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ORIGINAL ARTICLE

The Paradox of Health and Safety Risks: A Disclose of Handling Strategies in Informal Construction Sites in Tanzania

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ABSTRACT

Introduction: Informal construction (IC) involves people working in construction without a license or not under any kind of regulation. Due to its informality, the IC sector suffers from health and safety risk (HSR) handling strategies (HST). This study explored and ranked the HSR HSTs by masonry workers (MWs) in informal construction sites (ICS) in Tanzania. **Methods:** A total of 10 HSR HSTs were explored from 8 semi-structured interviews, and then, additional data were collected from 304 responses of MWs in ICS through a questionnaire that was formulated from the findings of the interviews. The study employed a sequential exploratory mixed methods approach whereby for qualitative data, direct content analysis was employed followed by quantitative data where descriptive and inferential statistics (one-sample t-tests) were used for analysis. **Results:** The results show that 'considering past experience', 'sitting together and discussing on HSRs', and 'supervisor's directives' are the most significant ranked HSTs by workers in ICS. In contrast, 'encouraging other artisans to work together', 'selling or sub-contracting the work to other artisans', and 'refusing to take high-risk work so as to avoid a risk' are the least-ranked HSTs. **Conclusion:** The explored health and safety risk-handling strategies in IC workplaces highlight the need for a health and safety framework in the IC sector using a bottom-up approach. This would help policymakers and practitioners achieve sustainable development goals number three and eight, which promote good health and safety for all, sustainable economic growth, and full and productive employment and decent work for all.

Keywords: handling strategies, health and safety risk, informal construction sites, Tanzania

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INTRODUCTION

The construction industry (CI) is a sector that plays a substantial role in the economic advancement of all nations. According to Luvara and Mwemezi (2017), the sector's growth rate in Tanzania was about 10.2% in 2010 as opposed to 7.5% in 2009, with a corresponding contribution to the national Growth Domestic Product (GDP) of 8.0% and 7.9% in 2010 and 2009, respectively. Despite such an enviable growth rate, the CI continues to grapple with the problem of ineffective management of health and safety risks (HSRs). Regular injuries that take place in many construction sites lend credence to this. That is why the relevance of risk management in the construction industry cannot be overemphasised, with the field enjoying extensive research of recently.

However, in order to be truly useful in the CI industry, this field of risk management must receive greater attention from both scholars and players in the construction sector. There are various risks that affect project goals, including time, cost, and quality in construction projects (Iqbal *et al*., 2015). Managing different forms of HSR is one of the most important facets of construction management (Chileshe and Dzisi, 2012).

Critical success elements for risk management implementation are still not well understood, according to a review of papers that have been published on the subject in developing nations (Hosseini *et al*., 2016). Additionally, the majority of previous studies emphasise on the formal construction sector, ignoring informal construction

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(IC). In Tanzania, the informal sector is not a new phenomenon. It initially surfaced during the colonial era as a tool for economic restructuring. Most of the urban surplus labour force works in the informal sector, which has grown significantly and has now taken over this sphere of social and economic activity. The colonial informal sector is substantially distinct from the modern informal sector (Bromley and Wilson, 2018; Murphy and Carmody, 2019; Riisgaard, 2022).

Generally, informal construction refers to construction activities that remain unrecognized, unrecorded, unprotected, or unregulated by the authorities. It is not limited to prosperous enterprises, but it also encompasses marginal activities. The Contractors' Registration Board (CRB), which oversees the regulation of contractors in Tanzania, has not been able to include informal contractors in its operations. As argued by Mwemezi (2018), policymakers and governments tend to overlook, provide minimal support, and at times, actively discourage the activities of the informal construction sector. According to Mitullah (2022), the construction industry is multi-layered, with the bulk of workers working for clients, contractors, and subcontractors who are primarily informal and not registered with the authorities (Mwemezi, Kikwasi and Phoya, 2022). The IC sector has been the only source of low-cost housing for the lowest poor, yet housing regulations and construction practices consistently ignore it, creating inefficiencies in the housing market (Nzau and Trillo, 2020; Van Noorloos *et al*., 2020). Because of this, it is difficult to monitor and uphold labour laws, regulations, and standards in the sector.

