



Reporting and Information Sharing Indicators for Positive Safety Culture in Construction Companies

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Shared values and beliefs are inherent in a culture, which helps an organization achieve superior safety performance. The study aimed to identify the reporting and information-sharing indicators that will promote positive safety culture within construction companies, especially among small and medium-sized enterprises (SMEs). Based on the related literature on safety culture, the study adopted the Delphi technique data collection method in Ghana, the research site. After a three-round Delphi technique, the indicators that reached consensus were retained and reported in this paper. The findings revealed that 11 indicators would show how reporting and information sharing promote a positive safety culture. Reporting and sharing information underpin an informed culture essential to a learning organization. Thus, how construction SMEs handle specific indicators, such as 'naming and shaming [the blame game], influence the timing and accuracy of reporting and sharing of information that may be vital to the safety of site operatives.

Keywords: Construction, Contractors, Safety Culture, Safety Information.

Introduction

The construction industry is considered one of the most dangerous due to its high rates of injuries, accidents, and fatalities. The impact of construction site accidents is high since it accounts for substantial workplace accidents (Mohammadi et al., 2018). Umeokafor et al. (2022) pointed out that the accident rate within African countries is 21.1 fatalities per every 100,000 workers. In South Africa, for example, there is a positive relationship between lost days and the average cost per accident, which means that for every increase in lost days, there is a corresponding increase in the cost of accidents (CoA) (Aiyetan & Anugwo, 2021). According to Bavafa et al. (2018), the case in Ghana is a concern. The available worker's compensation report confirmed that from 2010 to 2016, over 558 accidents occurred on construction sites in Kumasi and Accra (Simpson & Sam, 2019). The poor H&S performance of construction SMEs has been attributed to several factors, such as a lack of safety culture within construction SMEs regarding self-protection and awareness, ineffective H&S legislation and regulations, poor communication of safety programs, construction SMEs ignoring safety due to time pressure of the project schedule, poor personal attitudes toward H&S and lack of enforcement of safety

compliance (Agyekum et al., 2018). There is, therefore, the need for construction SMEs to address this negative safety performance to remain competitive.

To curtail the high accident rates in construction SMEs, there has been a considerable increase in the call to focus on proper management of H&S of construction workers across the globe. Construction SMEs continue to engage in unsafe acts and conditions because of an absence of a positive safety culture. Construction SMEs must formulate adequate measures and approaches that will lead to safety behavior, hence safety compliance on construction sites. These approaches should focus on the work environment and frontline operatives' beliefs, attitudes, and behaviors (Ardeshir & Mohajeri, 2018). This has led to introducing a safety culture to always commit workers to their safety and that of their co-workers during and after work. Positive safety culture paves the way for a safer workplace through improvements in technology, work design changes, personal protective equipment (PPEs), and modifications in construction performance (Hofmann et al., 2017). However, the literature is silent on the role of safety reporting and information concerning how to engender a positive safety culture. The limited literature on the subject informs the reported study in this paper. The study aimed to identify the key indicators of safety reporting and information sharing that will promote positive safety culture within construction SMEs. As such, the paper presents the indicators of safety reporting and information sharing that should promote positive safety culture within construction SMEs, using Ghana as a case in point. The indicators highlighted in the paper apply to construction SMEs in developing and developed countries.

Literature Review

Positive Safety Culture

Safety culture is the set of enduring values and attitudes regarding safety issues; shared by every member at every level of an organization. It comprises shared values and beliefs in an organization (Miang, 2018). It refers to the extent to which every individual and every group of the organization is aware of the risks and hazards induced by its activities; is continuously behaving to preserve and enhance safety; is willing and able to adapt itself when facing safety issues; is ready to communicate safety issues and consistently evaluates safety-related behavior (Piers et al., 2009). Aburumman et al. (2019) believe that poor safety culture within an organization creates an environment for errors and violations of safety rules and practices, which leads to increased accidents. It also exposes management's inability to acknowledge or address safety-related issues within the organization. In contrast, positive safety culture is the engine that drives the system towards the goal of sustaining the maximum resistance towards its operational hazards (Aburumman et al., 2019). Positive safety culture is an informed culture that improves company safety performance (Miang, 2018). A critical element of a positive safety culture is the reporting and sharing of safety information, succinctly highlighted in the next section.

