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The Use of 4IR to Counter Human Factors in South African Construction Industry Health and Safety

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Abstract:
This article seeks to evaluate the influence of 4IR and human factors on the construction health and safety in South Africa to provide an effective framework for improving construction health and safety in South Africa. The construction industry has been identified as one of the most hazardous industries in many parts of the world, as measured by work-related mortality, workers' compensation, injury, and fatality rates. The researchers adopted a mixed-methods approach, combining quantitative and qualitative methods to comprehensively address the research questions and employed SPSS analysis to examine safety factors related to work pressure and their effects on compliance with safe work procedures. The research found significant relationship between work pressure, safety violations, and construction accidents. By comprehending human factors' contribution to non-compliance with safe work procedures. The findings and recommendations can serve as a foundation for policy development, training programs, and practical strategies aimed at reducing accidents and promoting a safer construction environment.

Keywords: 4IR, human factors, construction health and safety

1. Background / Introduction

The construction industry has been identified as one of the most hazardous industries in many parts of the world, as measured by work-related mortality, workers' compensation, injury, and fatality rates [1],[2],[3],[4]. Safety at work is a complex phenomenon and a subjective area of study. This is because industrial safety has undergone significant changes over the past decade [5]. However, the construction sector is notable as it continues to register a high rate of accident-related casualties. Construction workers who work within the construction industry face a greater risk of fatality than workers in other industries [6],[7]. Against this backdrop, this study seeks to evaluate the influence of 4IR and human factors on the construction health and safety in South Africa to provide an effective framework for improving construction health and safety in South Africa.

2. Literature Review

The literature review encompasses established measures and strategies aimed at preventing, controlling, and eliminating occupational hazards, accidents, and risks. It underscores the necessity of addressing factors that lead to accidents to ensure project success. Moreover, the review highlights the intersection of safety factors with project success indicators. The need to identify causes of accidents for effective prevention. Safety factors are identified, including 4IR, motivation, organizational culture, skills, experience, competency, communication, and leadership [8].

The construction industry has been identified as one of the most hazardous industries in many parts of the world, as measured by work-related mortality, workers' compensation, injury, and fatality rates [9] [10] [11] [12]. Safety at work is a complex phenomenon and a subjective area of study. This is because industrial safety has undergone significant changes over the past decade [13]. However, the construction sector is notable as it continues to register a high rate of accident-related casualties. Construction workers who work within the construction industry face a greater risk of fatality than workers in other industries [14] [15].

Against this backdrop, this study seeks to evaluate the influence of 4IR and human factors on the construction health and safety in South Africa to provide an effective framework for improving construction health and safety in South Africa.

3. Research Methodology

The research adopted a mixed-methods approach, combining quantitative and qualitative methods to comprehensively address the research questions. For the mixed methods approach, the researcher employed SPSS analysis to examine safety factors related to work pressure and their effects on compliance with safe work procedures. A Likert-scale questionnaire was utilized to gather data from the construction industry in South Africa see table 1). Descriptive surveys' bias was minimized through careful distribution, explanation, and follow-up. And interviews with thematic content analysis for the qualitative approach part of the study.

Table 1: The evaluation scale for data

Level of Significance	Scale value
Not Significant (NS)	1.80 ≥
Somewhat Significant (SS)	1.80 ≤ 2.60
Significant (S)	2.60 ≤ 3.40
Very Significant (VS)	3.40 ≤ 4.20
Extremely Significant (ES)	4.20 ≤ 5.00

(Adapted from Kazaz *et al.,* 2008).

4. Results

The central issue this study aims to address is the prevalence of accidents in the accident-prone and high-risk construction industry, necessitating strategies for minimizing such incidents. Human factor as the second most significant cause of accidents and non-adherence to safe work procedures (see table 2). Human factor as a primary contributor to industry injuries. Human factor as a major accident causes influencing compliance with safe work procedures through training, supervision, and human behaviour (see table 3). The 4IR is upon the construction sector. Nowadays there is need to assess the usage of sensing and warning-based technologies to improve health and safety delivery of civil engineering projects in South Africa. In today's digital era, several industries are quickly adopting technological advancements to enhance their operations and create safer working environments for their workers. Thus, the study seeks to provide an effective framework for improving construction health and safety in South Africa.

