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Compliance Mechanisms of Occupational Health and Safety in Managing Workplace Accidents in Construction Industries in Tanzania

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Abstract
Compliance mechanisms for occupational health and safety (OHS) in managing workplace accidents are among the most challenging factors in Tanzania's construction industry. The study explored how OHS compliance mechanisms influence workplace accident management in the construction industry. The study adopted a cross-sectional research design. Data were collected from 92 respondents working at Samia Construction Project in Kawe Ward, Kinondoni District, and Dar es Salaam Region. The study used a questionnaire as the primary data collection instrument for all respondents and interview guides to collect information from Key informants, including project engineers and supervisors. Data were analysed using multiple linear regression in SPSS, while qualitative data were analysed through content analysis. The study found that OHS compliance mechanisms are positively and statistically significant ($P < 0.05$) in managing workplace accidents in the construction industry. The study recommends that employers ensure workers on construction projects are informed and trained on all aspects of OHS. Employers should identify and assess hazards and risks to workers' safety and health on an ongoing basis. Management should ensure regular monitoring teams conduct day-to-day supervision and compliance checks.

1.0 Introduction
Occupational health and safety in workplaces has become a major challenge, as many construction sites have failed to provide a better working environment for their employees (Mneymneh et al.,

2017). Recently, work-related injuries, diseases, and deaths in construction projects have been increasing day by day (Mrema et al., 2015). Among the issues are working with harmful minerals and chemicals, the spread of infectious diseases and passive smoking, making occupational health and safety a difficult activity to achieve.

Many developed countries, including those in Western and Middle Eastern regions, have sought to ensure that their workers have safe and healthy working environments, given their large construction industries. As a result, OSH compliance problems are inevitable. In China, with an estimated population of 900 million employees, more than 25 million workers are affected by occupational hazards each year (Zhang et al., 2017). The least developed countries in Africa (LDCs) have been making significant strides in both industrialisation and economic reform. The analysis found that the main problems studied in developing countries include sanitation and hygiene, concerns about the quality of safety equipment, and poor working conditions (Fuller, 2019). Many employees today are at risk of various types of career-related diseases (ILO, 2017).

Workplace hazards can affect workers physically, mentally, or biologically because they can be physical, psychological, ergonomic, chemical, or biological (Alli, 2008). Recently, the effects of workplace hazards have been increasing every day. The effects involve death, disabilities and management costs for workers, the community, organisations and governments at large (Tawiah & Mensah, 2016). The construction industry in Tanzania is considered the most dangerous sector, as it involves noise, movement, temperature, vibration, chemicals, pressure, and turmoil. Each of these causes affects employees and organisations in one way or another.

As the construction industry grows and expands, occupational injuries and diseases among workers are increasing due to poor compliance with Occupational Health and Safety, including falls from heights and electrical accidents (Farouk, 2017). This has created high demand for occupational health and safety services, which developing countries may struggle to meet, as they prioritise economic expansion without regard for its impact on occupational health and safety (Mrema et al., 2015).

Injuries such as being struck by objects and exposure to hazardous chemicals have occurred at the Samia construction project, and these injuries and accidents have affected employee performance and the organization in different ways (Andianto et al., 2022). Health, safety, and wellness are important for economic, legal, psychological, and ethical reasons (Bratton & Gold, 2017). National Housing Corporation has not experienced better compliance with Occupational Health and Safety strategies, specifically in the Samia construction project, since it is not among their objective within their recent ten-year Strategic Plan, as workers are not provided with enough protective equipment such as safety boots, gloves, clothes and helmets, which will endanger their safety, leading to loss of life, accidents and injuries at workplaces and loss of workforce, which affects production and causes it to become low (URT, 2015). This is because Samia Construction's project management has low cooperation with OSHA in providing workplace health and safety training. The construction industry is obliged to take adequate measures to minimize work-related health

and safety problems (URT, 2020). Therefore, this study aimed to bridge this gap by examining occupational health and safety compliance mechanisms in managing workplace accidents in the construction industry.

2.0 Theoretical and Empirical Literature Review

2.1 Theoretical Perspectives

The study was guided by Maslow's Hierarchy of Needs Theory, developed by Abraham Maslow (1943). The theory posits that human beings are motivated by a hierarchy of needs: physiological, safety, social, esteem, and self-actualization. Safety needs occupy the second level and include protection from physical harm, injury, illness, and unsafe working conditions.