Safety Information

Safety information echoes the extent to which it is disseminated among employees of an organization at the right time and with the right people (Piers et al., 2009). Construction SMEs must be encouraged to communicate safety-related information in the right way, at the right time, and in the p manner to the right people at construction sites to avoid hazardous situations that will lead to injuries, accidents, and fatalities. For any safety management system to be successful, safety information must be communicated throughout the construction firm because effective communication provides a robust safety management system. Piers et al. (2009) reported that sharing safety information properly is

needed to develop an understanding of the different types of hazards and risks on construction sites, ensure that assigned roles and responsibilities to employees are well understood, and identify exposures and determine the level of risk and develop appropriate mitigations against dangers. Safety information is crucial in planning safety to recognize hazardous situations at construction sites. It helps analyze health and safety status at any stage of the construction process, as it underpins the identification of the root causes of injuries, accidents, and fatalities at construction sites (Manase et al., 2011). According to Eyiah et al. (2019), poor implementation of safety information within construction SMEs will negatively impact employees, employers, progress, productivity, and profit margins, resulting in more injuries, accidents, and fatalities in construction operations. The safety information communicated and received by construction SME workers must be accurate, correctly recognized, and easily interpreted to establish a positive safety culture.

When a safety culture is considered, Chen et al. (2021) says that information sharing bridges workers' behavior with expected safety outcomes. Safety information sharing contains information that most often indicates the safety status of a particular activity from employer to employees within an organization (Luo & Wu, 2019). It is, therefore, appropriate to assume that incidents, near misses or accidents, may occur when there is a failure in safety information sharing. For instance, injuries, accidents, and fatalities are related to wrong safety information supply, incorrect safety information cognition, and faulty safety information feedback (Wu & Huang, 2019; Chen et al., 2021). For any safety system to be successful, safety information must be timely, accurate and well-understood by relevant parties to avoid accidents. Wu and Huang (2019) iterated that possible breakdowns in safety information sharing can be analyzed from failures of the acquisition of safety information, failures of the analysis of safety information and failures of the utilization of safety information.

Research Method

According to Piers et al. (2009), safety culture can be assessed through qualitative and quantitative means. They added that a researcher could use questionnaires or interviews during the assessment process. The Delphi method was selected and expedited in this study with a list of H&S experts identified from Ghana. The Delphi survey is preferred by scholars who aim to obtain a consensus among specialists regarding a complex problem (Ameyaw et al., 2016). The selection of experts was based on country residence, knowledge of H&S, academic qualification, work experience, employment, influence and recognition, and safety association affiliation, to mention a few. The minimum selection criteria follow other scholars (Keeney et al., 2001ab; Manase et al., 2011). The Delphi survey instrument was compiled based on a review of the related literature. From the literature, 11 indicators were identified and grouped under-reporting and information sharing. Six indicators were selected for reporting (Table 1), and five were for information sharing (Table 2). Thus, these 11 indicators form the basis of the results presented in the next section of the paper.

Table 1: *Reporting indicators and measuring metrics*

Measuring metrics	Sources
The blame game does not hinder incident reports.	Vecchio-Sadus & Griffiths (2004)
Reporting lines and systems are clear.	Choudhry et al. (2009)
Reports lead to reviews and improvements.	Díaz-Cabrera et al. (2007)
Incident reporting is nurtured and rewarded.	Choudhry et al. (2009)
Incident reporting leads to better SWPs.	Díaz-Cabrera et al. (2007)
Workers are willing to report incidents.	Cui et al. (2013); Håvold & Nasset (2009)

Additional sources: Al-Bayati (2021) and Oswald et al. (2018)

The Delphi survey instrument requested the panel to rate the importance of the indicators in establishing a positive safety culture in construction companies using a 10-point Likert-type scale. On the scale, 1 and 2 = unimportant, 3 and 4 = slightly important, 5 and 6 = neutral, 7 and 8 = important, and 9 and 10 = very important. Since several scholars in the Delphi survey literature observed that the most accurate results of the Delphi process were obtained after two iterations, the survey for this study was terminated after three rounds. The outcome of the 3rd round is presented in this paper. While recognizing other views on the agreement within a Delphi survey panel, the median and percentage were used to determine consensus in the current study. A consensus was reached when each indicator attracted a final median score of ‘importance’ of 5-10, and more than 50% of the experts rated each indicator between 5 and 10. Notably, the 11 indicators presented in this paper attained consensus among the panel.

