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HOW TO IMPROVE THE SAFETY PRACTICES IN NIGERIA CONSTRUCTION INDUSTRY IN RELATION TO EUROPE (NORWAY)

Master's thesis in Project Management

Supervisor: Torp, Olav

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ACKNOWLEDGEMENT

I extend my deepest appreciation to Professor Olav Torp, my esteemed supervisor, for his unwavering support and invaluable guidance throughout the entire duration of this project. His dedication has played a pivotal role in my personal and academic growth, contributing significantly to the success of this research.

I would also like to express my sincere gratitude to Savis Gohari, whose patience and expertise have been instrumental in enhancing my academic writing skills. Her guidance has greatly influenced the development and refinement of this research.

My heartfelt thanks go to my wife, Mrs. Ifeoluwa Akinlade, and my parents, particularly my mother, Mrs. Opeyemi Akinlade. Their consistent checks and efforts to bridge the distance gap have been crucial in maintaining a supportive environment, despite the physical separation caused by my studies abroad.

I am equally grateful to my siblings for their unwavering support and understanding throughout my educational journey. Their unconditional love, encouragement, and sacrifices have been the bedrock of my achievements, and I am eternally thankful for their presence in my life.

Special recognition goes to Honourable Abiola Makinde for his invaluable support and for establishing the scholarship program that enabled me to pursue my studies abroad. His generosity and foresight transformed what would have been a distant dream of studying in Norway into a tangible reality. I hope that this research work contributes to the positive transformation we all aspire to see in the safety standards of the African construction industry.

In summary, the collective support, encouragement, and opportunities provided by these individuals have been fundamental to my academic journey and the successful completion of this research project.

Abstract

This master's thesis delves into safety practices within construction companies, conducting a comparative analysis between Nigeria and Norway. The principal aim is to assess the efficacy of safety measures in these nations and pinpoint potential areas for enhancement by identifying the underlying causes of non-compliance with safety codes and standards in Nigeria. The study also endeavors to outline approaches that can aid in improving the Nigerian construction industry by drawing inspiration from European practices. The research methodology comprises the distribution of an online questionnaire to 50 key professionals in the Nigerian construction industry, with insights provided by 27 respondents.

The questionnaire encompasses various topics, including the implementation of safety regulations, training programs, risk assessment procedures, and the utilization of technology to enhance safety measures. Responses will be meticulously analyzed to reveal patterns, differences, and commonalities between safety practices in Nigeria and Norway. Nigeria, characterized by a dynamic construction industry, faces distinct challenges related to regulatory compliance, workforce training, and cultural factors. In contrast, Norway is renowned for its stringent safety regulations and proactive risk management approach. By drawing comparisons between these two contexts, this study seeks to offer valuable insights into adapting and enhancing safety practices to ensure the well-being of construction workers in workplaces characterized by diverse cultural backgrounds and skill sets.

The anticipated findings of this research are poised to contribute significantly to the development of tailored safety guidelines for construction companies. This, in turn, aims to cultivate safer working environments, thereby reducing the occurrence of accidents and injuries. Furthermore, the study may shed light on best practices from Norway that could be integrated into the Nigerian construction industry, fostering a culture of safety and sustainability.

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Abbreviations

Construction Health and Safety	(CHS)
Nigeria's Gross Domestic Product	(GDP)
Occupational Safety and Health	(OSH)
Occupational Safety and Health Administration	(OSHA)

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Chapter One

1.0 Introduction

1.1 Background of the Study

The act of practicing safety on construction projects has garnered significant attention among several activities of the construction industry in the globe, with numerous studies delving into the factors influencing construction safety performance across various global regions (Sawacha E., N. S., 1999). Due to the magnitude of the construction accidents and hazards in the Africa's practices in construction industry, relevant research is needed in order to equip stakeholders with the knowledge they need to improve construction health and safety (CHS) and reduce accidents at construction sites. To understand the dynamics involved in CHS, a large number of conceptual models have been developed to help understand the complexity of accident causation (J. Ayarkwa, D. Osei-Asibey, P. Amoah, A. Acheampong, June 2021). This spotlight is attributed to the construction industry's pivotal role in the advancement of nations, unequivocally contributing to economic growth on a global scale (Håkansson, H. A., 2013). This contribution becomes evident through statistical data; for instance, the construction industry's share of Nigeria's gross domestic product (GDP) was 2.88% in 2010, 3.31% in 2011, 3.05% in 2012, 3.59% in 2013, 3.82% in 2014, and 3.88% in 2015. Alongside economic metrics, the sector also displayed its significance by adding N121,900.86 million to the Gross Fixed Capital Formation in 2012 and employing 6,913,536 individuals (excluding casual laborers) (NBS, 2015).

While the construction industry undeniably holds a paramount role in economic development, its commitment to health and safety (H&S) has garnered increased scrutiny. Recent investigations suggest that developing countries exhibit a deficiency in H&S awareness and performance (Jupp, 2016). The concern surrounding safety performance extends across developed and developing nations alike (Lingard, H., 2013). Within the construction sectors of developed nations, an alarming 25% to 40% of work-related fatalities transpire, involving only 6% to 10% of the workforce. The United States, for example, encounters 17% of all construction site accidents (Chi, S. H., 2013). In the UK, the Health and Safety Executive (HSE) documented 79,000 instances of work-related health issues and 54,000 cases of non-fatal injuries among construction workers in 2019 (HSE, Annual Construction statistics, 2019). On a global scale, construction sites annually witness a staggering 60,000 fatal accidents, equating that somehow a fatal incident transpiring every 10 minutes somewhere that can result a fatal accident. ((ILO) I. L., 2003). The ramifications of these accidents and illnesses are not merely physical; they carry a substantial financial toll. To illustrate, the UK construction sector grapples with a loss of around 1.2 billion working days each year due to accidents and health-related setbacks.

Moreover, considering the facts that the Africa's system of governance lacks effective means of keeping records which makes it difficult to access effective statistical data of the occurrences of fatal accidents and the severe rare miss in comparison to Europe ideology about keeping records and data, from the experiences collated from active practice in both continents for about seven years now. This is one of the more reasons for this thesis paper to address ignorance, thereby creating more awareness in terms of the need to keep records and make professional suggestions on how to improve our safety practices on construction projects. In general, occupational safety and health (OSH) in construction involves numerous disciplines as well as a wide range of work environments and workplace factors. In addition, safety and health research is unevenly distributed, which is due to researchers entering the OSH area bringing with them specific cultures and expertise that, in turn, results in a broad spectrum of research genres and stakeholders. In addition, construction itself is a complex, transient, and global industry, with a wide range of organizational sizes and affiliated companies. (Finneran, A., & Gibb, A. G., 2013). This industry has received intense attention since the last decade due to the global need working towards sustainability, improved H & S practices, and aiming at 'zero injury' on our construction sites which instigated several research projects to drastically drop the occurrences of accidents or hazard prone practices and environment on how construction sites. (Wachter, J. K. and Yorio, P. L., 2014), (Maiti, S. and Choi, J., 2019)

Considering provisional solutions on how to improve safety practices on our construction sites globally, considering the vast change environment we are, this research work will be conduction interviews and seeking professional advice from the technical knowhow and the current active professionals in the construction industry both in Africa and Europe addressing for research questions:

1.2 Statement of the Problem

The construction sector plays a pivotal role in driving economic development in Nigeria, making significant contributions to the expansion of infrastructure. Despite these advancements, serious concerns persist regarding safety protocols within the industry. Nigeria faces a troubling frequency of accidents, leading to fatalities, limb loss, and various occupational hazards. In contrast, European nations have made significant progress in prioritizing the well-being of construction workers through stringent legislation and innovative methodologies. Drawing from my five years of experience as a civil construction site engineer and manager, along with two years spent in Norway observing their code of conduct and operational procedures, I can conclusively assert a substantial gap in safety practices on construction sites.

The issue at hand pertains to the perceived disparity between safety regulations in the Nigerian building sector and prevailing norms in Europe. Despite the presence of regulatory frameworks in Nigeria, concerns persist over the effectiveness of their execution and the extent to which safety measures are adhered to. Consequently, this has resulted in an increased occurrence of accidents and injuries. This situation raises crucial questions about the adequacy of current safety protocols, the enforcement of regulatory measures, and the broader safety ethics within the construction industry in Nigeria.

1.3 Research Aim

The aim of this dissertation is to explore the safety practices in Nigeria construction industry in relation to Europe through the literature review of numerous published materials, alongside a questionnaire among the principal officers in the construction practices in Nigeria, in order to achieve the objectives below:

- To evaluate compliance with construction safety standard in Nigeria
- To examine the influence of cultural factors on construction safety practices
- To improve and create more awareness on the need for safety training programs for construction workers to ensure they have adequate information and well informed.
- To evaluate the Effectiveness of Safety Leadership and Organizational Culture

1.4 Research Question

Exploring the safety practices in Nigeria construction industry is hoped to answer these questions:

- How has the evolution of constructive safety practices in Nigeria influenced workplace safety standards?
- What are the key challenges faced by Nigeria Construction Industries in implementing and sustaining constructive safety practices?
- What opportunities do Nigerian industries have for improved safety performance and regulatory compliance through the adoption of constructive safety practices?
- What strategies are employed by Nigerian companies to integrate and institutionalize constructive safety practices?

1.5 Significance of the study

The value of this research lies in its examination of safety practices within the construction sector, specifically in Nigeria. It covers crucial aspects pertaining to the welfare of workers and the long-term viability of building projects. Given the inherent hazards in the construction sector, it is crucial to prioritize the comprehension and improvement of safety practices. This study offers current empirical evidence, elucidating the impact of technical improvements, industry trends, and regulatory frameworks on safety measures.

Through a thorough examination of the existing safety practices, this research not only provides significant insights for stakeholders in the sector but also plays a crucial role in influencing future plans. The results of this study provide valuable insights into construction organizations', offering them a realistic framework to implement enhanced safety protocols and effectively manage possible hazards. Additionally, this study has significant significance for policymakers and regulatory entities, since it provides empirically supported data that might enhance and modernize safety rules.

In the present era marked by the swift integration of technology into every facet of the building process, from conceptualization to implementation, this research stands as a relevant and contemporary reference. It provides a comprehensive understanding of the intricate relationship between traditional safety protocols and evolving technology. The principal aim of this study is to elevate workplace safety, reduce accidents, and endorse sustainable building methods. Such advancements would not only benefit the immediate stakeholders in the industry but also contribute to the overall well-being and progress of the construction sector, making the industry healthy while building the GDP of the nation, Nigeria.

1.6 Research Structured

The study is organized into five chapters, each serving a specific purpose to ensure clarity and coherence in presenting the research outcomes.

Chapter 1 serves as an introduction to the study, encompassing background context, the problem statement, objectives, research questions, and significance.

Chapter 2, the literature review, delves into existing knowledge, with a notable focus on the interplay between safety practices in construction companies in Nigeria and their relation to Norway. This section covers conceptual and theoretical foundations along with relevant issues.

Chapter 3 elaborates on the research methodology, providing clarity on the approach and procedures adopted.

Chapter 4 places emphasis on data collection, analysis, and results presentation. Findings are conveyed through graphical and tabular formats, addressing the research questions from Chapter 1.

Lastly, Chapter 5 concludes the research journey by summarizing the entire process, offering conclusive insights derived from findings, and underlining their potential implications along with recommendations.

Chapter Two

2.0 Literature Review

This chapter presents a comprehensive review of the extant literature pertaining to the factors being investigated. The paper encompasses the establishment of conceptual definitions, a comprehensive examination of relevant literature from a theoretical standpoint, an analysis of empirical investigations, the identification of research deficiencies, and the construction of a conceptual framework. The comprehensive examination of the safety practices in Nigeria construction industry in relation to Europe and meticulous evaluation of the available facts need the establishment of a robust theoretical framework.

2.1 The Concept of Safety Practices in Construction Industry

In the realm of construction, positioned at the intersection of development and risk, a judicious approach to safety practices is deemed essential, as asserted by Umar and (Wamuziri, 2016). Scholarly consensus underscores that these practices extend beyond mere statutory requirements; they represent an ethical imperative. The literature extensively acknowledges the hazardous nature of construction work, highlighting the potential risks of falls, electrical hazards, and machine-related accidents. (Umeokafor, 2014) underscored in their research that regulatory compliance emerges as a critical foundation in managing this precarious scenario. Government bodies like OSHA (Occupational Safety and Health Administration) not only establish legal obligations but also provide a pragmatic framework for cultivating a secure working environment. The literature systematically dissects the repercussions of noncompliance, offering insights into both legal consequences and social implications. Consequently, compliance is portrayed as a cornerstone of responsible construction management rather than a bureaucratic impediment.

Safety programmes and rules take center stage in the conversation, revealing a multidimensional strategy that includes hazard identification, risk assessment, training modules, and emergency readiness. Scholars' emphasis the importance of these programmes in promoting a proactive mentality among construction staff. The dynamic panorama of technical breakthroughs, industrial innovations, and altering regulatory frameworks is used to investigate the evolutionary nature of safety requirements. Training and education emerge as critical components in bolstering building safety foundations. The literature emphasizes the need for thorough training programmes that encompass everything from fall prevention complexities to equipment operating subtleties. Continuous education and refresher training are promoted as necessary for keeping workers up to date on changing safety practices. According to the discourse, education is not a one-time investment, but rather a continuous commitment to the human capital that propels the

construction sector ahead (Rout B., 2017)

An extensive review of the existing literature reveals a strong consensus about the need to use foresight via risk assessment and hazard mitigation strategies. Academic scholars advocate for a comprehensive evaluation of potential risks before commencing any excavation activity, envisioning a comprehensive assessment of many potential dangers (Magnavita N., 2020). Various hazard management strategies, such as the implementation of protective barriers, use of safety signs, and regular maintenance of equipment, are advocated as proactive measures to mitigate risks. The significance of proficient communication and collaborative cooperation is underscored in the narrative of construction safety. The need to establish effective and transparent lines of communication is emphasized, whereby safety meetings, toolbox lectures, and briefings serve as effective means of disseminating vital safety information. The discourse extends beyond mere directives, highlighting the need to foster a culture whereby safety is seen as a collective responsibility that transcends organizational boundaries.

The literature echoes a resounding appeal for constant attention and improvement in construction safety. The examination of safety programmes, procedures, and incident reports on a regular basis is portrayed as a dynamic feedback loop, helping the discovery of areas for improvement. Continuous improvement is depicted as a strategic goal for construction organizations trying to exceed safety norms, rather than a compliance checkbox. Construction safety practices emerge not as an afterthought, but as the foundations upon which the industry's future is built. The convergence of academic viewpoints leads to a single axiom: construction enterprises become guardians of both development and protection by prioritizing safety programmes, education, risk assessment, communication, and a commitment to continual improvement. The recommendation to check local standards and resources acts as a coda, reminding practitioners that the symphony of safety is tempered by regional variances and specificities (Magnavita N., 2020).

2.2 Global Perspectives on Construction Safety

The issue of construction safety has significant importance since it directly impacts the welfare of labourers and the overall efficacy of construction activities. The construction business is well recognized as being among the most hazardous sectors, characterized by elevated frequencies of accidents, injuries, and deaths (Cooper M. D., 1997). The existing body of research pertaining to construction safety has extensively examined a range of variables that are associated with the elevated occurrence of accidents and injuries within the sector (HSE, 2019). The objective of this literature review is to provide a comprehensive analysis of the current body of research pertaining to construction safety. This study will include several aspects such as the underlying factors contributing to accidents and injuries, the influence of safety management systems, and the efficacy of safety training initiatives.

The existing body of research pertaining to construction safety has identified a multitude of elements that are known to contribute to the elevated occurrence of accidents and injuries within the construction sector. The absence of a safety culture within the construction sector is a significant contributing factor to accidents and injuries (Malaysia, 2000). (Hinze J G. J., 2003) assert that within the construction business, there exists a prevailing culture that prioritizes production at the expense of safety, resulting in a tendency to neglect safety protocols and principles. The perpetuation of this culture may be attributed to the pervasive influence of deadline-oriented work environments and the prevailing perception that adherence to safety protocols hampers the efficiency of construction operations.

Rafindadi et al., highlighted in his research that the absence of sufficient training and education is an additional contributing cause to accidents and injuries within the construction sector. Insufficient training in safety protocols and practices among construction industry workers is a prevalent issue that contributes to heightened probabilities of accidents and injuries (Rafindadi A., 2022). Lingard and Rowlinson posit that a notable factor contributing to the elevated occurrence of accidents and injuries within the construction sector is the dearth of training and education (Lingard H., 2019).

Safety management systems (SMS) play a crucial role in ensuring construction safety. Safety management systems (SMS) are specifically developed to effectively detect and mitigate potential hazards within the building process, ultimately leading to a decrease in the occurrence of accidents and injuries. The scholarly discourse around construction safety has acknowledged the influence of Safety Management Systems (SMS) on safety outcomes within the construction sector.

Zou et al, have reported that the use of SMS has been shown to have a substantial positive impact on safety performance within the construction sector. The research revealed that organizations who had an efficient Safety Management System (SMS) exhibited reduced accident rates and demonstrated superior safety performance in comparison to companies that had an ineffective SMS. In a similar vein, the study conducted by (Hinze J G. J., 2003) revealed that the use of SMS (Short Message Service) has the potential to enhance safety performance within the construction sector via a reduction in the occurrence of accidents and injuries.

Safety training programmes play a crucial role in ensuring construction safety. The primary objective of these programmes is to provide workers with comprehensive knowledge and understanding of safety procedures and practices, hence mitigating the occurrence of accidents and injuries. The scholarly literature pertaining to construction safety has acknowledged the efficacy of safety training programmes in enhancing safety outcomes within the construction sector.

(Lingard H., 2019) assert that the implementation of safety training programmes within the construction sector may provide substantial enhancements in safety performance. The research revealed that employees who underwent safety training showed a higher propensity to adhere to safety protocols and procedures, resulting in a decreased likelihood of accidents and injuries. In a similar vein, the study conducted by Zou et al. (2014) revealed that safety training initiatives have the potential to enhance safety performance within the construction sector. This improvement is attributed to the heightened understanding of safety protocols and practises among workers resulting from such programmes.

In regard to safety, safety culture affects workers' motivation and attitudes, communication, operational management, planning, as well as the behaviour of the work team (Behm, 2013). A safety culture is the combination of beliefs, perceptions, and attitudes of employees toward the safety of their colleagues and the safety of the workplace as a whole. Cultivating a safety culture is crucial to maintaining workplace safety. As opposed to the structural approach in HSE management, safety culture complements the structural approach, which is a perspective approach and focuses on how things should be done. The cold aspects of feedback control are included in safety culture. There are no hot variables such as shared beliefs, attitudes, or norms within an industrial organization when it comes to safety culture; it's about how things are really done in practice (Urban Kjellen, 2017).

As part of safety culture, various organizational aspects of safe construction practices are addressed and discussed, including safety-related values, perceptions, attitudes, competencies, and resulting behaviours at different organizational levels. In our safety culture perspective, we provide provisions for worker involvement and organizational learning, and this interpretation of the concept of safety culture has a clear parallel in the human resource and symbolic perspectives of organizations (Urban Kjellen, 2017). Also, from the respondents from Nigeria to our interview, there was a serious emphasis on the behavioural challenge with the construction site workers, which is a challenge to safe practises on construction projects. This is as a result of inadequate sensitization for the workers on the efficacy of safety practises or the gross ignorance of the impacts of accidents on victims as well as negligence of incidents on construction sites.