When it comes to concerns about employee health and safety, clients in the IC sector lack commitment and understanding. Because of their mostly unprotected status and usually less favourable working conditions, workers in the IC sector frequently experience a wider range of general and occupational risks than their counterparts in the formal construction sector (OECD/ILO, 2019). In developing countries, workers in the IC sector have a twofold chance of undergoing poverty while at work and monitoring of occupational safety and health (OSH) is a big challenge. OSH registries are usually absent or inadequate in the IC sector, despite the fact that most people are employed in the sector. Because of this, little is known about the origins of OSH outcomes (dangerous and unhealthy working conditions) and their effects (occupational injuries and illnesses). According to the OECD/ILO, 2019, poor OSH conditions are frequently found in the IC sector and are linked to high social and financial consequences.

Compared to the formal construction sector, the IC sector is more affected by health and safety risk management. Workers in the IC sector lack social welfare and social security benefits due to their informal status (Mitullah, 2022). It is for this reason that a lot of attention need to be paid to issues of health and safety risk management.

A risk is defined as an unfavourable result of an event, whose potential outcome may be identified, predicted, and quantified. Risks can be mitigated, removed, paid for by a third party or handled for profit because the unfavourable outcome lends itself to statistical research (Srinivas, 2019). One must follow the steps of being aware of the risk, identifying the risk factor, analysing the risk, and developing an appropriate management response in order to effectively manage all forms of risks in construction projects.

Health and safety risk handling refer to the response to all HSRs. Using the data gathered during the risk analysis phase, the risk management process entails developing management responses to the risks. Therefore, in order to manage risks based on their severity, it is necessary to identify risks, analyse risks, and evaluate risks before choosing a response approach (Phoya *et al*., 2018). Options for risk response include accepting the risk, transferring the risk, sharing the risk, reducing or eliminating the risk, and avoiding the risk (Szymański, 2017).

Risk avoidance is an appropriate course of action happens when the amount of risk is regarded as too great to bear. In this case, the risk-related activity should be stopped. This can entail developing an alternative solution or re-evaluating project strategies (Srinivas, 2019).

Risk mitigation/reduction involves reducing the chance and/or impact of an unfavourable risk to a level that is tolerable. Early risk mitigation is frequently more efficient than late damage restoration in terms of probability and/or impact reduction (Szymański, 2017; Srinivas, 2019).

In risk sharing, the risk ownership is transferred to a third party, usually by outsourcing services. Transferring threats and allocating opportunities are similar in that a third party is involved, and those who get the threats assume responsibility, and those who receive opportunities should be left to partake in any potential rewards (PMI, 2021).

Risk transfer involves shifting the onus of bearing the risk from one party to another. This can be done in construction projects by contract clauses or insurance. A threat that has been transferred is not eliminated; rather, it simply changes ownership and management (Szymański, 2017; Srinivas, 2019).

In risk acceptance, construction site participants decide to be cautious of the risk factor. This reaction can be applied if the risk can be managed, if the inherent liabilities are accepted, if the risk can be allocated to a third party, and when the risk cannot be allocated to a third party, or if the risk factor should be avoided. In this case, the potential rewards of taking the risk should be weighed against the potential liabilities (PMI, 2021).

The selection of a risk management response strategy is based on a number of factors, including the team's prior experience, the risks involved, and the project team leader's expertise. Team meetings are necessary for brainstorming and using each member's personal historical performance data (Phoya *et al*., 2018).

As of now, it is unclear how these procedures are followed in the IC sector. Mason workers in IC have perceived skin sanitizers, irritants such as cement, sickness due to poor drinking water or poor toilet facilities, and injury or death due to falling from height (slip and trips) as the most ranked health and safety risks in IC. However, the question that remains is what is the response to these HSR in the IC sector (Okoye, 2018). Phoya *et al*. (2018) conducted a study on the choice of risk management tactics in the IC industry. The study focused on general risks in construction works, and not on risks that are specifically related to health and safety. Mwemezi, Kikwasi and Phoya (2022) proposed that there is need for further research that could assess the current strategies employed by the IC sector in managing HSR. This study is responding to this call. The study will contribute to the achievement of the African Union (AU) Agenda 63 goal 3, which is "Healthy and Well-Nourished Citizens." This is in line with the United Nations (UN) Sustainable Development Goals (SDG) goal 3 whose aim is to "ensure healthy lives and promote well-being for all at all ages" and goal 8 whose aim is to "promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all." The study explored and ranked the health and safety handling strategies used by MW at IC workplaces.