Table 2 Information sharing indicators and measuring metrics

Measuring metrics	Sources
Safety information is in multiple languages.	Vecchio-Sadus & Griffiths (2004)
Voluntary safety information-sharing exists.	Milijic et al. (2013)
New safety regulations are shared timely.	Bronkhorst et al. (2018)
Safety concerns receive timely attention.	Bronkhorst et al. (2018)
SWP information is shared timely.	Petschonek et al. (2013)

Additional sources: Nitsche (2019), Zou et al. (2017)

After the selection, 31 experts were approached, but only 18 participated in the study. This confirmed the argument made by Trevelyan and Robinson (2015) and Keeney et al. (2001) that as the number of Delphi rounds increases, the more likely it is for participants to begin to drop out of the successive rounds due to either fatigue, attrition rates, time, or cost. Despite the attrition rate, the participants in the Delphi survey cut across the major cities in Ghana. In selecting the panel of experts, a balance between those in the academia and practitioners was sought to reduce bias. The experts were made up of 14 men and four women. Six per cent of them held professorial degrees, 33% had a doctoral degree, 55% held master’s degrees, and 6% failed to indicate their academic qualifications. Of the 18 respondents, nine were academicians lecturing at leading universities in Ghana, while others were professionals in the construction safety space.

Data Analysis and Results

As shown in Table 3, reporting had six indicator metrics that measured it. All the six-indicator metrics were rated very high, with minimum median importance of 7 and a response percentage higher than 80%. All six have achieved the required consensus and retained. This is in line with the results in rounds 1 and round 2. More than 50% of the experts rated all six indicators as important to significantly impact positive safety culture for improved construction SMEs safety performance. The data suggest that the leading indicator metrics impact positive safety culture among construction SMEs. The Delphi survey experts with cognate exposure to H&S matters agreed that all six-indicator metrics measuring safety reporting are critical in positively influencing safety information in establishing positive safety culture among construction SMEs. In addition, information sharing was measured with five indicator metrics. The indicators attained the critical consensus and were retained. This is in line with the results in rounds 1 and round 2. More than 50% of the experts rated all five indicators as essential to significantly impact positive safety culture for improved SME safety performance. The table also shows that the Delphi survey respondents agreed that five indicator metrics would positively impact safety information sharing among construction SMEs that will promote positive construction safety culture. The results

implied that no reporting and sharing of safety information among construction SMEs in Ghana would promote a positive safety culture.

Table 3 *Important leading indicators of reporting and information sharing*

S/N	Positive construction safety culture core elements and their leading indicator metrics	% Response (5-10)	Importance Mean	Importance Median
Reporting				
1.1	Blame game hinders incident reports	93.80	7.90	8.00
1.2	Reporting lines and systems are clear	93.80	7.60	8.00
1.3	Reports lead to reviews and improvements	93.80	7.40	8.00
1.4	Incident reporting is nurtured and rewarded	81.30	7.40	7.00
1.5	Incident reporting leads to better SWPs	87.50	7.60	8.00
1.6	Workers are willing to report incidents	87.50	7.60	8.00
Information-sharing				
2.1	SWP information is shared timely	75.00	7.20	8.00
2.2	Safety information is in multiple languages	75.00	6.70	7.50
2.3	Voluntary safety information sharing exists	75.00	6.50	7.50
2.4	New safety regulations are shared timely	75.00	7.20	8.00
2.5	Safety concerns receive timely attention	81.30	7.60	8.50