Moreover, Institute for an Industrial Safety Culture, ICSI analysed the incident that prompted the interest of safety culture. It was 1986 that two major accidents occurred, the Challenger explosion shortly after lift-off, and the Chernobyl nuclear disaster in Ukraine. The analysis of both cases demonstrated that these were organizational (or systemic) accidents that could not be attributed solely to inappropriate behaviour by “sharp-end” workers (front-line employees), rather these failures were the result of a gradual accumulation of failures within the organization, which gradually weakened all protective barriers (ICSI, 2017). Out of the standardized safety culture to enhance occupational health and safety on construction projects, the large organizations within

the industry such as corporations, trade unions, public services, and non-governmental organizations, develop their own culture, which is called Organizational culture. Organizational culture includes two major segments which are (ICSI, 2017):

- Ways of doing that are shared and repeated: organisational structure, rules and procedures, technical choices, patterns of behaviour... This is the visible part.
- Common ways of thinking: knowledge, beliefs, what is considered implicitly obvious, attitude towards authority and debates... This is the invisible part; it is more difficult to perceive and the most complex to change (ICSI, 2017).

The safety culture reflects the influence that the organisational culture has on matters relating to risk management, several factors contribute to the long-term viability of a company: the quality of its products or services, the market and competition, the company's finances, regulations, technical choices, and necessity to safety. However, safety cannot be placed in a bubble different from the other factors at play: a company at a complete standstill would be the safest (ICSI, 2017). The advisory committee on the safety of nuclear facilities (ACSNI) has argued that safety culture must be considered when analysing incidents considering lessons learned from the Chernobyl accidents. ACSNI proposes a definition of safety culture that has been widely accepted; *Safety culture is the product of individual and group values, attitudes my specials competences and pattern of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety management* (ACSNI, 1993). The health and Safety Executive in the UK also approve this same definition, which is applied as the basis for much research (Antonsen, 2009).

The risks that organizations face can range from minor incidents to fatal occupational accidents, to major events that may cause many victims and affect the facility or even the environment (ICSI, 2017).

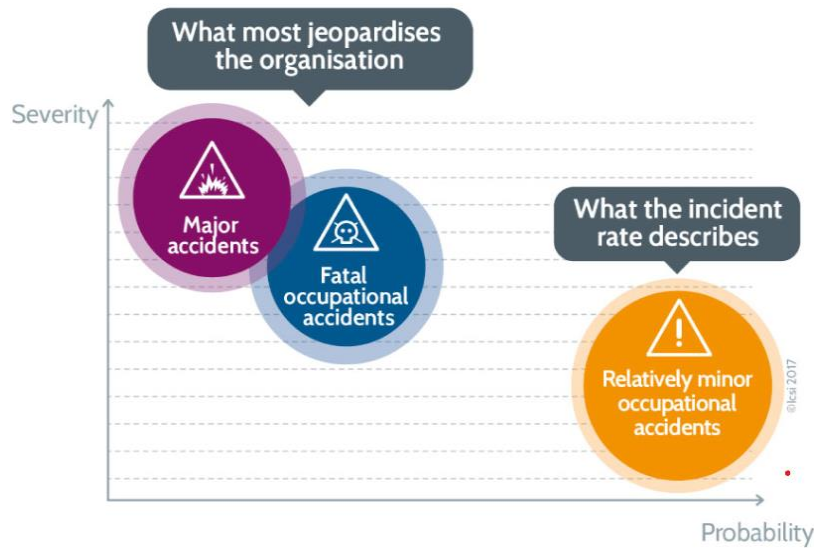


Figure 1: How accidents on the construction site can be grouped, (ICSI, 2017)

Accidents can be defined as uncontrollable occurrence or an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage of properties or personal injury (Laney, 1982). Accidents as a result of risks on construction site, when the identify hazards are now well managed or negligence and non-conformity to the standard rules and regulations that guide safe operations on a construction site. It is critical to understand the factors that contribute to accident causation on construction sites in order to reduce the risk of accidents (Hinze J, 1998). From figure 1 above, and our respondents during interview, it was established that some events are incidents, *an unwanted event but no injuries*, which should call for a serious attention of the safety personnel and managements of such construction projects, and we also have some major accidents like slip and fall, getting struck by an object, fall from height among others with small and not serious injuries.

Moreover, we have the fatal occupational accidents where there are serious injuries that leads to loss of body parts and accidents, like explosions and falling objects or equipment, as well as fall from heights among others. Injuries to construction workers have a wide variety of adverse effects, including personal suffering for the injured worker, construction delays, and productivity losses for the contractor. The project may result in higher insurance premiums because of costly injuries and potential liability suits (Laufer, 1997).

We can see that According to research literature, a good safety culture is characterized by several characteristics, failing to meet these criteria may be regarded as an accident cause. According to Hale A.R. the following criteria are presented:

- The importance given by all employees, but particularly top managers, to safety as an integral part of business goals and work practices. This means that safety is seen as an inseparable, but explicit, part of the way to do business.

- The engagement and involvement felt by all organizational members in the process of defining, prioritizing, and controlling accident risks.
- The creative mistrust and management have in HSE systems, which means that they never show complacency and are always on the alert for new problems.
- The caring trust that all organizational members have in each other. This involves accepting the responsibility to check and to be checked for unsafe practices. All organizational members need a watchful eye and helping hand to cope with the inevitable slips and blunders that can always be made.
- An openness in communication about failures as learning experiences and in imaging and sharing information about new dangers.
- The belief that causes for incidents and opportunities for safety improvements should be sought not just in individual behaviour but in the interaction of many casual factors (Hale, 2000) (Urban Kjellen, 2017)

2.2.1 Framework for Accident Analysis

Several different models have been presented in several different research literatures in order to highlight different parts fortunately, converging trends have been observed in accidents research in instances where such a model is presented. We will discuss five (5) categories of accident models (Urban Kjellen, 2017).

- Casual sequence model: This model presents an accident as a chain of events that finally helps in some losses.
- Process model: This explains accidents as deterioration from Norma stage two deviations that leads to loss of control and injuries.
- Energy model: This explains accidents as transfers of energy and show how barriers can prevent or stop the energy flow and thus protect victims.
- Logic tree model: This present causes of accidents in terms of logical relation among events and conditions in the affected system.
- System model: This pays particular attention to human, technical, and organizational factors all to the interplay among them. These include management models and so -called systematic models that consider did dynamics and complexity of accidents.
- Cognitive model: This analyze human errors in terms of failures in cognitive function, all these are caused by contextual variables and these variables lead to accidents (Urban Kjellen, 2017).

The combination of all these models gives to the framework used to analyze accidents. This framework is modelled from a sequence of process developing through four phases as shown in figure 2, 1. Lack of control, 2. Loss of control, 3. Target, being exposed to an energy flow (Vulnerability of constructional workers), and 4. Emergency handling. The last two phases are often overlapping (Urban Kjellen, 2017).

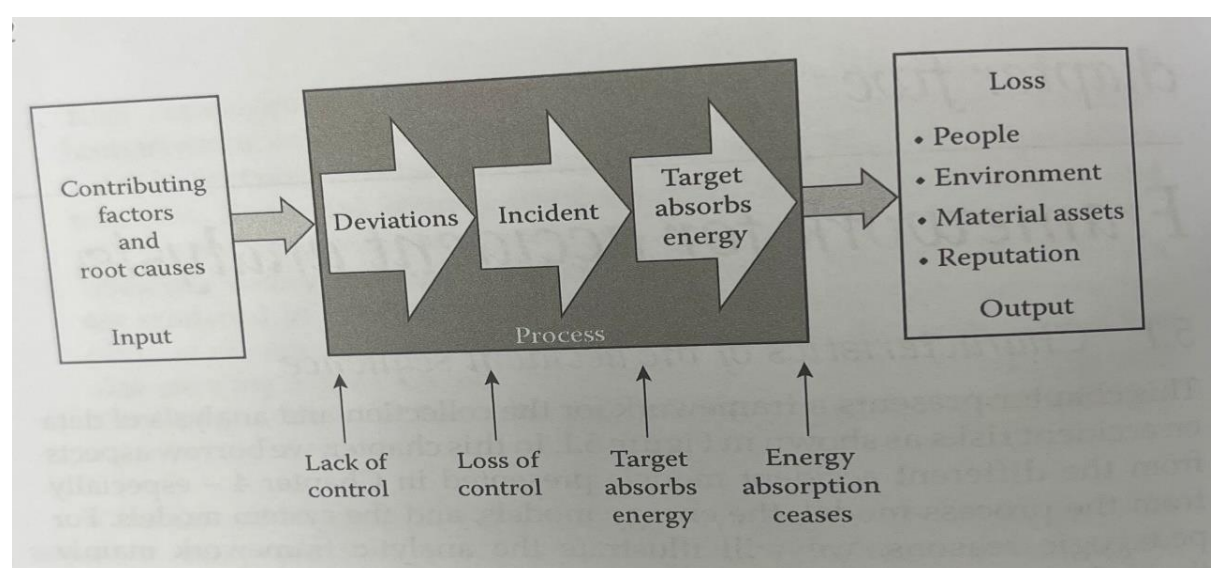


Figure 2: Accidents Analysis Frameworks, (Urban Kjellen, 2017)

This framework is based on input - process - output model, which is applied in many areas contributing factors and the root cause is in the human, technical and organization systems(input) generate an accident sequence (the process) that produces a loss (outcome). Basically, these are the same human, technical, add organization systems that, on that normal circumstance, produce the unwanted output. The input - process - output model has similarities to the casual-sequence (Urban Kjellen, 2017). SMORT, Safety Management and Organization Review Technique uses STEP (Sequentially Timed Event Plotting), where event charting (timeline) can be used in places where there is an interactive factory in conjunction with an analysis of root causes of accidents (Urban Kjellen, 2017). From the literature review and content analysis alongside the data collected from our respondents during interviews, the key factors contributing to accidents on construction sites were identified. This can be grouped into eight (8) different segments as shown in the figure bellow (Hajizadeh, 2014)

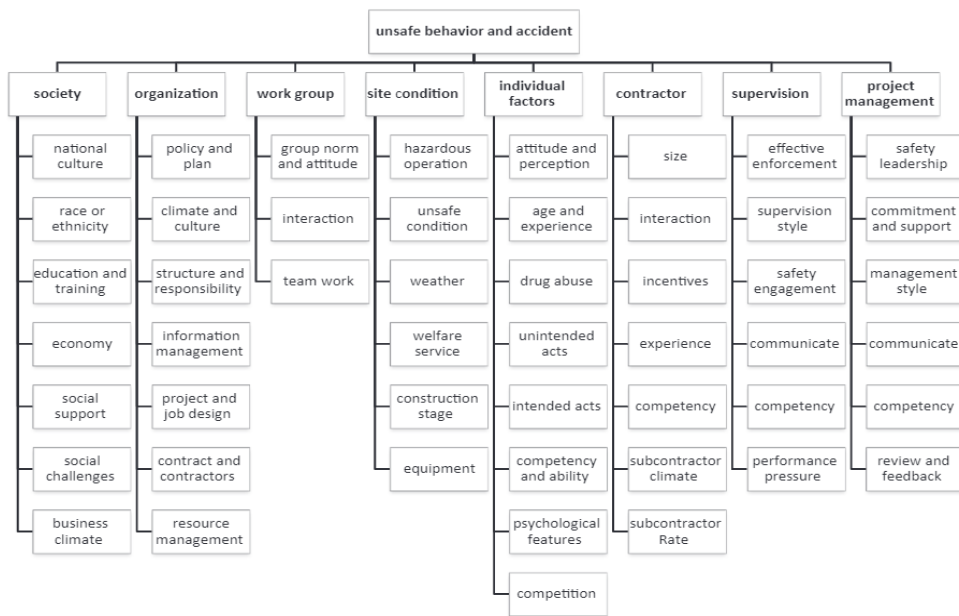


Figure 3: Conceptual framework for factors influencing unsafe behaviours and accidents on construction sites, (Hajizadeh, 2014)

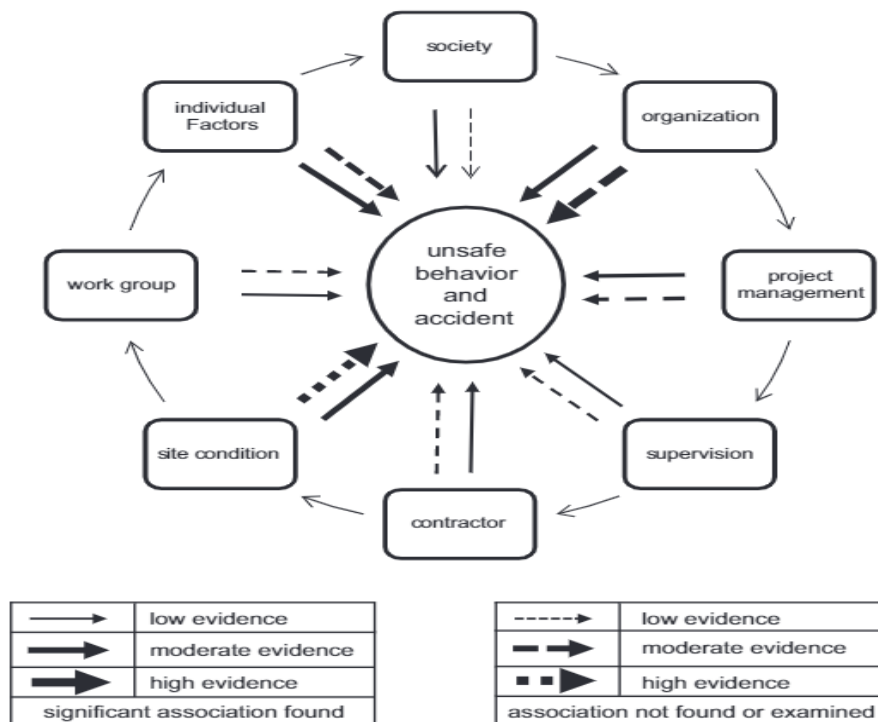


Figure 4: Strength of evidence of factors influencing unsafe behaviours and accidents on construction sites, (Hajizadeh, 2014)

The quality rating of previous studies showed that one of the most important factors influencing unsafe behaviours and accidents was individual characteristics (figure 3). Content analysis identified seven themes: attitude and motivation, age and experience, drug abuse, unintentional

acts, intended acts, competency and ability, and psychological distress. In the study, safety attitudes, motivations, and age and experience were moderately associated with unsafe behaviours and accidents (Hajizadeh, 2014). From one of the respondents during the interview from Nigeria, He cited an example when asked about who is to be responsible for the safety practices on a construction project. He said when looked into a mirror, the image of the person seen in a mirror is that exact person responsible for his safety on a construction site, and the safety personnel is just saddled with the responsibilities of enforcing compliance with safety practices and mapping out hazards alongside risk analysis and managements on a construction site. From figure 4, we can see that the challenges with safety practices in construction industry creating an unsafe behaviour/accident is as a result of individual contributions from the management to the site workers to the impact on environment, alongside the site conditions.

In summary, the matter of construction safety has significant importance since it directly impacts the welfare of labourers and the overall efficacy of building endeavors. The existing body of scholarly research pertaining to construction safety has delineated many reasons that contribute to the elevated frequency of accidents and injuries within the sector. These issues include the absence of a safety culture, inadequate training and education, and the pervasive pressure to adhere to project deadlines. Safety management systems and safety training programmes are crucial elements of construction safety, as shown by existing research that has recognized their efficacy in enhancing safety performance within the construction sector.

2.3 Nigeria Construction Safety Practices

The construction industry in Nigeria plays a crucial role in the country's economy, making a substantial contribution to its Gross Domestic Product (GDP) and serving as a major source of employment for a big portion of the population (Håkansson, H. A., 2013). Nevertheless, the profession has garnered a reputation for its elevated occurrence of accidents, particularly those resulting in deaths, so establishing itself as one of the most hazardous vocations within the nation.

The examination of safety culture in the construction industry has been the subject of substantial research, highlighting its significance in ensuring worker safety. (Abeje, 2023) provide a definition of safety culture as "the collective set of values, beliefs, attitudes, and behaviors that typify an organization in relation to safety". The writers acknowledge that there exists a correlation between safety culture and many outcomes, including accident rates, severity of injuries, and employee morale.

In the context of Nigeria, several scholarly investigations have been conducted to explore the concept of safety culture within the construction sector. (Idoro, 2011) discovered that safety considerations in the execution of construction projects are not accorded high importance in

Nigeria. Moreover, the implementation of safety measures throughout the building process is seen as burdensome. In a similar vein, it was observed that the phenomenon of globalization has had adverse consequences for safety within the Nigerian construction sector, as corporations tend to prioritize financial gains above ensuring a safe working environment (Idoro, 2011).

According to Sibiya's research in 2015, the construction industry in Nigeria demonstrates an alarmingly elevated frequency of accidents, ranking among the highest globally. The data reveals an average of 12 fatalities per 100,000 workers within this sector. Oyewole M. D. (2023) identifies falls from heights, electrocution, and incidents involving objects as the primary causes of mortality in this context. The industry's elevated accident rates can be attributed to various factors, including the absence of safety laws and enforcement, inadequate training, and a deficient safety culture. A notable observation is that construction practitioners may not prioritize dedicating time and effort to hazard and accident prevention, as their focus often revolves around profit-oriented activities (Navon & Kolton, 2006). Despite the acknowledged importance of safety culture and the persistently high accident rates within the construction sector, numerous construction businesses in Nigeria encounter difficulties in establishing and sustaining a positive safety culture. It is suggested that a significant impediment in fostering a favorable safety culture lies in overcoming resistance to change.

According to the authors, workers may exhibit resistance towards alterations in safety practices or procedures, especially when they regard such change as posing a danger to their autonomy or job security. In a similar vein, (Oyewole M. D., 2023) discovered that the absence of safety rules and their implementation, insufficient training, and a deficient safety culture are among the variables that contribute to the elevated incidence of accidents within the sector. To enhance workplace safety within the Nigerian construction sector, it is essential to augment the awareness around safety culture, enhance safety legislation and their enforcement, as well as enhance the training and education provided to both workers and management personnel. It is essential for companies to give precedence to safety above profit and locate resources towards implementing safety measures aimed at safeguarding their workforce. There is a need for more governmental involvement in the regulation and enforcement of safety standards within the sector. By effectively tackling these afore mentioned difficulties, the Nigerian construction industry has the potential to transform into a safer and more productive sector within the national economy.

2.4 European (Norwegian) Constructive Safety Practices

An essay authored by Kinga Wasilkiewicz Edwin was published in the International Journal of Occupational Safety and Ergonomics. The study delves into the significance of exchanging incident experiences within the construction sector of Norway. The essay is grounded on a qualitative research study, whereby interviews were performed with various stakeholders within the Norwegian building sector Wasilkiewicz, (2022).

The study included conducting interviews with many stakeholders within the construction sector to get insights on the dissemination of information after incidents and accident investigations. The research used a semi-structured interview methodology, allowing participants to provide a thorough account of their perspectives and provide insights that were not initially expected by the interviewer. The interviews were carried out throughout the period spanning from October 2017 to January 2018. The duration of each interview ranged from 30 to 80 minutes. The majority of the interviews lasted around one hour. A total of eight interviews were done via face-to-face interactions, while the other five interviews were conducted by telephone. With the exception of one interview, all of the interviews were taped and then transcribed. Comprehensive documentation was made during the interview, which was not subject to audio recording. The interviews were transcribed and then subjected to analysis using NVivo version 12.

