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| RESEARCH ARTICLE

Safety Culture in The Construction Industry: A Proposed Enhanced Safety Management Program

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| ABSTRACT
The construction industry faces persistent challenges in workplace safety, with safety compliance being a key determinant of accident prevention. This study investigates the relationships among positive leadership, job competence, safety participation, and safety compliance behavior to identify actionable strategies for enhancing safety performance. Data were collected from 249 respondents across two major construction companies, CSCO (Phils) and SM Development Corporation, using structured surveys and analyzed through Pearson correlation and multiple regression methods. The findings revealed that positive leadership significantly influences safety compliance behavior, accounting for 22.8% of its variation, while safety participation emerged as a stronger predictor, explaining 33.6% of the variance. Conversely, job competence showed limited direct impact, suggesting a disconnect between technical proficiency and compliance adherence. The study highlights the importance of integrating leadership development with targeted safety training to address gaps in emergency preparedness and proactive safety engagement. Recommendations include fostering a safety-oriented culture through participative leadership, recognition programs, and leveraging technology for training and hazard reporting. The research provides a comprehensive framework for reducing workplace accidents and enhancing employee well-being by aligning leadership, participation, and competency strategies. These findings underscore the critical need for collaborative efforts among stakeholders to build safer, more efficient construction environments. Keywords: Positive leadership, safety compliance, job competence, safety participation, construction safety.

| KEYWORDS

Safety Culture; Construction Industry; Safety Management Program

| ARTICLE INFORMATION

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1. Introduction

1.1. Background of the Study

Leadership is often seen as one of the crucial factors in the success or failure of an organization. As the direct leaders of miners, the supervisors inspire the miners' enthusiasm in daily work by encouraging, caring, and leading by example, and take the lead in complying with various safety rules and regulations of the coal mine and creating a good safety atmosphere (Cheng, L. et al. 2020 citing Niu et al., 2015). Positive leadership behaviors encompass qualities such as charisma, transformation, and service. These behaviors are highly improbable in influencing employees' attitudes, including their satisfaction and commitment to the organization and trust in and identification with leadership. Additionally, they can potentially guide and promote safe work behavior among miners directly or indirectly. By prioritizing safety as their main principle, miners inherently integrate the notion of individual safety into their work and actively cultivate safe behavior habits.

Conversely, leadership behaviors characterized by laissez-faire, authoritarianism, and abuse exert a detrimental influence on the safety awareness of miners and the overall safety climate within a workplace. These adverse effects can lead to negative behaviors and a lack of enthusiasm towards their work while also giving rise to psychological factors such as risk-taking and

laziness during the work process. Over time, these factors may gradually evolve into patterns of unsafe behavior (Cheng, L. et al. 2020).

Safety behavioral compliance is commonly defined as "the fundamental safety activities that individuals must perform to maintain safety in the workplace" (Wang et al., citing Griffin and Neal (2021). Within the construction site, the absence of safety behavioral compliance presents safety hazards and an increased likelihood of accidents among workers (Parn E.A et al., 2019). Within the construction industry, a substantial number of individuals suffer fatal injuries due to safety accidents each year. When considering the United States as an example, official statistics reveal that in 2018, there were 1038 deaths in the construction industry nationwide. This death rate significantly surpassed that of any other industry, and there has not been a noticeable decline in recent years (Ladewski, B.J. et al., 2019). Falls, electric shocks, and impacts resulting from violations of safety regulations are among the primary causes of these fatalities (Liwång, H., 2020). Consequently, within the context of the persistent and severe safety issues within the global construction industry, the effective enhancement of worker safety behavioral compliance and the assurance of worker safety have become significant strategic concerns that are closely tied to the sustainable development of the construction industry.

Scholars have undertaken specific research to enhance compliance with workers' safety behaviors. The exploration has mainly concentrated on the outlooks of staff, employers, and regulatory bodies. In terms of research content, the impact of three levels of factors, namely personal characteristics of employees, manager characteristics, and organizational characteristics, on safety behavioral compliance has been the central area of study (Liu et al., 2020). When considering research methods, the literature about improving employees' behavioral compliance utilizes qualitative methods, with only a few studies employing expert scoring methods for simple quantitative analysis (Pereira et al., 2020). The current research on enhancing safety compliance is primarily in the qualitative analysis stage, with limited diversity in the influencing factors being investigated.

Consequently, it is necessary to introduce new factors that exert influence to enhance the theory of safety management. In actual application, project managers still encounter significant perplexity when it comes to enhancing employee compliance with safety behavior. This perplexity suggests a dearth of more specific and targeted measures in the realm of management practices. Consequently, this investigation possesses both practical and theoretical requirements. Research has demonstrated that in safety incidents stemming from non-adherence to safety regulations during operational behavior, the absence of worker involvement in safety activities constitutes a significant cause of operational transgressions. Within project management, engagement in safety-related activities is usually expressed through the notion of "safety participation." The theory of social norms elucidates that a "norm-oriented organization" encompasses behaviors that are considered acceptable and appropriate, and individual behavior within the organization is influenced by the organizational environment constructed through norm orientation. Neal and Griffin's definition of safety participation is "behaviors that do not directly contribute to an individual's safety, but that do facilitate the development of an environment that supports safety." Given that employee safety participation falls within the realm of individuals integrating into the organizational environment, safety participation also exerts a significant impact on behavioral compliance. However, existing literature, such as the safety performance framework proposed by Neal and Griffin, bifurcates "safety behavior" into two parallel sub-dimensions of "safety participation" and "safety compliance," thereby neglecting the possible influence of safety participation on behavioral compliance. Subsequently, subsequent scholars have also conducted research based on this paradigm, and a substantial number of studies have examined safety participation as an explained variable rather than an explanatory variable. As "safety participation" is comparatively more feasible to implement in comparison to other factors that influence behavioral compliance, the disregard for this concept and the resultant imperfection in safety management theory has led to confusion among managers in practice.

To delve into the impact of safety participation on behavioral compliance, it is crucial to analyze the correlation between safety participation and behavioral compliance. According to social learning theory, human development arises from the interaction among individuals, their environment, and society. The environment and society influence human behavior, while individuals can acquire capabilities by observing their surroundings and society (Powers et al. 2020). Consequently, employees, through continuous observation and learning in safety participation, are inclined to enhance their competencies at work, and the enhancement of employees' competencies may foster adherence to safety behavior. In management, employees' competencies at work are commonly conveyed by job competence.

Nevertheless, the current research on work competence centers on assessing the job competency of educators, enhancing the job competence of college students before employment, and estimating the job competency of medical personnel (Song and Park (2018), Arteche et al. (2020). The focus on the job competence of employees in engineering projects has been limited. This paper defines job competency as "the capacity to perform specific tasks and fulfill roles within one's organization" (Wang et al. (2021) citing Eraut, M. 1998). This concept may serve as a critical mechanism for elucidating the connection between safety participation and behavioral compliance.

Therefore, this research raised the following questions: (1) What is the influence of positive leadership behavior on job competence and safety participation? and (2) What role do job competence and safety participation play in behavioral compliance? Consequently, the study aims to explore the relationship between positive leadership, job competence, safety participation, and compliance behavior.

1.2. Statement of the Problem

The study explores the relationship between positive leadership, job competence, safety participation, and compliance behavior. Specifically, it aims to answer the following questions:

1. What is the level of influence of the following safety culture variables?
   - 1.1. positive leadership;
   - 1.2. job competence;
   - 1.3. safety participation; and
   - 1.4. safety compliance behavior?
2. Is there a significant relationship between safety compliance behavior towards positive leadership, job competence, and safety participation among the respondents in the construction industry?
3. Is there a significant difference between safety compliance behavior with positive leadership, job competence, and safety participation?
4. From the findings of the study, what enhancing safety program in the construction industry may be proposed?

1.3. Hypothesis

In this study, the researcher will test the following hypotheses:

H1: There is no significant relationship between safety compliance behavior towards positive leadership, job competence, and safety participation among the respondents in the construction industry.

H2: There is no significant difference between safety compliance behavior towards positive leadership, job competence, and safety participation among the respondents in the construction industry.

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1.4. Significance of the Study

The study on the influence of leadership behavior in enhancing safety participation, job competence, and behavioral compliance in the construction industry will benefit the following:

Construction Companies. The study provides insights into how leadership behavior can impact safety culture and safety performance. By understanding the impact of leadership behavior on safety, construction companies can develop strategies to improve safety culture and reduce accidents.

Construction Site Managers. The study highlights the importance of rule-oriented and participative leadership in improving safety performance at construction sites. Construction site managers can improve safety performance by applying less passive/avoidant leadership and more transformational leadership.

Construction Workers. The study shows that supervisors' positive actions, such as praising workers for exemplary safety performance, can promote safety in the construction industry. Supervisors can encourage workers to engage in safe behaviors by providing positive reinforcement.

Future Researchers. Future researchers can benefit from the study on the influence of leadership behavior in enhancing safety participation and behavioral compliance in the construction industry by building on the existing framework, identifying additional safety leadership factors and styles, developing safety leadership models, and improving workplace safety.

Researcher. The researcher can benefit from the study on the influence of leadership behavior in enhancing safety participation and behavioral compliance in the construction industry by developing their expertise, enhancing their reputation and visibility, networking with other researchers and industry professionals, and contributing to the industry.

1.5. Scope and Limitation

The study aims to explore the specific relationship between positive leadership, job competence, safety participation, and compliance behavior in the construction industry. The primary participants of this investigation are two companies, namely: CSCO

(Phils) Construction and Development Corporation, located on the 12th Floor, Petron Mega Plaza, Makati City which has a high-rise residential building project in Pasay City, and SM Development Corporation (SMDC) located at One E-Com Center, Ocean Drive, Mall of Asia Complex, 1308 Pasay City, where CSCO (Phils) has a project in Batangas, Sunny Homes (a residential building project). Furthermore, the researcher aims to complete the data collection process within the timeframe of three (3) months. The survey questionnaires were selected from the comprehensive literature review conducted for the study on positive leadership, job competence, safety participation, and compliance behavior in the construction industry and will be disseminated face-to-face. The responses will then be collated by the researcher for data analysis.

1.6. Definition of Terms

Operational definitions for the following terms will be delineated within the scope of this study.

Job Competence. Job competence refers to the specific set of skills, knowledge, and abilities possessed by an individual to carry out duties within an organization.

Leadership Contingency Theory. Leadership contingency theory posits that the optimal leadership approach is contingent upon situational factors, advocating that there is no universal leadership style suitable for all workplace scenarios.

