Contemporary Safety Practices and Zero Fatalities Success Factors in the UK Construction Industry

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Abstract: Globally, Adverse Safety Practices And Persistent Fatalities Have Created An Impression That "There Will Always Be Accidents In The Construction Industry". Recent Evidence Suggests That Chronic Fatalities Are Exacerbated By Dysfunctional Safety Practices With Less Craving For Zero Fatality. Yet, Research That Unravels These Subtle Practices With Compelling Solutions Is Scarce. The Study Aims To Identify Subtle Dysfunctional Safety Practices And Propose Solutions To Persistent Fatalities In The Construction Sector. Key Research Questions Are: What Dysfunctional Safety Practices Influence Reoccurring Fatalities And What Do Zero Fatalities Success Factors (Zfsf) Look Like In The Construction Industry? The Study Adopted Mixed Research Methods With A Phenomenological Paradigm, Reviewing 10 Years Of Hse Archived Data And A Semi-Structured Interview Among Construction Professionals To Provide Deeper Insights Into The Study Variables. Quantitative Data Was Analysed Using Spss 29 And Power Bi Analytics For Visualizing The Archive Data. Initial Findings Indicate That Human Factors Such As Bad Personal Habits, Mindset Linked To Complacency, Distraction, Taking Shortcuts, And Overconfidence Contribute Significantly To Dysfunctional Safety Practices. The Study Reveals Significant And Disproportionate Safety Practices Among Construction Workers Requiring Harmonisation Across Different Sites. Also, Dysfunctional Safety Behaviours And Practices Are Prevalent, Particularly In Isolated Sites Managed By Small Construction Firms. It Concludes That Achieving Zero Fatalities Success Factors Is Unlikely In The Construction Industry And Recommends The Active Involvement Of Workers In Developing Health And Safety Strategies.

Introduction

Globally, there is growing awareness of occupational health and safety risks in the workplace, though, the standard of safety practices is more visible in some countries compared to others. For example, the United Kingdom has one of the most thorough health and safety regulations and enforcement regimes across the globe, compared to many countries in the global south [1]. Indeed, the introduction of health and safety laws has contributed to a significant reduction in fatalities across many high-risk industries, yet adverse safety incidents in the UK construction industry remain worrisome. For example, [2a] asserts that twelve (12) years of fatalities data from 2010 to 2022 show that on average, 38 fatalities occur annually among workers in the UK construction sector. Moreover, data from [3] show that the construction sector is leading other industries in terms of adverse health and safety statistics, with 30 out

of 123 deaths of workers in work-related accidents in 2021/22. Besides, [2b] claims that the construction industry remains "the UK's deadliest sector regarding fatalities and difficulties in managing health and safety at work".

Indeed, fatal accident cases in the construction sector are disturbing because the constancy of fatality data in the last 10 years has not changed significantly. Thus, steering many to resign to fate that "there will always be accidents in the construction industry" [4]. The notion of "continuous adverse incidents in the construction sector" is dangerous. Rather there is a need never to stop trying to curb emerging safety practices among workers in the construction industry. [5] posit that several mild but deadly dysfunctional (bad conduct of actual health and safety duties) practices exist in many industries, particularly the construction sector which requires thorough conceptualisation and identification for an accident-free workplace to thrive. Furthermore, an in-depth review of occupational health and safety studies reveals that recent research about contemporary safety practices vis-à-vis zero fatalities in the construction sector is rare. Therefore, the study seeks to identify subtle contemporary safety behaviours and practices that influence chronic fatalities in the construction sector.

Though, many studies have examined the causes of accidents in the construction industry and its contributing factors, [6, 7] stress that current safety practice methods failed to address the rising emergence of dysfunctional safety practices among workers vis-à-vis zero fatalities success factors in the UK construction industry. Also, ignoring contemporary safety practices could have huge financial implications on construction companies and impact workers' health. Therefore, the study aims to identify subtle dysfunctional safety behaviours, and to provide compelling solutions to chronic fatalities in the construction sector. Key research questions are: What dysfunctional safety practices influence reoccurring fatalities and what do Zero Fatalities Success Factors (ZFSF) look like in the construction industry?