Discussion

Safety climate can be used to assess and improve site safety for projects under construction (Choudhry et al., 2007). Similarly, safety information is critical in establishing positive construction safety culture among construction SMEs (Biggs et al., 2013; Gunduz & Laitinen, 2017; Piers et al., 2009). For this current study, two core elements of safety culture were highlighted: safety reporting (Al-Bayati, 2021; Oswald et al., 2018) and safety information sharing (Nitsche, 2019; Pedro et al., 2022; Zou et al., 2017). The two core elements (reporting and information sharing) were essential in influencing safety culture. Eleven leading indicator metrics (six measured reporting and five measured information sharing) were agreed upon by the H&S experts to significantly impact safety information for improved positive construction safety culture among construction SMEs in Ghana. The six reporting indicators received a higher median score of 7-8, confirming the opinions and judgements of the experts that if accidents and near misses were reported early and actions were taken at the right time, this would lead to considerable reductions in accidents in construction sites. There should be a robust accident reporting system to eliminate the “fear of blame” for improving safety culture in construction companies, as illustrated in Langer (2021). This indicates that when construction workers are aware of their responsibilities to report injuries, accidents and fatalities on construction sites, their motivated to keep the areas safe for solid safety culture. Williams et al. (2020) supported these results by stating that when there are no concerns

about why accidents occur on construction sites and why these accidents are not reported, it prevents how accidents must be stopped, which is a sign of negative safety culture. Ensuring a proper accident reporting norm is necessary to eliminate injuries, accidents and fatalities (Boadu et al., 2021).

In addition, the results indicated that a lack of safety information flow among construction SMEs should be a concern. This concurred with Gyensare et al. (2019). They reported that the high rates of accidents among construction SMEs in Ghana are due to a lack of appropriate flow of safety information among the employees of relevant firms. Eyiah et al. (2019) mentioned that the inability of construction SMEs to implement proper safety information flow would negatively impact employees, employers, the progress of work, productivity, profit margins and H&S performance. They claimed these are the major causes of injuries, accidents, and fatalities in the construction industry. The negative impact of safety information on safety culture means some construction firms may not consider safety information as the bridge connecting workers' behavior, as indicated by Chen et al. (2021). Previous research contends that when construction SME employees have greater access to suitable H&S information-sharing systems, positive safety culture would be firmly upheld in these construction firms. Yorio et al. (2019) advocated that whenever there is a lack of sharing safety information among construction workers, they would have low interest in safety culture programmes. All five indicators measuring information-sharing attained consensus and were retained. Over 75% of the experts acknowledged that these indicators are fundamental, with median values between 7 and 8. This affirmed the experts' opinions that, if information sharing were well addressed, it would promote a positive safety culture within the construction industry. This result is also in line with the results of the Delphi survey round 1 and round 2.

Conclusion

Reason's model of safety culture (1997) highlights the importance of an informed culture in a company. According to him, reporting culture, just culture, flexible culture, and learning culture make up an informed culture, which is socially engineering in an enterprise. An informed culture is a positive culture where "...in which those who manage and operate the system have current knowledge about the human, technical, organizational and environmental factors that determine the safety of the system as a whole" (Miang, 2018). To have an informed culture in construction SMEs, one must look at specific indicators. The 11 indicators outlined and discussed in this paper may be a starting point for companies, especially in the SME category.

Reporting and information-sharing indicators would help construction SMEs gather the right kind of data (leading indicators) to help them manage H&S proactively instead of relying on lagging indicators. The importance of the indicators in Table 3 from the perspective of the Delphi survey panel requires construction SMEs to design safety reporting and information-sharing systems that emphasize positive events to facilitate the character of a learning organization. It is argued that focusing on positivity helps to normalize the practice of reporting and sharing safety-related information. On the one hand, reporting and sharing information would encourage feedback that enhances compliance and behavior-based safety in construction SMEs. On the other hand, a blame and fear culture on a construction site or inside a construction SME would marginalize reporting and information-sharing to the detriment of safety. Like other methods, the Delphi survey limits generalization to a large population. Therefore, all the indicators that attained consensus in the soon-to-be-completed doctoral study were used to compile a structured questionnaire distributed to more than 400 professionals in Ghana. The general survey is further to confirm the views of the Delphi survey panel and evaluate relevant hypotheses such as:

- *H1*: Reporting positively influences the safety culture of SME construction companies

- *H2*: Information-sharing positively influences the safety culture of SME construction companies

After analysis, the general survey results will be shared with the construction management research community.

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