Positive Leadership. Positive leadership is a leadership style that emphasizes positive relationships, communication, and feedback to promote a safe and healthy work environment.

Safety Behavioral Compliance. Safety behavioral compliance refers to the extent to which workers follow safety rules and regulations in the workplace.

Safety Management. Safety management in the construction industry refers to the process of managing safety regulations, practices, and procedures on a construction site.

Safety Participation. Safety participation refers to the voluntary safety behavior of workers beyond their regular job roles.

1.7. Literature Review

1.7.1. Safety Management in the Construction Industry

Health and safety in the workplace are the number one concern of most businesses, yet still, deaths and injuries occur. ISO 45001 sets the minimum standard of practice to protect employees worldwide. ISO 45001 is an international standard for occupational health and safety management systems. It provides a framework for organizations to manage and improve their safety performance, reduce workplace accidents and illnesses, and ensure compliance with relevant legal and regulatory requirements (ISO, 2018). ISO 45001 is an international standard that specifies requirements for an occupational health and safety (OH&S) management system, which is intended to improve the safety and health of both employees and other personnel.

Introduced in March 2018, ISO 45001 marks a significant step forward in the overall effort to improve occupational health and safety (OHS) worldwide. Published by the International Organization for Standardization (ISO), the standard enables organizations to proactively improve injury prevention and reduce ill health while protecting their longevity. ISO 45001 supersedes previous occupational health and safety standards, including OHSAS 18001. Organizations that currently hold OHSAS 18001 certification will need to transition to the ISO 45001 standard by March 2021 (TÜV SÜD. (n.d.).

International Standards Organization (ISO) 19001-18001 safety management system works around the world (http://www.iso.ch) as a non-profit organization to improve work practices and standards. It has been demonstrated that companies registered with OHSAS 18001 certification perform better in terms of safety performance (Ajmal et al., 2021).

Safety management can be defined as "the process to realize certain safety functions," and a safety management system (SMS) is commonly defined as "... the management procedures, elements, and activities that aim to improve the safety performance of and within an organization" (Li & Guldenmund, 2018, p. 96).

According to Evans Ondimu Omweri and DR. Kepha Ombui (2018), the goal of the study was to ascertain the impact of occupational health and safety procedures on the performance of the building construction sector in Nakuru County, Kenya. The study discovered that training, occupational health hazard control measures, workplace inspections, and emergency response planning are important in influencing the performance of the building construction industry. Bhavya K and Priyanka M. K. (2020) said the study's objective is to identify and analyze the safety factors that are relevant to nearby construction projects. Throughout the construction project, a typical site-specific safety plan was used to provide direction on safety. This review paper by Umesh Patel, Chintan Raichura, and J. R. Pitroda (2021) discusses how to improve safety in the performance of the building industry. The main goal of the study is to identify the crucial success factors that influence how construction safety management is implemented. Lack of knowledge and awareness contributes to many fatalities and permanent injuries.

Safety management has been an area of great concern for researchers in the past decade. Jin et al. (2018) revealed that the safety management program had been an area of interest for researchers in the past decade after reviewing 513 articles in the construction safety domain. Construction safety management is the process of managing safety regulations, practices, and procedures on a construction site (Abas et al., 2020). However, many researchers also stated that the current safety practices rely immensely on human perception of safety, knowledge, experience, and cognitive abilities to identify hazardous situations (Nawaz et al., 2020).

One of the critical parts of safety management is hazard identification, and the ability to identify potential hazards on construction sites before initiating the actual work is a decisive factor in mitigating risks (Eiris et al., 2018). Similarly, workers' training, safety culture, safety behavior, risk assessment, stakeholders' relationship, resource allocation for safety, and the complexity of the construction projects are some of the renowned factors contributing to poor safety management highlighted by the researchers (Xia et al., 2018, Wang et al., 2019). There has been ample research on safety factors by researchers all around the world, either specific to their countries or projects; however, no holistic approach has been adopted to figure out all possible safety factors in the construction industry.

According to Ladewski and Al-Bayati (2019), safety management practices are the functions that are used to manage organizational occupational health and safety performance. Still, only those practices should include the fact that employees and employers commonly perceive a safe environment (Hanafi et al., 2018). However, previous studies show that organizations with low accident rates and injury ratios were characterized by employee safety training, management safety commitment, and display of safety rules and procedures (Hanafi et al., 2018; Lee, 2018). Lee (2018) highlighted safety training, workers' involvement, and management commitment to safety. Fruhen et al. (2019) argued that employees' safety behavior must demonstrate following safety rules and procedures.

Hence, management safety commitment should be an observable activity to maintain safety performance (Almost et al., 2019; Lee, 2018). In the organization, employees need to be active to participate in occupational health and safety training programs (Mazzetti et al., 2020). In addition, safety training improves employees' knowledge and capabilities to identify risk hazards at the workplace (Mazzetti et al., 2020; Teoh et al., 2020). In addition, safety training also helps minimize accident risk and takes corrective measures to prevent workplace accidents (Fruhen et al.,2019). Previous studies show that organizations with a low rate of accidents and injuries were found to have good safety training programs (Hanafi et al.,2018).

Safety practices depend on communication practices used in an organization (Gao et al., 2019). A safe work environment provides a sense of commitment and lowers the risk of hazards and injuries (Kim and Scott, 2019). Moreover, in decision-making, the involvement of employees is motivated to work safely (Fruhen et al., 2019). Numerous researchers have noted that communication patterns influence safety-related issues in the organization (Classen et al., 2020). Communication barriers present a challenge to adopting safety-related communication in the organization (Mehdibeigi et al., 2018). According to Kim and Scott (2019), effective communication may help to reduce hazard risk. Regular communication between supervisors and the workforce is an effective management practice to improve workplace health and safety performance (Kim and Scott, 2019). Nevertheless, in total quality management models, rewards and incentive practices are accepted- able to motivate workers to work safely in the organization (Ajmal et al., 2020).

However, employees need authority and empowerment to make decisions that affect the safety performance of individual and group-based decisions (Almost et al., 2019; Hanafi et al., 2018; Liu et al., 2020). Management safety commitment provides ultimate support to employees and encouragement to follow the safety rules and procedures (Fruhen et al., 2019). Besides, support from the top management reshapes employees' perception and behavior related to safety performance (Borowski et al.,2020; Feng et al., 2011; Hu et al., 2020). In the view of literature, many studies have been conducted on management safety commitment, including construction, hospitality, and heavy vehicle transport (Almost et al., 2019). Safety commitment has described the involvement of the individual in safety activities to achieve organizational safety goals and improve safety performance at the workplace (Newnam and Goode, 2019). In the past, many studies have discussed the importance of safety commitment and safety performance (Ajmal et al., 2020).

1.7.2. Leadership Contingency Theory

Contingency theories posit that the optimal leadership approach is contingent upon situational factors, advocating that there is no universal leadership style suitable for all workplace scenarios. Therefore, successful leaders could adjust their leadership style to the specific characteristics of the group, the circumstances at hand, and the desired outcomes (Kovach, 2018).

1.7.2.1. The Fielder Model

In the year 1967, Fred Fiedler made the Fiedler Contingency Model, which states that the performance of the group depends upon the match between a leader's style of interaction with his subordinates and the level of degree to which the situation gives the leader control and influence. Least Preferred Co-worker (LPC) was developed by Fielder to identify whether a leader is a task-oriented leader or relationship-oriented. Along with this, he also identified three contingency dimensions: leader-member relations, task structure, and position power (Deshwal, V., & Ali, M. A. (2020).

1.7.2.2. Situational Leadership Theory

Paul Hersey and Ken Blanchard (1969) defined situational leadership as one that assumes that the effective leadership style does not remain static and changes as per the situation. To be an effective and successful leader, one should adopt his style and approach to different situations. "Situational leadership means that leaders must change the degree of supportiveness and directness to their employees according to the given situation of subordinates and their level of motivation. "This type of Leadership demands that leaders vary their behavior and leadership style according to their subordinate's commitment." (Ghazzawi, Shoughari, & Osta, 2018). If followers are unable and unwilling to do work, then clear and specific directions must be given by the leader. If a follower is not able to do work but is willing to do it, a leader should show high orientation in both task and relationship behavior. When the follower is able but unwilling, then a supportive and participative style is used. When followers are able and willing, the leader does not need to do much.

1.7.2.3. Path-Goal Theory

In 1971, Robert House developed the path-goal theory. He was a graduate of Ohio State University; later, this theory was revised in 1996. It uses initiating structure, consideration, and expectancy theory of motivation to make the theory. It states that a leader should clarify the path of the followers and lead them effectively toward the goal by reducing roadblocks. When a task is stressful and ambiguous, directive leadership is preferable. In a structured task, supportive leadership yields high performance and satisfaction. "Path-goal leadership theory requires learning leaders, who are interested in spreading a learning culture to adopt directive, supportive, participative, and achievement-oriented behavior. Indeed, learning leaders can adopt one of these behaviors to achieve the goal of influencing subordinates' knowledge and experiences. Also, the adoption of an appropriate style is required to respond quickly to subordinates' expectations, needs, and wants." (Deshwal, V., & Ali, M. A. (2020).

1.7.2.4. Leader Participation Model

The Vroom–Yetton contingency model was made by Victor Vroom and Phillip Yetton in 1973 and later in 1988 with Arthur Jago. It concluded that the best leadership style depends on the situation. Five styles are suggested, and one is Autocratic Type 1, in which leaders exercise decisions based on readily available information. Second, the Autocratic type 2 style, in which information is taken up by the leader from followers but decides on his own. The third style is Consultative Type 1, leaders share problems with only a few followers who are relevant enough and not all, but one by one, and followers are not allowed to discuss among them. Fourth, Consultative Type 2, in which a leader consults with followers in a group, but their ideas are heard, but the decision is taken by the leader only on his own, Fifth, Group based Type 2, in which problems are discussed by a leader with followers, and that decision is taken which is accepted by the group (Deshwal, V., & Ali, M. A. (2020).

1.7.2.5. Leader-Member Exchange Theory

Leader-member exchange theory originally made in 1975 states that because of time pressure, a leader and some members build a special relationship, and this group is known as an in-group, and those members who are not part of this group come into the outgroup. Those followers who are the part of in-group get some favorable attitude from the employees in comparison to those members who are the part of out-group. The focus of the leader-member theory is on the relationship quality of a leader and his subordinates. Based on relationships, two types of groups are made by the leader. Those who are in low-quality relationships form an "out-group," and those with higher-quality relationships form an "ingroup." More influence and confidence are received by the subordinates of the in-group from their leaders, and they are more dependable and communicative in comparison to out-group subordinates; those who are in the in-group do extra tasks with more responsibilities (Deshwal, V., & Ali, M. A. (2020) citing Megheirkouni, 2017).