Literature Review

In simple terms, the word "contemporary" means existing or happening now [8]. The study combined the phrase contemporary safety practices to mean emerging adverse health and safety conducts, practices, or activities that are subtle but inimical to excellent safety practices in the workplace. [5] suggests that adverse health and safety refer to any abnormal, impaired practices or behaviours that negatively diminish the proper functioning of health and safety principles and standards.

[9] assert that dysfunctional behaviours refer to actions that damage safety in the workplace, affect performance, and productivity, attitudes that increase work-related stress, and other adverse effects amongst employees. Common examples of workers' behaviours and practices include but are not limited to non-functional job execution plan, failure to use Personal Protective Equipment (PPE) correctly, use of unauthorised machinery, incorrect use of equipment, tools/machinery, performing an unqualified task, poor housekeeping in the workplace, invisible/obscured emergency exit, poor lighting conditions, poorly maintained equipment, poor work/safety training, excessive workload on workers, extreme overtime work, bad personal habits, failure to protect working environment (such as trenches, pathways), failure to use indicators in a noisy workplace [10, 11].

[5] opine that unsafe practices in many industries are usually subtle and tricky, thus thorough conceptualisation and identification are required to overcome them. [12] is of the view that labelling workers and making them work in high-risk environments such as construction sites without detailed risk assessment, can trigger dysfunctional practices. Recent evidence suggests that adverse safety practices have without doubt become the basis for the rise in fatalities in most high-risk industries, particularly in the construction sector; thus, making zero

fatalities difficult to achieve. The succeeding section looks at the concept of Zero Fatalities Success Factors vis-à-vis its practicality in the UK Construction Industry.

Zero Fatalities Success Factors in the UK Construction Industry

Globally, there is a rise in awareness and advocacy for improved safety of workers across high-risk industries. Yet, safety performance is still inadequate, particularly in the construction sector [13]. Although recent Health and Safety Executive (HSE, 2023) fatality reports show significant improvement in the number of construction deaths [2], zero fatalities seem to be a long hurdle and difficult target to achieve by many construction companies. This is further corroborated by [14] who posits that many construction organisations have the impression that zero accidents are focused on the process of achieving a safe working environment rather than paying attention to the main goal of zero fatalities.

The construction industry is not exempted from the perspective that zero fatalities are mere philosophical expressions that are not realistic to attain due to the nature of construction projects [15]. Perhaps, the desire of most managers of construction sites to focus on a safe working environment could be largely due to the hazardous nature of construction works and as [16] succinctly stated, "construction projects are usually technologically and organisationally complex", therefore, achieving zero fatality target seemingly becomes elusive.

In the last decade, the global construction industry has witnessed a remarkable shift by setting the ambitious objective of zero injuries [17]. While many UK construction companies have continued to set Zero fatality targets in their project execution, [18] argues that setting a zero target could make contractors cut corners with fatality disclosures, under-report, and find alternative measurements to site processes. However, empirical findings by [15] indicate that the zero fatalities target is more achievable with multi-stakeholder effort. Thus, construction sites should operate in synergy where all workers take cognizance of their safety responsibilities and act in ways that would reduce construction accidents to the barest minimum.

Despite the UK being one of the safest countries in the world to work, there were 135 worker fatalities in 2022 with 45 deaths in the construction industry [19]. The inability of most construction companies to achieve zero fatalities can be attributed to unsafe practices and behaviours among workers. This was corroborated by [20] in their study which suggests that workers' unsafe behaviours are the major contributing factors to the rise of accidents and deaths in construction projects.

Identification of factors inhibiting zero fatalities success in the construction industry

Despite several efforts to prevent accidents from happening on construction sites, it is the ability to identify underlying causes of construction accidents that will elicit appropriate solutions [21]. In some circumstances, workers characteristics such as gender, ethnicity, and age are identified to influence workers' behaviours on construction sites in the build-up to accidents [22]. However, in the context of this study, the construction industry will be holistically assessed with the view of identifying significant contemporary practices that make zero fatalities unachievable among workers.