Maslow's Hierarchy of Needs Theory provides a useful framework for understanding the importance of occupational health and safety compliance in construction workplaces. According to Maslow, individuals are motivated to satisfy a hierarchy of needs, beginning with physiological needs and progressing to safety, social, esteem, and self-actualization needs. Safety needs are fundamental because employees must feel protected from physical harm, illness, and workplace hazards before they can focus on higher-level needs and perform productively.

The International Labour Organization (ILO) emphasizes protecting workers from occupational diseases, sicknesses, and injuries such as electrical accidents and being struck by objects at construction sites. Through the application and ratification of ILO conventions, governments, employers, and employees are encouraged to establish and maintain safe working environments by promoting the use of personal protective equipment (PPE), including helmets, gloves, safety boots, eye protection, and other hazard-control measures (ILO, 2016). This aligns with Maslow's safety needs, as workplace protection helps employees feel secure and reduces their exposure to risks.

Furthermore, workplace safety depends not only on the availability of PPE but also on developing a strong safety culture that encourages safe behavior among workers and management (Al-Bsheish, 2017). Despite the availability of protective equipment, some construction workers resist using PPE because they perceive it as uncomfortable or believe it hinders their ability to perform tasks efficiently. Such behavior increases their vulnerability to workplace accidents and injuries (Dukpa, 2017). From Maslow's perspective, failure to comply with safety measures undermines employees' safety needs and may negatively affect their well-being, job satisfaction, and performance.

The ILO further reports that fatal occupational injuries and workplace risks are significantly higher in developing countries than in developed nations, indicating the need for stronger safety compliance mechanisms (Baradan, 2018). While PPE serves as an important line of defence, it should complement broader hazard elimination and risk-control strategies rather than replace them. Therefore, ensuring compliance with occupational health and safety regulations and proper PPE use can significantly reduce workplace accidents and create a safer working environment. In line with Maslow's theory, when employees feel safe and protected, they are more likely to remain

healthy, motivated, and productive, thereby contributing to both individual well-being and organizational effectiveness.

2.2 Empirical Review

Using Personal Protective Equipment (PPE) protects workers and reduces infection risk when engineering and management controls are not feasible. PPE items include eye-glasses, safety caps, safety boots, and gloves. Research in Addis Ababa, Ethiopia found fewer injuries (60%) among site workers who used PPE than among those who never used it. The research also identified reasons for not using PPE: discomfort and limited knowledge of how to use it and why it matters (Tanko, 2012).

Most literature reviews on enhancing safety performance are either reactive or proactive. Reactive studies tend to test safety programmes by examining historical data and never assess the current status; despite identifying obstacles, they rarely offer practical measures. Proactive studies focus on evaluating hazard identification and observation, the overall environment of an area, safe practices, and the design for safety and hazard threat (Sanni-Anibire, 2019). Findings indicate that most site project threats stem from poor design, thereby encouraging professional designers to consider safety in their work.

3.0 Methodology

The study was conducted in Kawe Ward, Kinondoni District, Dar es Salaam Region, where the Samia Construction Project under the National Housing Corporation is located. The study used a cross-sectional research design to describe the phenomenon at the time of the study (Creswell, 2014). This design was employed to collect data to understand the phenomenon at a particular point in time.

The study population was 120 employees working directly on the Samia construction project implemented by NHC. The sample size was 92 employees, obtained using Yamane's formula. The sampling frame for this study was Samia Construction Project employees working directly on the project.

A well-structured questionnaire, arranged in a Likert scale format, was used to collect primary data from all employees in the field of study. The questionnaire was distributed to respondents. This method was supplemented by an interview guide with open-ended questions; eight key informant interviews, including four engineers and four health and safety supervisors, were conducted to obtain specific information from site actors. After data collection, the data were analysed using inferential statistics, including multiple linear regression, in the IBM Statistical Package for the Social Sciences (SPSS) software, version 20. This analysis showed the relationship between OHS compliance mechanisms and workplace accident management in the construction industry.