METHODS

Research Approach and Design

Since there is limited information from previous studies with regard to health and safety handling strategies in the IC sector, it was important to explore the handling strategies used by mason workers through interviews. The purpose of the interviews was to understand existing health and safety handling strategies in the IC sector to determine whether insights gained from a limited number of individuals in qualitative (QUAL) research could be extrapolated to a broader population in quantitative (QUAN) analysis. After exploring HS handling strategies through interviews, the identified strategies were merged with others from pertinent literature and put to the test using a survey study to determine the most effective ones. The study adopted a sequential exploratory mixed methods approach, aligning with the nature of the research and the corresponding procedures. This approach was used because a new instrument for the quantitative study was required to be built from the qualitative study (Creswell, 2014).

Population and Sampling Design

To obtain information on health and safety handling strategies in the IC sector, mason workers (MWs) were purposively selected for interviews. As not all IC site workers may be familiar with health and safety protocols related to construction activities, the researcher conducted interviews exclusively with individuals possessing considerable experience and knowledge in the field. A total of eight (8) MWs were successfully interviewed. The total number of interviews is within the acceptable range of between 5 and 50 interviews (Evarist *et al*.,2022).

For the quantitative data collection, MWs were the population of this study. Since the IC sector is unrecorded and unregulated in nature, its exact population size remains largely unknown. For this reason, the sample size for this study was computed using the formula for an unknown population established by Cochran in 1977. The data selected for sampling in this study incorporates maximum variability, set at 50% (p =0.5) and taking (Z) 95% confidence level with ±5% precision mirroring the approach employed by Mwemezi, Kikwasi and Phoya (2022). Therefore, the sample determined was 384 MW, which is above the threshold of not

fewer than 30 participants (Evarist *et al*.,2022). To eliminate biases and errors, distinct sites were chosen for the quantitative data sample compared to those selected for qualitative data. Additionally, the use of snowball sampling was employed to identify specific informal workplaces for data collection (Etikan and Bala, 2017).

Data Collection

Various data collection techniques were employed in this research, encompassing both interviews and questionnaires. The interview survey for this study included semi-structured interviews with individuals, specifically MWs, whom the researcher believed could provide valuable information. The HS handling strategies identified during an interview were amalgamated with additional strategies found in pertinent literature. Following a pilot study, a questionnaire, featuring closed-ended questions was refined, and a list of HSR handling strategies was subsequently sent to the MW to identify the most crucial strategies in the context of the IC sector. Given the nature of IC workers, the questionnaire needed translation from English to Swahili, along with a thorough review of its contents, following a similar approach employed by Phoya *et al*. (2018). The research employed KOBO toolbox forms for data collection. The data collection tool was chosen because of its reliability (Poloju *et al*., 2022). Data was collected between February and March of 2022. Among the 384 distributed questionnaires, 304 were completed, indicating a response rate of 79.17%.

Data Analysis

Qualitative content analysis was employed to scrutinize the qualitative data obtained from interviews. This method is widely utilized for the analysis of qualitative data, as indicated by Elo *et al*. (2014). Descriptive statistics were applied to analyse the quantitative data, facilitated by the computer software package SPSS version 26. To assess the significance of HS handling strategies in the IC industry, a one-sample t-test was used. The threshold for a 5-point Likert scale was established at "3.5" ($\mu = 3.5$), where μ represents the test value, maintaining a 95% confidence level. To collect pertinent HSRs handling strategies in the IC industry, the methodology's foundation was to allow for further ranking (Forza, 2002). The technique used to select the test value of "3.5" in this study is similar to one used by Kavishe and Chileshe (2019), Kavishe, Chileshe and Jefferson (2019), and Chileshe *et al*. (2022). The procedures outlined in Cronk (2018) were followed in conducting the analysis for the single-sample t-test. The hypothesis was posited as Ho: $p \leq 0.05$ and H1: $p > 0.05$. Additionally, it was assumed that responses from each respondent were independent of one another and exhibited a reasonably normal distribution (Kavishe, 2017).