Construction projects are known to have inherent risks irrespective of the size, nature, or complexity and the risks are persistent all through the project's lifecycle [23]. While many scholars such as [18] and [15] have conducted extensive research on zero fatalities and factors preventing its attainment in the workplace, [24] identified employer's inabilities to communicate safety concerns to their employees, absence of information on hazards, technologies, and macroeconomic trends as factors that impact on the safety of workers in the industry.

Similarly, [25] opine that the transitory nature of the construction projects, absence of a controlled work environment, complexity, and diversity on construction sites contribute to the safety performance of the industry. While [26] attributed fatal accidents in construction to the absence of awareness among construction workers, there is no doubt that zero fatalities are likely to remain a façade with the presence of incessant dysfunctional safety practices among workers in the construction industry.

The UK health and safety practitioners, as well as industry experts, have continued to evolve new strategies to bring fatalities in construction to a near-zero [27][28] and assert that, industries must adopt leading safety performance indicators which are control measures for managing the system or strengthen the organisation towards applying specific actions rather than generalities to prevent fatalities.

Furthermore, in many instances, safety issues in the construction industry are considered secondary while cost, time, and quality of the project are given priority [6]. [27] conducted a study and their findings suggested that strict compliance with health and safety rules, procedures, and processes, frequent toolbox meetings, and strong H&S targets are some of the factors that can significantly reduce or avoid accidents on construction sites.

Moreover, hazard detection abilities are beneficial because construction projects inherently involve risks, and their understanding is essential to prevent fatalities [29]. In addition, embarking on safety training has proven to be an effective measure in achieving a reduction in hazardous incidents at construction sites [30]. Hence, construction companies must ensure that achieving a significant reduction in fatalities is attainable with the right control measures put in place by the employer.

Therefore, achieving zero fatalities in construction sites is a possible target. [31] noted that having an ideal time frame could be challenging and ambitious, yet it is also realistic and within reach to at least reduce fatality rates by half in the workplace. With keen attention to evolving safety cultures that are focused on workers' welfare and safety, proactively preventing underlying dysfunctional safety practices among construction workers, and upholding safety guidelines, the construction industry will be better prepared to achieve a significant reduction in injuries and fatalities to its workers.

The Safety Triangle Theory and Zero Fatalities Success Factors

Many safety theories exist within the health and safety subject area. For example, the theory of Task dynamics, Domino theory, Hazard–barrier model, Accident casual factors theories, Health theory, and Health significant theory, exist to help advance and explain health and safety practices. However, the theory that is of interest and relevant to this study vis-a-vis zero fatalities success factors is the Safety Triangle Theory or safety pyramid theory propounded by [32] in a publication titled "Industrial Accident Prevention: A Scientist Approach". The theory states that for every 300 unsafe behaviours being committed in the workplace, 29 results in minor injuries, and one (1) serious or fatal injury in a ratio of 300:29:1 as shown in Figure 1.

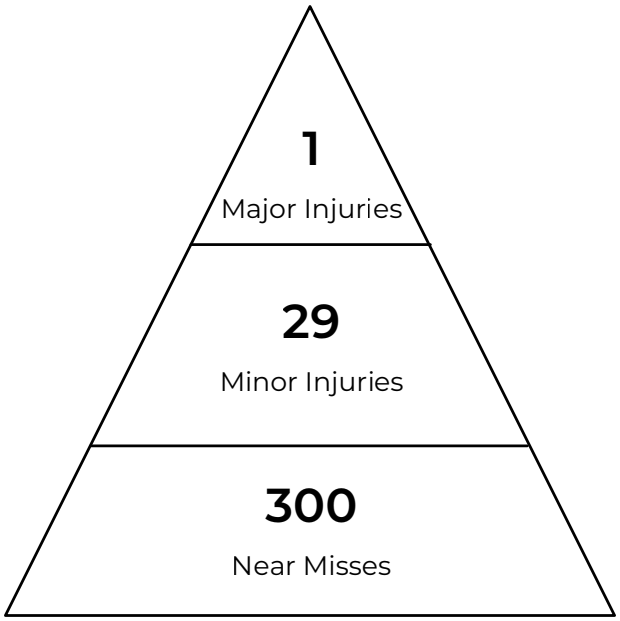

Figure 1: The Safety Triangle or the 300:29:1 (Model adapted from [32])