1.7.3. Positive Leadership

Leadership processes in construction companies in Sweden have extensively been investigated by researchers in the field of construction, resulting in a surplus of methodological depth in leadership studies within this context. Through a qualitative interview study conducted in Sweden's largest construction companies, it was discovered that leadership styles align with traditional work and organizational principles, while also creating tension with change initiatives aimed at enhancing organizational performance. In conclusion, this paper proposes the necessity of a strengthened focus on leadership in construction research, with an emphasis on methodological depth and the examination of leadership in specific contextual settings (Löwstedt et al., 2021).

Transactional and transformational safety leadership have been repeatedly found to be important for safety. However, how transactional and transformational leadership behaviors are most effectively demonstrated can be dependent on the context and industry. Using an ethnographic approach, supervisor safety leadership was explored across eleven construction sites in

Australia. The findings revealed that, within the construction site context, contingent reward, idealized influence, and management-by-exception behaviors demonstrated by supervisors closely aligned with their definitions in Full-Range Leadership Theory (FRLT). These three types of leadership behavior reflect observation of supervisors' positive actions, which included: praising workers for good safety performance; proactively anticipating and attending to safety issues; and consistently leading by example with safety, even at times of significant production pressure. Other theoretically described dimensions of leadership behavior, i.e., individual consideration, inspirational motivation, and intellectual stimulation, were not directly reflected in observed supervisors' behavior in the way they are conceptualized in FRLT. The existence of a good supervisor-worker relationship enabled workers to raise safety issues comfortably, think creatively about how to undertake work safely and talk to their supervisor if they were experiencing personal problems. These are motivational, intellectual, and empathetic elements of leadership, which do not directly align with the way leadership behaviors are conceptualized in mainstream FRLT. The study suggests that, in the construction worksite context, leadership behaviors may take a form that differs from theoretical ideal types and that ethnographically attained insights into supervisors' interactions with workers can contribute to understanding transformational and transactional leadership in practical terms (Oswald et al., 2020).

Currently, many construction companies offer construction services for Pile Foundation work and Bored Pile or Strauss Pile for Buildings, Bridges, BTS Towers, Residential Houses, Shophouses, Hotels, and the like using the Bored Pile or Strauss Pile method. The problem that exists is because of the influence of employee performance on construction where there are still some employees who are not satisfied with the leadership. This study aims to determine the effect of influence on employee performance and to see the influence of Organizational Culture on employee performance. This study shows that 1) Leadership has a positive and significant effect on Employee Performance, 2) Leadership has a positive and significant influence on Organizational Culture, and 3) Organizational culture has a positive and significant influence on employee performance (Tianingrum, A. S.,2021).

Ethical leaders in the construction industry can enhance employee well-being by creating a relaxing ethical environment and providing sufficient organizational support. Project managers should prioritize the accumulation of organizational resources, such as organizational approval of employees' abilities and efforts, to enhance employee wellbeing. Leaders should pay attention to the well-being of their employees in stressful and hazardous work environments, as ethical leadership has a positive effect on employee wellbeing. The study highlights the importance of a leader's ethical behavior in improving employee well-being, suggesting that leaders should exhibit ethical conduct to create a positive work environment. The findings of this research provide practical references for the construction industry to improve their performance by prioritizing employee wellbeing and providing the necessary support (Cheng et al., 2022).

Productivity in the construction industry is essential for business sustenance. Project Managers play a significant in achieving productivity in construction. The findings indicate that the main factors affecting construction productivity as incompetent supervising and management, poor leadership, lack of skilled and experienced labor, and poor project communication. Therefore, project managers should exhibit supportive (ability to delegate and assign tasks to the employees), charismatic (ability to transform attitudes and beliefs in employees), transformational (ability to inspire others), and democratic (ability to include employees in decision-making) leadership styles to influence construction productivity positively. There is an urgent need for project managers to be trained on the appropriate soft skills aspect of managing construction projects to improve construction productivity effectively, reduce project cost and time overruns, and sustain construction businesses (Robbertse & Amoah 2020).

1.7.4. Job Competence

Job competence in the construction industry is a crucial factor for success. Competency requirements for mid- and upper-level employees in construction include a specific set of skills and knowledge (Johari & Neeraj Jha, 2021). However, the industry faces challenges such as declining productivity, workplace safety issues, and work disputes (Pariafsai & Behzadan, 2021). To improve employee skills, effective strategies are needed, including education, training, and demonstrations through various learning media (Ma'arif, & Akande, 2023). Organizations in the construction industry recognize the importance of identifying and managing competencies for improved performance (Tiruneh & Fayek, 2021). Developing a competencies management system that reflects the characteristics of a construction manager's work is necessary. Overall, understanding and managing job competencies are essential for success in the construction industry.

The concept of "competence" can be comprehended as a collection of knowledge, abilities, and skills possessed by an individual to carry out duties within an organization. In numerous investigations regarding organizational safety management, job competence has served as a crucial indicator for evaluating employee job performance (Arteche et al, 2020). The theory of competency highlights that the core elements of job competence for members of an organization are knowledge and skills, and the acquisition of these attributes is closely linked to the assimilation of effective information from the surrounding environment. Since employee safety participation comprises the process of effectively interpreting information from the environment, employees

could continuously observe and learn through their engagement in safety initiatives, ultimately enhancing their knowledge and skills in safety matters.

Recent research conducted across various industries has revealed a potential and noteworthy association between safety participation and work competence. Cao et al (2108) explore the different effects of safety participation on accidents, possible relationships between safety participation, safety climate, safety knowledge, safety motivation, safety compliance, and accidents investigated. The 739 responses, coming from front-line employees in two coal mines and two power plants in China, were evaluated. The results suggest that safety climate, safety knowledge, and safety motivation partially mediate the relationship between safety participation and safety compliance, that safety compliance directly affects accidents, and that the effect of safety participation on accidents requires the mediating effects of other variables, especially that of safety compliance.

According to the viewpoint of agency theory, the top executives of a company can be considered as principals, while frontline employees can be considered as representatives. Prior research has indicated that when principals mandate agents to engage in specific behaviors that are advantageous to the principals but burdensome for the agents, challenges may arise in terms of the agents' compliance with these behaviors (Li et al, 2021). When faced with the same compliance requirements, employees with higher job competence often need to exert less effort in terms of time, energy, physical fitness, etc. to meet these requirements (Shevchenko et al., 2020). This suggests that enhancing job competence can reduce the costs for employees in carrying out the required behaviors, thereby significantly improving the level of safety behavioral compliance.

Currently, scholars have initiated initial discussions on the topics of job competence and safety. Through qualitative analysis, some scholars argue that safety knowledge and safety skills are crucial factors that influence employee compliance with safety behaviors. Neal and Griffin's survey revealed a positive correlation between employees' levels of knowledge and skill and their level of compliance with safety behaviors (Cherian et al., 2020).

1.7.5. Safety Participation

Safety participation in the construction industry refers to the voluntary safety behavior of workers beyond their regular job roles. It is important to promote safety participation among workers to mitigate the risks and negative consequences of accidents in this high-risk industry. Several factors have been identified as influencing safety participation. These include safety leadership, safety management practices, safety climate, job satisfaction, project identification, collaboration, and institutional support. Studies have shown that safety leadership and safety management practices have a positive impact on safety participation through their influence on safety climate and job satisfaction (Shi, H., & Nadeem, M. A. (2022), Rantsatsi et al., 2023). Collaboration between construction health and safety agents (CHSA) and other project members, such as clients, designers, and contractors, also plays a significant role in improving health and safety performance in construction projects (Choi & Lee, 2022). Additionally, the involvement of CHSA in construction projects and the promotion of CHSA collaboration can enhance health and safety performance (Feng et al, 2023).

The primary metric for assessing safety behaviors, safety participation generally encompasses safety training programs and other initiatives in which organizations, employers, and employees engage to enhance workplace safety (Wang et al (2019). Scholars such as Ghani argue that within the domain of construction engineering, effective safety training holds significant importance in improving employee safety consciousness and modifying employee conduct (Zhang et al 2020). Subsequently, numerous scholars have expressed their perspectives through qualitative analysis. Li et al. further explicated this viewpoint by affirming that efficient safety training initiatives, in which employees actively participate, may potentially lead to behavioral conformity in the workplace Neglecting to wear a safety helmet can result in serious injuries at construction sites, but the cause of such unsafe behavior has not been fully understood. (Li et al 2021). Drawing on data collected from 732 samples of Vietnamese hospitals during the COVID-19 epidemic, they initially concluded that a correlation exists between safety training and behavioral compliance. (Wang, J. M., et al (2021), Chi et al 2020).

The construction industry in Nigeria faces significant challenges in terms of safety performance, with a high number of accidents and fatalities recorded annually. Indigenous companies in Nigeria have a higher accident and injury level among workers compared to multinational companies, indicating the need for improved safety practices and regulations. Existing research studies have provided recommendations and frameworks to improve safety performance in the construction industry. However, these recommendations are often specific to certain countries or too complex to be implemented effectively. Therefore, there is a need to establish a self-regulatory model or framework in Nigeria to promote and enforce safety standards. This would provide guidance and support to industry stakeholders and ensure that the desired aim of improving safety performance is met. Inconsistent reporting of accidents and injuries in the construction industry of Nigeria poses a challenge in accurately assessing safety performance. Contractors often hesitate to report accidents due to fear of negative corporate image and potential consequences. The existing system of reporting occupational accidents in Nigeria is described as weak and ineffective (Mahmoud et al., 2020).

The safety management system (SMS) was introduced in the 1980s to reduce the risk of injuries and fatalities and minimize material waste in the construction industry. Construction companies have spent significant resources on implementing SMSs in the past 30 years. The top four benefits of implementing SMS are safer working conditions, reduced harm to workers, safety management as a part of project management, and better project management. The top five obstacles are putting safety as a lower priority due to cultural differences, workers' high turnover rates, tight project schedules, obstruction by sub-contractors, and inactive participation by project team members. The most significant benefit category for implementing SMS is "accident reduction and hazard elimination," while the most significant obstacle category is "project management and leadership." The organization's culture can hinder the development and implementation of SMS due to unsatisfactory ranking and participation in safety matters. Safety awareness and the promotion of a safety culture can help overcome these obstacles. The results of the study can enhance industry practitioners' understanding of SMS and help improve its implementation in construction workplaces. The findings also suggest a potential linkage between SMS implementation and project management (You et al., 2019).