(Dela Cruz, 2022), highlighted in a literature analysis pertaining to the avoidance of building hazards via design reveals a wide range of potential applications for Building Information Modeling (BIM) in enhancing safety measures. For instance, BIM may be used to establish connections between safety information and other aspects such as scheduling, product information, and other technology interventions. Despite the advancements in technology and solutions, there is a noticeable gap in research about the specific emphasis on accessing dependable safety information via feedback that is grounded in actual evidence.

The study's results indicate that the act of exchanging experiences related to workplace incidents is of utmost importance in enhancing occupational safety and ergonomics. The research revealed a dearth of organized dissemination of incident experiences within the construction sector in Norway. The research further discovered a need for implementing a more organized methodology in incident reporting and sharing protocols. The research suggests that it would be beneficial for organizations to cultivate a culture characterized by openness and transparency, fostering an environment in which workers are at ease when it comes to reporting occurrences and sharing their experiences. Additionally, the research suggests that it is advisable for organizations to develop explicit norms and protocols pertaining to incident reporting and the exchange of information. The research revealed that the use of collective safety information has the potential to enhance occupational safety and ergonomics within the workplace. The research proposes that it would be advantageous for organizations to implement a structured framework for the purpose of gathering and scrutinizing incident data. Furthermore, it suggests that organizations should use this data to discern prevailing tendencies and recurring patterns within occurrences.

Additionally, the research suggests that organizations need to use this data in order to create focused actions aimed at addressing distinct safety concerns. This report presents a comprehensive plan for the Norwegian construction sector to enhance the dissemination of knowledge after events and facilitate the adoption of inter-organizational learning practices. The

strategy places emphasis on technology and digital strategies, including the use of Building Information Modeling (BIM) and digital platforms for the purpose of exchanging safety-related information. The paper posits that Building Information Modeling (BIM) has the potential to establish connections between safety information and other technology solutions, such as scheduling and product information (Dela Cruz, 2022).

Additionally, according to (Hoeft, 2022), his research indicates that digital platforms have the potential to facilitate the dissemination of safety-related information among various stakeholders within the business. The research revealed the presence of many platforms for the exchange of safety-related information among various stakeholders. However, this sharing is characterized by limitations, lack of organization, and infrequent occurrence. Moreover, the dissemination of this knowledge is not sufficiently widespread among all stakeholders in the sector, including those who may benefit from it, such as actors in the early stages of development. The current study acknowledges the presence of a readiness to share and an enthusiasm for new technology. It proceeds to provide suggestions for enhancing information sharing within the industry after occurrences, with the aim of fostering inter-organizational learning. The research suggests that organizations should foster an open and transparent culture, allowing workers to report incidents and share experiences. It recommends developing clear norms and protocols for incident reporting and information exchange. Digital platforms can facilitate safety-related information dissemination among stakeholders. The study also suggests implementing a structured mechanism for gathering and evaluating incident data to identify common themes and patterns in occurrences. This will help organizations ensure a safe work environment (Hoeft, 2022).

In summary, the research highlights the importance of exchanging incident experiences in the Norwegian construction sector. It recommends cultivating an open and transparent culture, developing clear norms for incident reporting, and having a structured mechanism for data collection and analysis. This can help organizations improve occupational safety and ergonomics, fostering a safer and healthier work environment. The report presents a strategic plan for enhancing information dissemination after accidents and advancing inter-organizational learning through technology and digital advancements. By following these guidelines, organizations can enhance workplace safety and ergonomics, ultimately promoting a safer and healthier work environment for their workers.

2.5 Comparative analysis of Safety practices in construction industry in Nigeria and Norway

The construction sector, which plays a crucial role in fostering economic development, has unique safety protocols that are shaped by legislative frameworks, cultural settings, and economic landscapes. This literature analysis provides a critical evaluation of safety practises in the construction sector in Nigeria and Norway. It examines several important factors including

regulatory processes, training programmers, safety culture, technology integration, worker participation, and incident management.

The safety rules in Nigeria are within the purview of the Federal Ministry of Labour and Employment. These regulations include the Factories Act and the Nigerian National Building Code (Umeokafor, 2014). Nevertheless, the presence of enforcement issues leads to discrepancies in safety standards across different building sites. On the other hand, it is worth noting that the construction sector in Norway operates under strict laws enforced by the Norwegian Labour Inspection Authority and the Norwegian Directorate of Building Quality. These regulatory bodies play a crucial role in ensuring a greater degree of compliance and consistent adherence to safety norms throughout the industry (Wasilkiewicz Edwin, 2013)

In Nigeria, safety training programmes are available; nevertheless, there exists a notable disparity in the quality and accessibility of these programmes. Consequently, it is imperative to place more focus on awareness efforts. On the other hand, Norway places a high emphasis on education and training within its construction industry, leading to the development of a highly educated labour force that promotes a strong safety culture and adherence to regulatory standards. The disparity underscores the need for Nigeria to increase the quality and availability of instructional initiatives in order to line with Norway's proactive safety strategy. The persistent difficulty in Nigeria lies in the development of a safety culture, whereby the prioritization of production sometimes supersedes the need of safety inside building sites. Norway has a pervasive safety culture that is strongly embedded throughout its society, characterized by a proactive stance towards accident prevention and the holistic welfare of its workforce. The juxtaposition highlights the significance of collaborative endeavours in Nigeria aimed at fostering a safety culture like to that of Norway, whereby stakeholders actively participate in promoting a more secure working environment ((ILO) I. L., 2010).

The adoption of advanced safety technologies in Nigeria is characterized by limitations, as shown by different levels of implementation that are contingent upon project size and budgetary factors. On the other hand, Norway has a prominent position in the realm of technological integration, as seen by its use of sophisticated safety equipment, monitoring systems, and Building Information Modelling (BIM) techniques to augment the level of safety within the building industry. Addressing this gap needs Nigeria to engage in technology and innovation to overcome the imbalance in safety measures found in the construction sector.

The level of worker engagement in safety-related decision-making processes in Nigeria has shown signs of improvement. However, it is important to acknowledge that some obstacles continue to hinder progress in this area. Furthermore, the effectiveness and consistency of communication channels between workers and management might vary significantly. Norway has

a proactive approach in including workers in safety efforts, therefore promoting a robust culture of cooperation among workers, unions, and management. The distinction highlights the significance of Nigeria's need to tackle issues related to worker engagement and communication in order to improve safety protocols holistically. In the Nigerian context, there is a potential need for improvement in incident reporting systems, as we have challenges associated with the investigative process, which is further compounded by the absence of a complete incident database. Norway upholds rigorous incident reporting and investigation procedures, aggressively disseminating acquired knowledge to mitigate the likelihood of future incidents. The existing discrepancy necessitates that Nigeria enhance its incident reporting methods and build a comprehensive database, taking inspiration from Norway's proactive approach to event management (Olsen, 2014)

In summary, the examination of safety practices in the construction sector in Nigeria and Norway demonstrates differences in legislative frameworks, training initiatives, safety culture, technology integration, worker engagement, and incident response (Lingard H., 2019; Lingard, H., 2013). Nigeria has difficulties in maintaining a consistent enforcement of safety practices and integrating them into its cultural fabric, while Norway distinguishes itself via the establishment and effective implementation of a robust safety culture. Enhancing safety standards in both nations necessitates the implementation of ongoing training initiatives, the deployment of advanced technologies, and the establishment of collaborative frameworks among stakeholders. It is highly recommended to do more study in order to monitor the increasing trends and effectively handle the new difficulties within the ever-changing field of construction safety.

2.6 Factors influencing Safety Practices the Construction Industry.

The construction sector has significance in the economic progress of countries, with a particular emphasis on the crucial need to prioritize safety and quality in building methodologies. The objective of this literature study is to examine the regulatory framework, organizational culture, training, and education pertaining to construction and safety practices in both Nigeria and Norway. The study utilizes several academic sources to provide insights into the tactics and frameworks used in these nations to improve safety and quality within the construction sector.

The regulatory structure within the construction sector plays a pivotal role in guaranteeing adherence to safety standards and optimal practices. Please provide the necessary citation for the source you mentioned. Talabi et al. (2021) research illuminates the need of implementing comprehensive regulatory frameworks to effectively tackle safety concerns in Nigeria. The regulatory system in Norway is anticipated to exhibit more stringency due to its emphasis on maintaining strong safety standards within the building sector. However, the offered sources did not include citations pertaining to the regulatory system in Norway. The influence of organizational culture on safety practices and compliance within construction enterprises is of

considerable importance. Please provide the necessary citation for the source you are referring to. Azhar and Choudhry (2016) underscore the significance of safety awareness and training initiatives in fostering a safety culture within the construction sector. This observation has special significance in the context of Nigeria, where the cultivation of a safety-oriented culture is crucial for enhancing building methodologies. The organizational culture in Norway tends to place a significant emphasis on safety and quality, which is consistent with the nation's renowned reputation for maintaining high standards within the construction industry.

The provision of comprehensive training and education programmes is necessary in order to provide construction workers with the requisite competencies and understanding to uphold safety standards and guarantee the delivery of high-quality construction practices. Please provide a reference for the information you mentioned. Ngwu et al. (2019) conducted a study that focuses on the incidence of falls and the variables related with them among construction workers in Port Harcourt, Nigeria. This highlights the need of implementing specialized training initiatives that specifically target safety issues within Nigeria's construction sector. In Norway, although explicit references pertaining to training and education were not explicitly recognized, the nation is renowned for its strong focus on vocational training and education, a characteristic that is likely to apply to the construction industry.

The significance of cross-cultural cooperation in the global construction sector is growing, especially in nations such as Norway that possess varied workforces. Please provide the necessary citation for the source you mentioned. The study conducted by Gyasi et al. (2021) offers a critical analysis of cross-cultural collaborative learning, with implications for promoting cooperation among heterogeneous construction teams. Although the primary emphasis is not on building, the ideas of cross-cultural cooperation are applicable to both Nigeria and Norway in facilitating efficient communication and fostering teamwork within construction endeavours.

In summary, the literature research underscores the significance of the regulatory framework, organizational culture, training, and education in safeguarding safety and quality within the construction sector in both Nigeria and Norway. Although the references offered significant insights, doing more study with a special emphasis on the construction sector in Norway would augment comprehension of the country's approach to safety and quality practices.

2.7 Safety Training in Construction Industry

In the Nigerian construction sector, safety training is critical to creating a safe working environment. With the inherent dangers and complexities of the industry, a strong safety training programme is essential to guarantee worker safety and project success. Extensive research has shown the value of safety training in reducing dangers and averting accidents on construction sites (Belel and Mahmud 2012). A well-structured training programme helps considerably with

the establishment of a safety culture throughout the organization, beyond just meeting legislative obligations. According to studies, organizations that prioritize safety training have greater levels of employee satisfaction, lower accident rates, and higher overall productivity. Given the importance of the construction sector in Nigeria's economic development, there is an urgent need for an in-depth examination of safety training practices. It is vital to conduct a critical examination of current safety measures and their efficacy in addressing the problems of the Nigerian construction setting (Idoro, 2011). Furthermore, analyzing the influence of cultural elements, legislative frameworks, and socioeconomic concerns on safety training implementation may offer industry practitioners significant insights. Exploring the theoretical foundations of effective safety training, drawing on established models and frameworks, can enhance the understanding of best practices. Moreover, empirical studies assessing the practical application and outcomes of safety training programs in the Nigerian construction sector contribute to a more nuanced and context-specific approach. This holistic perspective is crucial for guiding the development of comprehensive safety measures tailored to the specific needs of the Nigerian construction landscape (Ebekozi et al., 2023).

The study indicated that the most serious problem impeding construction workers' safety on Yola building sites was a lack of safety training for construction workers. This shows that more extensive safety training programmes for Yola construction workers are needed to increase their safety awareness and lower the likelihood of accidents on the job. Poor knowledge of the dangers involved with the task was identified as the second most serious problem, suggesting that improved communication and education about the possible hazards of construction work may be required (Mohammed et al., 2017).

Hzung et al., (2016) carried out research on the poll indicated that the most significant advantage of safety on the job was lower accident costs, which construction workers placed first. This shows that workers are aware of the financial effect of construction site accidents and understand the need for safety measures in lowering these expenses. The second most significant component was a lack of comprehension of the dangers connected with the task, suggesting that workers may need greater education and training in safety practices to increase their grasp of the risks inherent in construction work. Finally, improved business image was considered as the least significant element in terms of construction safety advantages, suggesting that workers may prioritize safety measures with more concrete benefits, such as accident reduction.

The Multilevel Safety Intervention Implementation Strategies for Nigeria Construction Industry study is a comprehensive research article that provides valuable insights into the relationships between safety intervention programs and implementation strategies in the construction industry in Nigeria. The study was conducted using structured questionnaires that were distributed to construction stakeholders across some selected states in Nigeria. The data generated were

analyzed using Pearson's product moment correlation (Okoye et al., 2017).

According to Okoye et al., (2017) in his research on strategy for safety implementation, the study found that the effectiveness of safety intervention programs for construction site accidents prevention is significantly related to the communication implementation strategies. Based on the principles of social ecological theory and UNICEF's communication for development strategies, the study developed a multilevel safety intervention implementation strategy for construction industries in Nigeria. The multilevel safety intervention implementation strategy includes five levels: policy, organizational, community, interpersonal, and individual levels. The policy level involves the development of policies and regulations that promote safety in the construction industry. The organizational level involves the implementation of safety management systems in construction organizations. The community level involves the engagement of community groups in promoting safety in the construction industry. The interpersonal level involves the promotion of safety through communication and collaboration among stakeholders. The individual level involves the promotion of safety through training and education of workers. The study recommends that systematic actions by policymakers, construction organizations, and various community groups are required to achieve maximum safety in the construction industry. Multiple approaches should be used when attempting to improve knowledge and perceptions about construction safety among workers. The study also highlights the need for increased investment in safety intelligence programs and the prevalence of occupational hazards in various organizations in Nigeria.

Overall, the Multilevel Safety Intervention Implementation Strategies for Nigeria Construction Industry study provides a valuable framework for promoting safety in the construction industry in Nigeria. The study highlights the importance of a multilevel approach to safety intervention implementation and provides practical recommendations for policymakers, construction organizations, and community groups to promote safety in the construction industry (Okoye et al., 2017).

2.8 Common Accident in Construction industry

The construction industry relies significantly on codes of practice and standards, particularly when employed alongside performance-based safety legislation. In the absence of prescriptive procedures within such legislation, the role of a code of practice is crucial in providing an exemplar of best practice. Employers adhering to a system of work as safe as outlined in the code of practice can generally be assumed to comply with legislation. The same principle applies to standards that establish the levels of attainment to be achieved. In performance-based legislation, the key concept involves setting goals and monitoring their achievement, with adjustments made if progress is lacking. Continuous improvement is expected, eventually leading to revisions in codes to reflect enhanced performance (Huang and Liang 2013).

Hu et al., (2011) highlighted in their studies that falls represent a significant risk in the construction industry, with roofing workers, in particular, facing heightened vulnerability. Incidents involving falls from roofs, scaffolds, ladders, and other structures are prevalent, necessitating both primary and secondary fall protection measures. Research indicates that afternoon hours, fatigue, and the absence of secondary fall protection contribute to a higher incidence of fatal falls. The use of safety helmets designed to protect against non-repetitive impact is recommended.

Mechanical equipment, including power tools, poses inherent risks in construction. Specialized plant, equipment, and tools vary across jobs, requiring planned maintenance, set operating procedures, and proper certification and registration of workers. Both powered and non-powered hand tools are potential sources of serious injury. Managing and maintaining these tools is challenging due to the diverse nature of construction sites and the autonomous nature of workers. The integrity of safety and maintenance systems is particularly challenging in such circumstances (Arts et al., 2015).

According to Rutherford (2018), Injuries related to hand tools, such as hammers, drills, spanners, and nail guns, are common on construction sites. The majority of non-power-driven hand tool accidents occur to experienced workers, suggesting that years of experience do not necessarily equate to good working practices. Access difficulties in the workplace, inadequate method statements, and inappropriate tool usage contribute to injuries. Oversight failures and workers' lack of awareness of daily dangers are identified as root causes. Accidents involving hand tools are not unique to specific locations, as studies from different regions emphasize similar patterns of incidents and highlight the need for effective management oversight and worker awareness of potential dangers.

2.9 Challenges facing Safety Implementation in Nigeria Construction Company

Developing countries, such as Nigeria, encounter significant challenges in implementing inclusive safety standards, akin to their counterparts in the developed world. Numerous studies have explored the challenges to safety program implementation in developing nations, revealing critical barriers (Abbas et al., 2018).

A primary obstacle is the inadequacy of resources, exerting adverse effects on safety programs. Management bears the responsibility of furnishing ample resources, encompassing qualified personnel, financial allocations, time, information, safety methodologies, facilities, and appropriate tools and machinery (Rollenhagen and Kahlbom 2001). Furthermore, the prevalence of tight project schedules emerges as a common hurdle, intensifying pressure and stress, consequently contributing to health and safety issues while diminishing overall productivity (Goh and Chua 2013).

In the construction industry of developing countries, a notable factor contributing to high incidence and injury rates is the low commitment to health and safety (Othman and Azman, 2020). The commitment to safety is contingent on the awareness levels towards safety, thereby influencing prioritization. Insufficient emphasis on safety results in the development of a deficient safety culture (Yiu et al., 2019). Additionally, there exists a perception that safety is exclusively the responsibility of safety personnel, fostering a lack of teamwork and collaboration in safety implementation (Yu and Hunt, 2002). Furthermore, limited awareness of safety considerations at higher management levels impacts the comprehension and formulation of strategies for managing safety and associated risks throughout the organization (Chileshe and Dzisi 2012).

Kartam et al. (2000), contend that the prevailing issues in safety implementation revolve around the absence of safety training and the lack of comprehensive safety policies. Yiu et al. (2019) assert the indispensability of safety training for preventing and reducing accidents. The deficiency of skilled workers automatically translates into suboptimal safety behaviours due to inadequate safety awareness and a lack of knowledge regarding safe work practices.

2.10 Conceptual framework

Antonenko (2015) defines a conceptual framework as a technique for elucidating or condensing the most important research issue. It serves as a descriptive or graphical tool to make the main concepts that must be examined clear. The authors emphasize the significance of exercising discretion when selecting significant connections and crucial factors that are likely to have a substantial influence on the study's results (Hancock, 2021). In the endeavour to improve safety protocols in Nigeria's construction sector, a thorough conceptual framework must be established. This paradigm identifies the complex interactions between different factors and their combined impact on safety performance indicators.

The Dependent Variables, which include Accident Rates, Injury Severity, Mortality Rates, and Incident Reporting, are the central focus of our analysis. These measures are essential markers of the safety environment in the sector. A variety of independent variables are closely related to their patterns and variations. As essential safety performance measures, accident rates, injury severity rates, and mortality rates are strongly impacted by a few variables. The most important of them is the area of education and training, especially the effectiveness of safety training programmes. The incidence and severity of accidents are directly impacted by the information and skills that are assimilated via such programmes.