Though the theory is criticized for various reasons, the moral lesson of the theory remains valid and relevant because the array of unsafe behaviours or practices is still resulting in at least one major accident in many construction sites. Perhaps, the theory is fundamental to explaining that zero fatalities remain difficult to attain in the construction sector as dysfunctional behaviours and practices in construction sites will be responsible for a catalogue of near misses, minor injuries, and fatalities. Another lesson that can be deduced from the theory in Figure 1 is that although there is a general reduction of adverse safety in many industries in the UK, reoccurring cases of near misses and minor injuries particularly from emerging adverse safety practices will continue to add to tens of fatalities witnessed in the construction sector annually.

Methodology

The study adopted mixed research (Quan-Qual) methods with a phenomenological paradigm. The method involved the design of bespoke questionnaires and was followed by a semi-structured interview with professionals in the construction industry. [33] notes that the Quan-Qual concept implies the use of both qualitative and quantitative data. The choice of mixed research method allowed the researcher to have a better understanding of the study's variables. Construction professionals interviewed were selected based on their on-the-job knowledge, managerial, and supervisory experience.

The study's data collection procedure was segmented into three phases for ease of collation and analysis. In phase one, the study conducted an extensive review of archive data from the UK's Health and Safety Executive (HSE) repository on safety breaches in the construction industry. Ten years of data from 2013 to 2022 were obtained and analysed using into Microsoft Excel Spreadsheet. The archive data provided historical trends and perspectives into the chronic adverse safety in UK construction sites.

The second phase of the data collection involved the design of a bespoke questionnaire with a five-point Likert scale to capture the opinions of construction site operatives and safety

managers. The purpose of the questionnaire was to gather data from industry workers regarding safety practices. The questions were pilot-tested by 4 academics and 1 HSE Manager. The purpose of the pilot study was to ascertain whether the questions and measurement instrument were unambiguous to establish if participants would find the questions appropriate. Some questions that were improperly written were either teased out or reconstructed. A stratified random sampling strategy was used to select participants and to ensure that the sample was representative of the population. 45 out of 70 administered questionnaires were retrieved from construction participants with a response rate of 64%. [34] claim that "if measured appropriately; within the construction industry a 25% to 30% response rate is considered acceptable". Mann-Whitney homogeneity and Cronbach Alpha tests were conducted using SPSS 29 to determine the internal consistency and reliability of the data collected. A Cronbach Alpha value of 0.83 was obtained, denoting a very good internal consistency.

The third phase of the data collection involved the use of semi-structured interviews conducted with 7 participants from different construction companies comprising 4 HSE Managers and 3 Supervisors. [35] suggests that in phenomenological research, the number of participants can be between 2 and 25. Thus, with the homogeneity of the population sample, 7 participants are considered sufficient. All the construction professionals invited for the interview participated which is indicative of a 100% participation rate. The study adopted a purposive sampling technique for selecting participants for the interview and an important selection criterion is the length of years working in the construction industry with a supervisory experience. Consequently, participants with over 10 years of working experience in the UK construction industry were considered for the interview conducted through MS Teams.

The interview questions and reasoning were deduced from the adverse safety practices and behaviours highlighted in the study literature. Interviews with the senior safety managers and supervisors were conducted to identify and understand patterns and behaviours that predispose workers to accidents and their effect on achieving zero fatalities in construction sites.

Overall, interview questioning, and discussions were closely aligned to human errors, distractions, unsafe behaviours with elements of (complacency, fatigue, frustration, rushing attitude), incorrect use of PPE, poor housekeeping in the workplace, failure to use Personal Protective Equipment (PPE), bad personal habits, use of unauthorised machinery. Construction site managers were also scrutinised for behaviours and practices such as the excessive workload on certain personnel, poor work/safety training, negligence, inefficient supervision, poor housekeeping in the workplace, incorrect use of equipment, tools/machinery, obscured emergencies exit, and poor lighting conditions. Subsequently, the interview data were analysed using Nvivo 12 software to filter and code findings from the transcript.