1.7.6. Safety Behavioral Compliance

Safety behavioral compliance in the construction industry is a critical aspect of maintaining a safe workplace. Several studies have explored different factors influencing safety compliance among construction workers. Zhao and Yan (2023) conducted a study in Australia and found that perceived usefulness and perceived ease of use positively influenced deep compliance and negatively influenced surface compliance. Ding, Liu, and Luo (2022) developed a visual question-answering (VQA) model to detect unsafe behavior in construction sites, which can contribute to safety compliance checking. Xia, Griffin, Xie, and Hu (2023) conducted a meta-analysis and identified various antecedents of safety behavior, including safety knowledge, motivation, strain, job demands, job resources, key resources, and job attitudes. Wu, Xu, Sun, and Hsu (2023) used an evolutionary game model to explore the safety behavior strategies of main contractors and construction workers, highlighting the importance of effective incentives and constraints.

Liu, Ningning, et al. "Influencing Factors and Prewarning of Unsafe Status of Construction Workers Based on BP Neural Network." Applied Sciences, vol. 13, no. 6, 2023, p. 4026.

Sutarsa (2023) found a correlation between perceptions of safety climate and unsafe behavior among construction workers, emphasizing the need for communication, trust, and safety empowerment management.

In the construction industry, about 80–90% of accidents are caused by the unsafe actions and behaviors of employees. Thus, behavior management plays a key role in enhancing safety. Behavior observation is the most critical element for safely modifying workers' behavior. However, there is a lack of practical methods to measure workers' behavior in construction as current literature only focuses on a few unusual signs such as not wearing personal protective equipment. This paper proposes a system for recognizing workers' dangerous behaviors (Hung & Su, 2021).

The study investigates the impact of work environment and occupational stress on the safety behavior of individual construction workers. The research uses structural equation modeling to analyze the direct and indirect effects of various factors, including job demands, job control, job support, rewards, organizational justice, lack of reward, depression, trait anxiety, safety motivation, safety knowledge, safety compliance, and participation behaviors. The sample data for the study were collected from 399 construction workers working at 29 construction sites in South Korea. The results indicate that the safety compliance and participation behavior of construction workers are influenced by their safety knowledge and motivation, while depression and trait anxiety negatively impact safety motivation, knowledge, and behavior. Job demands, lack of job control, lack of reward, and lack of organizational justice were found to hurt safety behavior, while job support did not show a significant relationship with safety behavior (Jung et al., 2020).

Fargnoli, M., & Lombardi, M. (2019) discussed the need for a comprehensive approach to address occupational safety in the construction industry, going beyond normative compliance. It emphasizes the importance of empirical research on the factors influencing unsafe behavior of workers. The study proposes a procedure based on the assessment of human reliability factors to improve safety behavior and augment the company's safety climate. The paper mentions the use of human reliability tools in the safety assessment of working activities, which is not a novelty in the literature. It suggests that the proposed procedure can enhance practical knowledge of the integrated and coordinated use of these methods in the construction sector. The paper acknowledges the need for further developments and research by researchers and practitioners in this area. Overall, the paper highlights the importance of understanding human factors and their impact on safety management in the construction industry, providing a basis for further investigations and improvements in safety practices.

The paper acknowledges that past literature on behavior-based safety (BBS) in the construction industry is dominated by successful case studies, while unsuccessful cases and cases with mixed effectiveness are limited. The paper aims to contribute to the body of knowledge on behavior safety programs by providing a real BBS program with mixed effectiveness in reducing unsafe behavior on construction sites. The paper adopts a system dynamics view to explain the mixed effectiveness of the BBS program

and develops causal loop diagrams to capture behavior change mechanisms underpinned by reinforcement theory and goal-setting theory. The paper offers lessons and references for future design and implementation of BBS programs in the construction industry by reviewing the BBS program holistically and reflecting upon the details of the case study. The paper provides a comprehensive theoretical overview of the dynamics involved in the BBS program and examines the unintentional side effects of interventions. (Guo et al., 2018).

1.8. Synthesis

The authors agree that safety management is a critical concern in the construction industry. They all acknowledge the importance of identifying and analyzing safety factors and hazards on construction sites. They all recognize the need for safety regulations, practices, and procedures to be implemented and followed on construction sites. They all emphasize the importance of understanding human factors and their impact on safety management in the construction industry. However, the authors have different objectives and research questions. Bhavya K and Priyanka M K (2020) aim to identify and analyze safety factors relevant to nearby construction projects, while Jin et al. (2018) review the safety management program in the construction industry. The authors use different research methods and approaches. Bhavya K and Priyanka M K (2020) use a site-specific safety plan to provide direction on safety, while Nawaz et al. (2020) focus on the role of human perception and cognitive abilities in identifying hazardous situations. The authors have different recommendations for improving safety management in the construction industry. For example, Fargnoli and Lombardi (2019) propose a procedure based on the assessment of human reliability factors to improve safety behavior, while Abas et al. (2020) suggest the use of safety management software to enhance safety practices.

The optimal leadership approach is contingent upon situational factors as all authors agreed. They all advocate for adjusting leadership style to the specific characteristics of the group, the circumstances at hand, and the desired outcomes. They all recognize the importance of leader-member relations, task structure, and position power in determining the effectiveness of a leader's style of interaction with subordinates. They all acknowledge the role of the Least Preferred Co-worker (LPC) scale in identifying a leader's task-oriented or relationship-oriented style. The authors have different approaches to contingency theory. Kovach (2018) discusses contingency theories in general, while Deshwal and Ali (2020) focus on the Fiedler Contingency Model. The authors have different recommendations for improving leadership effectiveness. For example, Kovach (2018) suggests that successful leaders adjust their leadership style to the specific characteristics of the group, while Deshwal and Ali (2020) propose that leaders should match their style of interaction with subordinates to the level of control and influence they have in a given situation. The authors have different perspectives on the role of leader-member exchange. Deshwal and Ali (2020) discuss the in-group and out-group dynamics that can arise in leader-member exchange, while Kovach (2018) does not address this specifically.

All authors emphasize the importance of positive leadership in promoting safety in the construction industry. They all agree that positive leadership involves creating a safety culture that encourages workers to prioritize safety and take responsibility for their safety and the safety of others. They all recognize the importance of safety training and education in promoting a safe and healthy work environment. Deshwal and Ali (2020) focus on different leadership styles, including autocratic, consultative, and group-based, and how they can be used in different situations to promote safety. Jin et al. (2018) emphasized the importance of safety communication and feedback in promoting safety, while Bhavya K and Priyanka M K (2020) focus on the role of job competence in safety management. Overall, while the authors have different perspectives and approaches, they all agree that positive leadership is essential for promoting safety in the construction industry.

Job competence is a crucial factor for success in various industries, including the construction industry. The authors all recognize the importance of identifying and managing competencies for improved performance. They all acknowledge the role of education, training, and demonstrations in improving employee skills and knowledge. They all emphasize the importance of understanding and managing job competencies for success in the workplace. The authors have different perspectives on the definition of job competence. Johari and Neeraj Jha (2021) discuss the specific set of skills and knowledge required for mid- and upper-level employees in construction, while Arteche et al. (2020) highlight the core elements of job competence as knowledge and skills. The authors have different approaches to improving job competence. Johari and Neeraj Jha (2021) suggest effective strategies such as education, training, and demonstrations, while Pariafsai and Behzadan (2021) propose the use of digital technologies such as Building Information Modeling (BIM) to improve productivity and safety. The authors have different perspectives on the challenges faced by the industry. For example, Arteche et al. (2020) discussed the potential association between safety participation and work competence, while Pariafsai and Behzadan (2021) focused on declining productivity, workplace safety issues, and work disputes.

All authors agree that safety participation is a crucial factor in promoting safety in the workplace. They all recognize the importance of voluntary safety behavior of workers beyond their regular job roles. They all acknowledge the role of safety climate, safety knowledge, and safety motivation in promoting safety participation. They all emphasize the importance of understanding the relationship between safety participation and safety compliance. The authors have different perspectives on the definition of safety participation. For example, Cao et al. (2018) define safety participation as the extent to which employees engage in safety-

related activities beyond their formal job requirements, while Zeng et al. (2020) define safety participation as the degree to which employees actively participate in safety-related activities. The authors have different approaches to promoting safety participation. For example, Zeng et al. (2020) suggest that safety leadership and safety climate are important factors in promoting safety participation, while Cao et al. (2018) propose that safety motivation and safety knowledge are important factors. The authors have different perspectives on the relationship between safety participation and safety compliance. For example, Cao et al. (2018) suggest that safety compliance mediates the relationship between safety participation and accidents, while Zeng et al. (2020) propose that safety participation directly affects safety compliance.

Safety behavioral compliance is a crucial factor in promoting safety in the workplace. They all recognize the importance of understanding the factors that influence safety behavioral compliance. They all acknowledge the role of safety leadership, safety climate, and safety culture in promoting safety behavioral compliance. They all emphasize the importance of understanding the relationship between safety behavioral compliance and safety outcomes. The authors have different perspectives on the definition of safety behavioral compliance. For example, Zhang et al. (2020) define safety behavioral compliance as the degree to which employees comply with safety rules and regulations, while Wang et al. (2020) define safety behavioral compliance as the degree to which employees engage in safe behaviors. The authors have different approaches to promoting safety behavioral compliance. For example, Wang et al. (2020) suggest that safety leadership and safety climate are important factors in promoting safety behavioral compliance, while Zhang et al. (2020) propose that safety culture is an important factor. The authors have different perspectives on the relationship between safety behavioral compliance and safety outcomes. For example, Zhang et al. (2020) suggest that safety behavioral compliance mediates the relationship between safety culture and safety outcomes, while Wang et al. (2020) propose that safety behavioral compliance directly affects safety outcomes.

1.9. Theoretical Framework

Safety management relates to the actual practices, roles, and functions associated with remaining safe (Kirwan 1998). It is usually regarded as a sub-system of total organizational management and is carried out via the organization's safety management system with the help of various safety management practices. Safety management systems are mechanisms that are integrated with the organization and designed to control the hazards that can affect workers' health and safety. Safety management practices are the policies, strategies, procedures, and activities implemented or followed by the management of an organization targeting the safety of their employees. They are the essential elements permitting an effective management of safety in firms and are designed to comply with the existing legislations applicable to the organization.