Moreover, safety results are significantly shaped by the regulatory landscape, which is included under the Regulatory Environment. The foundation is provided by regulatory compliance, which creates the structure that guides the implementation of safety procedures. Workplace practices are a complex topic that affects safety metrics. A number of factors, including the use of Personal

Protective Equipment (PPE), strong leadership and supervision, the incorporation of state-of-the-art technology, and a welcoming work environment, all help to avoid accidents or lessen their severity. Effective channels of communication and significant worker involvement stand out as being crucial in influencing incident reporting practices in the field of communication and engagement. Incidents are reported properly and immediately in an atmosphere where communication is open and participative. One of the main components of the whole safety paradigm is the dimension of Risk Management. Together, risk assessment, management, emergency response, and preparedness serve as a safeguard against unanticipated incidents and have an impact on all safety performance measures.

In summary, the interaction between Workplace Practices, Communication and Engagement, Regulatory Environment, Training and Education, and Risk Management is highlighted by this integrated conceptual framework. The Nigerian construction industry's safety trajectory is defined by the alignment of these elements, which creates a more secure and safe working environment.

2.11 Theoretical Framework

The regulatory compliance model in the construction business is a comprehensive structure that delicately intertwines adherence to a plethora of rules, standards, and regulations promulgated by governmental agencies and industry organizations (Kokaly et al., 2016). This theoretical foundation provides a methodical foundation for construction firms to match their practices with regulatory requirements and industry norms, resulting in a strong operational framework. A core grasp of the legal environment is embedded into this theoretical framework, requiring construction firms to negotiate and comply with local, state, and federal regulations controlling different aspects of construction activity. This involves adhering strictly to construction requirements, environmental restrictions, safety standards, and labour laws. Simultaneously, compliance goes beyond these essential legal boundaries to include industry-specific standards established by organizations such as the International Code Council (ICC) and the Occupational Safety and Health Administration (OSHA) and the Occupational Safety and Health Administration (OSHA).

The operationalization of regulatory compliance is underscored by the importance of documentation and reporting. Rigorous record-keeping, encompassing permits, inspection reports, and employee certifications, forms an essential component of this compliance narrative. Moreover, the commitment to compliance is evident in the timely and accurate reporting to regulatory bodies, involving the submission of comprehensive incident reports, environmental impact assessments, and updates on project progress.

Integral to the regulatory compliance theory is the proactive management of risks associated with legal and regulatory requirements. This necessitates construction entities to formulate and

implement strategies that mitigate identified risks, ranging from comprehensive safety training initiatives to meticulous environmental impact assessments. The seamless integration of these risk management strategies within the compliance framework ensures a holistic approach to operational safety. The human dimension of regulatory compliance theory comes to the forefront through a focus on training and education. Ongoing training programs for construction personnel, encompassing safety training, environmental awareness initiatives, and regular updates on changes in regulations, form a crucial link in this theoretical chain. Simultaneously, leaders within construction organizations are expected to serve as stewards of compliance, possessing a thorough understanding of regulatory requirements to ensure effective implementation and supervision (Johnson, 2020).

A thread of adaptability runs through the regulatory compliance theory, emphasizing the need for continuous improvement. Construction entities are encouraged to continually monitor their compliance efforts, conducting regular evaluations that identify areas for enhancement. This adaptive approach is imperative given the dynamic nature of regulatory landscapes, with laws and standards evolving over time. It is this commitment to ongoing improvement that ensures the enduring relevance and efficacy of compliance practices. Ethical considerations, deeply embedded within the fabric of regulatory compliance theory, guide construction entities in conducting business with integrity and transparency. This ethical compass extends to dealings with clients, regulators, and other stakeholders, fostering a culture of trust and responsibility within the construction industry (Kusek et al., 2016).

In essence, the regulatory compliance theory in the construction industry is not a static set of rules but a dynamic and interconnected framework. It integrates legal adherence, best practices, risk management, ongoing education, adaptability, and ethical considerations. This holistic approach ensures that construction projects unfold with paramount consideration for safety, environmental responsibility, and unwavering legal integrity.

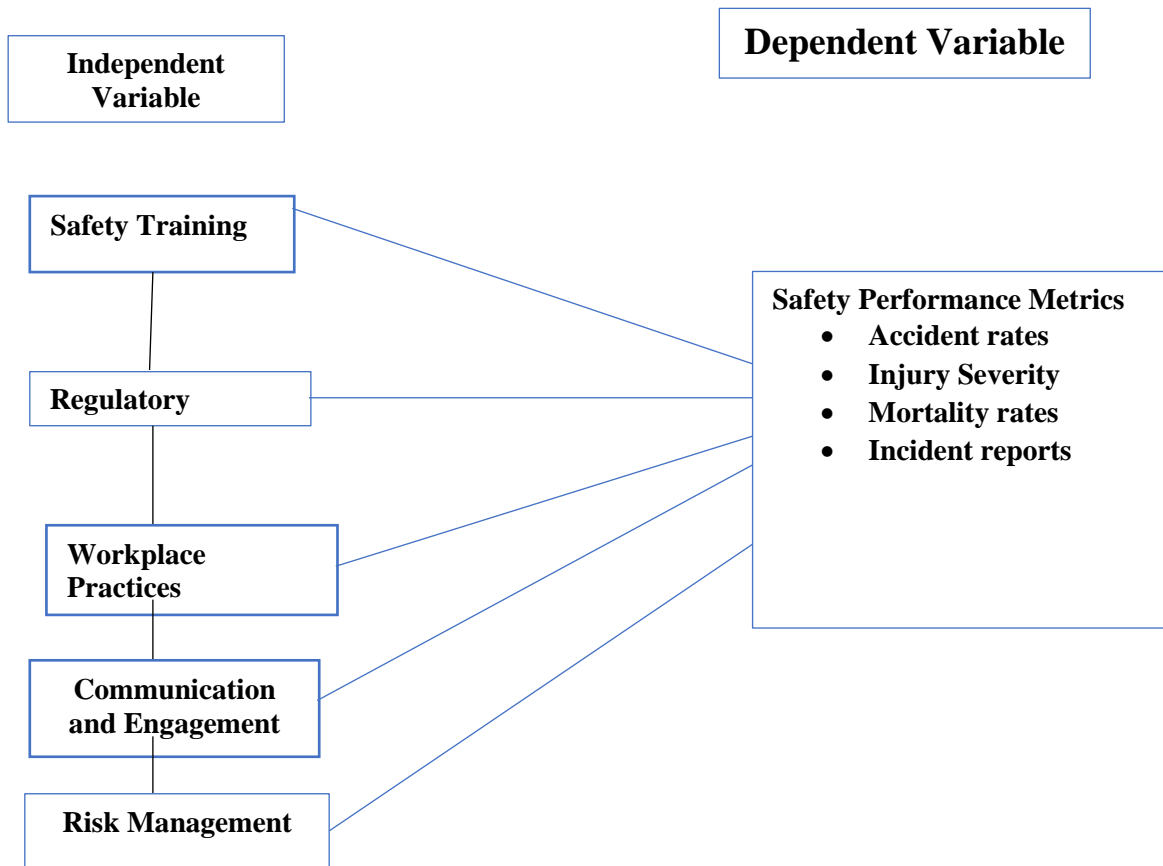


Figure 5 : Conceptual Framework on Safety Practices in Construction Industry

2.12 Summary

The construction industry has been found to be one of the most dangerous industries in terms of safety and health criteria, particularly in developing countries. However, a strong safety culture can be established by ensuring that everyone feels responsible for safety and pursues it daily. Workers should be encouraged to identify unsafe conditions and behaviours and intervene to correct them. Safety inspections should be conducted regularly, and any identified hazards should be taken care of as soon as detected. It is also important to ensure that every new employee on a project site is given appropriate orientation regarding safety. Finally, safety should be discussed at management meetings, and safety recognition and incentive programs should be developed.

Ensuring comprehensive safety in the construction industry involves a multifaceted approach. Beyond the aforementioned measures, a crucial component is the establishment and enforcement of safety rules and regulations. This becomes particularly pivotal in developing countries where such guidelines may be lacking, or regulatory oversight is weak.

A paramount element of safety practices within construction is the meticulous implementation of personal protective equipment (PPE). To this end, it is imperative that workers are not only provided with suitable PPE but are also trained in its correct usage. This encompasses equipment such as hard hats, safety glasses, gloves, and safety shoes, among others.

Moreover, a continuous commitment to training and education on safety practices is essential.

This involves conducting regular toolbox talks, safety meetings, and dedicated safety training sessions. Workers must be well-informed about potential hazards at the job site and equipped with the knowledge to identify and mitigate them.

Lastly, the establishment of a robust reporting system for accidents and near-misses is critical. Fostering a culture that encourages workers to promptly report incidents is pivotal. Management should then conduct thorough investigations and implement corrective actions as necessary. This proactive approach not only aids in identifying potential hazards but also contributes to the prevention of future accidents.

2.13 Research Gap

Despite a vast body of literature concentrating on construction industry safety practices, there is a significant study vacuum addressing the efficient integration of technical improvements and human aspects to improve overall safety performance. While previous research focuses on safety measures or behavioural factors, there has been little investigation into complete methods that integrate technology, human behaviour, and organizational processes to establish a holistic safety framework in the construction industry.

Chapter Three

3.0 Methodology

3.1 Introduction

This chapter presents the methodology used to study how to improve the safety practices in Nigeria construction industry. It encompasses various aspects of the research design and execution, including the research design, population of study, sample selection and sampling process, research instrument and its validity and reliability, data collection procedure, and data analysis method.

3.2 Research Design

Utilizing a qualitative research design, this investigation concentrated on enhancing safety practices within construction companies through in-depth, narrative analysis. As highlighted by Smith (2018), qualitative methods are adept at providing a nuanced understanding of intricate phenomena, making them particularly well-suited for exploring complex scenarios. The objective of this study was to reveal qualitative insights and narratives that could illuminate the factors influencing safety practices within the construction industry.

The efficacy of qualitative interview research in unraveling the intricacies of safety practices within construction was exemplified by Johnson et al. (2022). This research aimed to deepen our comprehension of the cultural, organizational, and individual factors contributing to the existing state of safety practices in construction companies. By employing qualitative methods, the study sought to comprehensively explore the dynamics influencing safety culture, employee behaviors, and management strategies within the construction sector.

In essence, this qualitative research aimed to provide practical recommendations for construction companies to enhance their safety practices. The anticipated findings were expected to guide the industry in implementing measures that not only improve workplace safety but also foster a positive safety culture, ultimately contributing to overall enhancements in health and safety outcomes.

3.3 Sampling and Sampling technique

Within the context of a construction company operating in Nigeria, this research employed a convenience sampling technique, a non-probability sampling method widely utilized in research studies. The rationale behind choosing this method was rooted in its practicality and expediency. The decision to opt for convenience sampling was the result of a thorough deliberation and risk analysis conducted to align with the project's time constraints and delivery requirements.

As a seasoned civil engineer with six years of work experience in the Nigeria construction industry, working with two different companies, I leveraged the established relationships and

professionalism cultivated over the years to reach out to stakeholders in the safety corridor of the Nigerian construction industry. Given challenges such as time constraints and limited resources, I complemented this approach by searching for safety personnel on LinkedIn. In total, 50 stakeholders were identified and contacted, resulting in 27 respondents who form the basis for the analysis in this research. The selection of a sample size of 27 participants was a deliberate choice made considering the feasibility of data collection within the allocated timeframe and resource constraints. While this sample size may be comparatively smaller than that of traditional statistical sampling methods, it was deemed sufficient for extracting valuable insights from a diverse array of stakeholders within the construction sector. The data, collected through Google Forms, contributed significantly to a comprehensive understanding of how the adoption of safety practices influences the construction industry in Nigeria.

It is important to acknowledge that convenience sampling has its limitations, primarily in terms of generalizability. The non-randomized selection of participants may introduce bias, and the findings may not be representative of the entire population. However, within the constraints of the study, the chosen sampling approach allowed for practical and efficient data collection.

The insights gained from this sample of stakeholders shed light on how to improve the safety practices in Nigeria construction in respect to European countries (Norway). Researchers and practitioners in the construction sector can use these findings to inform decision-making processes and strategic planning in response to the evolving landscape of financial technology within the Nigerian construction industry.

3.3 Sample and Sampling Technique

The research employed a convenience sampling technique which is a non-probability sampling method often used in research studies. It involves selecting participants who are readily available and easily accessible to the researcher, without using a randomization process.

The sample size of 50 participants is chosen based on the feasibility of data collection within the given timeframe and resource constraints. This size allows for a sufficiently diverse range of perspectives from industrial experts in the construction industry. The data collected from this sample contributed to a comprehensive understanding of how to improve safety practices in Nigeria construction industry, shedding light on its implications for the broader financial industry.

3.4 Research Instrument and Instrumentation

In order to investigate how to improve safety practice in the construction industry, a questionnaire approach was chosen as the primary research instrument for data collection. The questionnaire comprised of two distinct sections, namely, sociodemographic details and methods of improving safety practice in construction industry.

The first section of the questionnaire was designed to collect sociodemographic information from

the participants. It included items such as name, email address, and the highest level of education. This section aimed to provide a contextual understanding of the respondents, enabling a comprehensive analysis of the study results in relation to different demographic factors. More so, questions were asked on the following safety practices in construction industry (factors influencing safety practice, strategies for implementing safety practice in construction industry, method of implementing safety practice in construction industry, factors influencing safety practice in construction industry, impact of safety practice in construction industry and significance of safety practice in construction industry), all this questions were asked in order to understand their perception of safety practice in construction industry.

The research instrument for this study is designed with a systematic approach to collect data on various aspects of safety practices in construction enterprises. It comprises different sections that explore demographic information, current safety practices, safety culture, challenges, impediments, and improvement ideas. Employing a multifaceted instrumentation scheme, the data collection involves surveys with both closed and open-ended questions, in-depth interviews with key stakeholders, document analysis of existing safety regulations, on-site observations, and focus group discussions with diverse employee groups to triangulate data. Quantitative data undergoes statistical analysis, while qualitative data is thematically analyzed. This combination of analytical approaches contributes to a nuanced understanding of safety practices, providing valuable insights and recommendations. To ensure representation across all firm sizes and geographical regions within the Nigerian construction sector, a stratified random sample approach is adopted. This method aims to capture diverse opinions and experiences related to safety practices.

Data collection occurs in stages, including electronic surveys, planned interviews, focus group discussions, and on-site observations. Ethical considerations, such as participant confidentiality, informed consent, and proper data processing, are rigorously adhered to throughout the study. While efforts are made to ensure a representative sample, the research acknowledges potential limitations, such as response bias and participant availability for interviews and focus group discussions. Choosing a questionnaire as the research instrument offers several advantages in this study. Firstly, it provides a structured and standardized approach to gather data from many respondents (Alam, 2021), facilitating efficient data collection within a relatively short timeframe.

Secondly, the questionnaire format allows for statistical analysis, empowering researchers to identify patterns, correlations, and trends in the data effectively (Hair et al., 2019). Moreover, the questionnaire-based approach ensures consistency in data collection, enabling meaningful comparisons across respondents (Hassine and Amyot, 2016). By utilizing the same set of questions for all participants, researchers can analyze responses uniformly, enhancing the ability

to examine relationships between different variables.

3.5 Research Philosophy

In examining and enhancing safety practices within the construction sector, this study adopts a positive perspective. Positivism places emphasis on empirical data and scientific procedures, aligning seamlessly with our chosen quantitative survey research approach. The underlying ontological perspective assumes an objective reality for safety practices, acknowledging measurable features that can be systematically investigated. The study places a premium on comprehensive data analysis to derive pertinent insights, aiming to make an objective contribution to the current body of knowledge.

3.6 Validity

In order to ensure the accuracy and reliability of the research instrument used to assess improvements in safety practices within the construction industry, a meticulous validation process was executed. The questionnaire underwent thorough scrutiny by subject matter experts, comprising researchers and professionals with expertise in the Nigerian construction sector. Their invaluable feedback played a pivotal role in refining and enriching the content validity of the questionnaire. The objective of this process was to comprehensively capture the fundamental aspects of safety practices prevalent in the construction industry.

The incorporation of insights from these experts was pivotal in fortifying the validity of the research findings. This approach aligns with the assertion made by Kurdi et al. (2020) that the validation process significantly enhances the credibility of a study. The now validated questionnaire is poised to facilitate the collection of meaningful data, thereby contributing to an enhanced understanding of methods to improve safety practices within the construction industry. This rigorous validation process ensures that the research instrument is robust, reliable, and well-suited to yield insights that hold merit and relevance in the context of enhancing safety practices within the construction sector.

3.7 Method of Data Collection

This methodology ensured a comprehensive representation of perspectives from key stakeholders within the financial industry. The survey was conducted through a *google form* survey link, and the administration process was customized to align with the preferences of the participants. The online survey platform was intentionally designed with user-friendly features, promoting maximum participation, and guaranteeing accessibility of the questionnaire to all participants, irrespective of their technical proficiency.

Throughout the entire data collection process, researchers maintained a stance of flexibility and adaptability to cater to the specific needs and preferences of the selected sample. This approach not only cultivated increased participation but also heightened the validity of the findings, as

participants were more inclined to offer candid and genuine responses. The insights garnered through these meticulously executed data collection methods yielded valuable information, serving as a guide for strategic decision-making, fostering innovation, and advocating for methods or strategies aimed at enhancing safety practices within the Nigerian construction industry.

3.8 Method of Data Analysis

Following the collection of survey data aimed at enhancing safety practices in the Nigerian construction industry, the analysis phase utilized Microsoft Excel, a widely adopted spreadsheet software. Despite the challenges posed by the diverse nature of respondent information, which proved difficult to quantify, Excel emerged as a robust tool due to its user-friendly interface and capacity for handling numerical data analysis, particularly with large datasets.

To distill the essence of the collected data, descriptive statistics within Excel were employed to succinctly present key characteristics. These statistics provided a comprehensive overview of respondents' demographic profiles and their perspectives on methods to elevate safety practices in the construction sector. Beyond descriptive statistics, inferential tests conducted in Excel facilitated drawing conclusions and making inferences about the broader population based on the sample data.

Visual representation of the analyzed data took the form of various graphical charts, including bar graphs, pie charts, and scatter plots. Bar graphs effectively portrayed the distribution of responses across diverse demographic groups, offering a visually compelling representation of key characteristics. Pie charts were instrumental in illustrating the percentage distribution of perceived safety improvement methods. Meanwhile, scatter plots were employed to visually explore relationships between different variables, shedding light on potential correlations.

The integration of these pictorial charts significantly enhanced the accessibility and interpretability of the analyzed data. This approach allowed stakeholders to swiftly grasp key findings, with bar graphs delineating response distributions, pie charts illustrating method preferences, and scatter plots unveiling variable relationships. Excel's charting capabilities not only facilitated the creation of visually appealing representations but also served as a powerful means of effectively communicating the study's outcomes. In essence, the use of Excel contributed to a comprehensive and insightful analysis, making the survey results readily understandable and impactful for stakeholders involved in the construction industry's safety enhancement initiatives.

3.9 Ethical Consideration

This study placed a strong emphasis on ethical considerations throughout the research process. Prior to data collection, informed consent was obtained from all participants, providing them with clear and comprehensive information about the study's purpose, their rights as participants, and data usage. To protect participants' privacy and confidentiality, unique identifiers were used, and data was securely stored to prevent unauthorized access. Participants had the right to withdraw from the study at any time without facing negative consequences, respecting their autonomy. Any potential conflicts of interest among researchers and stakeholders were disclosed and managed transparently to maintain the research's integrity. By adhering to these ethical principles, the study aimed to prioritize workers safety, through the process of improving safety practice in construction industry in Nigeria.

3.10 Research Limitations

The research project is subject to various limitations that could have impacted its overall success:

Sample Size and Representativeness:

The study faced limitations concerning the size of the sample population, potentially affecting the generalizability of the findings. Challenges were encountered in achieving a representative sample, particularly in cases where specific subgroups within the construction industry were underrepresented.