Analysis And Findings

Archive Data Analysis and Presentation of Findings

The archive data obtained were subjected to robust analysis using Microsoft Power BI for insights and visualization into accident patterns. Data transformation and modelling were conducted, and visuals of the data were built as shown in Figures 2,3, 4, and 5. In Figures 2 and 4, archive data was examined to know the aggregated number of employees and the public affected by various health and safety breaches in the construction industry. While Figures 3 and 5 provide a breakdown of the adverse safety effects on workers.

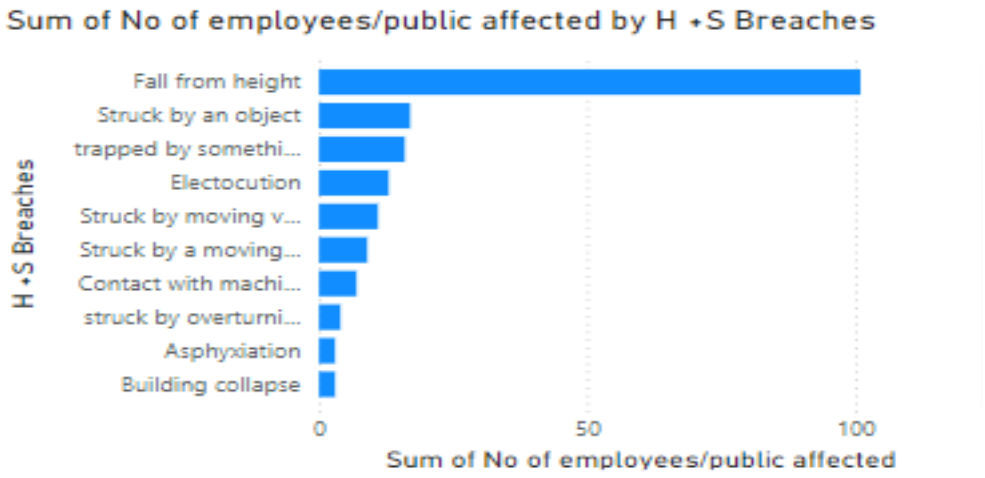

Figure 2. Visualization of Health and Safety breaches on Employees &Public in UK construction industry

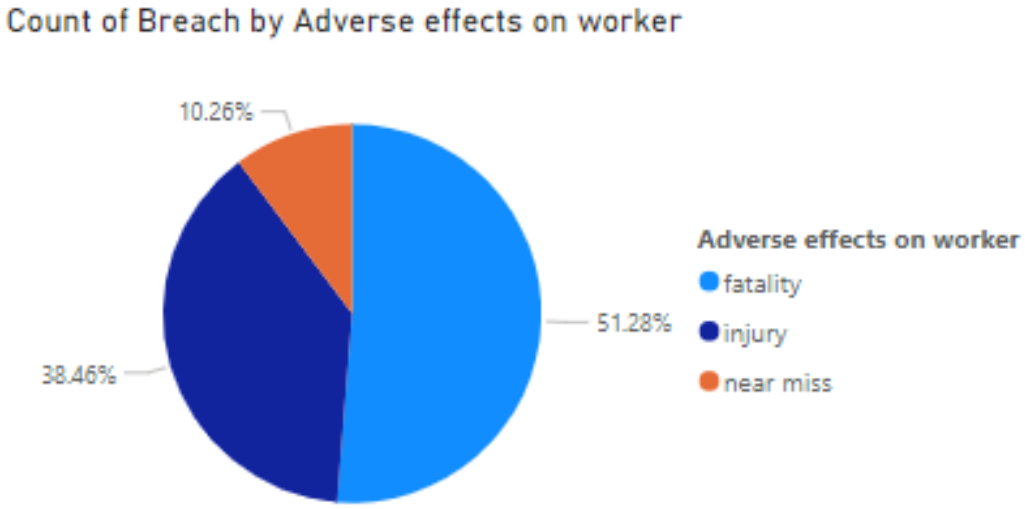

Figure 3. Visualization of Adverse Safety Effects on Workers in the UK Construction Industry