RESULTS

Interviews Findings

For the researcher to capture the real HS handling strategies in the IC sector, it was important to first examine the current situation of MWs, regarding HS handling strategies. This was achieved by carrying out interviews with artisans. Table 1 shows the profile of the interviewees.

Table 1 presents the total number of interviewees in this research as well as their individual attributes. It is evident that 50% of the interviewees, specifically 4 out of 8, possessed secondary education and vocational skills. Then

Table 1. Profile of the Interviewees

SN	Interviewee	Gender	Position in the Project	Years of Experience	Education Qualifications
1	Interviewee1	Male	Unskilled Labour	0- 5	PE
2	Interviewee2	Male	Skilled Labour	11- 15	SEVS
3	Interviewee3	Male	Skilled Labour	11- 15	SEVS
4	Interviewee4	Male	Gang Leader	11- 15	SEVS
5	Interviewee5	Male	Skilled Labour	11- 15	PEVS
6	Interviewee6	Male	Unskilled Labour	6- 10	PE
7	Interviewee7	Male	Skilled Labour	6- 10	PEVS
8	Interviewee8	Male	Gang Leader	16- 20	SEVS

Note: PE= Primary education, PEVS = Primary education + vocation skills, SEVS = Secondary education + vocational skills

3 (37.5%) had primary education and vocational skills, and only 1 (12.5%) had primary education. Their level of education and vocational skills make them the appropriate interviewees for this study. Table 1 also indicates that a significant number of interviewees possess considerable experience in IC workplaces, with the majority of respondents having over 5 years of experience working on IC projects. The chosen respondents, thus, affirm the reliability of the data gathered from the interviews.

Health and Safety Risks Handling Strategies

After the interviews, the results were processed following all the qualitative procedures. Table 2 shows explored health and safety risk-handling strategies in IC from Interview while Table 3 shows a summary of findings from interviews ready for use in quantitative procedures.

Questionnaire Survey Results

Reliability Analysis

Cronbach's alpha coefficients were determined to be 0.82, suggesting that the instrument exhibited a high level of internal consistency. Various methodologists have emphasized that an Alpha value of 0.70 and higher is the generally accepted threshold.

Survey Sample Characteristics

According to Table 4, among the 304 respondents, 65 individuals (21.4%) were affiliated with the Ubungo Municipal Council (MC), 60 (19.7%) with the Kinondoni MC, 51 (16.8%) with the Ilala MC, 66 (21.7%) with the Temeke MC, and 62 (20.4%) with the Kigamboni MC. This

Table 2. Explored Health and Safety Risks Handling Strategies (HSTs) at ICS – Interview Results

HSTs	Interviewees Mentions								F	%
	1	2	3	4	5	6	7	8		
Charging high labour costs as a consideration for high-risk projects to compensate for the risk					√				1	13
Considering past experience	√		√	√		√	√	√	6	75
Depending on the supervisor's directives	√	√	√		√	√	√	√	7	88
Encourage other artisans to work together so that the risk is shared		√						√	2	25
Making strong scaffolding depending on working height	√		√	√	√	√	√		6	75
Providing induction training in the presence of new workers to the work		√		√		√		√	4	50
Refusing to take high-risk work so as to avoid the risk	√								1	13
Sell or subcontract the work to other artisans			√		√		√		3	38
Sitting together and discuss on health and safety risks	√	√	√	√	√	√	√	√	8	100
Wearing locally available PPE depending on the materials to be used	√		√	√		√		√	5	63

Notes: F= Frequency; %=Percentage

Table 3. Summary of findings of Health and Safety Risks Handling Strategies (HSTs) at ICS – Interview