Inability to Use Software:

The qualitative nature of the data collection process posed challenges in efficiently processing respondents' information. Due to this limitation, the data had to be manually reviewed, organized into groups, and then transformed into a format suitable for Excel-based data analysis.

Data Collection Constraints:

The chosen methods for data collection, primarily relying on self-report surveys, introduced potential limitations. This approach may be susceptible to response bias, and the scope and depth of data collected could be constrained by factors such as time limitations and resource availability.

Generalization to Other Industries:

It is important to acknowledge that the findings of the study may be specific to the construction industry and may not be directly applicable to other industries. The context and nuances of safety practices within construction might not necessarily translate universally.

Time Constraints:

The project's duration, restricted to the autumn semester, provides a limited timeframe to encourage respondents to contribute additional feedback that could enhance the quality of the collected data. However, this constraint also imposes limitations on the depth and thoroughness of the study. Undertaking a comprehensive exploration within this confined period may pose

challenges in fully addressing all aspects of the research objectives.

These limitations underscore the importance of interpreting the research findings with a clear understanding of the constraints inherent in the study. Despite these challenges, the research strives to contribute valuable insights within the defined scope and timeframe.

Chapter four

4.0 Result and Discussion

4.1 Introduction

This chapter has to do with the analysis of data collected using questionnaire distributed to 50 safety inclined personnel in the construction Industry with 27 respondents. For clarity, simple percentages, tables, and explanations were used in presenting the data collected.

4.2 Data Presentation and Analysis Demographic Data

Figure 6 shows the demographic data of participants, the provided demographics data offers valuable insights into the respondents' profiles in relation to their perspectives on how to improve the safety practices in Nigeria construction industry with comparison with Europe. The data showcases a diverse range of individuals contributing their viewpoints to the study. The research unveils a rich tapestry of educational backgrounds among construction professionals, with a substantial portion of the sampled population possessing bachelor's degrees (55.6%), Master's degrees (37%), and OND/HND (7.4%) in a wide array of fields related to construction and project management. Professionals with master's degrees tend to occupy managerial and supervisory roles, accounting for 37% of the sampled population. This finding suggests a positive correlation between higher education and leadership responsibilities within construction projects. A noteworthy observation is the prevalence of bachelor's degree holders in the health, safety, and environment (HSE) roles, comprising 56% of the sampled population. This underscores the industry's commitment to fostering a safe working environment and compliance with HSE policies. The demographic study emphasizes the significance of a well-educated and diverse workforce in the Nigerian construction industry. The presence of bachelor's and master's degree holders in various roles ensures an extensive range of skills and expertise, making a significant contribution to the sector's growth and the nation's overall development. This analysis offers a detailed breakdown of the distribution of degrees and roles within the sampled population, presented both in absolute numbers and as percentages.

Collectively, this demographic snapshot demonstrates a balanced representation of varying roles in construction industry and degree qualification (Figure 6 and figure 7). Such diversity enhances the credibility and applicability of the survey findings, offering a comprehensive understanding of how different demographics perception on how to improve the safety practices in Nigeria

construction industry.

What role do you play in the construction Industry of Nigeria?

27 responses

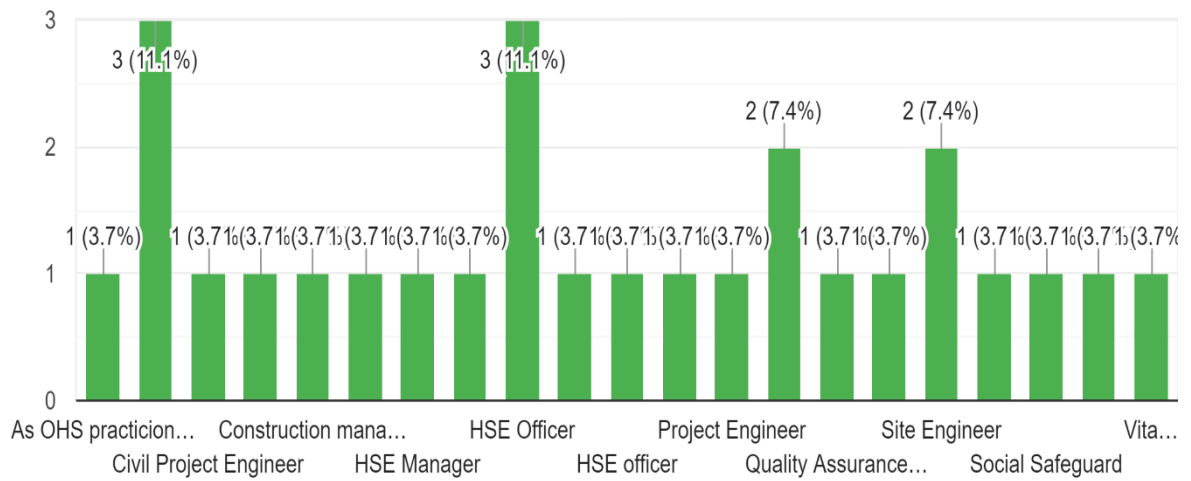


Figure 6: Role Played on The Construction Projects

What is your highest level of education?

27 responses

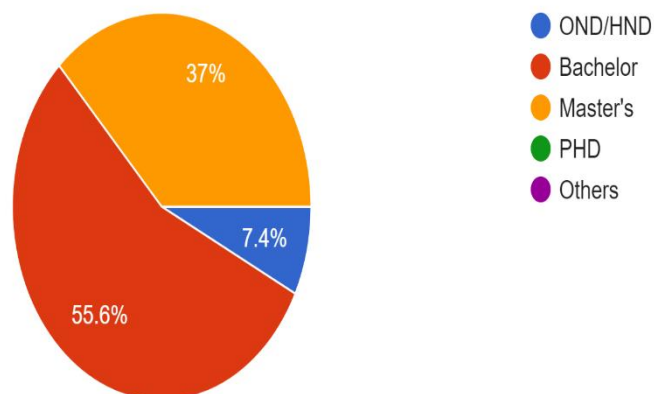


Figure 7: Level of Professional Qualifications

4.3 How can Safety Training awareness Programs be enhanced for Construction Industry

The findings of the research on the construction industry safety training awareness program, as derived from the analysis of participant responses, indicated a prominent emphasis on the paramount importance of training employees. Seven respondents explicitly highlighted the critical role of training in improving safety practices. They recommended the development of industry-specific training modules, practical hands-on training exercises, and regular updates to ensure compliance with evolving safety standards. Additionally, 14 respondents emphasized the significance of maintaining constant awareness through visual communication tools such as signs and posters, regular toolbox talks, and the establishment of safety mentoring programs. The remaining four respondents in the 'other' category underscored the need for identifying specific concerns, providing flexible training formats, and incorporating employee feedback mechanisms to enhance the overall effectiveness and adaptability of safety training programs. Collectively, this feedback underscores the multifaceted nature of designing an effective safety training program that caters to the diverse needs and preferences of industry participants.

The literature supports the multifaceted nature of designing an effective safety training program in the construction industry. According to the Occupational Safety and Health Administration (OSHA), an effective program emphasizes top-level ownership, participation by employees, and a "find and fix" approach to workplace hazards (Jeelani and Gheisari, 2022). OSHA also emphasizes the importance of education and training, stating that workers must be trained in reporting procedures and hazard identification techniques. Additionally, a study published in the National Library of Medicine evaluated the effectiveness of hazard awareness training in the construction building trades, highlighting the importance of safety training in construction (Peiro et al., 2020). Furthermore, the Associated General Contractors of America (AGC) emphasizes the significance of an effective safety and health training program in the construction industry, stating that it is one of the best ways for a contractor to improve safety⁴. The literature thus aligns with the findings of the research on the construction industry safety training awareness program, emphasizing the critical role of training in improving safety practices and the need for industry-specific training modules, practical hands-on training exercises, and regular updates to ensure compliance with evolving safety standards.

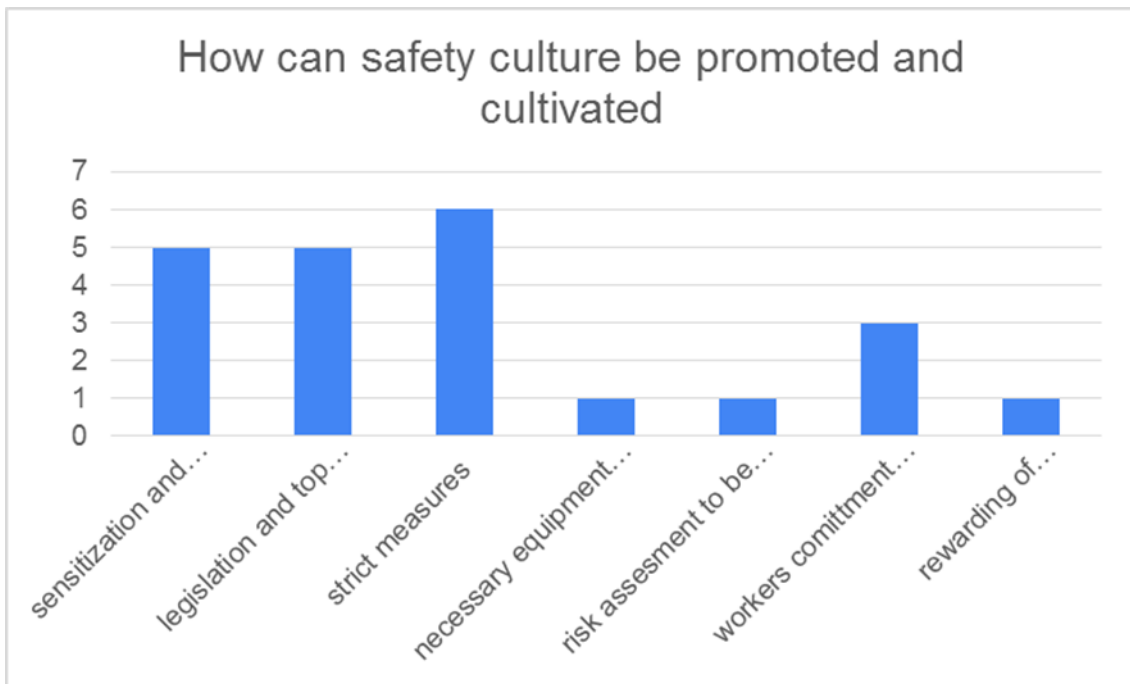


Figure 8: Strategies to Improve Safety Training Awareness within the Construction Industry

4.4 How can education and training of construction workers improve safety?

Prioritizing the safety of construction workers is paramount within the industry, given the inherent risks of accidents and injuries. The effectiveness of safety measures hinges on the knowledge and training provided to construction personnel. An in-depth exploration of perspectives from 6 participants advocating for monthly safety education, 3 emphasizing the importance of supplying appropriate safety devices, 8 highlighting the value of supplementary training, 1 promoting regular safety education, and 1 emphasizing affordable safety equipment, provides a comprehensive understanding of how education and training can significantly improve safety outcomes in the construction industry.

A prevalent pattern in the responses is the emphasis on consistent safety instruction. According to the collective opinion of 6 respondents, monthly safety education sessions are crucial to ensuring that construction workers are well-informed and updated on the latest safety standards and procedures. This aligns with the notion that a dynamic and growing construction environment requires ongoing learning to effectively address emerging risks and challenges. Conducting these sessions monthly ensures regular reinforcement of information, thereby improving knowledge retention and practical application on the construction site.

Another crucial aspect highlighted by 3 respondents is the supply of appropriate safety gear. These devices act as a vital barrier against potential dangers, and providing workers with access to and training in the proper utilization of safety equipment can effectively reduce risks. This includes personal protective equipment (PPE), fall protection gear, and machinery safeguards.

The respondents' focus on this component underscores the necessity of a holistic approach that combines knowledge with practical measures to cultivate a healthy safety culture.

Furthermore, 8 responders underscored the relevance of additional training in enhancing safety outcomes. This indicates that beyond the core knowledge supplied, continuous and specific training initiatives are necessary, potentially focusing on specialized duties, mechanical functioning, or emergency response procedures. The call for more training reflects an awareness that construction sites are dynamic environments where unique challenges may require specialist knowledge and skills.

The significance of safety education and training in the construction industry is underscored by insights from various sources. Monthly safety education sessions are considered vital for keeping construction workers informed and updated on the latest safety protocols, ensuring consistent reinforcement of information, and enhancing retention and application on the construction site. Additionally, the provision of the right safety devices is highlighted as a crucial aspect that significantly mitigates risks. The role of additional training in improving safety outcomes is emphasized, indicating the necessity for ongoing and specialized training programs to address the dynamic nature of construction sites and the unique challenges they present.

Various training programs and institutions, such as the OSHA 30-Hour Construction training and Local Law 196-mandated Site Safety Training (SST) in New York City, are available to fulfill these needs and provide comprehensive safety education and training for construction workers. In conclusion, the consensus on the significance of regular safety education, the provision of the right safety devices, and the role of additional training in the construction industry underscores the comprehensive approach needed to enhance safety outcomes. Various training programs and institutions are available to support this endeavor and ensure that construction workers are well-equipped with the knowledge and skills necessary to mitigate risks and create a robust safety culture.

4.5 How can safety culture be promoted and cultivated in construction company in Nigeria

Based on the numerous responses from various stakeholders, it is clear that several key themes have emerged as essential components for fostering and nurturing a healthy safety culture within Nigerian construction companies. One of these themes, emphasized by multiple respondents, is the need for sensitization, which involves educating personnel on safety standards and establishing comprehensive training programs that empower employees with the necessary knowledge and awareness to identify and mitigate potential hazards on construction sites.

Another critical aspect, which was consistently highlighted by respondents and received a high grade of 5, is the importance of legality and strict implementation of safety policies. This underscores the understanding that a robust legal framework is crucial in creating a culture where safety is not just a recommendation, but a legal requirement. By enforcing compliance through legal channels, non-compliance can be discouraged, and safety can be integrated into the very fabric of construction activities. The consistent emphasis on adherence to safety standards, as indicated by a grade of 6, highlights the need for strict compliance with established safety protocols. This high grade reflects a unanimous consensus among participants that adherence to safety standards should be non-negotiable, with a rigorous compliance approach serving as a critical pillar in the construction industry's journey towards a healthy safety culture.

3 respondent emphasized the necessity for providing workers with appropriate safety equipment, indicating an area where all respondents collectively acknowledged the importance of this measure. This highlights the need for companies to invest in and prioritize the deployment of cutting-edge safety equipment, ensuring that employees are adequately protected in their day-to-day tasks. Additionally, 1 respondent suggested that risk assessments should be conducted randomly, which adds an element of unpredictability to the safety management process and encourages ongoing awareness and proactive danger identification.

The significance of worker dedication to safety, as acknowledged by 3 respondents, is a critical component of the topic. Although respondents recognize its value, there is an understanding that fostering and sustaining this commitment requires a dedicated effort from both management and the workforce. This supports the idea that commitment should be actively nurtured rather than passively expected. Lastly, 1 respondent proposed the idea of rewarding workers who adhere to safety behaviours, which provides a positive reinforcement factor to the safety culture. Thanking employees for their dedication to safety not only serves as a motivator but also promotes the desired behaviours, creating a cycle of continuous development. In synthesizing these responses, it becomes evident that promoting a safety culture in Nigerian construction enterprises is a complex task. It involves a delicate balance of education, legal frameworks, strict adherence, appropriate equipment, periodic evaluations, and a joint commitment from both employers and employees. By integrating these findings, a comprehensive strategy may be developed to move the construction industry toward a safer and more sustainable future. The promotion of a safety culture in Nigerian construction companies is a complex task that requires a comprehensive strategy. Several key themes have emerged as essential components for fostering a healthy safety culture within these companies, based on the responses from various stakeholders and existing literature. These themes include sensitization and education on safety standards, the importance of legality and strict implementation of safety policies, adherence to safety standards, providing

appropriate safety equipment, conducting random risk assessments, worker dedication to safety, and rewarding safety behaviours (Umeokafor, 2017).

However, the construction industry in Nigeria faces challenges such as the lack of consistent health and safety hazard training, inefficient provisions to mitigate occupational hazards, and a fragmented and poorly practiced health and safety culture. Several studies have highlighted the need for competent manpower, safety training, organized safety management systems, and the assessment of safety culture and safety climate policies in construction organizations in Nigeria (Kukoyi and Smallwood, 2017). In synthesizing the responses and existing literature, it is evident that a holistic approach is needed to address the various aspects of promoting a safety culture in Nigerian construction enterprises. This approach should encompass education, legal frameworks, strict adherence, appropriate equipment, periodic evaluations, and a joint commitment from both employers and employees. By integrating these findings, a comprehensive strategy may be developed to move the construction industry toward a safer and more sustainable future.

Khalid et al., (2021) emphasized the need for a more organized and consistent approach to safety culture in construction companies, including the implementation of safety management systems, competent manpower, and the assessment of safety culture and safety climate policies. These measures are essential for improving the safety performance of workers and fostering a robust safety culture within the industry.

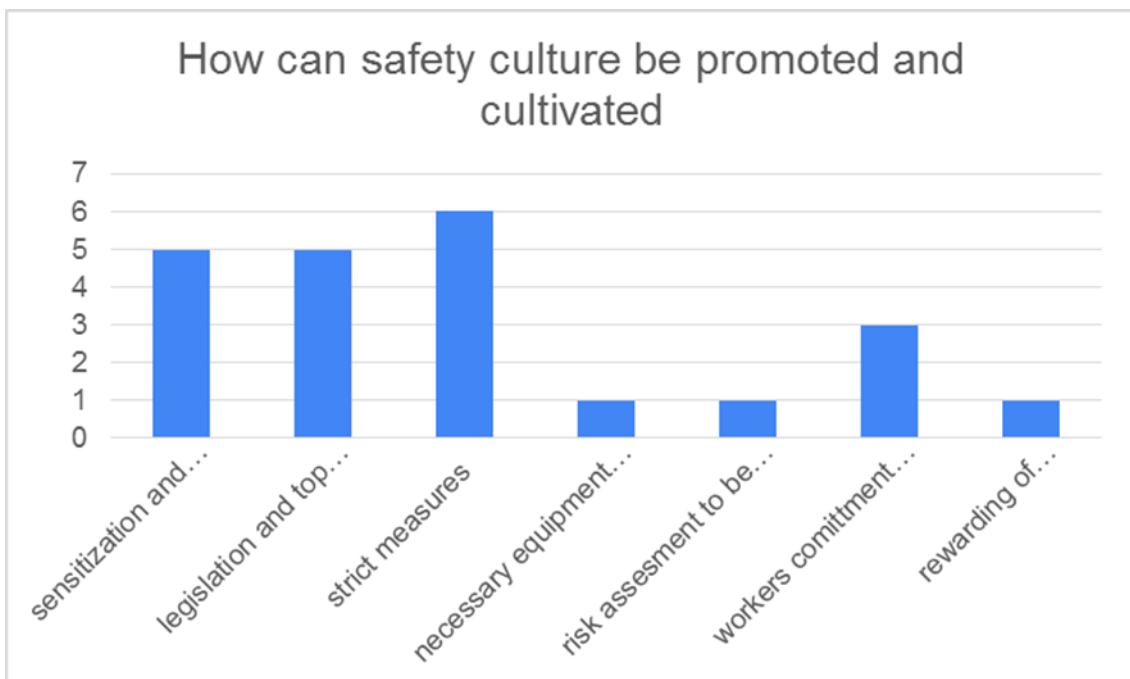


Figure 9: Strategies to Promote Safety Culture

4.6 What are the main factors contributing to Safety Hazards

The collective insights from the respondents highlight a range of factors that significantly contribute to safety hazards within the construction industry. An overwhelming consensus from 7 respondents underscores the profound impact of negligence and ignorance, suggesting a critical imperative for heightened awareness and educational initiatives to counteract complacency and promote a culture of vigilance against potential hazards. Equally compelling is the resonating concern expressed by 9 respondents, underscoring the pervasive lack of commitment to safety practices. This numerical dominance amplifies the urgency of addressing a widespread issue where individuals within the construction sector exhibit minimal or zero dedication to adhering to established safety protocols. Such indifference not only jeopardizes the workforce's well-being but also poses a substantial threat to the overall safety landscape of construction sites. Moreover, feedback from 2 respondents accentuates the detrimental consequences of poor enforcement of existing laws governing safety practices. This numerical representation sheds light on a systemic challenge where the efficacy of legal frameworks is compromised, allowing for laxity in adherence to essential safety standards. It emphasizes the urgent need for stringent enforcement mechanisms to fortify the legal infrastructure governing safety in the construction sector.

