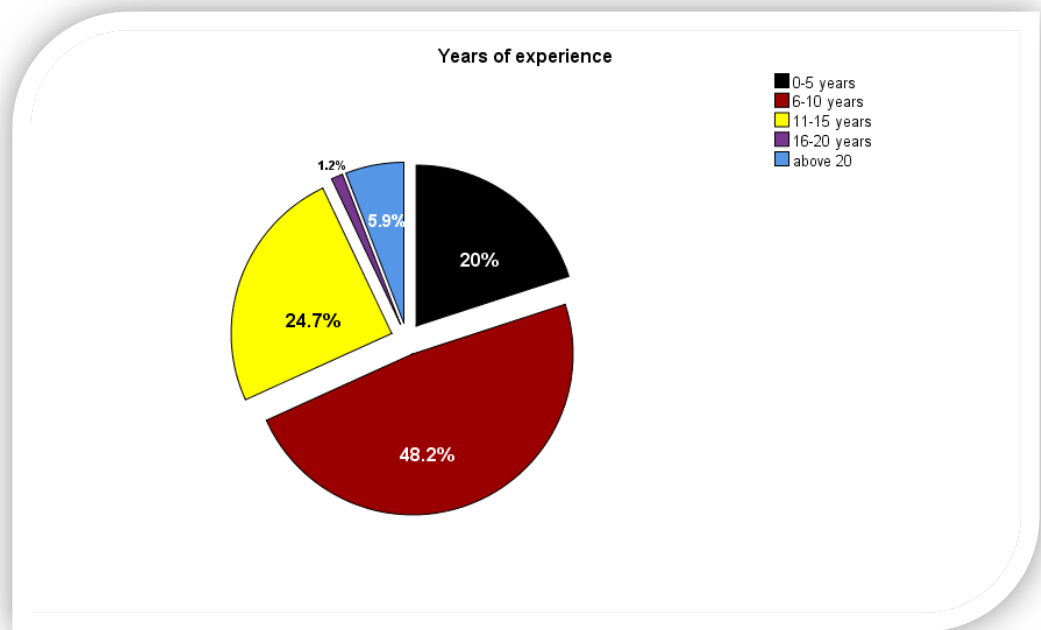
Figure 4.5 Work Experiences of the Respondents

Source: Questionnaire survey, 2024

The distribution of respondents' years of experience shows that about 48.2% have 6-10 years of experience, followed by 24.7% with 11-15 years, 20% with 0-5 years, 1.2% with 16-20 years, and 5.9% with over 20 years of experience.

This data indicates that the majority of the workforce in these construction projects has a moderate level of experience, with nearly half of the respondents (48.2%) having between 6 to 10 years of experience. This suggests that most workers are in the middle of their careers, likely possessing a solid mix of practical knowledge and technical expertise that is crucial for both operational efficiency and adherence to safety and health management practices.

The 20% of respondents with 0-5 years of experience represents newer entrants to the industry, who may still be developing the skills and understanding necessary for implementing effective

safety protocols. This group may require more guidance and training to ensure they are fully aware of safety standards and procedures.

Smaller but significant portions of respondents (24.7%) have 11-15 years of experience, likely bringing a deeper level of expertise and familiarity with safety challenges in construction. However, the relatively low percentage of respondents with over 15 years of experience (1.2% with 16-20 years and 5.9% with above 20 years) could suggest that there is either a trend of turnover or that fewer long-term professionals remain active in these projects, potentially limiting the benefit of seasoned expertise in safety and health management.

This mix of experience levels highlights the need for a comprehensive approach to safety and health management that accounts for the varying levels of knowledge and experience across the workforce, ensuring that both newer and more seasoned workers are effectively engaged in promoting a safe construction environment.

4.1.6 Employment pattern of the Respondents
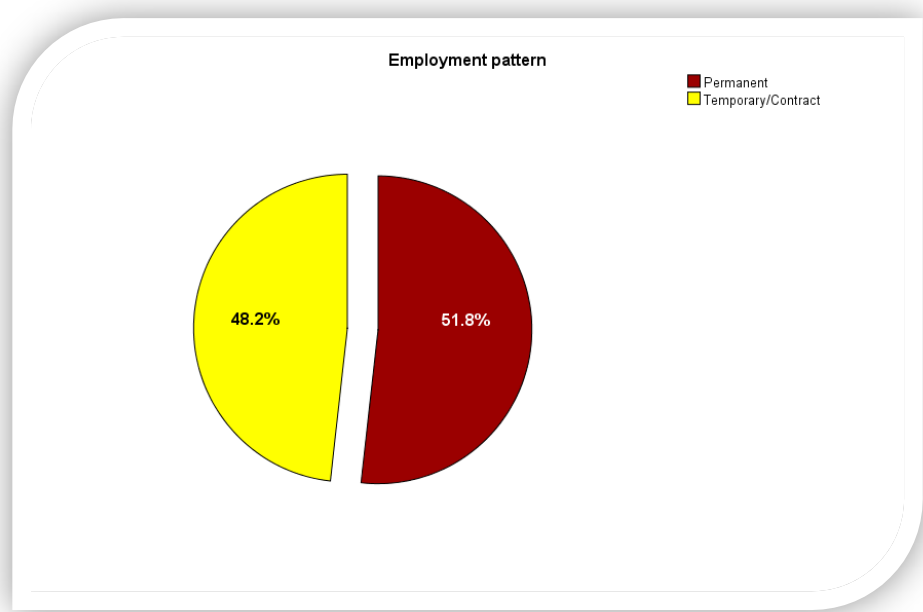
Figure 4.5 Employment patterns of the Respondents

Source: Questionnaire survey, 2024

The data on employment patterns reveals that 51.8% of the respondents are employed on a permanent basis, while 48.2% are temporary or contract workers.

This nearly equal split between permanent and temporary/contract employees indicates a diverse workforce structure within the building construction projects. The high percentage of temporary or contract workers (48.2%) is typical in the construction industry, where labor demand can fluctuate based on project timelines and needs. Temporary workers might be more vulnerable to workplace hazards due to shorter employment periods, which may limit their exposure to safety training or reduce their familiarity with project-specific safety protocols.

In contrast, permanent employees (51.8%) likely have more stable roles, offering them more consistent access to safety training programs, greater familiarity with organizational safety policies, and potentially stronger engagement with long-term health and safety goals. However, the presence of a significant temporary workforce suggests that safety and health management practices need to be adaptable, ensuring that even short-term workers are adequately trained and informed about safety procedures from the moment they join a project.

This balance between permanent and temporary workers highlights the need for tailored safety strategies to ensure that both groups, despite their differing employment durations, are equally protected and aware of safety protocols.

4.2 Safety culture in building construction projects

Safety culture in building construction projects is an essential aspect of ensuring a safe working environment, minimizing accidents, and promoting a commitment to health and safety practices among all workers. In the construction industry, where workers often face high-risk situations, establishing a strong safety culture is vital to achieving a safe workplace and preventing injuries or fatalities.

4.2.1 Data related to Safety culture in building construction projects

Table 4.1 Data related to Safety culture in building construction projects.

Statements	Response					Total
	Always	Often	Sometimes	Rarely	Never	
Frequency of Safety Meetings Conducted on Site	4(4.7)	32(37.6)	17(20)	32(37.6)	0	85(100)
Encouragement to Report Unsafe Conditions or Behaviors	4(4.7)	32(37.6)	15(17.6)	34(40)	0	85(100)
Regular Monitoring and Evaluation of Worker Safety	19(22.4)	13(15.3)	17(20)	36(42.4)	0	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

Only a small percentage (4.7%) reported that safety meetings are always conducted on the site, while the majority of respondents indicated that these meetings are held "often" (37.6%) or "rarely" (37.6%). This split in responses suggests that while safety meetings do occur, they may not be as frequent or regular as is ideal for maintaining a strong safety culture. The inconsistency in meetings could lead to lapses in safety communication and awareness, as not all workers are regularly engaged in discussions about safety procedures and protocols.

