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Behavioural Safety Practices in Accident Prevention and Reduction in Large-Scale Construction Projects

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Abstract
It is widely known that the construction sector has high rates of fatalities and injuries at work. In recent years, the focus has shifted from purely technical safety measures to the incorporation of behavioural safety practices as a means to enhance safety outcomes. The purpose of this study is to investigate the effect of behavioural safety practices in preventing and reducing accidents in major construction projects in Qatar. An online questionnaire-based research methodology was used in the study to collect data from 104 participants who were conveniently sampled. The results of the study show that behavioural safety techniques, when applied correctly, significantly reduce the number of accidents that occur in major building projects. Active leadership involvement and the development of a supportive safety culture that motivates employees to take personal accountability for their safety as well as the safety of their coworkers are important components. The study also reveals that more thorough and successful safety strategies are produced when behavioural safety practices are integrated with currently in-place safety management systems. In conclusion, the study highlights the crucial role of behavioural safety practices in improving safety performance in major construction projects. The adoption of these practices in combination with conventional safety precautions, improves accident prevention and reduction.

Keywords: Incident prevention, intervention, safety compliance, construction

1. Introduction

Due to an elevated incidence of workplace accidents, injuries, and fatalities, construction operation is acknowledged on a global scale as one of the most hazardous sectors (Saleh & Othman, 2022). This risk is especially noticeable in large-scale construction projects because of the intricate structure of the work environment, its size, and itss dynamic character, all of which increase the likelihood of safety mishaps (Abukhashabah et al., 2020).

Personal protective equipment (PPE), safety laws, and engineering controls have been the mainstays of traditional approaches to construction safety. (Ammad et al., 2021). Although these precautions are crucial, they frequently deal with the symptoms of safety problems rather than their underlying causes. Consequently, there is a rising understanding of the necessity of incorporating human factors-related techniques into these conventional procedures to mitigate the causes of accidents.

According to the Global Trends by the International Labour Organisation (ILO, 2015), industrial illness or injury claims the lives of approximately 2.3 million individuals annually. Nearly 2 million deaths are caused by deadly work-related diseases, and over 350,000 deaths are the result of fatal accidents. Furthermore, non-fatal industrial accidents resulting in significant injuries and work absences affect more than 313 million workers. Additionally, 160 million non-fatal work-related sickness cases are estimated to occur annually by the ILO. Based on these statistics, 860,000 individuals sustain injuries at work daily, and 6,400 people die from illnesses or accidents related to their jobs. Additionally, estimates indicate that occupational diseases account for about six times as many worker deaths as occupational accidents, making work-related diseases the primary cause of death at work. Given that Qatar devotes a sizeable portion of its yearly budget to the construction industry, the country's construction industry has expanded to rank among the largest in the world (Ajayi, 2021). However, serious safety concerns have risen over the years, leading to occupational injuries and fatalities among Qatar construction workers. Hundreds of workers lost their lives as a result of work-related accidents between 2014 and 2020, with the construction industry accounting for a large portion of these deaths. These events are frequently caused by hazardous practices, inadequate training, and poor enforcement of safety laws (Fass et al., 2017).

Previous research has revealed that the behaviour of construction workers is the focus of behavioural safety since it is a major contributor to workplace fatalities and injuries (Salem, Lothlikar, Genaidy & Abdelhamid, 2017). Salem et al. (2017) identified that key checklists that support behavioural safety at construction sites include the use of Personal Protective Equipment (PPE) such as safety glasses and hearing protection, physical environment controls, housekeeping (access to the construction site), fall protection, body protection, ergonomics, and the appropriate tools and equipment. Additional measures include those that shield construction workers from risks associated with their jobs, including exposure to physical and psychological dangers (Abdalla, Apramian, Cantley, Cullen, 2017). However, construction managers prioritise results over the safety of their workforce when there is a deficiency of safety information or a negative attitude towards safety protocols among workers, as well as when there is an improper use of safety gear, behavioural safety becomes weakened and ephemeral (Ajayi, 2021).