The extent to which these practices are implemented in an organization will be manifested through various actions and programs of the management and will be visible to an insider like an employee. Safety management system (and its practices) can be regarded as an antecedent of the firm's safety climate.

Leadership contingency theory is also known as situational leadership and emphasizes the interrelationships between leadership, employees, and work situations. The Fiedler contingency model measures the management style of leaders through the least preferred co-worker questionnaire, which illustrates whether the style of leaders is relationship-oriented or task-oriented (Fiedler, 1971). When job requirements contradict leaders' management style, leadership effectiveness can only be improved by replacing the appropriate leader or changing the work situation. Based on the Fiedler model, Hersey, and Blanchard in 1969 proposed four kinds of leadership styles: informative, marketing, participatory, and empowered. The theory focuses on the ability and willingness of employees to complete a specific task within a given time. House and Mitchell in 1974 developed the path-goal theory, proposing that leaders should choose different leadership behaviors according to changing situations, and should provide guidance and support to employees when necessary (Cheng et al, 2020).

In summary, leadership behavior has a significant impact on work behavior. In different situations involving workers with distinct characteristics and job requirements, corresponding leadership behaviors should be adopted. Although there is no absolute or fixed optimal leadership behavior, some types of leadership behavior are more suitable than others in each situation. Whether leadership behavior is positive or negative, distinctive styles can be suitable for different working situations, and good leaders will adopt appropriate leadership behaviors according to environmental changes.

1.10. Conceptual Framework

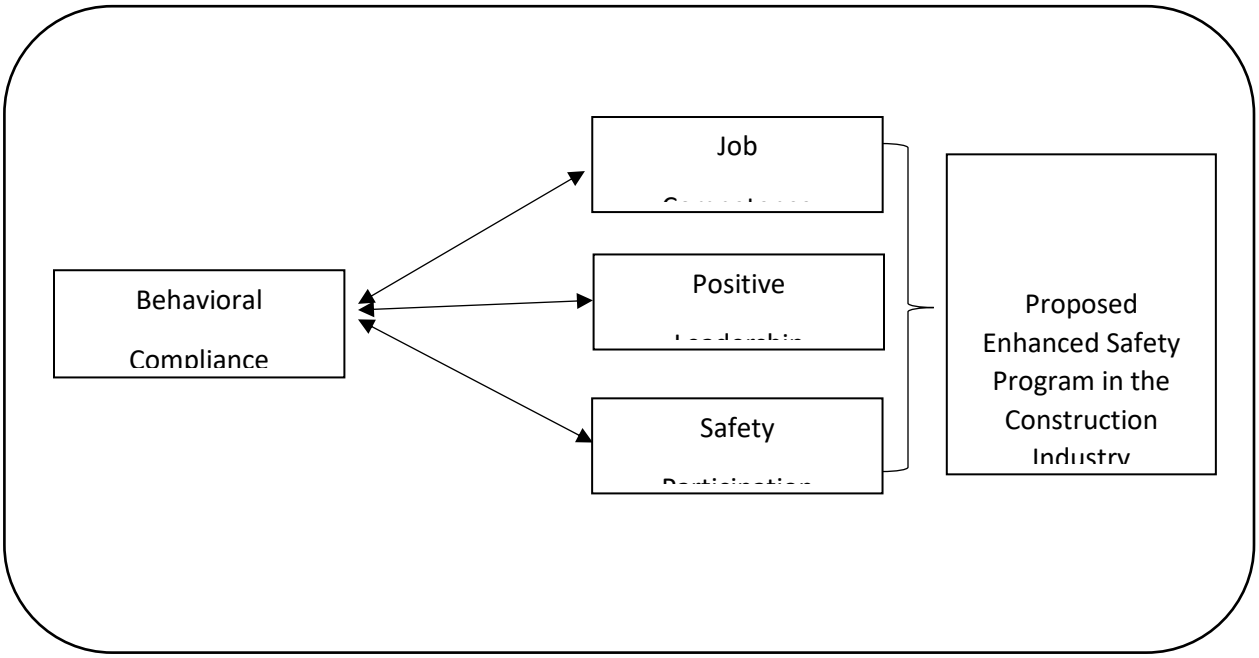
Safety Management serves as the overarching framework for ensuring safety within the construction industry. It includes components like safety policies, hazard identification, risk assessment, safety training, and continuous improvement. Positive Leadership encompasses leadership behaviors that are conducive to creating a culture of safety and fostering a strong commitment to safety within the organization. Job Competence represents the knowledge, skills, and abilities of construction workers and supervisors to execute their tasks safely and proficiently. It includes technical proficiency, safety training, hazard recognition skills, and decision-making capabilities related to safety. Safety Participation denotes the active engagement of construction workers and leaders in safety-related activities and initiatives. It encompasses reporting hazards, suggesting safety improvements,

participating in safety meetings, and engaging in safety training. Behavioral Compliance signifies the extent to which construction workers adhere to safety rules, regulations, and best practices. It includes following safety procedures, using personal protective equipment (PPE), and complying with safety directives.

This conceptual framework highlights the interplay between Positive Leadership, Job Competence, Safety Participation, and Behavioral Compliance, emphasizing their roles in promoting safety within the construction industry while integrating the principles of Safety Management and leadership behaviors.

Figure 1

Author's Conceptual Framework



2. METHODS

This chapter provides an overview of the methods that will be used in the study, including the research approach, data collection methods, sampling techniques, and data analysis methods. It also briefly explains why these methods are appropriate for addressing the research questions and assessing the hypotheses of the study.

2.1. Research Design

This research design outlines a quantitative descriptive study that aims to explore the specific relationship between positive leadership, job competence, safety participation, and compliance behavior in the construction industry. Through the utilization of a purposive and convenience sampling method, data will be collected via structured surveys and questionnaires. The research focuses on enhancing safety in the construction industry. The researcher will utilize purposive and convenience sampling, participants with experience in the construction industry will be identified. Structured surveys and questionnaires will collect quantitative data on positive leadership, job competence, safety participation, and compliance behavior. Employees from CSCO (Phils) Construction and Development Corporation, and SM Development Corporation (SMDC) will participate. Quantitative data will be statistically analyzed using descriptive and inferential techniques, highlighting patterns and relationships.

2.2. Data Management

Data management is crucial in any research study, especially one that involves quantitative analysis. The study of employees from CSCO (Phils) and SMDC, and data management will play a significant role in ensuring the accuracy and reliability of the results. In this study, it will involve several steps to ensure the accuracy and integrity of the collected data. These steps may include designing a data collection template, setting up a data collection system, ensuring data security and privacy, cleaning and organizing the data, and performing quality checks to identify and address any data inconsistencies or errors. The study will use statistics to perform data analysis, enabling the researchers to identify relationships, patterns, and statistics that can provide insights into the consumers' perspectives. Data management will also facilitate the interpretation of the study's findings to stakeholders.

2.3. Sampling Design

2.3.1. Sampling Population

The sampling population for this quantitative study will consist of employees from CSCO (Phils) (who have at least 500 employees and SMDC with at least 200 employees) who engage in the construction industry. The study aims to collect data on their perspective and participants will be selected through a purposive and convenience method, and data will be collected through a survey. The study will also ensure the privacy and confidentiality of participants by securing their personal information and keeping them anonymous. The findings of this study will offer valuable insights to the employees of both companies.

The researcher will be using Raosoft, to determine the minimum sample size required for this study. The results based on multiple linear regression and analysis of variance (ANOVA) with three independent and dependent predictors which are positive relationship, job competence, safety participation, and behavioral compliance, respectively, indicate that this study needs a minimum sample size of 249.

2.3.2. Respondents

The respondents for this study will be selected from CSCO (Phils) and SMDC, who are laborers, supervisors, project managers, safety officers, and engineers among others who are in the project sites, with ages 18 to 60 years old. The sampling population will be through a purposive and convenience sampling approach. Purposive sampling is a non-probability sampling technique where units are selected because they have specific characteristics that the researcher needs in their sample. In other words, units are selected "on purpose" to fulfill the research objectives. Convenience sampling is a non-probability sampling technique in research where researchers select participants or elements for a study based on their ease of access and availability rather than through a random or systematic method. In other words, individuals or elements are chosen because they are convenient to reach or because they are readily available to the researcher. The number of respondents will depend on the desired sample size for statistical validity. The selection of respondents will aim to ensure diversity in terms of organization size, industry, and experience level to capture a broad range of perspectives.

The construction workforce is primarily composed of mid-career individuals aged 31-40, with younger workers contributing fresh energy and older employees offering leadership experience. The industry is male-dominated, with females representing a smaller segment. Educational levels are varied, with most workers having high school education or less, highlighting a need for foundational safety training, while a smaller proportion holds advanced degrees suited for leadership roles.

Laborers form the largest group, followed by engineers, with fewer workers in supervisory and management roles. The workforce shows substantial experience, predominantly with 6-10 years in the industry, though there is a segment of less-experienced workers requiring mentorship and targeted training. Most employees are full-time, offering stability, while contract workers highlight the need for enhanced onboarding.

Safety training and certifications are inconsistent; a significant portion of workers lacks formal training, while others hold basic, advanced, or specialized certifications. This distribution underscores the need for expanded access to safety education and leveraging the expertise of certified employees.

2.3.3 Research Instrument

The research instrument to be used in this study will be a structured questionnaire that includes (20) items that were selected from the comprehensive literature review conducted for the study on positive leadership, job competence, safety participation, and compliance behavior in the construction industry. The questionnaire was structured into four parts. The first part contained questions that aimed to gather information about the respondents' demographic profiles. The second part contained questions that focused on the extent of compliance behavior influence in the construction industry in terms of positive leadership, job competence, and safety participation. The questions were formulated using a 4-point Likert scale ranging from no or little influence to strong influence. The questionnaire respondents were selected from a sample of 249 who had been involved in the construction industry. The validity and reliability of the questionnaire were ensured through pretesting and piloting. Data collected from the questionnaire respondents were analyzed using descriptive statistics and analysis.

2.3.4 Control Procedure

The pre-testing process serves as a quality assurance measure to refine the questionnaire and ensure that it meets the study's objectives. It helps identify ambiguities, misunderstandings, or any other issues that might arise when participants interpret the questions. Feedback from this stage is vital for improving the questionnaire's clarity, reliability, and validity.

The researcher distributes the preliminary version of the questionnaire to a small, representative group—in this case, two companies. Selecting participants from the target population ensures that their feedback will be relevant and applicable to the broader audience for the final study.