The encouragement to report unsafe conditions or behaviors also appears inconsistent. While 4.7% of respondents feel they are always encouraged, 37.6% said they are "often" encouraged, and a notable 40% reported they are only "rarely" encouraged. This lack of consistent encouragement may lead to underreporting of unsafe conditions by way of reducing the ability of management to address and mitigate hazards effectively. This will lead for the development of organizational culture that does not fully promote worker involvement and prevent the identification of potential safety risks.

The monitoring and evaluation of worker safety seem to occur inconsistently, with only 22.4% of respondents indicating that it is done "always." A significant portion of respondents (42.4%) reported that safety monitoring happens "rarely," suggesting a potential gap in proactive safety management practices. Regular monitoring and evaluation are critical to identifying and addressing potential hazards before they lead to incidents. The irregularity in this practice may mean that emerging risks go unnoticed, placing workers at greater risk.

4.2.2 Respondent opinions towards Importance of safety on site

Table 4.2 Respondent opinions towards Importance of safety on site

Statements	Response				Total
	Very important	Important	Not important	Neutral	
Importance of safety on site	54(63.5)	31(36.5)	0	0	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

The data in table 4.2 indicate that all respondents recognize the importance of safety on construction sites, with a significant majority (63.5%) considering it "very important" and the remaining 36.5% viewing it as "important." The lack of "not important" or "neutral" responses highlights a universal acknowledgment of safety's critical role in the work environment. This is a positive finding, suggesting that there is a strong safety awareness among workers and a shared commitment to maintaining a safe working environment.

4.2.3 Respondent opinions towards communication of safety policies and procedures

Table 4.3 Respondent opinions towards communication of safety policies and procedures

Statements	Response				Total
	Very clear	Clear	Unclear	Very unclear	
communication of safety policies and procedures	4(4.7)	34(40)	44(51.8)	3(3.5)	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

More than half of the respondents (51.8%) find the communication of safety policies and procedures to be "unclear," with an additional 3.5% stating it is "very unclear." Only 4.7% rated the communication as "very clear," while 40% feel it is "clear." This lack of clarity in communicating safety policies may lead to confusion, misunderstandings, and potentially unsafe practices, as workers may be unsure of specific guidelines or expectations.

4.2.4 Respondent opinions towards Frequency of safety rules and procedure updated on site

Table 4.4 Respondent opinions towards Frequency of safety rules and procedure updated on site

Statements	Response				Total
	Occasionally	Rarely	Never	Not sure	
Frequency of safety rules and procedure updated on site	39(45.9)	44(51.8)	2(2.3%)	0	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

The majority of respondents (51.8%) reported that safety rules and procedures are "rarely" updated, while an additional 45.9% indicated they are updated "occasionally." Only a minimal 2.3% indicated that updates are "never" made, and no respondents were unsure about the update frequency.

This data suggests that updates to safety protocols on construction sites are infrequent, which can be problematic given the dynamic and evolving nature of construction environments where new hazards can emerge frequently. Without regular updates, safety rules may fail to address current risks, leaving workers vulnerable to unmitigated hazards.

4.2.5 Respondent opinions towards incentive or recognition for employees who demonstrate good safety practices

Table 4.5 Respondent opinions towards incentive or recognition for employees who demonstrate good safety practices

Statements	Response		Not sure	Total
	Yes	No		
Are there incentives or recognition for employees who demonstrate good safety practices?	23(27.1)	55(64.7)	7(8.2)	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

The majority of respondents (64.7%) reported that there are no incentives or recognition for employees who demonstrate good safety practices, with only 27.1% indicating the presence of such incentives, and 8.2% unsure. This lack of positive reinforcement for safe behavior may hinder the development of a proactive safety culture on construction sites.

The absence of incentives or recognition programs can lead to reduced motivation for employees to consistently engage in safe practices. Incentives and recognition are key elements in reinforcing safe behavior, as they provide tangible and psychological rewards for adhering to

safety protocols. Without these, workers may feel less valued for their efforts in maintaining a safe work environment, potentially diminishing adherence to safety practices over time.

4.2.6 Respondent opinions towards rate of the overall safety culture on their construction site

Table 4.6 Respondent opinions towards rate of the overall safety culture on their construction site

Statements	Response				Total
	Excellent	Good	Average	Poor	
How would you rate the overall safety culture on your construction site?	4(4.7)	32(37.6)	12(14.1)	37(43.5)	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

As indicated in Table 4.6, the largest portion of respondents (43.5%) rated the safety culture on their construction site as "poor," with only 4.7% rating it as "excellent." This stark contrast suggests a substantial gap between the ideal safety environment and the reality experienced by most workers. While 37.6% rated the culture as "good," the significant proportion of "poor" and "average" ratings (57.6% combined) indicates that many workers view safety culture as lacking.

This data implies that there are considerable deficiencies in the existing safety culture that likely impact adherence to safety practices and risk management on-site. Poor safety culture can lead to increased accidents, low morale, and reduced productivity, as employees may not feel adequately supported or protected. Moreover, a weak safety culture can discourage workers from reporting unsafe practices, diminish the effectiveness of safety protocols, and hinder the consistent application of safety policies.

4.3 Health and safety system in the project

This section delves into examining respondents' views on various aspects of health and safety systems, including the frequency of safety meetings, communication of safety policies,

availability of training, and monitoring practices. By examining these responses, we can identify potential strengths and weaknesses within the existing health and safety systems, determine areas for improvement, and assess the overall safety culture on-site. The findings offer a comprehensive view of employees' experiences and perceptions, which can inform recommendations to enhance safety practices and ensure a more secure and healthy work environment. This analysis is essential for understanding the alignment between safety policies and on-site practices, ultimately contributing to safer project execution and reduced risk for workers.

4.3.1 Management commitment to safety

Table 4.7 Management commitment to safety

Statement	Response		Total
	Yes	No	
Do you feel that management is committed to safety?	38(44.7)	47(55.3)	85(100)
Reason for "No" answers			
A. Lack of interest	4(4.7)		
B. Focus on cost reduction	19(22.4)		
C. Lack of awareness	24(28.2)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

More than half of the respondents (55.3%) feel that management is not sufficiently committed to safety on the construction site, with a predominant view that a lack of awareness (28.2%) and

focus on cost reduction (22.4%) are the main reasons behind this perception. A smaller segment attributes this perception to management's lack of interest (4.7%).

This data suggests that a significant portion of the workforce perceives safety as secondary to other project priorities, particularly cost efficiency. When management prioritizes cost cutting over safety, it can lead to diminished morale, unsafe practices, and a heightened risk of accidents, as workers may feel pressured to prioritize productivity over adherence to safety protocols. Additionally, the "lack of awareness" response implies that some managers may not fully understand the importance of active safety involvement, possibly resulting in inadequate communication, insufficient training, or infrequent policy updates.

4.3.2 Safety meetings regularity

Table 4.8 Safety meetings regularity

Statement	Response		Total
	Yes	No	
Are safety meetings conducted regularly on your site?	37(43.5)	48(56.5)	85(100)
Reason for "No" answers			
A. lack of time	29(34.1)		
B. lack of management support	19(22.4)		
C. lack of organization	0		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

The majority of respondents (56.5%) indicate that safety meetings are not held regularly on their sites, with "lack of time" (34.1%) being the primary reason, followed by a "lack of management

support" (22.4%). The absence of responses for "lack of organization" or other reasons suggests that the issue lies primarily with prioritization rather than logistical or organizational factors.

The predominance of "lack of time" as a reason indicates that safety meetings might be seen as a secondary activity, possibly due to tight project schedules or a focus on productivity over safety discussions. This prioritization can lead to a reactive approach to safety rather than a proactive one, as regular safety meetings are crucial for identifying and mitigating risks, updating workers on new safety protocols, and fostering open communication about potential hazards.