The corporate culture of Qatar's construction sector may be difficult for employees to adapt to, which could make following health and safety protocols more challenging. Thus, it is imperative to highlight attention to the issues of safety in Qatari building businesses. Thus, the overall goal of the research is to assess the role that behavioural safety plays in preventing and reducing accidents in large-scale building projects in Qatar. Therefore, the purpose of this study is to investigate the effect of behavioural safety practices in preventing and reducing accidents in mega construction projects in Qatar.

2. Methodology

A hundred and four participants were purposively selected using a convenience sampling technique to select respondents within the construction industry. An online-based questionnaire was adopted as the primary research instrument to collect pertinent information regarding the respondents' views and opinions. Essentially, the questionnaire comprised a series of questions grouped into different sections,

including Five-point Likert scales (ranging from 1 'highly unlikely' to 5 'highly likely') and close-ended questions. Throughout the study, participant confidentiality was upheld, and reports were only released in aggregate for the purpose of transparency. The Statistical Package for Social Sciences (SPSS) software determined descriptive, inferential statistics, and correlational analysis.

3. Results

3.1 Socio-demographic Data

Of the responses, 99(95.2%) were men and only 4(3.8%) were women. Six respondents (or 5.8%) were 51 years of age or older, 36(34.6%) were between the ages of 18 and 35, and the bulk of respondents 66(63.5%) were between the ages of 36 and 50 (Table 1). It was also observed that 80(76.9%) of the respondents were black, 18(17.3%) of the respondents were Asian, and 6(5.8%) of the respondents did not disclose their ethnicity. Based on their educational backgrounds, the majority of the respondents 43(41.3%) had a degree, with 13(12.5%) having a first degree, 26(25.0%) having a National Diploma, 12(11.5%) having a Higher National Diploma, 12(11.5%) having a postgraduate degree, and 10(9.5%) having various kinds of certificates.

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency	Percent
Gender		
Male	99	95.2
Female	4	3.8
Prefer not to say	1	1.0
Age group of respondents		
18-35	36	34.6
36-50	66	63.5
51 and above	2	1.9
Ethnic group of respondents		
Asian	18	17.3
Black	80	76.9
Prefer not to say	6	5.8
Highest level of education		
First degree	43	41.3
National Diploma	13	12.5
Higher national diploma	26	25.0
Postgraduate	12	11.5
Others	10	9.6

n = 104

3.2 Level of Participants' Knowledge and Experience in the Qatar Construction Sector

According to Table 2, 52(50.0%) of the respondents have fewer than ten years of experience in the Qatari construction industry, 48(46.2%) have between eleven and twenty years of experience, 3(2.9%) have between twenty and thirty years of experience, and just 1(1%) has more than thirty years. The quantity of

projects the responders have worked on is likewise shown in the Table. Just 26(25.0%) of them have worked on four projects or less, 65(62.5%) on five to ten projects, and 13(12.5%) on more than ten projects in Qatar. One general manager, one project manager, three project engineers and site inspectors (2.9%), sixteen site supervisors (15.4%), the 65(62.5%) HSE Team, and seven (6.7%) labourers were among the respondents. Eight (7.7%) of the respondents hold different positions or ranks within the Qatar construction industry. Table 2 also shows that some respondents, 14(13.5%), agreed that the company implements behavioural safety practices annually; others, 4(3.8%), agreed that the company implements them biannually; still others, 29(27.9%), agreed that the company implements them occasionally; and the majority of respondents, 57(54.8%), agreed that the company implements them quarterly.