Table 2: Main safety factors groups ranking

Factor	Mean	Rank in total
Equipment	4.44	1
Human	4.41	2
Workplace and site	4.33	3
Material	4.29	4
Environment	3.63	5

Table 3: Human safety factors

1.1 Factors	Rank	EL	Min	Max	Mean	SD
Training, supervision and human behaviour						
Lack of staff training HSE in practices	1	ES	3	5	4.63	.0.565
Lack of HSE supervision	2	ES	2	5	4.52	0.802
Poor safety behaviour	3	ES	2	5	4.41	0.931
Lack of staff skills in work execution	4	ES	2	5	4.33	0.832
Lack of expert supervision in the works trade	5	VS	2	5	4.15	0.907
Average		ES			4.41	

SD = Standard deviation, Min = Minimum, Max = Maximum, EL = Effect level

This research found that there is significant as it fills a gap in the current knowledge by explicitly investigating how work pressure contributes to safety violations on construction sites. It also found that there is a need for a comprehensive examination of the health and safety factors that require attention within construction project organizations in South Africa, thereby enhancing awareness of their significance. This research holds several implications for the construction industry in South Africa:

- **Improved Safety:** By identifying the root causes of safe work procedure failures, the findings can lead to targeted interventions that enhance safety practices and reduce accidents.
- **Regulatory Enhancement:** The research outcomes can contribute to the refinement of safety regulations and guidelines in the construction sector.
- **Training and Education:** The insights gained can inform the development of more effective training programs that address specific human factors leading to non-compliance.
- **Cultural Shift:** Understanding the cultural aspects influencing behaviour can facilitate a cultural shift toward prioritizing safety on construction sites.

Through this research it was established that unsafe behaviour is intrinsically linked to workplace accidents. It has also been confirmed that a positive correlation exists between workers safe behaviour and safety climate within construction site environment and that workers attitudes towards safety are influenced by their risk perceptions, risk management, safety rules and procedures and cultural background. Accidents on construction sites results to many human tragedies de-motivate workers, disrupt site activities, delay project progress, and adversely affect the overall cost, productivity, and reputation of the construction industry. In recognition of the problems above, countries all over the world have seen the necessity of improving occupational health and safety management on construction sites, particularly, the reduction of the number of accidents on construction sites.

The central issue this study addressed is the prevalence of accidents in the accident-prone and high-risk construction industry, necessitating strategies for minimizing such incidents. Highlight the human factor as the second most significant cause of accidents and non-adherence to safe work procedures. Human factor as a primary contributor to industry injuries.

Human factor as a major accident causes influencing compliance with safe work procedures through training, supervision, and human behaviour. The 4IR is upon the construction sector. Nowadays there is need to assess the usage of sensing and warning-based technologies to improve health and safety delivery of civil engineering projects in South Africa. In today's digital era, several industries are quickly adopting technological advancements to enhance their operations and create safer working environments for their workers. Thus, the study seeks to provide an effective framework for improving construction health and safety in South Africa.

This research is expected to contribute to the existing literature by providing a comprehensive analysis of the human factors influencing the failure of safe work procedures in the context of the South African construction industry. The findings and recommendations can serve as a foundation for policy development, training programs, and practical strategies aimed at reducing accidents and promoting a safer construction environment.

5. Conclusions

This research emphasizes the significant relationship between work pressure, safety violations, and construction accidents. By comprehending human factors' contribution to non-compliance with safe work procedures, the study aims to devise targeted mitigation strategies that enhance construction site safety in South Africa. This research addressed the critical issue of construction site safety in South Africa by investigating the impact of human factors on the failure of safe work procedures. By uncovering the underlying reasons for non-compliance and accidents, the research contributed to the development of effective strategies that improve safety practices and reduce the incidence of accidents in the construction industry.

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