The lack of management support (22.4%) further emphasizes a potential gap in leadership commitment to safety. When management does not actively support or prioritize safety meetings, it can signal to employees that safety is not a core value of the organization, potentially resulting in decreased adherence to safety protocols and a weakened safety culture.

4.3.3 Safety policies and procedures communication

Table 4.9 Safety policies and procedures communication

Statement	Response		Total
	Yes	No	
Are safety policies and procedures clearly communicated to all employees?	38(44.7)	47(55.3)	85(100)
Reason for "No" answers			
A. Poor communication channels	30(35.3)		
B. Language barriers	4(4.7)		
C. Lack of training	13(15.3)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

Over half of the respondents (55.3%) perceive that safety policies and procedures are not effectively communicated to all employees, with "poor communication channels" being the most commonly cited reason (35.3%). This response suggests that existing methods for conveying safety information may not be accessible or effective for all workers, possibly due to unclear messaging, inconsistent dissemination of information, or lack of direct engagement with employees. Without reliable communication channels, critical safety information may not reach all team members, increasing the likelihood of misunderstandings and unsafe practices.

The second most frequent reason, "lack of training" (15.3%), points to a deficiency in structured programs that educate employees on safety policies and procedures. Insufficient training can lead to misunderstandings or unfamiliarity with safety protocols, influencing adherence and potentially compromising site safety. Addressing this issue could involve implementing more comprehensive training sessions tailored to various levels of workers, ensuring that all team members fully understand and can apply safety procedures.

"Language barriers," though less commonly reported (4.7%), also present an obstacle to effective communication, especially in diverse work environments where employees may have varying levels of proficiency in the primary language used on-site. This issue could be mitigated by providing multilingual safety materials or appointing bilingual safety officers to bridge any communication gaps.

4.3.4 Safety vs. Project Deadlines and Cost Savings

Table 4.10 Safety vs. Project Deadlines and Cost Savings

Statement	Yes	No	Total
Do you believe that safety is prioritized over project deadlines and cost savings?	19(22.4)	66(77.6)	85(100)
Reason for "No" answers			
A. Pressure to meet deadlines	15(17.6)		
B. Budget constraints	32(37.6)		
C. Lack of management focus	19(22.4)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A notable 77.6% of respondents believe that safety is not prioritized over project deadlines and cost savings. The most common reason cited is "budget constraints" (37.6%), suggesting that financial limitations often impact the resources allocated for safety measures. This could mean that the cost of safety equipment, training, or safety personnel may be perceived as expendable in favor of budget efficiency. When financial limitations are prioritized, safety standards can be compromised, potentially leading to accidents, injuries, or other costly incidents in the long term.

"Pressure to meet deadlines" (17.6%) indicates that tight project schedules also play a significant role in deprioritizing safety. Under high pressure to complete work within specified timeframes, employees may feel compelled to work faster, sometimes at the expense of thorough safety checks or compliance with safety protocols. This pressure can lead to a culture where speed and productivity are valued over adherence to safety standards, heightening the risk of accidents.

"Lack of management focus" (22.4%) further reflects a need for stronger leadership commitment to safety. Without active support and prioritization from management, safety policies may be

implemented inconsistently, or employees may receive mixed messages regarding the importance of safety compared to productivity.

4.3.5 Encouragement to Report Unsafe Conditions or Behaviors

Table 4.11 Encouragement to Report Unsafe Conditions or Behaviors

Statement	Yes	No	Total
Do you feel encouraged to report unsafe conditions or behaviors?	57(67.1)	28(32.9)	85(100)
Reason for "No" answers			
A. Fear of retaliation	4(4.7)		
B. Belief that nothing will change	7(8.2)		
C. Lack of reporting mechanism	17(20)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A majority of respondents (67.1%) feel encouraged to report unsafe conditions or behaviors, which suggests that there is an established openness to addressing safety concerns within the work environment. However, nearly a third of respondents (32.9%) do not feel the same, indicating that barriers still exist.

The most commonly cited reason among those who feel discouraged is the "lack of a reporting mechanism" (20%). This points to a structural issue where workers may not know how to report issues, or there may be no straightforward or accessible way to do so. Implementing or improving reporting mechanisms, such as anonymous reporting tools or open communication channels, could help address this barrier and encourage more proactive safety reporting.

The "belief that nothing will change" (8.2%) suggests that some workers doubt the effectiveness of reporting, perhaps due to past experiences where reported issues went unaddressed. This

perception can discourage workers from taking the initiative to report unsafe conditions, reducing overall workplace safety. Addressing this belief requires visible actions from management to respond promptly and transparently to safety concerns, signaling to employees that their feedback leads to real changes.

Finally, a smaller percentage of respondents cited "fear of retaliation" (4.7%) as a reason for not reporting. While less common, this response is critical as it reflects a potential cultural or managerial issue where employees might worry about negative consequences for raising safety concerns. Cultivating a culture where safety reporting is valued and protected from any form of retaliation is essential for maintaining trust and ensuring worker safety.

4.3.6 Frequency of Hazard Identification and Risk Assessments on Site

Table 4.12 Frequency of Hazard Identification and Risk Assessments on Site

Statement	Yes	No	Total
Are regular hazard identification and risk assessments conducted on your site?	19(22.4)	66(77.6)	85(100)
Reason for "No" answers			
A. Lack of resources	10(11.8)		
B. Focus of expertise	25(29.4)		
C. Lack of time	31(36.4)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A significant 77.6% of respondents indicate that regular hazard identification and risk assessments are not conducted on their sites. This statistic points to potential gaps in preventive safety measures, which are crucial for reducing accidents and maintaining worker safety.

"Lack of time" was the most commonly cited reason (36.4%) for not conducting regular risk assessments. This response suggests that risk assessments may be viewed as time-consuming and, as a result, are deprioritized in favor of tasks perceived as more urgent. However, this approach can lead to preventable incidents, as hazard identification and risk assessments play a crucial role in anticipating and mitigating risks. Allocating specific time for safety assessments as part of the workflow could help address this issue.

"Focus of expertise" (29.4%) reflects a lack of specialized knowledge on the site, suggesting that employees may not be adequately trained or skilled in identifying potential hazards or conducting risk assessments. This finding emphasizes the importance of either recruiting skilled safety personnel or providing employees with specialized training in hazard identification and assessment, ensuring that safety standards are consistently upheld.

The "lack of resources" response (11.8%) highlights resource constraints that prevent regular risk assessments, potentially due to budget limitations, lack of necessary equipment, or insufficient safety personnel. Addressing this challenge requires investing in safety resources and ensuring that regular assessments are feasible within the project budget and schedule.

4.3.7 Availability of Appropriate Personal Protective Equipment (PPE)

Table 4.13 Availability of Appropriate Personal Protective Equipment (PPE)

Statement	Yes	No	Total
Do you have access to appropriate personal protective equipment (PPE)?	57(67.1)	28(32.9%)	85(100)
Reason for "No" answers			
A. Insufficient supply	25(29.4)		
B. Poor quality	0		
C. Lack of awareness	3(3.5)		

Note: Numbers in () represents percentage (%)

A majority (67.1%) of respondents have access to PPE, suggesting that most sites make an effort to provide safety gear to their workers. However, the remaining 32.9% who report not having access to appropriate PPE underscores a significant safety issue, as PPE is critical in reducing the risk of injuries and ensuring worker safety.

The most common reason for lack of access, "insufficient supply" (29.4%), suggests that while PPE may be available, it is not provided consistently or in adequate quantities. This could be due to logistical issues, budgeting constraints, or poor planning, and it highlights the need for regular PPE supply assessments to ensure availability for all workers.

The response of "lack of awareness" (3.5%) among a smaller portion of respondents points to a potential gap in understanding PPE requirements, indicating that some workers may not recognize the importance of using PPE or may be unaware of how to access it. Addressing this gap could involve increasing awareness campaigns and conducting training sessions on the use of PPE to reinforce its significance in workplace safety.