HSTs	Health and Safety Risks Handling Strategies	Corresponding Terminologies as Used in Formal Construction
HST1	Sitting together and discuss on health and safety risks	Acceptance through Brainstorming
HST2	Depending on the supervisor's directives	Risk Acceptance/Reduction (Mitigation)
HST3	Considering past experience	Risk Acceptance/Reduction (Mitigation)
HST4	Making strong scaffolding depending on working height	Risk Reduction (Mitigation)
HST5	Wearing locally available PPE depending on the materials to be used	Risk Reduction (Mitigation)
HST6	Providing induction training in the presence of new workers to the work	Risk Avoidance/Reduction (Mitigation)
HST7	Sell or subcontract the work to other artisans	Risk Transfer
HST8	Encourage other artisans to work together so that the risk is shared	Risk Sharing
HST9	Refusing to take high-risk work so as to avoid the risk	Risk Avoidance
HST10	Charging high labour costs as a consideration for high-risk projects to compensate for the risk	Risk Avoidance/Reduction (Mitigation)

suggests that there was a good geographical spread across all the municipal councils. Consequently, the results effectively present data from the IC sector across Dar es Salaam. The data also shows that 290 respondents, or 95.4%, were male, while 14 respondents, or 4.6%, were female. It is well known that there are more males than women employed in the construction business, which contributes to male's dominance. The ratio shows that the level of female involvement is worse informal construction than in formal construction. Furthermore, the results indicate that the largest portion of respondents (n = 141; 46%) fell within the age range of 18 to 35, with the next significant group being those aged between 36 and 45 (n = 100; 33%). This age range represents the working age in the IC sector. In addition, it was noticed that 17 (5.6%) of the survey's respondents were under the age of 18. This demonstrates that child labour is also a problem in the IC sector. The results showed 109 respondents (35.85%) had only primary education, followed by those with vocational skills and primary education (n = 74; 24.34%) and secondary education (n = 61; 20.07%). Only three respondents (n = 3; 0.99%) had higher education. Gang leaders made up 27.6% of the workforce, followed by skilled workers at 30.3% and unskilled workers at 42.1%.

Table 4. Survey Sample Characteristics

Characteristics	Frequencies	Percentages (%)
Location of the Site		
Ubungo	65	21.4%
Kinondoni	60	19.7%
Ilala	51	16.8%
Temeke	66	21.7%
Kigamboni	62	20.4%
Gender		
Male	290	95.4%
Female	14	4.6%
Age		
12-17	17	5.6%
18-35	141	46%
36-45	100	33%
46-55	35	11.5%
Above 55	11	3.6%
Education Qualifications		
Primary education	109	35.85%
Primary education+Vocation skills	74	24.34%
Secondary education	57	18.75%
Secondary education+Vocation skills	61	20.07%
Higher education	3	0.99%
Position of the Respondent at the Site		
Gang leader	84	27.6%
Skilled labor	92	30.3%
Unskilled labour	128	42.1%
Experience in Construction Workplaces		
0-5	62	20.4%
6-10	86	28.3%
11-15	91	29.9%
16-20	38	12.5%
Above 20	27	8.9%

The predominant workforce primarily consisted of unskilled labour, reflecting the educational backgrounds discussed earlier. Respondents were evenly distributed with regard to work experience in the construction sector. In the 0-5 years we had 20.4% of the respondents, 28% in the 6-10 years bracket, and 29.9% in the 11-15 years bracket. The minority consisted of individuals with experience ranging from 16 to 20 years (12.5%) and over 20 years (8.9%).

Table 5 shows that all the10 HRS HSTs are statistically significant, with a p-value of less than 0.05. This is supported by their mean and test values where highly rated handling strategies have mean and test value scores above 4.10 and 8.8, respectively. The mean and test value was ranging from 4.46 and 25.4, respectively for 'considering past experience' as the most significant strategy. It was 4.15 and 16.8, respectively for 'depending on the supervisor's directives' as a third most-rated significant strategy.

DISCUSSION

The three most ranked health and safety risks handling strategies in informal construction are discussed here as shown in Table 5.