A multiple linear regression model was specified as follows: -

Thus, from the regression results, the general form of the equation to predict the dependent variable from independent variables can be presented as:

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon$$

Where: -

Y= Managing workplace accidents in the construction industry –Dependent variable

β_0 =Constant

β_1 to β_6= Coefficients of corresponding explanatory variables

X_1= Safe working environment (safe work environment = 1, unsafe work environment. = 0)

X_2= Regular workplace inspections (availability of regular inspection = 1, Unregular inspection = 0)

X_3= Use of Personal Protective Equipment (PPE) (use of PPE = 1, non-use of PPE = 0)

X_4= Knowledge on use of PPE (Knowledgeable on use of PPE = 1, unknowledgeable on use of PPE = 0)

X_5= Existence of warning signs on the site (availability of warning signs = 1, absence of warning signs = 0)

X_6= Awareness of risk and hazard protection (awareness of risk and hazard protection = 1, unawareness of risk and hazard protection = 0)

4.0 Findings and Discussion

4.1 Profile of the Respondents

This section presents the respondents' demographic information. Table 1 presents the study's respondent profile, including sex, age, marital status, educational level, and work experience in the study area.

The findings show that respondents aged 18-30 years accounted for a higher proportion (68.5%) compared to those aged 31-42 years (22.8%) and those aged 43 years and above (8%). The results suggest that youth have better physical abilities, such as stamina, durability, and strength, which are essential for tasks like heavy lifting, digging, and climbing on construction sites. Additionally, youth tend to be more adept at technological operations, such as operating heavy machinery and interpreting technical drawings, making them more employable in the construction industry. These findings align with a study by Adetunji and Oluwole (2021) in Nigeria, which also reported that most construction workers were aged 20-29. A similar age distribution was observed in a study conducted in South Africa by Oyedele et al. (2018), where most construction workers were aged 20-34.

By gender, the study found that men accounted for 87.7% of respondents, while women accounted for only 12.0%. This suggests that men are more heavily involved in construction activities in Tanzania, potentially due to gender inequality, safety barriers, and the complex nature of

construction work. These findings are supported by a 2020 report by the National Bureau of Statistics (NBS) titled "Employment and Earnings in the Informal Sector in Tanzania", which indicated that the construction sector in Dar es Salaam is predominantly male-dominated. Another study by Mills et al. (2021) in Australia highlighted significant barriers to women's participation in the construction industry, including gender stereotypes, lack of employer support, and a lack of female role models.

Table 1: Profile of Respondents in the Study Area

Variable	Category	Frequency	Percentage
Sex of Respondents	Male	81	88.0
	Female	11	12.0
		92	100.0
Ages of Respondents	18-30 years	63	68.5
	31-42 years	21	22.8
	43 years and above	8	8.7
		92	100.0
Education level of Respondents	Primary school	37	40.2
	Secondary school	36	39.1
	College/university	15	16.3
	Less educated	4	4.3
		92	100.0
Marital Status	Single	55	59.8
	Married	34	37.0
	Widowed/Separated	3	3.3
		92	100.0
Work experience	1-5 years	77	83.7
	6-10 years	8	8.7
	11 years and above	7	7.6
		92	100.0

Regarding education levels, respondents showed a varied distribution, with primary school (40.2%) and secondary school (39.1%) as the dominant levels. This suggests that construction projects in Tanzania tend to employ many workers with lower levels of education. Potential reasons include lower wages for less-educated workers, which reduces project costs; limited construction-related skills and knowledge; and inadequate training in safety procedures. Studies by Kapinga and Mushi (2019) and Mbise et al. (2020) in Dar es Salaam support these findings, highlighting limited OHS knowledge and practices among uneducated construction workers, including low awareness of occupational risks and low use of Personal Protective Equipment (PPE).

The study presented findings using multiple linear regression analysis supported by qualitative data. The study examined how occupational health and safety (OHS) compliance mechanisms influence workplace accident management in the construction industry. The compliance mechanisms analysis included a safe working environment, regular workplace inspections, the use of personal protective equipment (PPE), employees' knowledge of PPE, the presence of warning signs at construction sites, and workers' awareness of workplace risks and hazard protection.