Interestingly, "poor quality" was not cited as a reason, suggesting that when PPE is provided, it generally meets quality standards. This finding indicates that the primary barrier to PPE usage on these sites is supply rather than quality.

4.3.8 Frequency of Safety Inspections on Site

Table 4.14 Frequency of Safety Inspections on Site

Statement	Yes	No	Total
Are safety inspections conducted regularly on your site?	25(29.4)	60(70.6)	85(100)
Reason for "No" answers			
A. Lack of personnel	19(22.4)		
B. Lack of planning	5(5.8)		
C. Lack of management support	36(42.4)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

With 70.6% of respondents reporting that regular safety inspections are not conducted on their sites, it is clear that consistent oversight and adherence to safety protocols are lacking. Regular safety inspections are fundamental to identifying hazards and ensuring compliance with safety standards, making this deficiency a critical risk factor in workplace safety.

The predominant reason for the lack of inspections, cited by 42.4% of respondents, is "lack of management support." This suggests that even if the necessity of safety inspections is recognized, management may not prioritize or allocate resources for these inspections. This lack of support could stem from an emphasis on productivity over safety or from limited understanding of the benefits of regular safety checks. Addressing this issue may require management-level training to emphasize the importance of safety inspections and the potential long-term cost savings associated with preventing accidents.

"Lack of personnel," noted by 22.4% of respondents, points to staffing limitations that hinder the ability to conduct frequent safety inspections. This may indicate a need for hiring or designating dedicated safety personnel, as well as considering shared safety responsibilities across roles.

The "lack of planning" (5.8%) response highlights inadequate scheduling or organization around safety inspection routines, suggesting that safety checks are not systematically incorporated into the project workflow. Establishing a structured safety inspection schedule could help alleviate this issue, ensuring inspections are seen as integral to project timelines.

4.3.9 Incidents and Near Miss Reporting and Investigation Effectiveness

Table 4.15 Incidents and Near Miss Reporting and Investigation Effectiveness

Statement	Yes	No	Total
Are incidents and near misses reported and investigated properly?	30(35.3)	55(64.7)	85(100)
Reason for "No" answers			
A. Lack of reporting system	12(14.1)		
B. Fear of blame	8(9.4)		
C. Lack of follow-up	35(41.2)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

With only 35.3% of respondents indicating that incidents and near misses are adequately reported and investigated, it is clear there is a significant breakdown in capturing and addressing safety-related events. Proper incident reporting and investigation are vital for identifying risks, preventing future incidents, and fostering a proactive safety culture.

The most common reason cited for not reporting or investigating incidents, by 41.2% of respondents, is "lack of follow-up." This suggests that even when incidents are reported, they are not systematically addressed; creating a sense, that reporting is ineffective. This lack of follow-up may discourage employees from reporting issues in the future and leads to a failure to learn from past incidents, potentially allowing risks to persist unaddressed.

"Lack of a reporting system" (14.1%) also highlights a structural barrier to effective safety practices, indicating that employees may not have clear or accessible mechanisms for reporting incidents or near misses. Implementing a user-friendly reporting system could make it easier for workers to document incidents, thereby improving safety tracking and risk assessment.

Additionally, "fear of blame" (9.4%) suggests that there may be a punitive culture surrounding incident reporting, which can further dissuade workers from speaking up. Addressing this issue would require shifting towards a no-blame safety culture where employees feel safe to report hazards or incidents without fear of negative repercussions.

4.3.10 Emergency Management Procedures on Site

Table 4.16 Emergency Management Procedures on Site

Statement	Yes	No	Total
Are there established procedures for managing emergencies on your site?	35(41.2)	50(58.8)	85(100)
Reason for "No" answers			
A. Lack of procedures	22(25.9)		
B. Focus of training	8(9.4)		
C. Lack of awareness	17(20)		
D. Others	3(3.5)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

With only 41.2% of respondents confirming the existence of established emergency management procedures, there is a concerning lack of preparedness for handling emergencies in construction projects. Proper emergency procedures are essential for protecting workers and mitigating

potential harm during unexpected events, such as accidents, natural disasters, or hazardous material spills.

The most commonly cited reason, "lack of procedures" (25.9%), suggests that these sites may not have predefined protocols for emergency scenarios. This absence of structured guidelines could lead to confusion or ineffective responses during an actual emergency, increasing the risk to worker safety.

The "lack of awareness" (20%) underscores the need for better communication and education regarding any existing emergency protocols. Even if procedures are in place, they are only effective if all personnel understand and are familiar with them. This gap indicates a potential failure in both communication and training, where workers may not have been adequately informed about the protocols.

"Lack of training" (9.4%) further supports the need for dedicated training programs to equip workers with the necessary skills to respond confidently to emergencies. Without regular and thorough training, even well documented procedures may not be properly followed during high-stress situations.

The presence of an "other" category (3.5%) may reflect additional unique site-specific issues, although these are less commonly cited.

4.3.11 Safety Training Received on This Project

Table 4.17 Safety Training Received on This Project

Statement	Yes	No	Total
Have you received safety training since starting work on this project?	66(77.6)	19(22.4)	85(100)
Reason for "No" answers			
A. No training provided	10(11.8)		
B. New employee	2(2.4)		
C. Lack of training programs	7(8.2)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A substantial majority (77.6%) of respondents have received safety training, which reflects a positive commitment to workplace safety practices. However, the 22.4% who reported not receiving any safety training indicate areas needing improvement, particularly in ensuring all workers are adequately prepared for on-site risks.

The most commonly cited reason for lack of training, "no training provided" (11.8%), implies a significant gap where some employees begin work without formal safety instruction. This lack of initial training is concerning, as untrained employees are at greater risk of injury and may inadvertently endanger others by not following established safety practices.

"Lack of training programs" (8.2%) suggests that, for some sites, structured safety training programs may not exist or are not consistently administered. This absence can result in significant safety vulnerabilities, as employees may lack critical knowledge on hazard identification, risk mitigation, and emergency response.

"New employee" status, cited by 2.4%, highlights the need for orientation programs that ensure new hires receive immediate safety training before starting work on-site. This measure could prevent preventable incidents and foster a culture of safety from the onset.

4.3.12 Frequency of Regular Safety Training Sessions

Table 4.18 Frequency of Regular Safety Training Sessions

Statement	Yes	No	Total
Are regular safety training sessions conducted?	38(44.7)	47(55.3)	85(100)
Reason for "No" answers			
A. Lack of trainers	13(15.3)		
B. Lack of budget	21(24.7)		
C. Lack of scheduling	13(15.3)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A significant majority (55.3%) of respondents indicated that regular safety training sessions are not conducted on-site. The most frequently cited reason, lack of budget (24.7%), implies that financial limitations are a major obstacle in implementing continuous safety training. This shortage of funding can limit the resources available for organizing, scheduling, and facilitating training sessions, compromising workforce safety and preparedness.

The lack of trainers (15.3%) further highlights the difficulty in maintaining a trained workforce, suggesting a gap in either internal or external support for qualified trainers. Without access to knowledgeable trainers, employees may not receive adequate training in the latest safety protocols, which could affect their capacity to respond effectively to risks.

Additionally, lack of scheduling (15.3%) suggests that, even if resources and trainers are available, logistical issues might still hinder regular training. Effective scheduling requires dedicated time allocations, often challenging in construction due to tight project timelines and demands. This lack of structured training schedules can prevent workers from fully benefiting from the necessary safety reinforcement.