Considering Past Experience

The topmost rated significant health and safety risks handling strategy is 'considering past experience', this was ranked first with (mean=4.46, SD=0.659, t (303) =25.499, p = 0.000 < 0.05). According to Phoya *et al*. (2018), previous experience is one of the very important handling strategies of HSRs in informal construction sites.

The past experience serves as available data for use in future.

This strategy is further substantiated by Musonda (2012), who argues that individuals who have worked for five years in their respective roles are considered to have gained sufficient exposure and have accumulated diverse experiences in dealing with HSR handling strategy at construction sites. Drawing on their prior experience in similar projects, one can create an analogy for identifying strategies to manage health and safety risks at construction sites. As suggested by Mahendra *et al*. (2013), analysing project characteristics will offer valuable insights into shared elements.

As pointed out by Ehsa *et al*. (2010), a project's historical context influences the choice of strategies for managing health and safety risks at construction sites. More recent projects tend to carry higher risk levels since their processes have not been perfected over time. Conversely, if numerous similar projects have been previously executed, the chances of success with the present project are also heightened. Vaghela (2020) emphasises the importance of reviewing past projects as a valuable tool for managing health and safety risks at construction sites. Such a review may uncover potential risk events that could impact the current project.

In order to implement HSR handling strategies effectively, prior knowledge of how HSRs work is crucial. It refers to a set of strategies that have been used in the past when handling HSRs of a similar. Having experienced artisans at a construction site means that you have a number of options when it comes to being safe, and vice versa. It is a fact that artisans with enough experience in the IC field have a lot to share with each other. This is good information to use in the future. This is collaborated by evidence from the interviews where about 75% of the interviewees mentioned that consideration of past experience is important in determining the handling of present and future HSRs in informal construction places.

Sitting Together and Discuss on Health and Safety Risks

The second most rated strategy is 'sitting together and discuss on health and safety risks' with scores (mean=4.26, SD=0.749, t (303) =17.612, p = 0.000 < 0.05). One of the most widely used methods in this strategy is brainstorming (Cagliano *et al*. (2014); Dziadosz and Rejment (2015); Mahendra *et al*. (2013)). It is typically used to generate ideas, but it is also incredibly helpful for choosing risk responses. The project's pertinent participants congregate at one location. One facilitator briefs the participants on various topics before taking down any issues that come up during the discussion. Before concluding, the moderator goes over the points brought up during the conversation and removes any that are unnecessary (Phoya *et al*., 2018; Srinivas, 2019). By the end of the collective deliberations on the associated risks, a course of action is charted.

As put by Smith *et al*. (2014), Marle and Gidel (2014), and Chapman and Ward (2003), brainstorming sessions entail the assembly of

Table 5. Display the Results of a One-sample T-Test for the HSRs Handling Strategies (HSTs) at ICS

HSTs	Mean score	SD	Rank	Test value (μ = 3.5) *t*	*df*	p-value (p <0.05) 2-tailed	Mean difference	95% Confidence interval of the difference	
								Lower	Upper
HST3	4.46	0.659	1	25.499	303	0.000	0.964	0.89	1.04
HST1	4.26	0.749	2	17.612	303	0.000	0.757	0.67	0.84
HST2	4.15	0.673	3	16.886	303	0.000	0.651	0.58	0.73
HST4	4.13	1.131	4	9.639	303	0.000	0.625	0.50	0.75
HST5	4.12	0.848	5	12.720	303	0.000	0.618	0.52	0.71
HST10	4.02	1.029	6	8.862	303	0.000	0.523	0.41	0.64
HST6	3.91	0.886	7	8.158	303	0.000	0.414	0.31	0.51
HST8	3.64	1.047	8	2.356	303	0.019	0.141	0.02	0.26
HST7	3.15	1.356	9	-4.484	303	0.000	-0.349	-0.50	-0.20
HST9	2.99	1.393	10	-6.340	303	0.000	-0.507	-0.66	-0.35

Notes: Results significant at 95% when p<0.05; df= Degree of freedom=303; STD=Standard deviation; TNR=Total Number of Respondents

primary project stakeholders to pinpoint and rank a project's health and safety risks in construction. This method facilitates stakeholders in listening to the perspectives of other project team members regarding risks and leveraging these insights to help uncover further project risks.