Table 2: Level of Participants' Knowledge and Experience in the Qatar Construction Sector

Variables	Category	Frequency	Percent
How many years have you been in practice in the construction sector of Qatar?	Less than 10	52	50.0
	11-20	48	46.2
	21-30	3	2.9
	Above 30	1	1.0
Please indicate averagely, the number of projects you have worked on.	Less than 5	26	25.0
	5-10	65	62.5
	More than 10	13	12.5
What is your position in the firm?	General Manager	1	1.0
	Project Manager	1	1.0
	Project Engineer	3	2.9
	Site Inspector	3	2.9
	Site Supervisor	16	15.4
	HSE Team	65	62.5
	Labour	7	6.7
	Others	8	7.7
Does your company implement behavioural safety practices?	Annually	14	13.5
	Bi-annually	4	3.8
	Occasionally	29	27.9
	Quarterly	57	54.8

3.3 Behavioural Safety Practices and Compliance Levels of Workers in the Qatar Construction Sector

The outcome in Table 3 illustrates how employees behave and how well they follow instructions in Qatar's construction industry. The fact that the p-value of 1.000 is higher than the conventional p-value of 0.005 suggests that the findings do not support the research hypothesis, indicating that respondents firmly believed that workers in Qatar's construction industry are observing proper conduct. Additionally, responses showed a substantial awkward posture at a p-value of 0.000, suggesting that workers generally need a lot of energy and stamina to finish a task. With a p-value of 0.000, there is a positive significant difference in the degree of compliance with workers wearing personal protective equipment. At the 0.000 p-value, it demonstrates that workers most frequently dispersed materials, tools, and equipment around

the physical environment. Workers appear to be less conscious of the need for effective material management, as seen by the significant difference in awareness of improper equipment setup at the 0.000 p-value. The findings show that employees were occasionally careless with machinery and occasionally neglected to participate in or follow safety instructions and training (p-value = 0.000). With a p-value of 0.500, there is insufficient data to conclude that the number of near-miss accidents at the site has decreased. According to the respondents, personnel are frequently reminded to follow safety and health regulations and instill a good safety culture inside the organization (p-value = 1.000). The findings indicate that workers are not committed to safety and that there is insufficient funding for behavioural safety training. Additionally, it is shown at the p-value of 0.000 that there are not many safety and health workers in Qatar's building industry.

Table 3: Behavioural Safety Practices and Compliance Levels of Workers in the Qatar Construction Sector

Items	Response				P-value	
	Agree	Disagree	Strongly agree	Strongly disagree	Neutral	
Behavioural practice	48	3	35	5	13	1.000
Awkward postures	37	34	9	13	9	.000
Refusal to wear PPEs	23	37	15	24	5	.000
Scattered material tools and equipment in the physical environment	39	17	13	22	12	.000
Unawareness of improper setup of equipment	42	23	10	20	8	.000
Failure to participate/adhere to safety training and guidance	39	17	13	22	12	.000
Non-careful operation of machinery	34	24	24	9	13	.000
Reduces near-miss incidents on site	58	4	2	9	31	.500
Cause alertness of employees to adhere to safety and health rules	55	7	3	5	34	1.000
Inculcates proper safety culture into the company	52	4	4	7	37	1.000
Lack of safety commitment from workers	46	17	20	11	5	.000
Inadequate resource allocation for behavioural safety training	48	16	20	11	6	.000
Low number of safety and health personnel	50	18	12	13	7	.000

3.4 Impact of Management in Ensuring Proper Safety Measures in the Qatar Construction Sector

The importance of management in guaranteeing appropriate safety measures in Qatar's construction industry is demonstrated by the results in Table 4. To investigate the effects of behavioural safety practices on accident prevention in Qatari construction companies, the results revealed that the p-value of 1.000

indicates statistical support for the industry's claim that the management of construction businesses actively ensures that workers have a strong sense of responsibility for their own safety as well as the safety of others. Additionally, they are designed to support workers in wearing personal protective equipment (PPE), guarantee that tools and supplies are positioned and kept correctly, and assist staff in using only machines in which they are proficient. The company's incapacity to appropriately apply behavioural models to intervention design and its incapacity to forecast and explain behaviours related to health and safety result in a positive significant difference with a p-value of 0.000. At a p-value of 0.000, it became clear that managing a high number of personnel in complicated projects presents challenges for management. The outcome also demonstrates that management has a sufficient commitment to safety at a p-value of 1.000.