A sample size of twenty (20) participants is chosen. While small, this sample size is adequate for identifying general issues in questionnaire design. The goal here is not statistical generalization but rather to test the instrument's effectiveness.

Participants are asked to provide feedback on the clarity of the questions, the relevance of the items, comprehensiveness, and ease of response and the researcher reviews participant feedback. The goal is to refine the questionnaire so that participants across the entire study will interpret the questions in the intended manner.

After incorporating feedback from the pre-test, the researcher finalizes the questionnaire. The version should exhibit improved validity, ensuring it measures what it is intended to measure, and reliability, ensuring consistent results across participants. The primarily designed questionnaire is in Appendix A.

2.4. Statistical Treatment

The data collected for this study will undergo analysis using IBM SPSS Statistics, and the specific statistical methods employed will align with the research questions and study objectives. To ensure the reliability of survey items, the researcher utilized Cronbach's alpha, considering coefficients of 0.7 and above as acceptable. Items falling below this threshold were systematically removed until an acceptable alpha coefficient was achieved. The analysis will encompass a range of statistical techniques, including descriptive statistics which involve summarizing and presenting the main features of a dataset. Multiple linear regression analysis is employed to examine the relationship between a dependent variable and two or more independent variables. It helps identify the strength and nature of these relationships and Analysis of Variance (ANOVA) is a statistical method used to compare means across multiple groups to determine if there is a significant difference among them. It is often applied when the research involves testing hypotheses about group means, particularly when there are more than two groups. This statistical method is valuable for examining associations between variables. These methods will be applied to uncover insights, assess relationships within the data, and provide valuable interpretations that directly address the research objectives of the study.

2.5. Ethical Consideration

Throughout the entire duration of the study, the researcher will uphold the rights of all participants and adhere to the relevant requirements set forth by the UERC. The highest ethical standards will always be maintained to ensure the protection and well-being of all individuals involved in the study.

2.5.1. Conflict of interest. This study is for academic purposes only and has no commercial purpose. The researcher is not sponsored by any organization or individual, and the researcher has no financial interest in the subjects or participants of the study.

2.5.2. Privacy and Confidentiality. The researcher distributed paper questionnaires on the spot for the target respondents to fill in, and then the researcher collected the paper questionnaires. The data collected on the questionnaire were personally entered by the researcher and saved to an encrypted personal computer. These data would only be used for academic research. Once the research is completed, the researcher will permanently delete the data, and the collected paper questionnaires will also be destroyed through a shredder to prevent the disclosure of respondent information.

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2.5.4 Informed Consent Process. Before the questionnaire will be distributed the researcher will briefly inform the respondent of the main research purpose and school. The questionnaire will be completed voluntarily by the respondents and will not contain any information unrelated to the survey, such as the name of the respondent. At the same time, the researcher will also express respect and gratitude to those who will not participate.

2.5.5. Vulnerability. The survey will be used to obtain respondents' opinions and does not have any inductive activities; however, to protect vulnerable groups, this study will exclude them as respondents.

2.5.6 Recruitment. The study relies on data from the two companies, CSCO (Phils) and SMDC who are involved in the construction industry and these companies have different profiles, sizes, and sectors. The study relies on data from.

2.5.7. Assent. The data collection for this study will not involve the opinions of minors.

2.5.8. risk. The collection and collation of the data will be handled by the researcher himself, respecting the participants' answers, not tampering with any information, and not involving any conflicts of interest. Therefore, there is no foreseeable risk.

2.5.9. Benefits. The participation of the respondents is of greatest help to the researcher's academics. To prevent participants from feeling threatened, the researcher will express gratitude and promise to keep the information confidential and not disclose the original data.

2.5.10. Incentives or compensation. The researcher will express sincere gratitude to the participants, without giving the participants financial incentives or any compensation.

2.5.11. Community Considerations. This study did not cause any problems or negative effects on participants and communities.

3. RESULTS

This chapter details the researcher's data collection process after receiving the initial approval certificate from the University Ethics Review Committee (UERC). It encompasses the demographic profiles of the respondents and the application of Pearson Correlation and multiple linear regression analysis.

Table 1.1

Level of Influence on Positive Leadership

Positive Leadership	Mean	Interpretation
Your supervisor's leadership is clearly delineated and well-defined.	3.34	Strong Positive Influence
Your supervisor's leadership is primarily centered on ensuring workplace safety during production.	3.42	Strong Positive Influence
Your supervisor actively seeks your input and recommendations.	3.35	Strong Positive Influence
Your supervisor delegates authority as part of their leadership approach.	3.39	Strong Positive Influence
Your supervisor consistently displays a genuine concern for your professional well-being.	3.25	Moderate Positive Influence
Positive Leadership Weighted Mean	3.35	Strong Positive Influence

The results provided in Table 1.1 show that the overall perception of "Positive Leadership" is generally favorable, with a weighted mean of 3.35, interpreted as a "Strong Positive Influence." However, one item stands out as having a relatively lower score: "Your supervisor consistently displays a genuine concern for your professional well-being" which received a mean score of 3.25, which falls under "Moderate Positive Influence." This is slightly lower than the other areas, which all maintain scores above 3.34. While leadership is generally viewed positively, a notable gap exists in supervisors' concern for employees' professional well-being. This discrepancy suggests that while aspects like workplace safety and decision-making involvement are prioritized, professional development may be overlooked (Mori, T. et al (2022), Mikkelson, A. et al (2024) and Dyrbye, L. N. et al (2024).

Table 1.2

Level of Influence on Job Competence

Job Competence	Mean	Interpretation
Gain a comprehensive understanding of equipment, facility, and tool operation procedures, safety requirements, risk assessment, and effective troubleshooting for equipment failure within the role.	3.45	Strong Positive Influence
Exhibit expertise in identifying workplace risks, especially regarding hazardous chemicals, including their properties, management, and emergency response measures.	3.70	Strong Positive Influence

Demonstrate proficiency in job-specific emergency procedures, responsibilities, and the correct utilization of emergency equipment.	3.29	Strong Positive Influence
Master post-emergency event management, covering disposal processes, emergency escape procedures, and first-aid knowledge and skills.	3.45	Strong Positive Influence
Display familiarity with role-specific safety protocols and operational procedures, ensuring competent and skilled equipment and facility operation, maintenance, and efficient issue resolution.	3.40	Strong Positive Influence
Job Competence Weighted Mean	3.46	Strong Positive Influence

The results in Table 1.2 for Job Competence show that, while the overall weighted mean is 3.46, interpreted as "Strong Positive Influence," one item has a notably lower score: "Demonstrate proficiency in job-specific emergency procedures, responsibilities, and the correct utilization of emergency equipment" (3.29). This score, while still categorized as a strong positive influence, is lower than the others, indicating a potential area for improvement in emergency preparedness. The lower proficiency scores in emergency procedures among employees indicate a significant gap in confidence and experience compared to other competencies like risk identification. This deficiency can critically impact workplace safety and emergency response effectiveness (Akin, G. C. et al (2024), Aldawsari, S. et al (2022) and Alacahan, Ö. F. et al (2023).

Table 1.3

Level of Influence on Safety Participation

Safety Participation	Mean	Interpretation
I help my colleagues when they are operating in environments characterized by potential risks or hazards.	3.63	Strong Positive Influence
I consistently bring safety-related concerns to the attention of the management within my organization.	3.55	Strong Positive Influence
I exert additional efforts in endeavors aimed at enhancing the overall safety standards within the workplace.	3.55	Strong Positive Influence
I willingly undertake responsibilities and tasks that contribute to the enhancement of workplace safety.	3.60	Strong Positive Influence
I actively promote and advocate for a culture of safety among my fellow employees.	3.55	Strong Positive Influence
Safety Participation Weighted Mean	3.58	Strong Positive Influence

The results for Safety Participation shown in Table 1.3 that all items fall under the "Strong Positive Influence" category, with a weighted mean of 3.58. However, three items scored lower than others: "I consistently bring safety-related concerns to the attention of the management within my organization" (3.55); "I exert additional efforts in endeavors aimed at enhancing the overall safety standards within the workplace" (3.55), and "I actively promote and advocate for a culture of safety among my fellow employees" (3.55). While these scores still indicate a strong positive influence, they are slightly lower compared to the highest score of 3.63, indicating a small gap in these areas. While safety participation among employees is generally high, there are indications that improvements can be made in reporting safety concerns and enhancing safety culture. This suggests a need for targeted strategies to foster deeper engagement. In contrast, while some organizations may struggle with low reporting rates, others have successfully implemented frameworks that encourage proactive safety engagement, demonstrating that effective strategies can lead to significant improvements in safety culture and outcomes (Robinson, C. (2023), BAYRAM, M. et al (2023) and Boczkowska, K. et al (2022).

Table 1.4

Level of Influence on Safety Compliance Behavior

Safety Compliance Behavior	Mean	Interpretation
Utilize the required personal protective equipment while performing your duties.	3.75	Strong Positive Influence
Diligently adhere to safety operation regulations throughout your work tasks.	3.54	Strong Positive Influence
Conduct pre-work assessments of equipment and your workspace.	3.61	Strong Positive Influence
Proactively engage in safety inspections.	3.49	Strong Positive Influence
Actively collaborate with the directives provided by personnel responsible for production safety control during your work activities.	3.80	Strong Positive Influence
Safety Compliance Behavior Weighted Mean	3.64	Strong Positive Influence

The results for Safety Compliance Behavior shown in Table 1.4 an overall positive perception, with a weighted mean of 3.64, interpreted as a "Strong Positive Influence." However, one item has a relatively lower score: "Proactively engage in safety inspections" (3.49). While this is still categorized as a "Strong Positive Influence," it is the lowest score compared to the other items, indicating a potential area for improvement in proactive safety inspection participation. The slightly lower score for proactive engagement in safety inspections indicates a potential gap in employees' understanding and involvement in proactive safety measures. While compliance with safety protocols is generally observed, the lack of initiative in inspections suggests a need for enhanced engagement strategies. While these findings emphasize the importance of proactive engagement, it is also essential to consider that some employees may feel overwhelmed by safety protocols, leading to compliance without active participation. Addressing this perception could enhance overall safety engagement (Mohd, R. H. et al (2022) and Inyang, U. J. et al (2024).