The experience of most construction sites is that workers must have a meeting every morning to discuss site issues, and among the issues discussed are health and safety risk-handling strategies. This is the right time to remind all workers to be conscious of HSRs and insist on the philosophy of taking care of themselves and their co-workers. The discussion is normally chaired by the site leader. It allows for questions and comments from workers for clarity and improvement.

As found in this study, all the eight interviewees identified this strategy. Furthermore, having a discussion at the site for health and safety risk handling strategies is important. This is what one of the interviewees had to say on brainstorming;

We normally talk about how to handle the risks, but it is not on a daily basis. This is done when a hazard occurs to one of us or when we use our common sense to see the high risk in the work section ahead of us. This is done through brainstorming among members present at the site (Interviewee 5, 2022).

Depending on the supervisor's directives

The third most ranked strategy is 'depending on the supervisor's directives', scoring (mean=4.15, SD=0.673, t (303) =16.886, p = 0.000 < 0.05). Scholars, such as Hammer *et al*. (2019) state that in order to maximize performance in terms of safety and health, managers, supervisors, and safety and health specialists all play a part. In a construction company that prioritizes safety and health, senior managers, middle managers, first-line supervisors, and safety professionals share an equal level of responsibility in supervising safety and health management (Smith *et al*., 2014).

The instructions given by supervisors, regarding risk management for health and safety on construction sites are of paramount significance. Close supervision directly influences both worker behaviour and the handling of health and safety risks, emphasizing the crucial role of supervisors in preventing unsafe conditions and actions, as well as in organising work to reduce risks. Supervisors have a crucial role in strategizing and controlling risks at different levels within the domain of health and safety risk management. This highlights the crucial aspect of addressing risks at different levels and involving various stakeholders in construction projects (Winge *et al*., 2019; Bluff, 2019).

Managers have a duty to minimize health and safety risks on-site and oversee all workers to ensure that the tasks they carry out do not introduce any avoidable hazards to anyone's well-being and safety (Khalid *et al*., 2021; Agyekum *et al*., 2021).

Basically, the main contractor has an obligation to give workers directives with regard to health and safety risk-handling strategies. Failure to do so eventually leads to a number of accidents and illnesses affecting workers at construction sites. In the IC sector, artisans who have been given the construction work by the clients have to make sure that their workers are organised to tackle any HSR at the site.

This was pointed out by one interviewee as follows:

The one who owns the tender at the site usually tries to give directives to workers on the way we have to be careful of various risks at the site. This is explained by the team leader as an alert to workers to be careful because there is no amount of money being allocated to take care of any occupational health and safety risk from the client (Interviewee2, 2022).

In the lower part, encouraging other artisans to work together so that the risk is shared, selling or subcontracting the work to other artisans, and refusing to take high-risk work so as to avoid the risk were the least rated HSRs handling strategies in the IC sector with a mean score of 3.64, 3.15, and 2.99, respectively, which corresponds to their respective p-values of 0.019, 0.000, and 0.00 that are less than 0.05 (Szymański, 2017). These correspond to the interviewee findings where their rate of being mentioned was 38%, 25% and 13%, respectively.

CONCLUSION

Different studies have been conducted on risk management in construction works, but there are limited studies and a gap of knowledge on health and safety risk handling strategies in informal construction workplaces in developing countries, including Tanzania. This study was designed to fill this knowledge gap. From the findings of this study, the three top-ranked risk handling strategies are; considering past experience, sitting together and

discuss on health and safety risks and depending on a supervisor's directives. In the lower quartile, the least significant ranked HSR handling strategies are as follows: encouraging other artisans to work together so that the risk is shared, selling or subcontracting the work to other artisans, and refusing to take high-risk work so as to avoid the risk. This is due to the nature of the IC sector where there are no any guiding regulations. Findings of one sample t-test show that all HSRs handling strategies in the IC sector in Dar es Salaam, Tanzania, was statistically significant.

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