4.3.13 Effectiveness and Adequacy of Safety Training

Table 4.19 Effectiveness and Adequacy of Safety Training

Statement	Yes	No	Total
Do you feel the safety training provided is adequate and effective?	27(31.8)	58(68.2)	85(100)
Reason for "No" answers			
A. Inadequate content	19(22.4)		
B. Poor delivery	7(8.2)		
C. Lack of practical examples	22(25.9)		
D. Others	10(11.8)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A significant majority (68.2%) of respondents felt that the safety training was not adequate or effective. This indicates a clear gap in the current training programs, which may have serious implications for worker safety and well-being.

Inadequate content (22.4%) was the most commonly cited reason for dissatisfaction, suggesting that the training materials may not cover all relevant safety issues or are not comprehensive enough. This highlights the need for more robust and detailed safety training content that addresses specific hazards and risks on the construction site.

Lack of practical examples (25.9%) is a critical concern, as construction workers often learn best through real-life scenarios. The absence of practical demonstrations may make it difficult for workers to relate the training to their actual work tasks, reducing the effectiveness of the learning experience.

Poor delivery (8.2%) indicates that even if the content is adequate, how the training is communicated is just as important. If the training is poorly delivered, it may fail to engage the workers, leading to poor retention and implementation of safety measures.

Others (11.8%) may include factors like inadequate training resources, lack of interaction during the training sessions, or insufficient time dedicated to safety training, all of which could further diminish the training's effectiveness.

4.3.14 Construction Site Emergency Preparedness

Table 4.20 Construction Site Emergency Preparedness

Statement	Yes	No	Total
Are you trained to handle emergencies on the construction site?	33(38.8)	52(61.2)	85(100)
Reason for "No" answers			
A. Lack of emergency training	41 (48.2)		
B. Lack of drills	6 (7.1)		
C. No emergency plans	5 (5.9)		

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

A majority (61.2%) of respondents reported that they have not been trained to handle emergencies on the construction site, which raises serious concerns about the readiness and safety preparedness of the workforce. This could increase the likelihood of poor responses to

accidents or emergencies, potentially leading to more severe consequences in the event of an incident.

Lack of emergency training (48.2%) is the primary reason why workers feel unprepared to handle emergencies. This indicates that many workers may not be familiar with the procedures to follow in case of an accident, which could lead to confusion or improper responses, further escalating the situation.

Lack of drills (7.1%) suggests that even if there are emergency procedures in place, they are not being regularly practiced. Emergency drills are essential for reinforcing the correct actions to take during an emergency. The lack of such drills may hinder workers' ability to react quickly and effectively in real-life situations.

No emergency plans (5.9%) indicate that some sites may not have established protocols or procedures for emergencies. This lack of structured planning further jeopardizes the safety of workers, as it means there are no clear guidelines to follow during an emergency.

4.3.15 Determining Responsibility for Industrial Accidents on Construction Sites
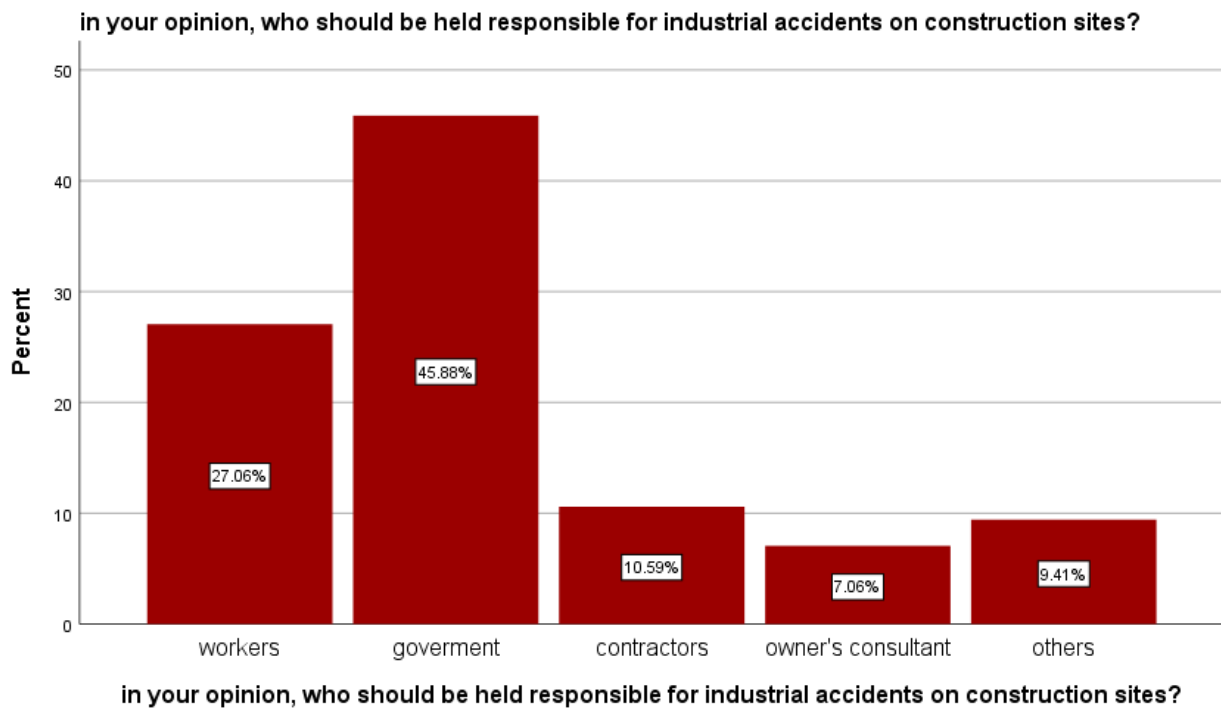
Figure 4.7 Determining Responsibility for Industrial Accidents on Construction Sites

The data reveals the following distribution of opinions on who should be held responsible for industrial accidents on construction sites:

Government (45.88%): A significant portion of respondents believes that the government should bear the primary responsibility for industrial accidents. This perspective likely stems from the expectation that the government is responsible for enforcing safety regulations, conducting inspections, and ensuring compliance. The high percentage suggests a perceived gap in oversight or enforcement mechanisms by regulatory bodies.

Workers (27.06%): Workers being held accountable could indicate the view that individuals directly involved in operations should adhere to safety protocols and take responsibility for their actions. However, this perspective may overlook systemic issues like inadequate training, insufficient protective equipment, or lack of proper supervision, which are often beyond the control of workers.

Contractors (10.59%): Contractors have a pivotal role in implementing safety standards on-site, and the relatively low percentage may reflect either a lack of direct accountability perceived by respondents or a belief that contractors operate within a framework shaped by others, such as government policies or owner instructions.

Owner's Consultant (7.06%): The role of the owner's consultant in ensuring safety compliance during the project appears to be viewed as minor by respondents. While consultants do oversee certain aspects of project execution, the responsibility for safety is often seen as being more directly tied to operational or regulatory roles.

Others (9.41%): This category may encompass shared responsibilities or other stakeholders, such as designers, suppliers, or even the community. It suggests a recognition that accidents often result from multiple factors and shared lapses rather than a single point of failure.

The study reflects the complexity of assigning responsibility for industrial accidents. While the government is seen as the primary entity responsible for ensuring safety through regulation and enforcement, contractors, workers, and consultants also play crucial roles. Effective safety

management requires collaboration among all stakeholders, with clear delineation of roles, responsibilities, and accountability.