Table 4: Impact of Management in Ensuring Proper Safety Measures in the Qatar Construction Sector

Items	Response					P-value
	Agree	Disagree	Strongly agree	Strongly disagree	Neutral	
Proactively ensures employees are highly concerned about their safety as well as others	45	4	4	4	47	1.000
Ensures tools and equipment/materials are properly stored and positioned	54	2	2	7	39	1.000
Encourages the use of PPEs among workers	45	2	49	2	3	1.000
It helps employees to know to only operate machinery with which they have expertise in	49	4	39	4	5	1.000
Inability to apply behavioural models properly to intervention design	52	21	9	13	9	.000
Failure to predict and explain behaviours associated with health and safety	50	25	11	10	5	.000
Complexity to manage large number of employees in mega projects	48	19	17	11	6	.000
Lack of safety commitment from management	13	6	21	83	2	1.000

3.5 Challenges to Implementing Behavioural Safety Practices in Qatari Construction Companies

Additional challenges that the respondents acknowledged exist in Qatar's construction industry include workers' lack of commitment to safety (46.5%), insufficient funding for behavioural safety training (48%), and a shortage of safety and health personnel. Refer to the figures below.

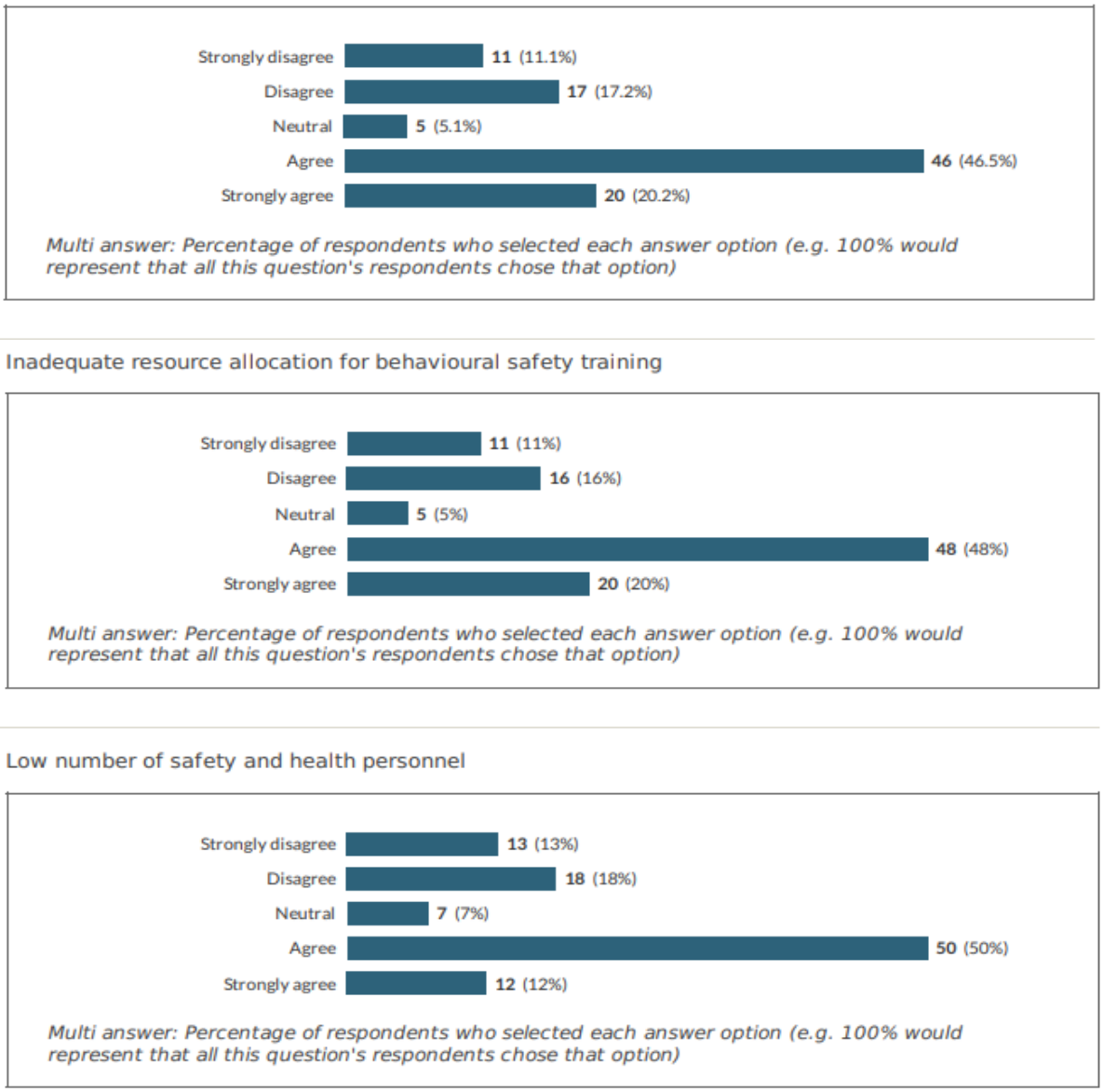

Figure 1: Challenges to Implementing Behavioural Safety Practices in Qatari Construction Companies

4. Discussion

While some construction organisations recognise the importance of safety conduct and implement safety measures every three months, others do it annually, twice annually, or even less frequently, which goes against the fundamental principles of their industry. Belayutham and Ibrahim (2019) contend that construction enterprises that adhere to proper safety procedures will be shielded from ongoing high implementation costs, a deficient safety culture, and a lack of commitment to safety on the part of their workforce. Regular safety procedures also shield these businesses against organisational problems such as insufficient managerial support, poor communication, bad worker-superior relations, and a lack of appropriate feedback (Chartered Institute of Building, 2006).

Respondents overwhelmingly agreed that their colleagues in the Qatari construction industry observe behavioural safety practices when answering the questions about common behaviours that raise the