Table 2.1

Linear Regression on the significant relationship between safety compliance behavior towards positive leadership among the respondents in the construction industry.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.478[a]	.228	.225	.468

a. Predictors: (Constant), Safety Compliance Behavior Weighted Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.992	1	15.992	73.065	.000[b]
	Residual	54.064	247	.219		
	Total	70.056	248			

a. Dependent Variable: *Positive Leadership Weighted Mean*

b. Predictors: (Constant), Safety Compliance Behavior Weighted Mean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig
		B	Std. Error	Beta		
1	(Constant)	1.061	.257		4.123	.000
	Safety Compliance Behavior Weighted Mean	.583	.068	.478	8.548	.000

a. Dependent Variable: *Positive Leadership Weighted Mean*

The results of the simple regression analysis in Table 2.1 indicate the relationship between Safety Compliance Behavior (independent variable) and Positive Leadership (dependent variable). A simple linear regression was calculated to predict respondents' positive leadership toward safety compliance behavior. A significant regression equation was found (F (1,247) = 73.065, p < .001), with an $R2$ of .228. The regression analysis demonstrates a ***significant*** and ***moderately positive relationship*** between Safety Compliance Behavior and Positive Leadership. Approximately 22.8% of the variation in Positive Leadership is explained by changes in Safety Compliance Behavior, and this relationship is statistically significant. Organizations can enhance workplace safety and leadership effectiveness by fostering a strong connection between safety compliance and positive leadership. This relationship is crucial for creating a culture of safety that benefits both employees and organizational outcomes (Wang, D. et al (2023), Omidi, L. et al (2023).

Table 2.2

Linear Regression on the significant relationship between safety compliance behavior towards job competence, and safety participation among the respondents in the construction industry.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.580[a]	.336	.333	.409

a. Predictors: (Constant), Safety Compliance Behavior Weighted Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.916	1	20.916	124.988	.000[b]
	Residual	41.333	247	.167		
	Total	62.249	248			

a. Dependent Variable: *Safety Participation Weighted Mean*

b. Predictors: (Constant), Safety Compliance Behavior Weighted Mean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig
		B	Std. Error	Beta		
1	(Constant)	1.000	.225		4.446	.000
	Safety Compliance Behavior Weighted Mean	.667	.060	.580	11.180	.000

a. Dependent Variable: *Safety Participation Weighted Mean*

The simple linear regression analysis in Table 2.2 examines the relationship between Safety Compliance Behavior (independent variable) and Safety Participation (dependent variable) in the construction industry. A simple linear regression was calculated to predict respondents' positive leadership toward safety compliance behavior. A significant regression equation was found (F (1,247) = 124.988, p < .001), with an *R2* of .336. The regression results show a ***significant*** and ***moderately strong positive relationship*** between Safety Compliance Behavior and Safety Participation in the construction industry. Approximately 33.6% of the variance in Safety Participation is explained by changes in Safety Compliance Behavior, and this relationship is highly significant. Improving safety compliance behaviors among workers is crucial for fostering a safer and more engaged workforce. Research indicates that enhancing safety compliance can significantly elevate safety participation, ultimately leading to reduced workplace accidents and improved organizational performance. While the focus on compliance is essential, it is also important to consider that not all factors, such as risk perception and stigma, significantly influence safety behaviors, indicating a need for targeted interventions in safety training and management practices (Kang, C. X. et al (2024), Zhang, Z. et al (2024) and Aidoo, I. (2024).

Table 2.3

Linear Regression on the significant relationship between safety compliance behavior towards safety participation among the respondents in the construction industry.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.076[a]	.006	.002	.501

a. Predictors: (Constant), Safety Compliance Behavior Weighted Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.361	1	.361	1.440	.231[b]
	Residual	61.880	247	.251		
	Total	62.241	248			

a. Dependent Variable: *Job Competence Weighted Mean*

b. Predictors: (Constant), Safety Compliance Behavior Weighted Mean

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.166	.275		11.503	.000
	Safety Compliance Behavior Weighted Mean	.088	.073	.076	1.200	.231

a. Dependent Variable: *Job Competence Weighted Mean*

The simple linear regression analysis in Table 2.3 investigates the relationship between Safety Compliance Behavior (independent variable) and Job Competence (dependent variable) among respondents in the construction industry. A simple linear regression was calculated to predict respondents' safety compliance behavior and job competence. The regression equation was not significant (F (1, 247) = 1.440, p > .005) with an *R2* of .006. The very low R Square value (0.6%) and non-significant p-value (.231) suggest that changes in safety compliance behavior do not meaningfully explain variations in job competence. While the

analysis suggests a disconnect between safety compliance and job competence, it is essential to consider that safety behaviors are multifaceted and influenced by various organizational and individual factors. Further research may be needed to explore these dynamics more deeply (Wang, Y. et al (2024), Kang, C. X. et al (2024), Zhang, Z. et al (2024) and Samuelsson, A. U. et al (2023).

Table 3

ANOVA results on the significant difference between safety compliance behavior towards safety participation among the respondents in the construction industry.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig
Positive Leadership Weighted Mean	Between Groups	15.992	1	15.992	73.065	.000
	Within Groups	54.064	247	.219		
	Total	70.056	248			
Safety Participation Weighted Mean	Between Groups	20.916	1	20.916	124.988	.000
	Within Groups	41.333	247	.167		
	Total	62.249	248			
Job Competence Weighted Mean	Between Groups	.361	1	.361	1.440	.231
	Within Groups	61.880	247	.251		
	Total	62.241	248			

The results from the ANOVA analysis in Table 3 provide insights into the significance of differences in safety compliance behavior and related factors among respondents in the construction industry. The F-value of 73.065 is very high, and the p-value (Sig) is .000, which is below the conventional threshold of significance (e.g., .05). This indicates a statistically significant difference in safety compliance behavior based on positive leadership. The F-value of 124.988 is extremely high, and the p-value is .000, indicating a highly significant difference in safety compliance behavior related to safety participation. The F-value of 1.440 is low, and the p-value (Sig = .231) is above the significance threshold of .05. This indicates no statistically significant difference in safety compliance behavior related to job competence.

Positive leadership and safety participation are significant factors influencing safety compliance behavior in the construction industry. These findings highlight the critical role of leadership styles and active participation in promoting safety compliance.

Job competence does not significantly impact safety compliance behavior. This might imply that job-related skills or competencies are not directly linked to safety participation in this specific context.

Safety leadership, along with working conditions, significantly influences safety behavior. Organizational support is critical in reducing work accident rates, suggesting that leadership development and strategic interventions are essential for improving safety outcomes (Narendra & Dudija, 2024). Enhancing safety participation involves addressing health and safety obstacles, which can lead to improved safety standards and economic benefits for construction firms. Promoting worker health and safety fosters public trust and company reputation, emphasizing the importance of safety participation (Zhong, 2024).

While leadership and safety participation are pivotal, the role of job competence in safety behavior is less straightforward. Context-specific studies are essential to exploring this relationship further. Understanding the nuances of how competence interacts with safety behavior could provide deeper insights into developing comprehensive safety strategies.

SOP 4

Proposed enhancing programs in the construction industry

This study offers actionable recommendations to enhance safety practices and job competence in the construction industry, addressing key roles across all stakeholders. Construction companies are urged to invest in comprehensive training programs tailored to their workforce's needs, from foundational safety training for novices to advanced courses for leaders. These efforts should be complemented by fostering a safety-first culture through open communication, regular safety meetings, and rewards for safe practices. Leveraging technology, such as digital platforms for training and incident reporting, and conducting routine safety audits, can further strengthen safety management systems.

For site managers, the focus is on integrating safety into all facets of project planning and execution. By modeling safe behaviors and involving workers in safety decision-making processes, managers can inspire compliance and engagement. Effective communication, such as regular safety briefings and clear signage, is critical to ensuring that safety protocols are consistently understood and followed.

Construction workers are encouraged to take ownership of their safety by actively participating in training and adhering to established protocols. They should feel empowered to report hazards and promote a culture of safety among peers, fostering a supportive work environment where everyone is accountable for each other's well-being.

Researchers play a pivotal role in driving innovation and improvement in safety practices. Future research should explore the unique challenges faced by diverse groups, investigate the role of technology, and study the long-term impacts of safety interventions. Collaborating with industry stakeholders and disseminating findings through academic and practical channels can ensure that research outcomes translate into meaningful on-site improvements.

By aligning efforts across companies, site managers, workers, and researchers, the construction industry can build a culture of safety and competence. These recommendations aim to reduce workplace accidents, improve worker well-being, and enhance overall organizational performance, paving the way for a safer and more sustainable future in construction (See Appendix for details)

4. DISCUSSIONS

This chapter provides a comprehensive review and synthesis of the key research findings. Furthermore, it offers practical recommendations and insights drawn from the study's outcomes.

4.1. Conclusions

In this study, we explored the intricate relationship between job competence, safety practices, and the demographic profiles of workers in the construction industry. The findings underscore the critical importance of understanding the workforce's composition, particularly in terms of age, experience, and educational background, to enhance safety protocols and overall job performance.

The data collected from 249 respondents revealed a diverse workforce, with a significant representation of laborers (53.8%) and a notable presence of engineers (24.1%). This distribution indicates a strong technical foundation within the workforce, which is essential for implementing effective safety measures. However, the educational attainment of the respondents also highlighted potential gaps in technical training, particularly among those with a high school diploma or less, who comprised 53.8% of the sample. This demographic may require more hands-on, practical safety training to ensure adherence to complex safety regulations.

The analysis of job competence revealed a weighted mean score of 3.46, categorized as a "Strong Positive Influence." However, the item concerning proficiency in job-specific emergency procedures received a notably lower score of 3.29. This discrepancy indicates a critical area for improvement, as emergency preparedness is vital for workplace safety. The findings suggest that while workers exhibit strong competencies in risk identification and equipment operation, there is a significant gap in their confidence and experience regarding emergency response measures.

The implications of these findings are profound for safety practices in the construction industry. Given that a substantial portion of the workforce is relatively inexperienced, particularly those aged 18-30, it is essential to implement targeted training programs that address their specific needs. Mentorship programs that pair younger workers with experienced professionals can facilitate knowledge transfer and enhance safety leadership practices. Such initiatives can help cultivate a culture of safety, where experienced workers model best practices and younger employees feel empowered to engage in safety protocols actively.

Moreover, the study highlights the necessity of tailoring safety training to accommodate the varying educational backgrounds of workers. For those with limited formal education, training should focus on practical, task-specific hazards and basic safety practices. Conversely, workers with higher educational attainment may benefit from more advanced training that

delves into complex safety regulations and risk management strategies. By adopting a differentiated approach to safety training, organizations can maximize the effectiveness of their safety initiatives and ensure that all workers are equipped to handle potential hazards.