4.4 Key challenges and barriers hindering the implementation of effective safety and health management practices

Table 4.21 Key challenges and barriers hindering the implementation of effective safety and health management practices

Likert Scale Response						
Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Effective communication about safety between management and workers	3(3.5)	44(51.8)	2(2.4)	28(32.9)	8(9.4)	85(100)
Sufficient resources(e.g., PPE) available for safety management	19(22.4)	8(9.4)	1(1.2)	40(47.1)	17(20)	85(100)
Employees are actively involved in safety programs and decision-making	24(28.2)	29(34.1)	2(2.4)	22(25.9)	8(9.4)	85(100)
There is adequate time allocated for safety related activities	11(12.9)	35(41.2)	3(3.5)	25(29.4)	11(12.9)	85(100)
There is adequate support from regulatory bodies to ensure safety compliance	24(28.2)	22(25.9)	4(4.7)	28(32.9)	7(8.2)	85(100)
Up-to-date safety information is readily	18(21.2)	29(34.1)	2(2.4)	25(29.4)	11(12.9)	85(100)

available to all employees					
Safety inspections are conducted regularly and thoroughly	12(14.1)	40(47.1)	1(1.2)	23(27.1)	7(10.6)	85(100)
There is adequate funding for all essential safety activities	30(35.3)	17(20)	13(15.3)	17(20)	8(9.4)	85(100)
Changes to safety procedures are welcomed and implemented smoothly	26(30.6)	30(35.3)	1(1.2)	18(21.2)	10(11.8)	85(100)

Note: Numbers in () represents percentage (%)

Source: Questionnaire survey, 2024

Table 4.22Mean and Standard deviation of Table 4.21

	1	2	3	4	5	6	7	8	9
Mean	2.929	3.329	2.541	2.882	2.671	2.788	2.729	2.482	2.482
SD	1.1730	1.4751	1.3849	1.3221	1.4006	1.4066	1.2946	1.3940	1.4194

Note: The means and standard deviations are organized in the same order as the statements listed in the table above.

Based on table 4.21 and table 4.22 the findings analyzed as follows:

1. Effective Communication about Safety

The results indicate that while a considerable percentage of respondents agree (32.9%) or strongly agree (9.4%) with the statement, a majority disagree (51.8%). This highlights a significant communication gap between management and workers, which may hinder the effective implementation of safety protocols.

2. Availability of Resources for Safety Management

With nearly half of the respondents (47.1%) agreeing that sufficient resources such as PPE are available, followed by 20% strongly agreeing, there is a positive perception. However, the notable disagreement (22.4%) suggests areas for improvement, particularly in consistent access to these resources.

3. Employee Involvement in Safety Programs

The data shows a predominant level of disagreement (28.2% strongly disagree, 34.1% disagree), indicating that employees feel inadequately involved in safety-related decision-making. This lack of engagement may lead to reduced ownership of safety practices.

4. Time Allocation for Safety Activities

Although some agreement (29.4%) exists, the majority either disagree (41.2%) or strongly disagree (12.9%) about adequate time being allocated for safety activities. This points to potential workload pressures or insufficient prioritization of safety-related initiatives.

5. Support from Regulatory Bodies

Respondents highlight mixed perceptions, with the highest proportions split between disagreement (28.2%) and agreement (32.9%). This suggests varying experiences with the support provided by regulatory bodies, which may be inconsistent or limited in scope.

6. Availability of Up-to-Date Safety Information

Approximately 34.1% disagree, followed by 29.4% agreeing that up-to-date safety information is accessible. This suggests a need for better dissemination and communication channels to ensure timely access to crucial safety updates.

7. Frequency and Thoroughness of Safety Inspections

The majority (47.1%) perceive that safety inspections are not conducted thoroughly or regularly, with only 27.1% agreeing. This could impact the organization's ability to identify and mitigate risks proactively.

8. Funding for Essential Safety Activities

A high level of disagreement (35.3%) regarding funding adequacy for safety activities reflects significant financial constraints or resource mismanagement, potentially limiting effective safety measures.

9. Smooth Implementation of Changes to Safety Procedures

The majority express dissatisfaction, with 30.6% strongly disagreeing and 35.3% disagreeing. This could indicate resistance to change, inadequate communication, or insufficient training on new procedures.

Mean and Standard Deviation Analysis

The mean scores across statements range between 2.482 and 3.329, indicating a general leaning towards disagreement or neutrality. Standard deviation values (ranging from 1.1730 to 1.4751) suggest considerable variability in responses, reflecting diverse perceptions and experiences among respondents.

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4.5 Primary safety and health risks in building construction projects

Table 4.23 Primary safety and health risks in building construction projects

Statement	Likert Scale Response				
	High	Medium	Low	Insignificant	Total
Falls from heights	82(96.5)	3(3.5)	0	0	85(100)
Slips, Trips, and Falls	74(87.1)	11(12.9)	0	0	85(100)
Struck by falling objects	55(64.7)	30(35.3)	0	0	85(100)
Electrocution	83(97.6)	2(2.4)	0	0	85(100)
Exposure to hazardous materials(e.g., asbestos, chemicals)	25(29.4)	58(68.2)	2(2.4)	0	85(100)
machinery and equipment accidents	54(63.5)	31(36.5)	0	0	85(100)
noise induced hearing loss	0	1(1.2)	52(61.2)	32(37.6)	85(100)
manual handling injuries(e.g., lifting, carrying)	1(1.2)	77(90.6)	7(8.2)	0	85(100)
confined space entry risks	0	29(34.1)	54(63.5)	2(2.4)	85(100)
fire and explosion hazards	58(68.2)	27(31.8)	0	0	85(100)

health risks from dust and fumes	0	36(42.4)	49(57.6)	0	85(100)
inadequate lighting	0	36(42.4)	49(57.6)	0	85(100)
weather related hazards(e.g., extreme heat, cold, rain)	0	15(17.6)	65(76.5)	5(5.9)	85(100)
psychosocial risks(e.g., stress, harassment)	0	1(1.2)	46(54.1)	38(44.7)	85(100)
poor housekeeping	0	17(20)	66(77.6)	2(2.4)	85(100)

Table 4.24 Mean and Standard deviation of Table 4.23

	1	2	3	4	5	6	7	8	9	10
Mean	1.035	1.129	1.353	1.024	1.729	1.365	3.365	2.071	2.682	1.318
SD	.1856	.3376	.4807	.1525	.4973	.4842	.5082	.3003	.5167	.4683

	11	12	13	14	15
Mean	2.576	2.635	2.882	3.435	2.824
SD	.4971	.5946	.4734	.5221	.4412

Note: The means and standard deviations are organized in the same order as the statements listed in the table above.

Based on table 4.23 and table 4.24 the findings analyzed as follows:

1. Key Safety Risks Identified

The results indicate that certain risks are overwhelmingly considered high, while others are perceived as moderate or low.

A. High-Risk Hazards

Several hazards are overwhelmingly rated as high-risk by the majority of respondents:

- **Electrocution (97.6%)** – The most significant concern, highlighting the need for strict electrical safety measures.
- **Falls from heights (96.5%)** – A major hazard in construction, reinforcing the importance of fall protection measures.
- **Slips, trips, and falls (87.1%)** – A frequent cause of workplace injuries that requires attention to site maintenance.
- **Fire and explosion hazards (68.2%)** – Significant due to the presence of flammable materials.
- **Struck by falling objects (64.7%)** – Indicates the importance of protective gear and proper securing of materials.

These findings suggest that effective preventive strategies, such as personal protective equipment (PPE), regular safety training, and strict adherence to safety guidelines, are essential in mitigating these risks.

B. Medium-Risk Hazards

Some hazards received a mixed response, with a majority rating them as medium-risk:

- **Manual handling injuries (90.6%)** – Proper equipment handling and regular maintenance are crucial for reducing accidents.
- **Exposure to hazardous materials (68.2%)** – Though only 29.4% see this as a high-risk issue, consistent monitoring and regulation are necessary.
- **Confined space entry risks (34.1%)** – While a minority (34.1%) view this as a medium risk, most respondents (63.5%) rate it as low risk.

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These findings highlight the importance of proper training, hazard assessments, and ensuring compliance with safety regulations.

C. Low-Risk Hazards

The following risks were predominantly rated as low:

> **Noise-induced hearing loss (61.2%)** – Although not viewed as a high-priority risk, prolonged exposure to high noise levels can have long-term health effects.
> **Manual handling injuries (90.6% rated medium-risk, 8.2% low)** – Suggests that ergonomic interventions can help minimize injuries.
> **Health risks from dust and fumes (57.6%)** – Requires further monitoring as prolonged exposure can lead to respiratory issues.