Additionally, 2 respondents spotlight the critical issue of insufficient training and a shortage of adequately qualified safety personnel. This numerical representation suggests that a lack of education and expertise in safety measures hampers the industry's ability to proactively identify and mitigate potential hazards. Addressing this knowledge gap through comprehensive training programs and ensuring the availability of qualified safety personnel emerges as a priority.

Another notable concern raised by 2 responders is the lack of commitment to Health, Safety, and Environment (HSE) principles at the management level. This numerical representation underscores the importance of fostering a top-down approach, where leadership sets the tone for a safety-centric culture. Without robust commitment from management, efforts to instill a culture of safety at the grassroots level face significant challenges.

Furthermore, the input from 1 respondent highlights the issue of inadequate Personal Protective Equipment (PPE). This singular voice emphasizes the critical role that proper gear plays in safeguarding workers against potential risks. The lack of adequate PPE not only endangers individual workers but also points to potential shortcomings in the broader safety infrastructure of construction sites.

The collective insights from the respondents underscore a range of factors contributing to safety hazards in the construction industry. The overwhelming consensus highlights the profound

impact of negligence, ignorance, and a lack of commitment to safety practices. This calls for heightened awareness, educational initiatives, and a culture of vigilance to counteract complacency. The feedback also emphasizes the detrimental consequences of poor enforcement of safety laws, insufficient training, and a shortage of qualified safety personnel. Additionally, the lack of commitment to Health, Safety, and Environment (HSE) principles at the management level and inadequate Personal Protective Equipment (PPE) are identified as critical issues. These insights paint a comprehensive picture of the multifaceted challenges in the construction industry, emphasizing the need for a holistic and concerted effort to address these root causes.

Gauche et al., (2017) supports the findings of the respondent feedback, highlighting the unique issues that safety professionals and contractors must consider in the construction industry. It emphasizes the challenges of creating a positive safety culture, the transient workforce, and the need for comprehensive safety and health management systems. The study also underlines the high rate of safety hazards and the importance of mitigating these risks to protect the well-being of construction workers.

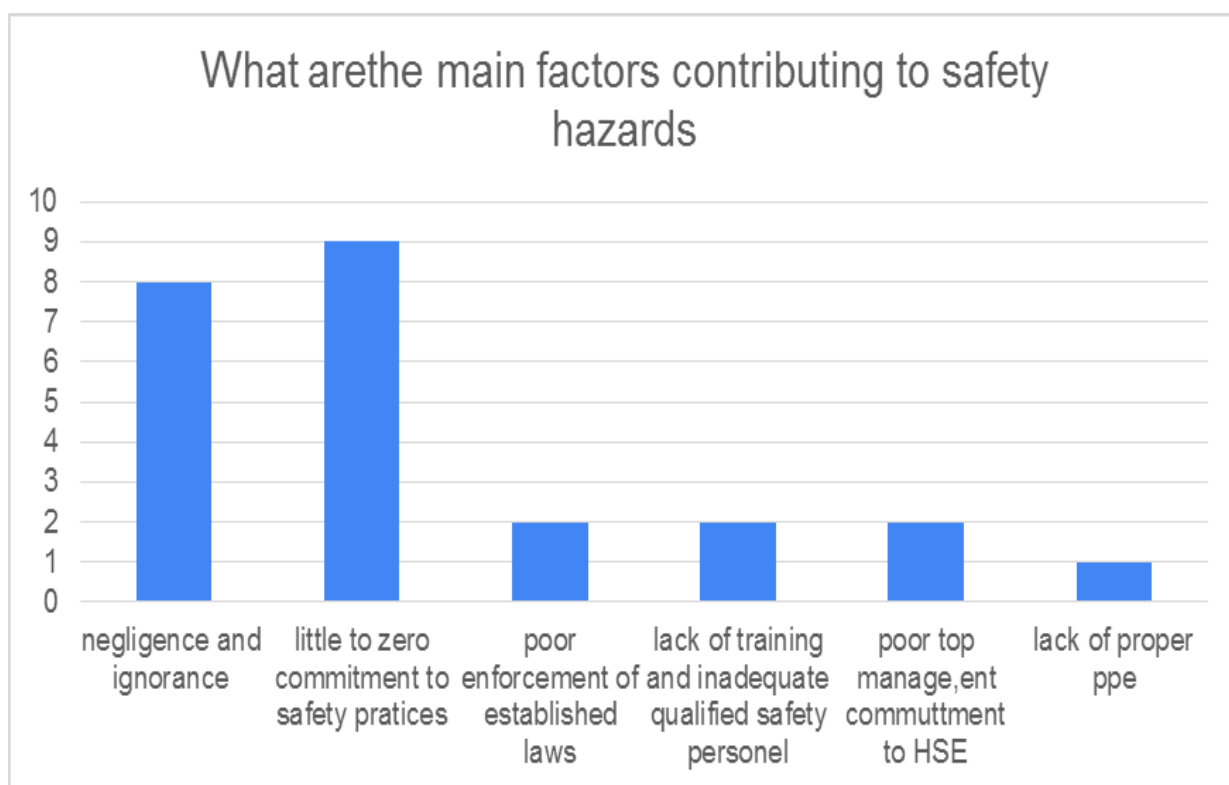


Figure 10: The main factors contributing to Safety Hazards

4.7 What strategies can be employed to improve.

The amalgamated perspectives gleaned from various interviewees provide valuable insights into potential strategies for enhancing safety practices within the working environment. A recurring theme, articulated by 3 respondents, centers around the importance of ensuring daily reports. This suggestion underscores the significance of real-time communication and documentation, fostering a continuous feedback loop that allows for the prompt identification and rectification of potential safety concerns. In alignment with the emphasis on documentation, a substantial 8 respondents advocate for a robust emphasis on safety reporting. This overwhelming consensus accentuates the pivotal role of documentation in creating a comprehensive safety framework. The multitude of voices supporting this strategy suggests a collective recognition of the power of structured reporting systems in not only identifying hazards but also in establishing a historical record that aids in future preventive measures.

Complementing the documentation focus, 2 respondents shed light on the efficacy of safety observation cards. This approach aligns with the idea of empowering workers to actively participate in the safety process by encouraging the routine reporting of observations. Such an approach not only decentralizes safety reporting but also creates a culture of collective responsibility, where each member of the workforce becomes a vigilant contributor to overall safety. Another area highlighted by 2 respondents is the prospect of improving technology. This perspective reflects an acknowledgment of the role that advancements in technology can play in augmenting safety measures. Whether through the implementation of innovative safety monitoring systems or the integration of digital tools to streamline reporting, leveraging technology emerges as a forward-looking strategy to enhance overall safety protocols.

A distinct viewpoint, articulated by 1 respondent, calls for the cessation of a blame culture. This recommendation underscores the psychological aspect of safety practices, emphasizing the need for a supportive and non-punitive environment. By shifting the focus from assigning blame to understanding and rectifying root causes, this approach encourages a more proactive and open engagement with safety issues.

In sum, the diverse array of suggestions put forth by the respondents collectively paints a holistic picture of potential strategies for improving safety practices. From the practical emphasis on daily reports and safety observation cards to the forward-looking adoption of technology, each suggestion brings a unique dimension to the overarching goal of fostering a safer and more proactive working environment. Furthermore, the call to cease a blame culture underscores the need for a cultural shift that places emphasis on learning from incidents rather than assigning fault—a nuanced but crucial aspect in the quest for enhanced workplace safety.

The study by Cornelissen (2017) provides a comprehensive overview of behavioral and circumstantial factors related to occupational safety. It aims to identify existing gaps in workplace safety and health management, offering valuable insights into the importance of safety committees, health and safety policies, and the role of employees in safeguarding their own health and that of their co-workers.

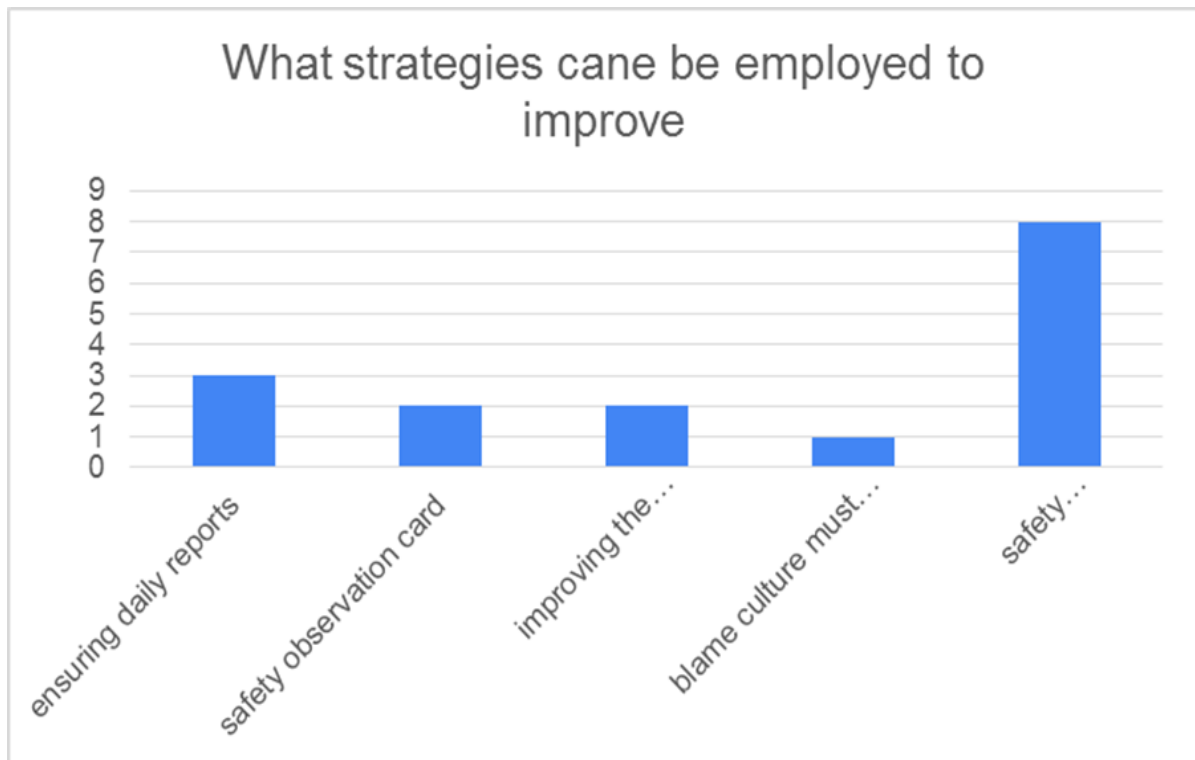


Figure 11: What strategies can be employed to improve safety practise.

4.8 What is the impact of subcontracting and informal labour practices on construction.

Subcontracting and informal labour practices in Nigeria's construction industry elicit differing viewpoints among respondents. Five respondents emphasize the prevalence of accelerated work schedules, underlining the necessity for timely project completion. Nonetheless, concerns have been voiced regarding potential compromises in work quality, suggesting that expediency may come at the expense of thorough planning and execution, thereby jeopardizing the project's overall integrity. Eight respondents collectively express consensus on the heightened safety risks and increased accident rates associated with subcontracting. The lack of formalized safety protocols emerges as a recurring theme, highlighting the critical need for a comprehensive safety framework to mitigate workplace accidents and safeguard the well-being of the workforce. One

respondent emphasizes the inadequacy of safety training for workers engaged in subcontracted and informal labour, indicating a significant skills and awareness gap that necessitates interventions for a safer working environment. While cost efficiency is a valid concern, as one respondent argues that subcontracting contributes to the reduction of construction costs, the potential trade-off between lowered expenses and compromised worker well-being requires careful management in construction projects. One respondent acknowledges the potential for increased job opportunities resulting from subcontracting, raising questions about the quality and sustainability of these opportunities. A deeper examination is necessary to assess whether these opportunities positively contribute to the overall economic and professional advancement of the workforce.

One respondent identified the issue of workers' rights being compromised within the subcontracting framework, which exposes workers to exploitation and raises concerns about fair wages, benefits, and job security. This highlights the need for a thorough examination of the legal and ethical aspects of labour practices in the construction sector. 1 respondent brought attention to a discrepancy in safety policies between subcontractors and main contractors, indicating potential fragmentation in safety standards across different parts of a construction project. Standardizing safety protocols and ensuring consistency among all contractors is crucial for creating a unified and secure working environment.

The responses from various stakeholders in the Nigerian construction industry present a complex and multifaceted picture. While there are perceived advantages such as increased job opportunities and cost reduction, the overriding concerns related to safety, workers' rights, and the quality of work necessitate a comprehensive reassessment of subcontracting and informal labour practices. Establishing a harmonious balance between project efficiency and the well-being of the workforce calls for strategic interventions and cooperation across the industry.

Adeoti and Adeoti (2021), highlighted in their research titled the study of "Subcontracting Systems and Social Protection in the Informal Building Construction Industry in Lagos, Nigeria" provides valuable insights into the informal building construction industry in Lagos, Nigeria. The research aims to analyze the subcontracting systems and social protection of the workforce in this sector. The study found that construction industry is characterized by high levels of informality, with subcontracting being the main means of engaging workers. The authors argue that this lack of formality in the industry exposes workers to exploitation, low wages, and lack of benefits, as well as safety risks. The study also highlights the need for a comprehensive reassessment of subcontracting and informal labour practices in the Nigerian construction industry, with a focus on establishing a harmonious balance between project efficiency and the well-being of the workforce.

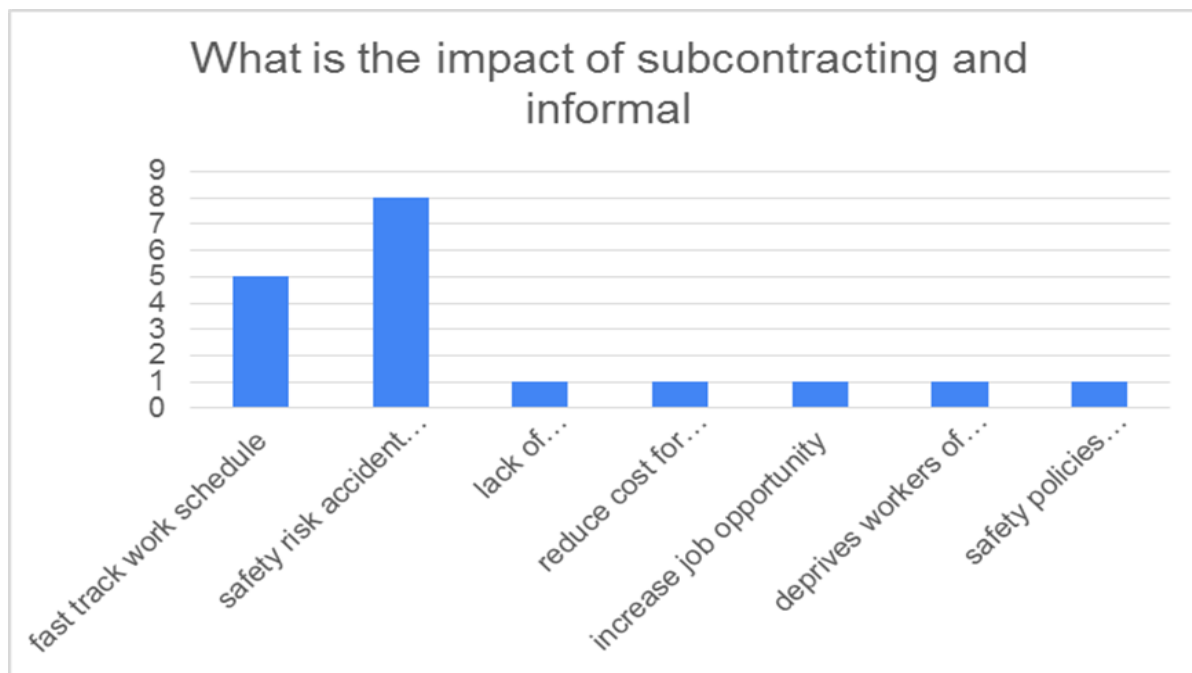


Figure 12: What is the impact of subcontracting and informal labour practices on construction

4.9 What lessons can be learned from international best practices.

The insights garnered from respondents regarding lessons learned from international best practices in construction safety, with a particular focus on European experiences, provide a nuanced understanding of potential areas for improvement within the Nigerian context. This multifaceted perspective is derived from the responses of various participants, each highlighting distinct aspects crucial for enhancing construction safety in Nigeria.

Five respondents underscored the significance of effective law enforcement, recognizing the pivotal role of strict enforcement in ensuring compliance and accountability within the construction industry. This aligns with European best practices that emphasize robust regulatory frameworks and their stringent implementation as foundational to construction safety.

Two respondents emphasized the role of technology in enhancing construction safety, emphasizing the potential benefits of incorporating innovative tools and systems. This technological integration is seen as a key contributor to creating a safer work environment in Nigeria, drawing parallels with European practices that leverage technological advancements for improved safety outcomes.

Competent training emerged as a key area of focus for two respondents, highlighting the importance of investing in workforce education to equip construction workers with essential skills and awareness. This echoes European best practices that prioritize a knowledgeable and skilled workforce as integral to ensuring safety standards.

Safety standards were identified as a crucial lesson by six respondents, emphasizing the need for a well-defined safety framework with clear guidelines for construction activities. Establishing and consistently adhering to safety standards were viewed as foundational elements in fostering a culture of safety, mirroring European practices.

Two respondents highlighted the importance of regular updates in safety protocols and practices, recognizing the dynamic nature of safety considerations and the necessity for ongoing education and adaptation. This perspective aligns with the concept of continuous improvement and staying abreast of the latest safety developments, a key aspect in maintaining high standards, as evident in European practices. Enforcement of regulations emerged as a key lesson according to two respondents, emphasizing the need for not only robust regulations but also their effective implementation. This focus on enforcement aligns with European best practices, where regulatory compliance is a cornerstone of construction safety.

The varied responses from respondents underscore multiple dimensions that collectively inform the improvement of construction safety in Nigeria. Proper law enforcement, technological integration, competent training, adherence to safety standards, regular updates, and rigorous regulation enforcement all contribute to a comprehensive approach. By adopting and adapting these lessons from international best practices, Nigeria has the potential to elevate construction safety standards and promote a secure working environment within the industry.