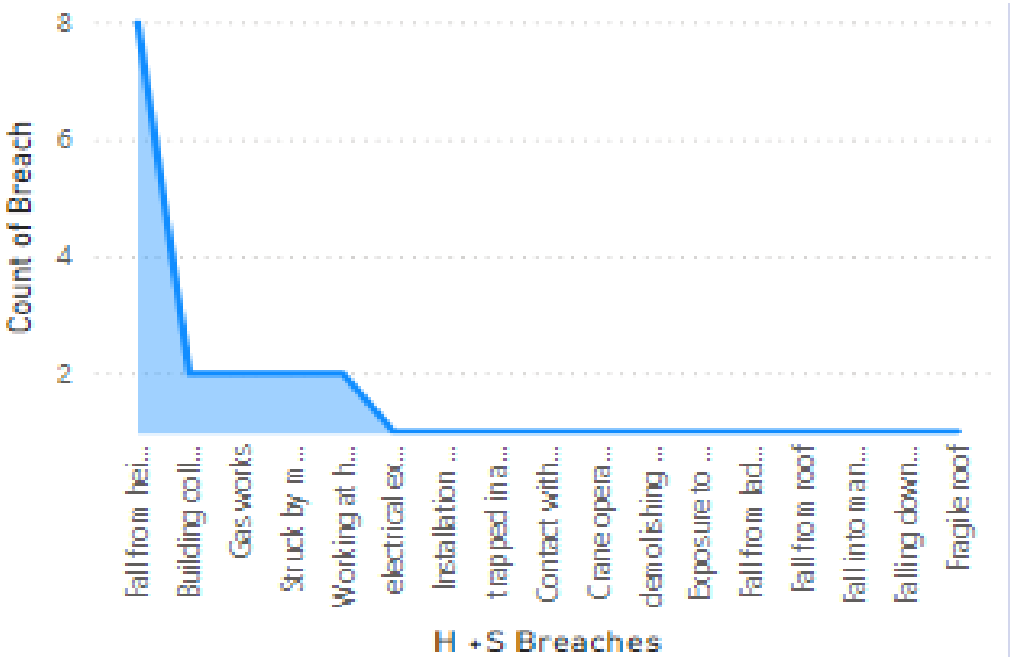

Figure 4. Visualization of Health and Safety breaches in UK construction industry

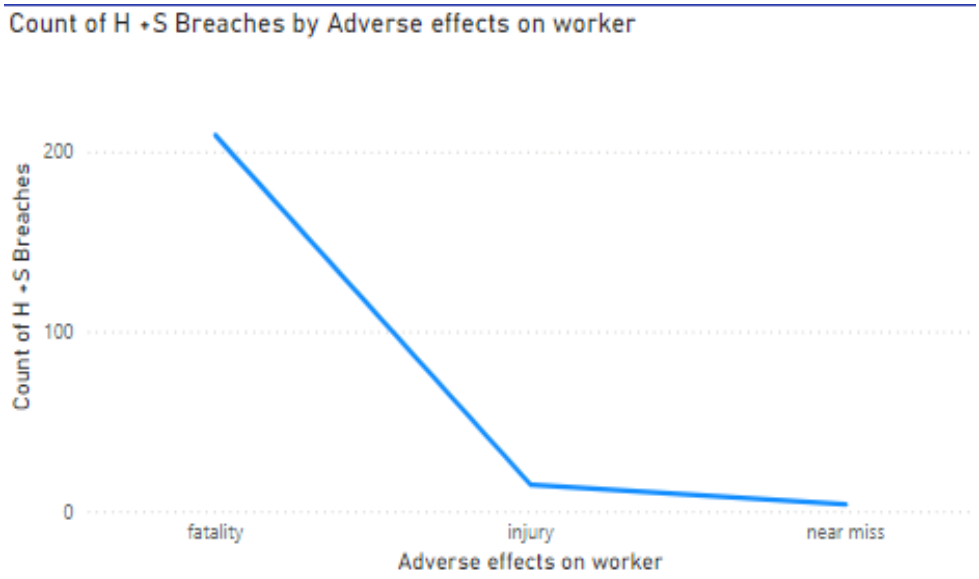

Figure 5. Visualization of Health and Safety breaches and Adverse effects on workers in the UK construction industry

Questionnaire Data Analysis and Presentation of Findings

First, the study made key assumptions regarding the questionnaire data collection instrument. The assumption includes consideration that there are many definitions and viewpoints concerning what constitutes dysfunctional safety practices and behaviours. However, the study

infers to [5] and [9] assertions that actions that impair safe working conditions, principles, and standards in the workplace can be classified as dysfunctional safety behaviours and practices.