D. Insignificant Risks

The following hazards were rated as either low or insignificant:

> **Psychosocial risks (54.1% low, 44.7% insignificant)** – Stress, harassment, and mental health risks seem to be of less concern to workers.
> **Poor housekeeping (77.6% low, 20% medium)** – While not a major risk; poor housekeeping can contribute to accidents.

2. Statistical Insights

The mean scores of risk perception range from 1.024 (electrocution) to 3.435 (psychosocial risks), with lower values indicating a higher perceived risk. The standard deviations indicate the variation in responses, with relatively low variability for high-risk hazards (e.g., electrocution SD = 0.1525) and greater variability for less critical risks (e.g., psychosocial risks SD = 0.5221).

> **High-risk hazards (Mean ~ 1.0 - 1.3)**: Falls, electrocution, slips, and fire hazards.
> **Medium-risk hazards (Mean ~ 2.0 - 2.6)**: Hazardous materials, manual handling injuries.
> **Low-risk hazards (Mean ~ 2.8 - 3.4)**: Psychosocial risks, poor housekeeping, and inadequate lighting.

CHAPTER FIVE

MAIN FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Summary of Main Findings

The assessment of safety and health management practices in building construction projects across Arada and Lideta Sub-Cities identified several critical issues:

1. **Weak Safety Culture**: A pervasive lack of prioritization for safety over cost and deadlines, poor communication between management and workers, and insufficient involvement of employees in decision-making characterize a weak safety culture. This deficiency undermines proactive safety measures and discourages reporting unsafe conditions.

2. **Inadequate Training and Awareness**: Safety training programs are inconsistent and insufficient in content, delivery, and practical application. Many workers report a lack of emergency preparedness training, which limits their ability to respond to on-site risks effectively.

3. **Policy and Regulatory Gaps**: There is a significant absence of clear company safety policies and inadequate enforcement of existing regulations. Weak regulatory oversight and infrequent safety inspections exacerbate unsafe practices.

4. **Resource Constraints**: Limited availability of personal protective equipment (PPE) and insufficient funding for safety initiatives create barriers to maintaining safe work environments. Over one-third of respondents reported inconsistencies in the provision and accessibility of necessary safety tools.

5. **Risk Management Deficiencies**: Proactive risk assessment practices, such as regular hazard identification and emergency drills, are rarely conducted. This gap leaves workers ill-prepared for potential emergencies and exposes them to avoidable risks.

6. **High-Risk Hazards**: Common injury sources include falls from heights, electrocution, and slips or trips, reflecting an urgent need for targeted interventions to mitigate these risks. Fire hazards and exposure to hazardous materials also pose significant dangers.

7. **Limited Stakeholder Involvement**: Worker engagement in safety decisions is minimal, and safety meetings are irregular, reflecting a top-down approach to safety management that fails to leverage worker insights.

8. **Comparative Disparities**: Projects managed by international contractors demonstrate better safety practices compared to locally managed projects, attributed to stronger adherence to global standards and better resource allocation.

9. **Emergency Preparedness Challenges**: A majority of sites lack clear emergency response plans, training, or drills, leaving workers vulnerable during critical incidents.

10. **External Influences**: Factors such as contractor experience, gender dynamics, and inadequate government support further hinder safety outcomes.

These findings align with both global and local studies, indicating that challenges in safety culture, training, and regulatory compliance are common in construction projects. Addressing these issues through enhanced training programs, robust safety culture development, better resource allocation, and stronger regulatory oversight is essential for improving safety outcomes in the construction sector.

5.2 Conclusion

The assessment of safety and health management practices in building construction projects in Arada and Lideta Sub-Cities reveals critical challenges that hinder the development of a robust safety culture. These challenges include poor safety culture, inadequate management commitment, insufficient training programs, and weak regulatory enforcement. Despite the presence of safety policies and the availability of basic Personal Protective Equipment (PPE), the implementation of safety standards remains inconsistent, leaving workers vulnerable to preventable accidents and hazards.

Globally, research such as Fernández-Muñiz *et al.* (2007) underscores the importance of management's role in fostering safety culture, while Gambatese *et al*. (2017) highlights the trade-off between safety investments and cost concerns. Similarly, local studies by Kassie et al. (2021) and Adugna & Aklilu (2018) emphasize systemic weaknesses in Ethiopia's construction sector, particularly regarding resource constraints and regulatory gaps. These parallels demonstrate that

the challenges identified in Arada and Lideta Sub-Cities are not isolated but reflective of broader industry trends.

One of the most pressing concerns is the deprioritization of safety in favor of cost and deadline pressures. This is exacerbated by inadequate communication between management and workers, inconsistent training programs, and insufficient emergency preparedness. High-risk hazards, such as falls from heights and electrocution, remain prevalent due to the lack of clear procedures and proactive hazard assessments. Furthermore, regulatory oversight is weak, with infrequent inspections and limited enforcement mechanisms.

Despite these shortcomings, there are opportunities for improvement. Workers demonstrate a growing awareness of safety practices, and basic PPE is widely available. By capitalizing on these positive aspects, a systematic approach can be implemented to improve safety outcomes. This includes fostering a stronger safety culture, enhancing training programs, and increasing worker involvement in safety-related decision-making. Additionally, more stringent regulatory oversight and enforcement mechanisms are critical for ensuring compliance and addressing systemic issues.

In conclusion, addressing the deficiencies in safety and health management practices within construction projects in Arada and Lideta Sub-Cities is essential for reducing accidents, improving worker morale, and ensuring the sustainability of the construction industry. A concerted effort from stakeholders, including construction firms, regulatory bodies, and workers, is required to prioritize safety as a core component of project management. By integrating comprehensive training, effective communication, and robust enforcement of regulations, the construction sector in these sub-cities can move toward safer and more efficient practices, ultimately benefiting both workers and the broader community.

5.3 Recommendation

1. Recommendations for Construction Companies

- **Enhance Safety Culture**: Foster a robust safety culture by conducting regular safety meetings, promoting open communication, and encouraging employees to report unsafe conditions without fear of retaliation.
- **Invest in Comprehensive Training Programs**: Provide tailored safety training for all workers, focusing on hazard identification, emergency response, and the proper use of personal protective equipment (PPE).
- **Allocate Adequate Resources**: Ensure a sufficient budget for safety initiatives, including the procurement of high-quality PPE and investment in modern safety technologies.
- **Conduct Regular Safety Inspections**: Implement a structured schedule for safety inspections and risk assessments to proactively identify and address potential hazards on construction sites.
- **Promote Worker Involvement**: Actively involve workers in safety decision-making processes and recognize employees who demonstrate exemplary safety practices.

2. Recommendations for Construction Workers

- **Participate in Training**: Attend all safety-training sessions provided and actively engage in learning about workplace hazards and safety protocols.
- **Follow Safety Protocols**: Consistently use PPE and adhere to safety guidelines, ensuring personal and collective safety on-site.
- **Report Unsafe Conditions**: Take responsibility for reporting hazards, unsafe behaviors, or near-miss incidents to supervisors promptly.
- **Engage in Safety Culture**: Contribute to fostering a positive safety culture by encouraging peers to follow safety protocols and participate in discussions on workplace safety.

3. Recommendations for the Government (*City Administration of Addis Ababa Design and Construction Bureau*)

- **Strengthen Regulatory Frameworks**: Develop and enforce comprehensive occupational safety and health (OSH) policies tailored to the construction industry.
- **Enhance Oversight**: Conduct regular inspections of construction sites to ensure compliance with safety standards and penalize non-compliance.
- **Support Training Initiatives**: Collaborate with construction companies to provide subsidized safety training programs for workers and supervisors.
- **Promote Public Awareness:** initiate awareness campaigns to highlight the importance of workplace safety and the shared responsibilities of all stakeholders in preventing accidents.
- **Invest in Safety Research**: Fund research to identify emerging risks in the construction industry and develop innovative safety solutions.