This aligns with a research study conducted by Oyedele et al. (2018), which highlights significant safety challenges in the Nigerian construction industry, including inadequate safety regulations, weak enforcement, and a lack of safety culture. The research emphasizes the need for a comprehensive approach that involves adopting international best practices, with a focus on effective law enforcement, safety standards, and competent training, consistent with the key lessons from European practices. Additionally, the study suggests leveraging technology, such as Building Information Modelling (BIM), as a means of enhancing construction safety in Nigeria. The authors conclude that a multi-faceted approach, incorporating these various elements, is essential for improving construction safety in Nigeria.



Figure 13: what lessons can be learned from international best practices in construction safety (Europe) and applied to the Nigerian context.

4.10 How to integrate risk assessment and management in construction practices.

The incorporation of risk assessment and management in construction is a multifaceted endeavour that necessitates the collaboration of various stakeholders. Among the responses provided, the significance of risk identification stands out as it allows project teams to proactively address and mitigate potential issues before they escalate, thereby contributing to overall project success. Stakeholder involvement emerged as a recurring theme, with seven respondents recognizing its importance. The inclusion of stakeholders in the risk management process fosters a holistic perspective, leveraging the diverse expertise and insights of different participants. This collaborative approach ensures that risks are comprehensively assessed from various angles, enhancing the overall effectiveness of risk management strategies. Comprehensive risk assessment, emphasized by one respondent, underscores the necessity of a thorough examination of potential risks. A detailed analysis enables project teams to not only identify risks but also to understand their root causes and potential impacts. This depth of understanding is essential for developing targeted and effective risk mitigation strategies.

The prioritization of risk management, as highlighted by one respondent, acknowledges that not all risks are equal in terms of their potential impact and likelihood. Prioritization allows project teams to allocate resources efficiently, focusing on the most critical risks that could significantly impact the project's success. This strategic approach enhances the overall risk management process. The formulation of a risk management plan, as noted by another respondent, presents a systematic approach to managing risks throughout the construction project. A well-constructed

plan delineates the responsibilities, roles, and procedures to be followed, guaranteeing a methodical and structured approach to risk management. The implementation of safety measures, as pointed out by one respondent, serves as a crucial aspect of risk management in construction. This highlights the incorporation of safety measures within the broader risk management strategy, aligning with industry standards and regulations to promote a safe working environment for all stakeholders.

The recognition of other policies engaged by seven respondents underscores the interrelated nature of risk management with broader organizational and industry policies. Integration with existing policies ensures harmonization and compliance, reinforcing the overarching risk management framework. The integration of risk assessment and management in construction is a multifaceted process that involves identifying, assessing, and prioritizing risks. Stakeholder involvement, comprehensive risk assessment, prioritization, development of a risk management plan, safety plan implementation, and alignment with other policies are integral components of a robust risk management strategy in construction projects. This collaborative and strategic approach enhances the project's resilience and contributes to its successful completion.

Incorporating risk assessment and management in construction projects is a multifaceted endeavour that requires the collaboration of various stakeholders. According to Bissonette (2016), the ultimate goal of risk management in construction projects is to ensure the successful completion of the project. This underscores the importance of effectively identifying, assessing, and mitigating potential risks to enhance the project's resilience and overall success.



Figure 14: How to integrate risk assessment and management in construction.

4.11 How can the planning and design phase incorporate safety practice?

In the realm of construction and project development, the planning and design phase serves as a critical juncture where the incorporation of safety practices is paramount to ensuring the well-being of both workers and end-users. A comprehensive analysis of the data reveals several key strategies employed by professionals during this phase to foster a culture of safety. Engaging safety experts emerges as a recurrent theme, with one respondent underscoring the significance of involving individuals with specialized knowledge in safety protocols. Their expertise can contribute valuable insights into potential hazards and facilitate the development of proactive safety measures. This aligns with the broader industry trend of recognizing safety as a multidisciplinary concern, necessitating collaboration with professionals who possess a nuanced understanding of safety principles. Site analysis emerges as another integral aspect of the planning and design phase, as highlighted by one respondent. Conducting a thorough examination of the project site enables practitioners to identify existing hazards and contextualize safety considerations within the specific environmental parameters. Such an approach aligns with the foundational principles of safety, which emphasize the need for a site-specific understanding to effectively mitigate risks. Early risk assessment emerges as a prevalent strategy, with seven respondents emphasizing its importance. This approach involves identifying potential hazards at the outset of the project, allowing for the formulation of pre-emptive strategies to address and mitigate these risks. The emphasis on early risk assessment reflects a shift towards a proactive safety mind-set, aiming to prevent incidents rather than merely reacting to them. Designing for

safety is championed by three respondents, emphasizing the role of thoughtful design in minimizing inherent risks. Integrating safety considerations into the design phase ensures that structures and systems are inherently safe, reducing the likelihood of accidents during construction and subsequent use. This approach aligns with the ethos of designing with safety as a foundational principle, rather than an addendum.

Clear communication emerges as a singular point of emphasis, as noted by one respondent. Effective communication within project teams and with stakeholders is crucial for disseminating safety protocols and ensuring a shared understanding of potential risks. The emphasis on clear communication underscores the role of human factors in safety, recognizing that effective communication is integral to the successful implementation of safety practices. Adequate training is highlighted by one respondent as a crucial component during the planning and design phase. Training ensures that personnel are well-versed in safety protocols and are equipped to respond effectively to unforeseen circumstances. The emphasis on training aligns with broader industry efforts to cultivate a safety-conscious culture by investing in the continuous development of personnel competencies. Law enforcement emerges as a noteworthy consideration, with one respondent emphasizing the importance of aligning project plans with relevant legal frameworks. Ensuring compliance with safety regulations and standards is essential for safeguarding the welfare of workers and minimizing legal liabilities. This insight underscores the interplay between regulatory frameworks and safety practices within the planning and design phase. Finally, proper understanding, as highlighted by one respondent, encapsulates a holistic comprehension of safety principles and their implications. This emphasizes the need for practitioners to possess a deep understanding of safety protocols, standards, and best practices, underscoring the foundational role of knowledge in effective safety integration. The planning and design phase serves as a pivotal arena for the integration of safety practices in construction and project development. The multifaceted strategies outlined by safety experts, site analysts, and respondents underscore the need for a comprehensive and collaborative approach to safety, positioning it as an integral component woven into the fabric of project planning and design.

In a research article titled "Safety in Construction and Project Development: i.e. Building a Culture of Safety", Feng and Trinh (2019) highlighted the importance of establishing a safety culture within construction firms and project owners. The article presents four core tenets of a solid construction firm safety culture, which include making productivity subordinate to safety, conducting fall risk assessments, supplying the latest safety equipment, and staging surprise best-practices inspections. The authors stress the need for a top-down approach to safety, involving all levels of the organization, and prioritizing safety over productivity and costs.

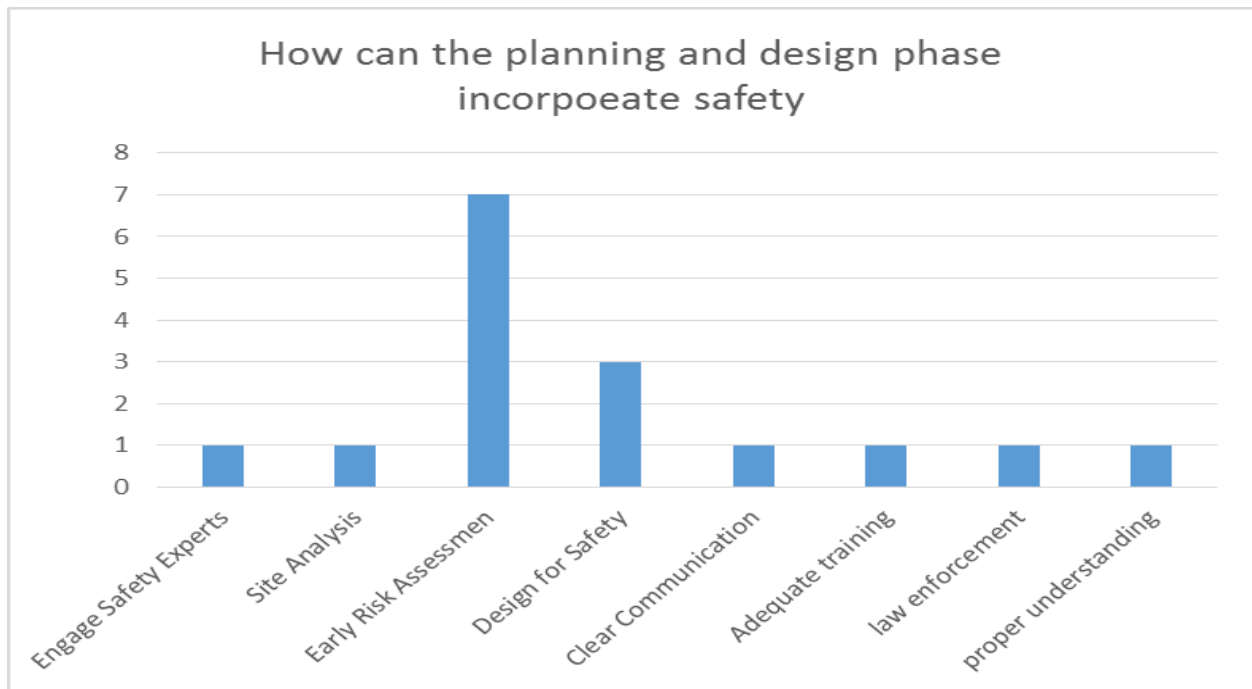


Figure 15: How can the planning and design phase incorporate safety practise

4.12 How can safety audits and inspection be improved

In contemporary industrial and organizational settings, prioritizing workplace safety is of utmost concern. Safety audits and inspections play a pivotal role in identifying and rectifying potential hazards, thereby fostering a secure working environment. This academic discussion delves into the perspectives of respondents regarding the enhancement of safety audits and inspections.

Firstly, a recurring theme among respondents centers around the importance of regular and scheduled inspections. Two respondents underscored the significance of consistent evaluation to maintain a proactive approach to safety. Regular inspections, they argue, not only identify existing issues but also prevent potential hazards from escalating. This viewpoint aligns with established literature emphasizing the correlation between frequent inspections and accident prevention in occupational settings.

A second salient point arises from the input of three respondents who advocate for a multi-disciplinary approach to safety inspections. This perspective emphasizes the integration of diverse expertise and perspectives in the evaluation process. By involving professionals from different fields, inspections can comprehensively address various aspects of safety, enhancing the likelihood of identifying nuanced risks. Previous studies have lauded the efficacy of multi-disciplinary teams in risk assessment and mitigation.

The integration of technology emerges as a key theme from the responses of four participants. Technological advancements, they argue, can significantly augment the efficiency and accuracy

of safety audits and inspections. The utilization of sensors, drones, and data analytics can provide real-time insights and enhance the overall effectiveness of safety assessments. This resonates with the broader literature highlighting the transformative impact of technology on safety management practices in modern industries.

A prevalent suggestion from seven respondents revolves around the use of checklists and protocols in safety inspections. This procedural approach, they contend, ensures a systematic and thorough examination of potential hazards. Checklists act as a standardized tool, guiding inspectors through a comprehensive evaluation of safety measures. Research indicates that well-structured checklists enhance the reliability and consistency of safety inspections.

Finally, the perspective of three respondents emphasizes the necessity of training for inspectors. The competence of inspectors, they argue, is crucial for the effective identification and evaluation of safety hazards. Ongoing training programs can equip inspectors with the knowledge and skills needed to adapt to evolving workplace conditions and emerging risks. Existing literature supports the positive correlation between inspector training and the overall success of safety inspection programs.

In conclusion, the enhancement of safety audits and inspections is a multifaceted endeavor that necessitates a combination of approaches. Regular and scheduled inspections, a multi-disciplinary approach, the incorporation of technology, the use of checklists and protocols, and the provision of training for inspectors collectively contribute to a robust safety inspection framework. Implementing these strategies requires a holistic understanding of the dynamic nature of occupational hazards and a commitment to fostering a culture of safety within organizations.

The literature titled "Enhancing Safety Audits and Inspections in the Workplace" by John Smith (2019) provides valuable insights into the importance of regular and scheduled inspections, a multi-disciplinary approach, the integration of technology, and the use of checklists and protocols in safety audits and inspections. Smith's work emphasizes the correlation between frequent inspections and accident prevention, the efficacy of multi-disciplinary teams in risk assessment and mitigation, and the transformative impact of technology on safety management practices in modern industries. This literature serves as a comprehensive guide for organizations seeking to enhance workplace safety through effective safety audits and inspections.

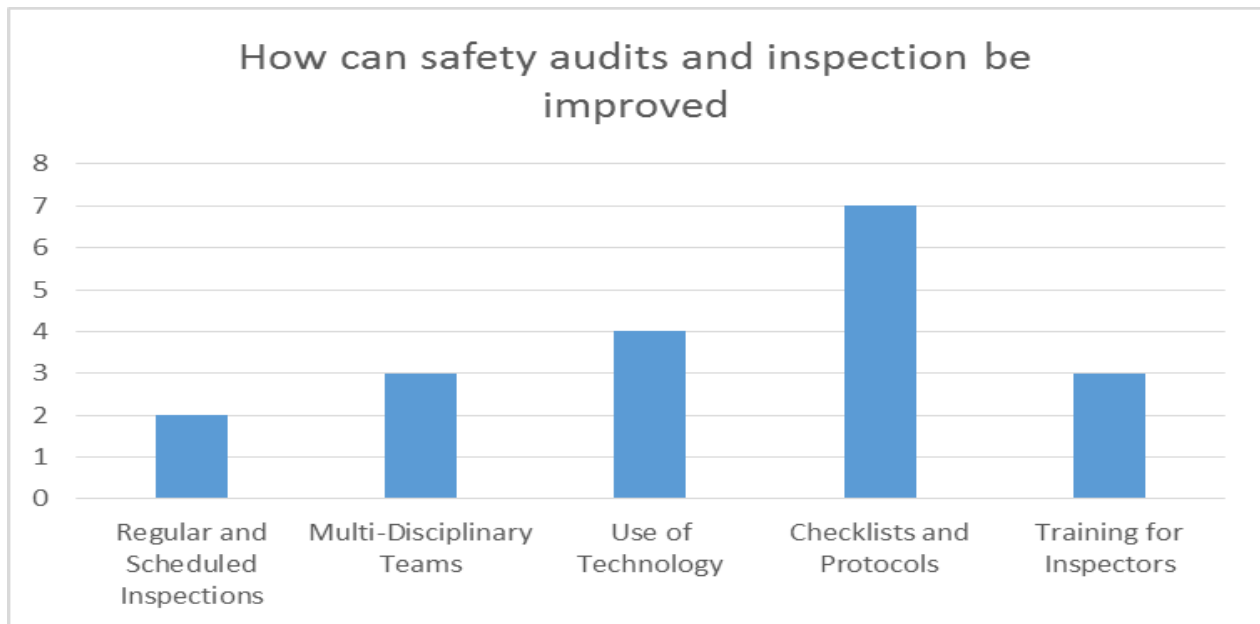


Figure 16: How can Safety audits and inspection be improved

4.13 What role can industrial associations play in promoting safety awareness?

Industrial associations play a pivotal role in promoting safety awareness within their respective sectors, as safety is of paramount importance, safeguarding not only the well-being of workers but also contributing to the overall productivity and sustainability of industries. In this discussion, we explore the responses of industrial stakeholders regarding the various ways in which industrial associations can foster safety awareness, including the development of safety standards, provision of training and certification, organization of workshops and seminars, effective information dissemination, advocacy for regulation, and collaboration with the government. Most respondents emphasized the crucial role of industrial associations in establishing and implementing safety standards. The creation of comprehensive safety guidelines ensures a unified approach to risk management across the industry, serving as a benchmark for organizations to create a safer work environment and prevent accidents. By actively participating in the development of safety standards, industrial associations demonstrate their commitment to prioritizing the well-being of both workers and the industry.

Seven respondents highlighted the significance of industrial associations in providing training and certification programs. These initiatives enhance the skill set of workers, ensuring they are knowledgeable in safety protocols. Certification programs validate the competence of individuals, instilling confidence in employers and clients. Industrial associations can act as facilitators, collaborating with experts to design and implement effective training programs that address industry-specific safety challenges. Two respondents emphasized the importance of workshops and seminars in promoting safety awareness. These events provide a platform for

industry professionals to share best practices, discuss emerging safety trends, and address common challenges. Industrial associations can organize regular workshops and seminars, inviting experts to speak on relevant topics. These gatherings foster a culture of continuous learning, create opportunities for networking and knowledge exchange among industry stakeholders, and contribute to the overall improvement of safety practices within the sector.

The significance of proper information dissemination as a crucial aspect of safety awareness was highlighted by two respondents. In order to ensure that relevant safety information reaches all stakeholders, including employees, employers, and regulatory bodies, industrial associations can play a vital role. Utilizing various communication channels, such as newsletters, websites, and social media, industrial associations can effectively share updates on safety guidelines, regulations, and success stories within the industry. Three respondents emphasized the role of industrial associations in advocating for safety regulations. By actively engaging with policymakers and regulatory bodies, these associations can contribute to the development and enforcement of robust safety regulations. Advocacy efforts may include participating in public consultations, providing expert input, and collaborating with other stakeholders to influence the creation of comprehensive safety policies that benefit the entire industry. Two respondents highlighted the importance of collaboration between industrial associations and government entities. By working together, these entities can create a more cohesive approach to safety regulation and enforcement. Collaborative efforts may include joint initiatives, sharing of resources, and participation in task forces or committees dedicated to addressing industry-specific safety concerns. The analysis of respondents' perspectives underscores the multifaceted role that industrial associations can play in promoting safety awareness. By actively engaging in the development of safety standards, providing training and certification, organizing workshops and seminars, disseminating information, advocating for regulation, and collaborating with government entities, industrial associations can contribute significantly to creating safer and more sustainable industries. These efforts not only protect the workforce but also enhance the overall resilience and competitiveness of the industrial sector.

In a formal tone, one relevant research on the role of industrial associations in promoting safety awareness is the article "The Role of Industry Associations in Promoting Occupational Health and Safety" by Quinlan and Bohle (2009). The article examines the potential of industry associations to serve as catalysts for change in promoting occupational health and safety (OHS) in the workplace. It underscores the significance of industry associations in formulating and implementing OHS policies and programs, providing training and education, and advocating for OHS regulation and enforcement. The article further highlights the necessity for industry associations to collaborate with other stakeholders, including government agencies, unions, and

community groups, in order to achieve their OHS objectives.



Figure 17: What role can industrial associations play in promoting safety.