accident rate. Additionally, workers typically need a lot of strength to do a task and wear PPE (personal protective equipment). However, they admitted that they lacked sufficient awareness of the correct handling and management of building materials. According to several studies (Li et al., 2015; Talabi et al., 2015; Park et al., 2020; Zhang et al., 2020 & Newaz et al., 2020), the latter result is a forerunner to safety-related mishaps on construction sites. When construction workers receive enough consistent training on how to properly manage building materials, there will be strong management support and communication (Ayangade and Ikpo, 2021). However, the rate of accidents increases when construction workers have low behavioural safety awareness due to insufficient safety training (Ajayi et al., 2021). Therefore, Aulin et al., (2019) stated that management must have a strong commitment to the health and safety of all workers, regarding safety procedures in the construction industry.

Furthermore, the majority of responders occasionally disregarded safety instructions and safeguards. They occasionally disregard construction equipment and the potential for accidents. As a result, these actions occasionally cause workplace accidents involving employees who are working on construction sites. It is anticipated that workers in the construction industry will be more likely to increase preventive and on-the-spot efforts to mitigate risks related to construction processes when they are exposed to safety training and behavioural culture at all levels of engagement (Ayangade & Ikpo, 2021).

The outcome also revealed the workers' lack of dedication to safety. Considering that unexpected accidents happen whenever people disregard safety protocols, as the respondents disclosed. The respondents claimed that even though they are frequently reminded to follow safety and health regulations and foster a suitable safety culture, their sporadic infractions are self-inflicted. This mindset is consistent with research by Ajayi et al. (2021), which found that workers on construction sites often prioritize production over safety due to the pressure and timeliness of their work.