Table 2: Regression results on Compliance mechanisms of OHS in managing workplace accidents

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.173	0.377		0.869	0.047
Safe work environment	.254	.336	.089	.254	.021
Regular workplace inspections	.432	.395	.076	.302	.012
Use of Personal Protective Equipment (PPE)	.329	.321	.279	4.055	0.001
Employee Knowledge on PPE	0.269	0.091	0.282	1.409	0.124
Existence of warning signs in the site	0.214	0.093	0.426	2.192	0.046
Awareness of risk and hazard protection	0.225	0.1	0.249	2.243	0.034

R = .855a, R-square = .731, Adjusted R square = .687

4.2.1 Safe work environment

The findings indicated a safe work environment. The results show that a safe work environment significantly affects workplace accident management in the construction industry. The estimated coefficient of Safe work environment was 0.254. This implies that a one-unit increase in safe work environment would improve workplace accident management in the construction industry by 0.254 units. The estimated p-value (0.021) is less than the 5% significance level (0.05), indicating that the estimated coefficient is statistically significant. The positive coefficient suggests a positive relationship between the independent variable and workplace accident management in the construction industry. Therefore, an increase in the independent variable is associated with improved workplace accident management.

Studies support the findings; the International Labour Organisation (ILO, 2017) indicated that a safe work environment can motivate employees to perform better, thereby increasing organizational performance and employees' trust in the organization; safety rules and guidelines in the organization can also increase workplace safety.

4.2.2 Regular workplace inspection

The results also show that regular workplace inspection significantly affects workplace accident management in the construction industry. The estimated coefficient of regular workplace inspections was 0.214. This implies that a one-unit increase in regular workplace inspections would improve workplace accident management in the construction industry by 0.214 units. Also, the estimated p-value of 0.046 is less than 0.05, implying that the estimated coefficient had a positive and statistically significant influence on managing workplace accidents in the construction industry.

The findings suggest that the company takes employee safety seriously, implements effective safety measures to prevent accidents and injuries, and that employees follow safety protocols and guidelines. For example, one participant reported that: -

> *"The management has ensured that all workers when are in their works stay safe, it has been ensuring it through enhancing OHS measures in their sites like encouraging safe working environment and day to day inspections"* (KI. 1 Kawe, 16 February, 2023)

Therefore, a safe working environment and regular workplace inspections significantly impact workplace accident management in the construction industry. Bashir et al. (2019) conducted a study in Pakistan on OHS performance among construction industry employees and found that a safe working environment and workplace inspections positively affected construction workers' safety performance. Similarly, a study conducted in India by Kumar and Yadav (2020) on training programs for construction workers found that safety programs, OHS training and education programs for construction workers were effective in improving their knowledge and awareness of safety issues.

4.2.3 Usage of Personal Protective Equipment (PPE)

The findings show that the use of personal protective equipment (sun-glasses, safety boots, gloves, helmets) and employees' knowledge of its use significantly affect workplace accident management in the construction industry. The estimated coefficient for protective gear (sunglasses, safety boots, gloves, helmets) was 0.329. This implies that a one-unit change in the use of these protective gears would improve workplace accident management in the construction industry by 0.329 units. Also, the estimated p-value is .001 is less than 0.05, implying that accepting the estimated coefficient is statistically significant. Thus, at the 0.05 level of significance, we conclude that using protective gear significantly impacts workplace accident management in the construction industry. The findings align with the study conducted in Addis Ababa, Ethiopia, which found 60% fewer injuries among the construction employees who used PPE compared to those who did not (Tanko & Anigbogu, 2012)

4.2.4 Knowledge on the use of protective gears

The results also show that knowledge of using sunglasses, safety boots, gloves, and helmets has no significant effect on managing workplace accidents in the construction industry. The estimated coefficient for knowledge of using sunglasses, safety boots, gloves, and helmets was 0.269. This implies that a one-unit increase in knowledge of using sunglasses, safety boots, gloves, and helmets would improve workplace accident management in the construction industry by 0.269 units. Also, the estimated p-value of 0.124 is greater than 5%, implying that rejecting the estimated coefficient is not statistically significant. Thus, at the 5% level of significance, we conclude that knowledge of how to use sunglasses, safety boots, gloves, and helmets has no significant impact on managing workplace accidents in the construction industry.