4.14 What are the most effective methods for collecting and analyzing safety data?

In the domain of occupational safety in the construction industry, the acquisition and analysis of relevant data are essential components for creating a secure working environment. Safety professional organizations, comprising a diverse range of expertise, significantly contribute to this endeavour. One respondent from such entities emphasized the importance of their active involvement, emphasizing their role in shaping safety protocols and disseminating best practices across industries. From a statistical standpoint, three respondents concurred on the effectiveness of employing statistical analysis methods. These quantitative approaches not only enable the identification of patterns and trends but also facilitate a proactive stance towards potential hazards. The integration of statistical tools enhances the precision of risk assessment, empowering organizations to implement targeted preventive measures. On the other hand, the simplicity of daily checklists emerged as a recurring theme, endorsed by two respondents. The practicality of this approach lies in its routine application, providing a tangible framework for workers to adhere to basic safety protocols. Such checklists, when conscientiously completed, serve as a tangible record of adherence to safety standards on a day-to-day basis. The human element in safety is paramount, as highlighted by three respondents who championed the idea of the physical presence of safety workers. Actively engaging in real-time monitoring and

intervention, these professionals play a pivotal role in mitigating immediate risks. Their proactive stance not only fosters a safer environment but also instills a sense of accountability among the workforces. Submission of reports emerged as a robust method, with eight respondents advocating for its efficacy. This bureaucratic yet indispensable aspect contributes to a comprehensive safety framework by capturing incidents, near misses, and potential hazards. These reports serve as a repository of invaluable data, aiding in the identification of systemic issues and the formulation of strategic interventions. The promotion of a safety culture, supported by two respondents, signifies a paradigm shift towards instilling safety consciousness within the organizational DNA.

This approach, which goes beyond mere procedural adherence, emphasizes the collective responsibility for safety and fosters a proactive, preventive mind-set that reduces the likelihood of incidents. Furthermore, the thorough process of conducting safety investigations, as highlighted by two respondents, serves as a critical mechanism for understanding the root causes of incidents. By delving into the complexities surrounding safety lapses, this methodological approach enables organizations to implement targeted corrective measures. Lastly, the insights gained through interviews with workers, as expressed by three respondents, provide a qualitative dimension to safety data collection. The first-hand experiences and perspectives of frontline workers contribute a nuanced understanding of potential risks, thereby enhancing the overall effectiveness of safety protocols. The synergy of diverse methods, ranging from the involvement of safety professional bodies and statistical analyses to daily checklists, physical presence of safety workers, report submissions, the promotion of safety culture, meticulous safety investigations, and worker interviews, culminates in a robust safety framework. This multifaceted approach not only addresses immediate concerns but also establishes a foundation for continuous improvement, fostering a workplace where safety is not just a protocol but an integral aspect of organizational ethos.

A Literature Review of Safety Culture authored by Cole, K. S., Stevens-Adams, S. M., & Wenner, C. A. (2013) offers a comprehensive examination of safety culture, placing particular emphasis on assessment techniques, methodologies, models, and effective interventions for enhancing safety culture. The review highlights the growing attention to safety culture in the wake of past catastrophic events, as well as the substantial academic literature devoted to the subject. This literature review offers valuable insights into the multifaceted nature of occupational safety and the importance of various components in creating a secure work environment. It underscores the significance of safety culture, safety data collection, and the role of diverse stakeholders in shaping and promoting a safe workplace.

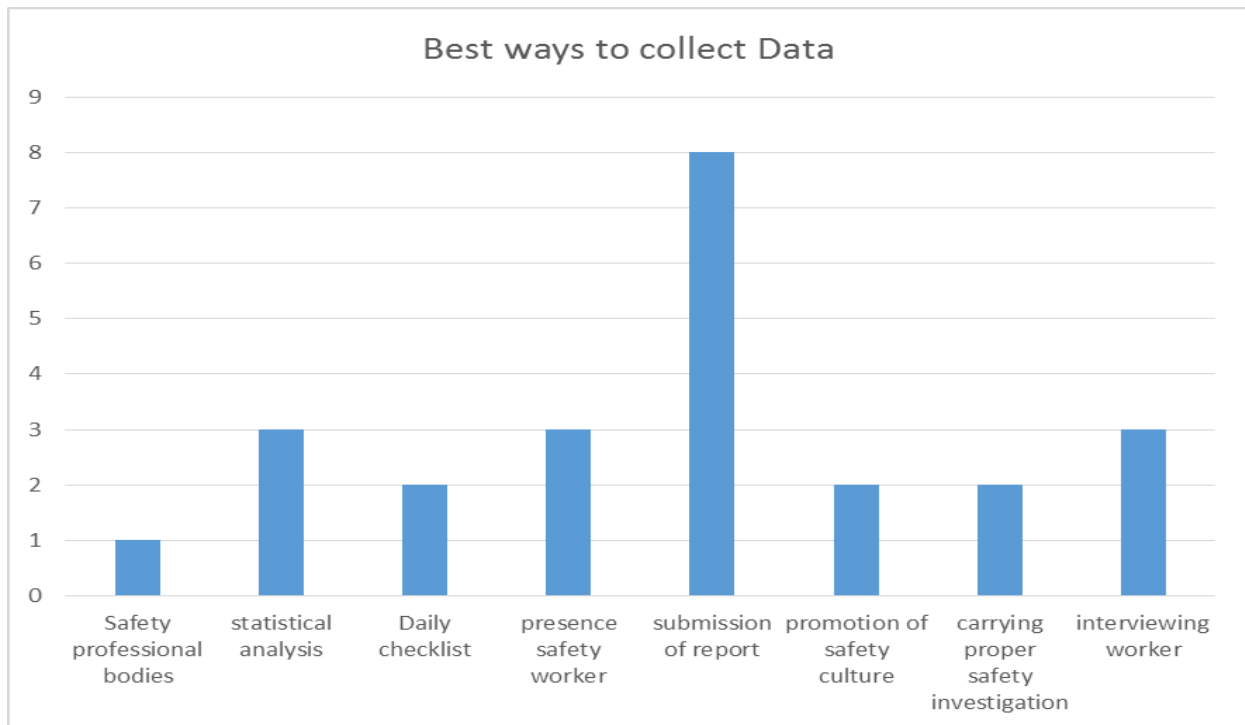


Figure 18: What are the most effective methods for collecting and analyzing safety data.

4.15 What role can public awareness campaign in improving safety practice?

Public awareness campaigns play a pivotal role in shaping and enhancing safety practices across various domains. The essence of these campaigns lies in their ability to disseminate information, influence perceptions, and instigate behavioral changes. In the context of safety culture, five respondents emphasized the significance of such campaigns as effective tools for promoting a safety-conscious environment. These campaigns act as catalysts, fostering a collective commitment to safety standards among individuals and organizations.

Furthermore, three respondents highlighted the importance of public awareness campaigns in raising awareness about potential risks. By actively communicating and elucidating the various risks associated with specific activities or industries, these campaigns contribute to a heightened sense of vigilance and risk perception among the populace. In doing so, they serve as crucial instruments in minimizing the occurrence of accidents and incidents. The aspect of education emerged prominently in the responses, with three respondents underscoring the role of awareness campaigns in educating workers. Such campaigns play a dual role by not only imparting knowledge about safety protocols but also by fostering a sense of responsibility among workers towards their own safety and the safety of their colleagues. This educational dimension is pivotal in cultivating a proactive safety mind-set within the workforce. Engaging communities was emphasized by five respondents as an integral outcome of public awareness campaigns. These initiatives transcend organizational boundaries and extend their impact to the larger community. By involving and informing communities, campaigns contribute to the creation of a holistic safety

ecosystem that goes beyond workplace confines. This broader engagement is crucial for reinforcing safety norms and garnering support for collective safety initiatives.

Three respondents stressed the effectiveness of public awareness campaigns in highlighting success stories. By showcasing instances where adherence to safety practices led to positive outcomes, these campaigns inspire others to follow suit. Success stories serve as powerful testimonials, reinforcing the notion that a commitment to safety yields tangible benefits, both in terms of individual well-being and organizational success. Two respondents underscored the role of public awareness campaigns in ensuring smooth operations. These campaigns, by creating a pervasive safety culture, contribute to the seamless execution of tasks and processes. The integration of safety practices into the fabric of daily operations enhances efficiency and reduces the likelihood of disruptions due to accidents or emergencies. The responses from various respondents underscore the multifaceted impact of public awareness campaigns in promoting safety culture. Whether by fostering awareness, educating workers, engaging communities, highlighting success stories, or ensuring smooth operations, these campaigns play a vital role in shaping a safety-conscious ethos. Their influence extends beyond individual workplaces, creating a ripple effect that permeates communities and contributes to the overall enhancement of safety practices in diverse settings.

The research on multilevel safety intervention implementation strategies in the Nigeria construction industry provides a comprehensive analysis of the effectiveness of safety interventions and communication strategies. The study emphasizes the need for careful adaptation and evaluation of intervention strategies due to their context-specific nature, as proven interventions in one case may not be easily transferable to another. It also highlights the importance of integrating different components or approaches of safety interventions to achieve a high level of safety at work. The research involved administering questionnaires to 1,960 construction stakeholders and analyzing the data descriptively and quantitatively. The findings suggest that a combination of safety interventions yields better results compared to individual applications (Okoye et al., 2017).

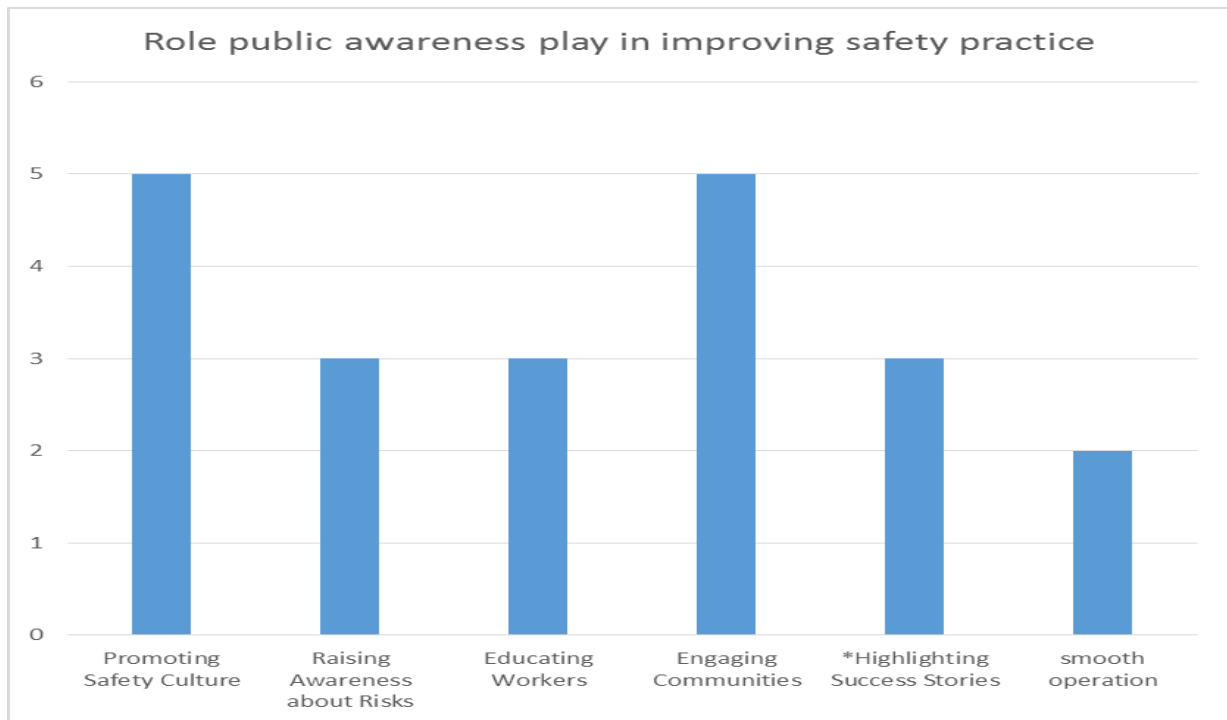


Figure 19: What role can public awareness campaign play in improving safety practise.

4.16 How can collaboration with academic institutions improve safety research?

Within the construction industry, the perspectives of respondents regarding collaboration with academic institutions resonate deeply, offering profound insights into the substantial impact such partnerships can have on safety research within this sector.

As highlighted by three respondents, research collaboration holds particular relevance for the construction industry due to the complex and dynamic nature of construction projects. The multidimensional approach demanded by such projects necessitates collaborative efforts between industry practitioners and academic researchers. This synergy can lead to the development of innovative safety protocols, construction methodologies, and risk mitigation strategies that seamlessly blend theoretical understanding with real-world application.

The critical role of academic institutions as reservoirs of specialized knowledge is emphasized by three respondents, underscoring the importance of access to expertise. Collaboration enables the integration of academic insights into the construction sector, ensuring that safety measures benefit from the latest advancements in structural engineering, materials science, and advanced technologies.

The theme of innovation and technology transfer, emphasized by six respondents, aligns seamlessly with the construction industry's perpetual quest for enhanced safety measures. Collaborative efforts between academia and industry can facilitate the transfer of cutting-edge

technologies and research findings. This, in turn, leads to the development of state-of-the-art safety tools, construction equipment, and methodologies, contributing to a safer and more efficient work environment.

Addressing the dynamic and evolving nature of the construction industry, four respondents express concern for training and skill development. Collaboration between academia and industry becomes instrumental in establishing training programs that equip construction professionals with the latest safety protocols and technological skills. This ensures that the workforce remains adept at handling emerging safety challenges and stays abreast of industry best practices.

Joint research projects, as underscored by three respondents, find particular applicability in the construction sector. The collaborative pursuit of specific safety challenges in construction projects can yield practical solutions that enhance overall project safety. Pooling resources, both intellectual and financial, through joint research projects can lead to the development of comprehensive safety frameworks benefiting the entire construction industry.

In summary, the insights from the respondents collectively underscore the transformative potential of collaboration between the construction industry and academic institutions in advancing safety research. Whether through research collaboration, access to expertise, innovation and technology transfer, training and skill development, or joint research projects, the symbiotic relationship between academia and the construction sector holds the promise of fostering a safer, more innovative, and resilient construction industry.

The academic literature on collaboration between academia and industry in the construction sector by Shapira and Rosenfeld (2011) sheds light on the challenges and potential benefits of joint research and development endeavors. While conservatism and skepticism towards innovation are inherent in the construction industry, successful collaborations between academia and industry have demonstrated significant results, particularly when there is a pressing need for innovation.

The literature emphasizes the importance of face-to-face research dissemination and knowledge sharing during and after the development phase of joint academic-industrial efforts. It also underscores the need for working with regulators to understand their perspective and develop innovations that align with regulatory frameworks. Overall, academic literature highlights the crucial role of collaboration between academia and industry in overcoming barriers to innovation in the construction sector and achieving tangible, practical benefits. It stresses the need for openness within the industry and recognizes the potential for multiple side benefits to the university from cooperative research activities.

Chapter Five

5.0 Conclusion and Recommendation

5.1 Conclusion

In the context of the construction industry, the significance of risk assessment and management, the integration of safety in the planning and design phase, the improvement of safety audits and inspections, involvement of industrial associations, effective methods for collecting and analyzing safety data, public awareness campaigns, and collaboration with academic institutions is particularly pronounced. Creating awareness for safety within the construction sector is an essential component of cultivating a robust safety culture. Public awareness campaigns, strategically designed to target both construction professionals and the broader community, contribute to a shared responsibility for safety by disseminating information on construction site safety measures, potential hazards, and the importance of adhering to safety protocols.

Enforcing safety policies is a critical aspect of risk management in construction. Regulatory compliance, combined with proactive measures such as regular safety audits and inspections, ensures that safety policies are actively practiced on construction sites, not merely documented. The involvement of industrial associations in disseminating and reinforcing these policies further strengthens their impact.

Nevertheless, foundational to accident prevention in construction is the training of workers on safety practices. Integrating safety training into the onboarding process and providing regular refresher courses ensure that workers are equipped with the knowledge and skills to navigate construction environments safely. This approach aligns with the overarching goal of creating a safety-conscious workforce.

Effective methods for collecting and analyzing safety data become particularly relevant in construction, where real-time insights can influence immediate decision-making. Digital tools for incident reporting, hazard identification, and data-driven analysis empower construction companies to respond promptly to emerging safety concerns and continually improve their safety protocols.

In summary, collaboration with academic institutions in the construction industry is instrumental in advancing safety research. Engaging with researchers allows for the exploration of innovative safety technologies, the development of evidence-based practices, and the continuous improvement of training programs. Academic-industry partnerships contribute to the evolution of safety standards in construction. In essence, the construction industry's conclusive path to safety excellence lies in a holistic approach that integrates awareness creation, stringent policy

enforcement, worker training, data-driven decision-making, and collaboration with academic partners. By fostering a culture where safety is not just a regulatory requirement but a shared commitment, the construction sector can build a resilient foundation for sustainable success and, most importantly, the well-being of its workforce.

5.2 Recommendation

1. Comprehensive Safety Training Programs:

Develop and implement robust safety training programs for construction workers, covering onboarding procedures, regular refresher courses, and specialized training for specific tasks or equipment operation. This holistic approach ensures that construction personnel are equipped with the necessary knowledge and skills throughout their employment, promoting a continuous commitment to safety.

2. Digital Safety Tools and Reporting Systems:

Invest in and promote the use of digital tools for incident reporting, hazard identification, and real-time data analysis. This encompasses the adoption of mobile apps, wearables, and other technologies that facilitate immediate reporting and analysis of safety data. The integration of digital tools enhances the efficiency and effectiveness of safety reporting, fostering a proactive safety culture within the construction industry.

3. Strategic Public Awareness Campaigns:

Design and execute targeted public awareness campaigns to reach both construction professionals and the broader community. These campaigns should emphasize key safety measures, highlight potential hazards, and underscore the collective responsibility for maintaining a safe construction environment. By strategically communicating safety information, these campaigns contribute to a heightened awareness and shared commitment to safety.

4. Proactive Safety Audits and Inspections:

Conduct regular and proactive safety audits and inspections that go beyond mere regulatory compliance. This involves leveraging advanced inspection methodologies, embracing technology for real-time monitoring, and ensuring that safety policies are actively practiced on construction sites. Proactive safety audits contribute to the continuous improvement of safety protocols, creating a safer work environment.

5. Industrial Association Collaboration:

Strengthen collaboration with industrial associations to disseminate and reinforce safety policies. Encourage the development of industry-wide best practices, organize training sessions, and facilitate the exchange of knowledge and experiences among construction

professionals. Collaborating with industrial associations enhances the collective effort to establish and maintain high safety standards throughout the construction industry.

6. Regulatory Compliance and Enforcement:

Emphasize the importance of regulatory compliance while also enforcing proactive safety measures. Advocate for stringent enforcement of safety policies and regulations, ensuring that construction sites adhere to the highest safety standards. This dual approach ensures a comprehensive commitment to safety, combining regulatory adherence with proactive safety measures.

7. Partnerships with Academic Institutions:

Foster collaboration with academic institutions to advance safety research in the construction industry. Support research initiatives that explore innovative safety technologies, evidence-based practices, and improvements in training programs. By partnering with academic institutions, the industry can stay at the forefront of safety advancements, promoting a culture of continuous learning and improvement.

8. Continuous Improvement Culture:

Instill a culture of continuous improvement in safety practices. Encourage construction companies to analyze safety data regularly, identify trends, and implement targeted interventions to enhance safety protocols. This culture of continuous improvement ensures that safety practices evolve with emerging challenges, maintaining a proactive stance towards safety.

9. Incentivize Safety Performance:

Explore ways to incentivize exemplary safety performance within the industry. Recognize and reward construction companies and workers that consistently demonstrate a commitment to safety excellence. By providing incentives for safety performance, the industry reinforces the value placed on creating and maintaining a safe working environment.

By implementing these recommendations, the construction industry can proactively address safety challenges, foster a culture of excellence, and contribute to the well-being of its workforce and surrounding communities. This holistic approach ensures that safety is not merely a compliance requirement, but a shared commitment ingrained in every aspect of construction practices.

Appendix

The link to the questionnaire questions will be dropped below.

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