The lack of safety and health personnel in the construction industry in Qatar is another major contributing factor to accidents, pointing to inadequate funding for behavioural safety training. This result supports the argument made by Oostakhan et al. (2012) that workers in the construction sector got relatively little training and information about health and safety at work; as a result, their opinions on behavioural safety are typically shaped by their actual work experiences. According to Awwad et al. (2016), other factors contributing to the high injury and fatality rates in construction companies include a lack of safety awareness, ineffective safety laws and regulations, inadequate safety training for employees and senior management, and unsupportive top management.

Additionally, it was observed that when construction businesses prioritize behavioural safety, their management will take proactive measures to guarantee that their workers are deeply concerned about their safety as well as the safety of others. This is the argument made by Aulin et al. (2019) that safety procedures in the construction industry require a high degree of management commitment to everyone's health and safety, as well as less peer pressure and a well-defined, open communication with management. According to previous research, workers will always be endangered by risk-inducing actions if management does not take proactive measures to address the risky behavioural safety practices of its employees (Grytnes et al., 2020; Huang & Yang, 2019; Shamsuddin et al., 2015). Consequently, when their employers fail to provide them with support regarding safety protocols, construction workers will face serious hazards (Huang & Yang, 2019).

Furthermore, the study found that when construction companies prioritize safety practices, they will make sure that tools and materials are handled, stored, and positioned correctly. They will also support workers in wearing personal protective equipment (PPEs) and assist staff in operating only machinery that they are

knowledgeable about (Huang & Yang, 2019; Cermelli et al., 2019; Berhanu et al., 2019; Berhanu et al., 2019). However, managing a large number of employees in mega projects can be complex, which may lead to unsafe behaviour and risky practices on construction sites for the management of the respondents' workplace (Khosravi et al., 2014; Nawaz et al., Din et al.; Shah, 2020; Adebayo & Emoh, 2019; Nadhim, 2019).

The majority of respondents stated that there are redeemable challenges associated with safety behaviour practice, such as low numbers of safety and health personnel, inadequate resource allocation for behavioural safety training, and a lack of commitment from workers towards safety. Considering that training is necessary for workers at construction sites, to comply with safety procedures, employees must receive health and safety training that will enable them to manage situations that may pose a significant risk. The findings of Oostakhan et al. (2012) and Awwad et al. (2016) also support the observation in this study, which highlighted the lack of regular training as a factor. In this regard, insufficient training and knowledge on health and safety for construction workers lead to a lack of awareness of safety issues, ineffective laws and regulations, and a lack of support from upper management for safety. Accidents involving behaviour safety are therefore not far off.

The study has theoretically validated the claims made by the behavioural-based safety theory. In other words, this research has demonstrated that occasionally, respondents' inappropriate safety conduct leads to accidents, supporting the theory that unsafe behaviour in the construction industry is the main contributor to accidents (Chen & Tian, 2012). Therefore within the framework of components of the theory, an enhancement or activation of the respondents' learning processes can be achieved if they receive ongoing training, supervision, and evaluation of modern safety protocols.

5. Conclusion

The study emphasizes how crucial behavioural safety approaches are to improving safety outcomes in major building projects. These practices target the underlying behaviours that lead to workplace accidents by emphasizing the human element of safety and providing a proactive approach to accident prevention. According to the findings, when behavioural safety practices are effectively implemented, they lead to a significant reduction in accidents, fostering a safer work environment. The study also emphasizes how critical it is to incorporate behavioural safety principles into the current safety management systems. By addressing both procedural and technical aspects of safety, this integration develops a more comprehensive approach to safety that also fosters a strong safety culture among employees. The implementation of behavioural safety principles is known to need active leadership, ongoing safety training, and worker participation.

Ultimately, behavioural safety practices are critical to lowering the number of accidents in major building projects. It is not only possible but also imperative for construction businesses to prioritize behavioural safety to increase the safety performance of their operations. Businesses can make long-lasting gains in safety results by incorporating these practices into their safety plans, thereby safeguarding the lives and well-being of their workers.

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