Table 1 presents the Relative Importance Index (RII) test performed using SPSS version 29. The questionnaire highlighted and identified eleven (11) dysfunctional safety behaviours and practices from the study literature. Study participants were asked to rank the identified workplace safety practices and behaviours from the most common to the least common which can expose workers to accidents. Responses from the questionnaires were ranked using the Relative Importance Index. The findings from Table 1, revealed that non-compliance with regulation ranked 83%, followed by inadequate supervision (79%) and language differences among workers (44%).

Table 1: Assumed Contemporary Safety Practices and Behaviours in the Construction Industry

Industry safety practices and behaviours causing accidents	Relative Importance Index (RII)
Poor housekeeping	0.76
Negligence at work	0.74
Poor Judgement	0.74
Complacency	0.75
Ineffective leadership decision	0.73
Blame culture	0.52
Over-familiarity with industry process	0.74
Non-compliance with regulation	0.83
Unauthorized use of equipment	0.73
Inadequate supervision	0.79
Language differences among workers	0.44

Interview Data Analysis and Presentation of Findings

Interviewees were asked to express their views concerning patterns and trends in adverse safety incidences on construction sites. For brevity, some textual contents of interview data were trimmed from the transcribed data. For a better understanding and spontaneity of the interaction between researchers and study participants, an interview allocation code was assigned as shown in Table 2. The textual excerpts are highlighted as follows:

Table 2: Participant's Professional Status and Interview Allocation Code

S/N	Professional Status	Interview Allocation
1	Construction Manager	CM1
2	Construction Safety Supervisor	CS1
3	Construction HSE Manager	CM2
4	Construction MAnager	CM3
5	Construction Site Supervisor	CS2

S/N	Professional Status	Interview Allocation
6	Construction Safety Supervisor	CS2
7	Construction Site Supervisor	CS4

Below are some questions that the researchers asked study participants, some textual excerpts are summarized as highlighted below:

Construction HSE Manager Questions:

Are you noticing new patterns in workers' behaviours that are exposing them to adverse incidents?

> "... Yes, new behaviours triggered by technology such as workers using their smartphones during critical tasks without a full understanding of the safety implications at work."
>
> (Similar view was expressed 6 times by CM1, and CM2).

Probing question:

What do you think is responsible for these new patterns of behaviours?

> "I think distraction and perhaps overconfidence in knowing what the result could be, there is also peer pressure as well as certain health and safety requirements which focuses on ticking a box and makes the paperwork deflects from where the focus should be" (Similar view was expressed 5 times by CM1, CM2, and CM3).
>
> "Also, construction workers have a culture of 'We know what we are doing', 'We do not need to ask', 'We have done it before'". (Similar view was expressed 3 times by CM1 and CM2).

Construction Safety Supervisors Questions:

High-risk industries such as construction are still facing adverse fatalities nowadays despite improvements in technology and automation. What will you say is causing these persistent fatalities?

> "In my view, I think we have made great strides in the United Kingdom over the past couple of decades. However, incidents and fatalities that are still occurring now can be put down to an important factor which is the ageing population".
>
> (Similar view was expressed 3 times by CS1, CS2, CS3, and CS4).

Probing question:

Your answer to my question suggests that the aging population on construction sites predisposes them to accidents. Is this the case?

> "Yeah, when you look at the population that works within the construction industry are in their late 50s. So, this aging population is more prone to incidents and accidents. Although technology is there to assist, however, they may not be as familiar with technology as a

younger person. Also, the behaviours of an older person who was brought up without technology may predispose them to adverse incidents".

(Similar view was expressed 2 times by CS2 and CS4).

Probing question:

From your experience, how will you not describe the influence of these behaviours in accident causation?

"Behaviours play a very significant role in any accident. The behaviour of the individual is 90% in my view the main factor. Incidents do not just happen, so improper behaviour of an individual always leads to some form of incidents". (Similar view was expressed 3 times by CS1, CS3, and CS4).