While this study provides valuable insights into the relationship between job competence and safety practices, further research is warranted to explore additional factors that may influence workplace safety. Future studies could investigate the impact of organizational culture on safety behaviors, examining how leadership styles and communication practices affect employee engagement in safety initiatives. Additionally, longitudinal studies could provide a deeper understanding of how safety competencies evolve as workers gain experience and undergo training.

Another area for exploration is the role of technology in enhancing safety practices. With the increasing integration of technology in the construction industry, research could focus on how digital tools and platforms can facilitate training, improve communication, and enhance overall safety outcomes. Understanding the intersection of technology and safety can provide organizations with innovative solutions to address the challenges they face in maintaining a safe work environment.

This study underscores the critical importance of understanding the demographic profiles of workers in the construction industry to enhance safety practices. The findings reveal significant gaps in emergency preparedness and highlight the need for targeted training programs that cater to the diverse needs of the workforce. By fostering a culture of safety through mentorship and tailored training initiatives, organizations can empower their employees to take an active role in promoting workplace safety.

As the construction industry continues to evolve, safety practices must adapt to meet the changing needs of the workforce. By prioritizing safety and investing in the development of their employees, organizations can not only improve safety outcomes but also enhance overall job competence and productivity. The insights gained from this research serve as a foundation for future studies and initiatives aimed at creating a safer and more competent workforce in the construction industry.

Ultimately, the commitment to safety must be a shared responsibility among all stakeholders, including employers, employees, and industry leaders. By working collaboratively to address the challenges identified in this study, the construction industry can pave the way for a safer, more efficient, and more resilient future.

The construction industry faces unique challenges in ensuring workplace safety and enhancing job competence. This study highlights the importance of fostering a culture of safety through comprehensive training, effective leadership, employee engagement, and the strategic use of technology. Safety compliance, participation, and leadership are identified as key drivers in improving safety outcomes, while job competence requires distinct and targeted interventions. Collaborative efforts between companies, managers, workers, and researchers are essential to address these challenges. Aligning these initiatives can lead to significant reductions in workplace accidents, improved worker well-being, and enhanced organizational performance, contributing to a safer and more sustainable future for the industry.

4.2. Recommendations

From the researcher's perspective, this study underscores the critical need for a multidimensional approach to enhancing safety practices within the construction industry. The recommendations derived from the findings aim to provide stakeholders with actionable strategies to foster a culture of safety by addressing key areas such as leadership development, comprehensive training, safety culture, technological integration, and job competence enhancement.

First, leadership development emerges as a cornerstone of safety advancement. Training programs tailored for supervisors should emphasize the principles of positive leadership, integrating safety compliance with employee well-being. Supervisors must be encouraged to balance operational priorities with initiatives that support professional growth and holistic employee care. Regular feedback mechanisms can serve as an invaluable tool to monitor leadership effectiveness while fostering collaboration between leaders and employees can build a shared commitment to safety goals, creating a cohesive and safety-oriented workforce.

Second, comprehensive safety training is essential to equip workers with the knowledge and skills necessary to navigate complex construction environments. Implementing tiered training programs—from foundational safety courses for new employees to advanced leadership-focused modules—can address the varying needs of the workforce. Integrating safety compliance into technical training ensures that safety awareness becomes an integral part of job competence. Practical sessions, such as real-life simulations and drills, are critical for enhancing emergency preparedness and proactive engagement. Additionally, establishing open channels for hazard reporting and feedback promotes transparency and continuous improvement.

Building a safety-first culture is another pivotal recommendation. Recognizing and rewarding employees for adhering to and promoting safety practices can inspire a deeper commitment to compliance. Regular safety meetings and audits ensure that

protocols are consistently reinforced and that gaps are promptly addressed. Empowering employees to take ownership of workplace safety through active participation in inspections, committees, and decision-making processes can further instill a sense of accountability. Simplifying safety inspection processes can also encourage greater engagement and proactive behavior among workers.

The integration of technology into safety practices offers transformative potential. Digital platforms for training, incident reporting, and data tracking provide efficient and accessible tools for managing safety. Wearable safety devices and AI-driven systems can monitor hazards and mitigate risks in real time, enhancing both individual and organizational safety outcomes. Exploring innovative technological solutions can further enhance compliance and participation, ensuring that safety management systems remain agile and effective.

Enhancing job competence through targeted development initiatives is equally critical. Mentorship programs, personalized development plans, and experiential learning opportunities can address the multifaceted nature of job competence. Encouraging continuous learning through certifications and skill-building activities helps workers remain competent and confident in their roles. Clear organizational policies and robust resource allocation are essential to support these efforts and foster an environment that values both safety and professional growth.

A collaborative safety framework is vital for uniting stakeholders in the pursuit of safety excellence. Safety committees that include management and workers can promote accountability and shared goals, creating a platform for open dialogue and joint problem-solving. Partnerships with researchers and industry experts can facilitate the piloting of innovative safety interventions, while interdisciplinary collaboration ensures that training modules are tailored to address specific industry challenges.

Future research directions must delve deeper into the barriers preventing proactive safety behaviors, hazard reporting, and the promotion of a safety culture. Studies on the role of technology in enhancing compliance and participation will be instrumental in harnessing its full potential. Additionally, exploring the unique challenges faced by diverse workforce groups—such as women, migrant workers, and older employees—can ensure that safety protocols are inclusive and effective. Investigating the indirect relationships between job competence and safety compliance, with a focus on mediators like organizational culture or leadership style, will provide deeper insights. Longitudinal studies will also be crucial for assessing the long-term effects of leadership training, safety interventions, and job competence enhancement programs on overall organizational outcomes.

As a researcher, these recommendations is a roadmap for the construction industry to achieve a safer, more competent, and collaborative workforce. By aligning efforts across leadership, workers, and technology and fostering a culture of safety and continuous improvement, the industry can pave the way for sustainable success and well-being.

4.3. Implications of the Study

This study underscores the importance of adopting a comprehensive approach to safety and competence within the construction industry. It offers actionable recommendations aimed at various stakeholders—construction companies, managers, workers, and researchers. The findings emphasize the role of leadership, training, participation, and strategic interventions in fostering a culture of safety and addressing critical gaps.

Construction companies are encouraged to make strategic investments in safety-focused training programs and advanced technologies. By creating a safety-first culture, organizations can reduce workplace accidents, enhance worker morale, and improve operational efficiency. Comprehensive training programs should address both safety compliance and technical job competence to equip workers with the skills necessary to perform their tasks safely and effectively. Furthermore, companies should recognize and reward employees for adherence to safety protocols and active participation in safety initiatives, fostering a sense of responsibility and engagement.

The study highlights the significant influence of leadership on safety compliance and participation. Managers must model safe behaviors, integrate safety considerations into project planning, and foster a collaborative environment where workers feel supported. Regular communication, such as safety briefings and feedback sessions, ensures that employees understand and adhere to safety protocols. Leadership training should focus on balancing operational priorities with efforts to support employee growth and well-being and promote a shared commitment to safety.

Empowering workers to take ownership of their safety is critical. Workers should be actively involved in safety initiatives, such as inspections, committees, and hazard reporting. Providing opportunities for skill enhancement through certifications and mentorship ensures that workers are well-equipped to handle complex tasks while maintaining safety standards. Encouraging

mutual accountability among peers fosters a supportive work environment where everyone feels responsible for maintaining safety.

Researchers play a vital role in driving innovation and advancing safety practices. They should focus on targeted interventions to address barriers such as stigma, risk perception, and diverse workforce needs. Studies investigating the role of technology, such as AI-driven risk management systems and wearable safety devices, can provide insights into how innovation enhances compliance and participation. Research on the indirect relationships between job competence and safety compliance can help uncover contextual mediators, such as organizational culture or leadership styles, to inform inclusive and effective strategies.

A key area for improvement is equipping leaders with the tools and knowledge needed to drive safety compliance while prioritizing employee well-being. Leadership training programs should focus on fostering a proactive safety mindset, building trust, and effectively managing workplace operations. Regular feedback mechanisms can provide leaders with valuable insights into their performance, enabling them to adapt and improve their approaches. Collaboration between leaders and employees is essential for achieving shared safety goals. By working together, teams can establish a unified commitment to maintaining a safe and productive workplace.

Tailored training programs are vital to address the diverse needs of the construction workforce. Foundational safety courses for new employees should be complemented by advanced leadership modules for supervisors and managers. Incorporating real-life simulations and drills can help workers prepare for emergencies, ensuring they are well-equipped to respond effectively. Open channels for hazard reporting and feedback are essential for continuous improvement, enabling organizations to identify and address safety concerns promptly and transparently.

Creating a safety-first culture is fundamental to reducing workplace risks and improving overall performance. Recognizing and rewarding employees for adhering to safety protocols and actively promoting safety can foster greater engagement and accountability. Regular safety meetings and audits should be conducted to identify gaps, reinforce standards, and maintain high levels of compliance. Simplifying safety inspection processes will encourage employees to take a more proactive role in hazard identification and mitigation, further embedding safety into daily practices.

Technology plays a transformative role in modern safety management. Digital platforms can be utilized for training, incident reporting, and real-time data tracking, ensuring that information is accessible and actionable. Wearable devices and AI-driven systems provide innovative solutions for monitoring hazards and preventing incidents, enhancing both individual and organizational safety outcomes. These technologies enable organizations to remain agile and responsive to evolving safety challenges.

Advancing job competence requires a multifaceted approach that combines mentorship, experiential learning, and skill-building opportunities. Providing employees with these resources not only enhances their technical capabilities but also ensures they are better equipped to integrate safety into their daily tasks. Aligning job competence initiatives with organizational goals ensures that workforce development efforts contribute to overall productivity and safety.

Collaboration is essential for fostering accountability and innovation in safety practices. Establishing safety committees that include both management and workers promotes shared responsibility and open dialogue. Partnering with researchers and industry experts enables organizations to implement cutting-edge safety interventions and stay ahead of industry trends. This collaborative approach ensures that safety strategies are both practical and forward-looking.

Future research should explore the unique challenges faced by diverse workforce groups, investigate the long-term effects of safety training, and assess the role of technology in enhancing safety compliance and participation. Understanding the nuanced relationships between job competence and safety compliance will provide deeper insights into developing effective and inclusive safety strategies.

By aligning efforts across these areas, stakeholders can create safer, more efficient, and resilient construction environments. The integration of leadership, technology, and collaboration ensures that safety is not just a requirement, but a priority woven into the fabric of organizational culture, paving the way for a sustainable and high-performing industry.

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