This implies that employees lack sufficient knowledge of how to use sunglasses, safety boots, gloves, and helmets. Using appropriate Personal Protective Equipment (PPE) protects workers and minimizes exposure to hazards and risks when engineering and administrative controls are not feasible. PPE items include eye-glasses, safety helmets, safety boots, high-visibility clothing and gloves.

Qualitative data from Key Informant (KI) interviews with a few participants, including supervisors and engineers in the study area, revealed that OHS policies and procedures prioritise casual labourers to avoid risks that might occur in their work. For example, one participant said that: -

> *"The staff has been ensuring provision of PPEs to all employees as well as provision of trainings to all employees on OHS to avoid accidents and injuries" (KI. 2, Kawe, 19 February, 2023)*

The study conducted in Addis Ababa, Ethiopia, illustrated some of the leading factors for not using PPE and lack of awareness on the use of PPE, discomfort and poor knowledge on usage and importance of PPE (Tanko & Anigbogu, 2012).

4.2.5 Existence of warning signs on the site

The results show that the existence of warning signs on the site has a significant effect on managing workplace accidents in the construction industry. The estimated coefficient for the existence of warning signs on site was 0.214. This implies that a one-unit change in the existence of warning signs on site would improve workplace accident management in the construction industry by 0.214 units. The estimated p-value is 0.046, which is less than 0.05, indicating that the estimated coefficient is statistically significant. The results were justified by one of the respondents, who added that: -

> *"In our site (workplace) there are warning signs which alert workers and visitors on those areas which are dangerous for people to pass by without putting on protective gear such as boots, helmets and gloves"* (KI. 3 Kawe, 16 August, 2023)

4.2.6 Awareness of risks and hazard protection

Moreover, the results show that awareness of risk and hazard protection significantly affects workplace accident management in the construction industry. The estimated coefficient for awareness of risk and hazard protection was 0.225. This implies that a one-unit increase in awareness of risk and hazard protection is associated with a 0.225-unit improvement in managing workplace accidents in the construction industry. Also, the estimated p-value of 0.034 is less than 5%, implying that the estimated coefficient is statistically significant. Thus, at the 5% level of significance, we conclude that the presence of warning signs on site and awareness of risk and hazard protection significantly affect workplace accident management in the construction industry.

Qualitative data collected through KIs with engineers and supervisors in the study area revealed that employees face several OHS risks at work. For example, one participant reported that:

> *"Of course, to a large extent improper use of machines at workplace has been causing frequent incidents and injuries to workers in their sites"* (KI. 4, Kawe, 21 February, 2023)

Normally, in less developed nations within construction industries, most employees have faced high risks related to work involving exposure to hazardous chemicals and electrical accidents leading to serious fatalities (Gul & Faith, 2018).

In addition, the model included OHS compliance mechanisms and showed a strong positive effect on managing workplace accidents in the construction industry, with an R-value of 0.855. The R^2 which explains the magnitude of the independent variable towards dependent variable had value of 0.731(73.1%) indicating that the variations on the effect of Compliance mechanisms of OHS were accounted for the managing workplace accidents in construction industries and the remaining 26.9% are the Compliance mechanisms of OHS factors that were not included in the model but still can affect managing workplace accidents in construction industries.

5.0 Conclusion and Recommendations

The study concludes that a safe work environment, regular workplace inspections, the proper use of personal protective equipment (PPE), the presence of warning signs at the workplace, and workers' awareness of occupational risks and hazards all play a significant role in managing workplace accidents in the construction industry. The findings suggest that improving these safety practices enhances accident prevention by reducing workers' exposure to hazards and encouraging compliance with established safety procedures. Therefore, strengthening these occupational safety measures can help create a safer working environment and minimize workplace accidents in construction projects.

Based on the study findings, construction companies should prioritize creating and maintaining a safe working environment by conducting regular workplace inspections, providing and enforcing the proper use of personal protective equipment (PPE), installing clear and visible warning signs in hazardous areas, and continuously educating workers on occupational risks and hazard prevention. In addition, management should strengthen its commitment to occupational safety by ensuring compliance with safety regulations, promoting a strong safety culture, and allocating adequate resources to workplace safety initiatives. Implementing these measures consistently will help reduce workplace accidents, protect workers' health and well-being, and improve overall safety performance in the construction industry.

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