These recommendations aim to improve safety and health management practices in building construction projects by addressing responsibilities at the organizational, individual, and systemic levels.

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APPENDICES

Appendix A

Dear Participant,

I am conducting a research study as part of my MSc thesis to assess safety and health management practices in building construction projects in Arada and Lideta sub-cities of Addis Ababa. The objective of this study is to evaluate the current safety and health management practices and identify areas for improvement in the construction industry.

The information you provide will be used solely for academic purposes, and all responses will be kept strictly confidential. Your expertise and experience in the construction industry are invaluable to the success of this study, and I am confident that this research will contribute to the development and enhancement of the Ethiopian construction sector.

I kindly request your full participation by responding to each question in the attached questionnaire. Your time and insights are greatly appreciated.

Thank you for your support and cooperation.

Sincerely,
Ismael Yimam
Smithyimam13@gmail.com
St, Mary's University

Title- Assessment of Safety and Health Management Practices in Building Construction: The Case of Arada and Lideta Sub City Projects

QUESTIONNAIRE

Section One: Respondent and Company Information

Instructions; Please indicate your response by checking [✓], filling in the blanks, or providing comments as appropriate.

1.1. Respondent's Personal Information

I. Sex

Male ☐   Female ☐

II. Age

18-30☐   31-40☐   41-50☐   above 50☐

III. Role/Position

Project Manager☐   Safety Engineer☐   Site Engineer☐

Foreman☐   Residential Engineer☐   Daily Laborer☐

IV. Education status

Primary or High school ☐   vocational education or technical skills☐

Bachelor's Degree☐   Master's Degree☐   other: Please Specify _____

V. Years of Experience in Construction Industry

0-5 years☐   6-10 years☐   11-15 years☐   16-20 years☐ above 20 years☐

VI. Employment Pattern

Permanent☐   Temporary/ Contract☐

Section Two: Safety Culture in Building Construction Projects

2.1 How often safety meetings conducted on your site?

        Always☐   Often☐   Sometimes☐   Rarely☐   Never☐

2.2 How often are you encouraged to report unsafe conditions or behaviors?

        Always☐   Often☐   Sometimes☐   Rarely☐   Never☐

2.3 Do you feel that the safety of workers is regularly monitored and evaluated?

        Always☐   Often☐   Sometimes☐   Rarely☐   Never☐

2.4 How would you rate the importance of safety in your construction project?

        Very Important☐   Important☐   Not Important☒   Neutral☐

2.5 How would you describe the communication of safety policies and procedures on your site?

        Very Clear☐   Clear☐   Unclear☐   Very Unclear☐   Neutral☐

2.6 How frequently are safety rules and procedures updated on your site?

        Frequently☐   Occasionally☐   Rarely☐   Never☐   Not Sure☐

2.7 Are there incentives or recognition for employees who demonstrate good safety practices?

        Yes☐   No☐   Not Sure☐

2.8 How would you rate the overall safety culture on your construction site?

        Excellent☐   Good☐   Average☐   Poor☐   Very Poor☐

Section Three: Health and Safety System in the Project

If your answer is "Yes," please mark the box. If your answer is "No," select one of the provided reasons that best explains why, or specify your own reason in the blank space.

3.1 Do you feel that management is committed to safety? Yes☐   No☐ (If No, why?)

      A. Lack of interest

      B. Focus on cost reduction

      C. Lack of awareness

      D. Other: _____

3.2 Are safety meetings conducted regularly on your site? Yes☐   No☐ (If No, why?)

      A. Lack of time

      B. Lack of management support

      C. Lack of organization

      D. Other: _____

3.3 Are safety policies and procedures clearly communicated to all employees? Yes☐ No☐ (If No, why?)

      A. Poor communication channels

      B. Language barriers

      C. Lack of training

      D. Other: _____

3.4 Do you believe that safety is prioritized over project deadlines and cost savings? Yes☐ No ☐ (If No, why?)

      A. Pressure to meet deadlines

      B. Budget constraints

      C. Lack of management focus

      D. Other: _____

3.5 Do you feel encouraged to report unsafe conditions or behaviors? Yes☐   No☐ (If No, why?)

      A. Fear of retaliation

      B. Belief that nothing will change

      C. Lack of reporting mechanism

D. Other: _____

3.6 Are regular hazard identification and risk assessments conducted on your site? Yes☐ No☐

(If No, why?)

    A. Lack of resources

    B. Lack of expertise

    C. Lack of time

    D. Other: _____

3.7 Do you have access to appropriate personal protective equipment (PPE)? Yes☐ No☐ (If

No, why?)

    A. Insufficient supply

    B. Poor quality

    C. Lack of awareness

    D. Other: _____

3.8 Are safety inspections conducted regularly on your site? Yes☐ No☐ (If No, why?)

    A. Lack of personnel

    B. Lack of planning

    C. Lack of management support

    D. Other: _____

3.9 Are incidents and near-misses reported and investigated properly? Yes☐ No☐ (If No,

why?)

    A. Lack of reporting system

    B. Fear of blame

    C. Lack of follow-up

    D. Other: _____

3.10 Are there established procedures for managing emergencies on your site? Yes☐ No☐

(If No, why?)

    A. Lack of procedures

    B. Lack of training

    C. Lack of awareness

    D. Other: _____

3.11   Have you received safety training since starting work on this project? Yes☐ No☐ (If No, why?)

      A. No training provided

      B. New employee

      C. Lack of training programs

      D. Other: _____

3.12   Are regular safety training sessions conducted? Yes☐ No☐ (If No, why?)

      A. Lack of trainers

      B. Lack of budget

      C. Lack of scheduling

      D. Other: _____

3.13   Do you feel the safety training provided is adequate and effective? Yes☐ No☐ (If No, why?)

      A. Inadequate content

      B. Poor delivery

      C. Lack of practical examples

      D. Other: _____

3.14   Are you trained to handle emergencies on the construction site? Yes☐ No☐ (If No, why?)

      A. Lack of emergency training

      B. Lack of drills

      C. No emergency plans

      D. Other: _____

3.15   In your opinion, who should be held responsible for industrial accidents on construction sites?

    A. Workers

    B. Government

    C. Contractors

    D. Owners' Consultant

    E. The Company

Section Four: Key Challenges and Barriers Hindering the Implementation of Effective Safety and Health Management Practices

№	Items	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	There is effective communication about safety between management and workers.					
2	There are sufficient resources (e.g., PPE, safety equipment) available for safety management.					
3	Employees are actively involved in safety programs and decision-making.					
4	There is adequate time allocated for safety-related activities.					
5	There is adequate support from regulatory bodies to ensure safety compliance.					
6	Up-to-date safety information is readily available to all employees					
7	Safety inspections are conducted regularly and thoroughly					
8	There is adequate funding for all essential safety activities					
9	Changes to safety procedures are welcomed and implemented smoothly					

Section Five: Questionnaire: Primary Safety and Health Risks in Building Construction Projects

No	Safety and Health Risks	Rate of Injuries and Fatalities			
		High	Medium	Low	Insignificant
1	Falls from Heights				
2	Slips, Trips, and Falls				
3	Struck by Falling Objects				
4	Electrocution				
5	Exposure to Hazardous Materials (e.g., asbestos, chemicals)				
6	Machinery and Equipment Accidents				
7	Noise-Induced Hearing Loss				
8	Manual Handling Injuries (e.g., lifting, carrying)				
9	Confined Space Entry Risks				
10	Fire and Explosion Hazards				
11	Health Risks from Dust and Fumes				
12	Inadequate Lighting				
13	Weather-Related Hazards (e.g., extreme heat, cold, rain)				
14	Psychosocial Risks (e.g., stress, harassment)				
15	Poor Housekeeping				