Discussion

Findings from the study, particularly from the quantitative data corroborate existing literature that the UK construction industry remains the deadliest sector regarding fatalities and difficulties in managing health and safety risks at work. The output as shown in Figures 2 and 4 is consistent with the findings of [36] that there exists a correlation between falls from height and a high rate of fatalities in the construction industry. The output of the data analytics Figure 3 showed that there were 51% fatalities and 38% injuries to construction workers, this further confirms that the construction industry remains a high-risk industry [37]. Also, in the last 10 years, falls from height were the most prevalent cause of accidents in construction sites as shown in Figure 5.

The study findings also insinuate that actions that impair safe working conditions, principles, and safety standards in the workplace could be deemed dysfunctional safety behaviours and practices. This is revealed in Table 1 that construction sites are now witnessing emerging dysfunctional safety practices which are major contributors to chronic safety fatalities. The findings align with the study of [38] who suggested that safety issues described in Table 1 have characterised the industry for decades with possible lessons from the past yet to be learned. Though some adverse behaviours and practices are often overlooked, subtle, or tricky to comprehend as propounded by [5], these unsafe acts continue to pose great threats to the success of construction projects. Thus, the study focused on conceptualising and identifying dysfunctional safety practices that are inimical to standard health and safety principles of working in the UK and particularly in the construction industry as espoused by the Health and Safety at Work Act 1974 [39].

For a better understanding of contemporary safety behaviours and practices, the study classified dysfunctional practices into complacency, poor housekeeping in the workplace, overconfidence, failure to use Personal Protective Equipment (PPE) correctly, bad personal habits, unauthorized use of machinery. The study also identified human factors and state of mind (such as complacency, negligence, frustration, distractions, and poor judgment) among some workers as contributing factors to dysfunctional safety practices. Moreover, the study also identified organisational dysfunctional practices, including non-compliance with regulations, poor housekeeping, inadequate supervision, ineffective communication, and over-familiarity with industry processes.

Overall, the key deductions from both quantitative and qualitative inquiries as illustrated in subsections 4.1 and 4.2 show that human factors such as complacency, distractions, negligence, and workers' poor judgment were identified as habitual and are still contributing

factors toward adverse safety even in present times. At organisational and construction site management levels, there was a clear acceptance that non-compliance with safety regulations and inadequate supervision is the leading cause that triggered most unsafe acts among construction workers. Therefore, achieving a substantial reduction in accidents will require concerted efforts that are directed at the identified causal influences [38].

Conclusion

Comparatively, health and safety practices in the construction sector, and indeed, other high-risk industries in the UK have improved significantly in contrast to other countries. Yet, adverse behaviours and practices that are often ignored continue to wreck unrelenting fatalities in the construction industry. The primary aim of the study was to identify the subtle contemporary dysfunctional safety behaviours and practices that continue to influence chronic fatalities in the construction sector. Moreover, human factors and other personal mindsets such as complacency, hastiness, distractions, non-compliance with regulations, individual carelessness, and inadequate supervision were typical factors that fuel dysfunctional safety practices. These are the remote reasons behind falls from heights, slips, trips, and falls which are the leading causes of accidents in the construction sector.

Furthermore, zero fatalities success factors remain elusive. They will be difficult to actualize in the construction industry as findings also suggest significant, disproportionate safety behaviours and practices across different construction sites, particularly among subcontractor construction workers that require harmonisation in different sites. Other findings suggest that dysfunctional safety practices are becoming more ubiquitous in isolated construction sites, especially those managed by small construction firms with less appearance or conspicuous presence of health and safety officers. Hence, further research with multi-national construction firms will be suggested for future consideration.

Finally, solutions to these safety challenges in the construction sector must include targeted and measured safety communication, continual safety education and training, and active involvement of workers in the development of health and safety strategies. The identified solutions offer practical and knowledge contributions towards safety awareness in the construction industry and provide the UK's Health and Safety Executive (HSE) with a dynamic approach to managing contemporary safety practices in the construction industry.

Limitation

The research was limited by its inability to gather sufficient data from large construction companies for comparison with small-scale construction firms.

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