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Effect of Adoption of Fourth Industrial Revolution Technologies on Health and Safety Practices of Workers in Construction Projects in Abuja

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Abstract
This study assessed the effectiveness of 4IR technologies for effective H&S in construction projects in Abuja with a view to enhancing the safety performance of employees at construction workplace. The study adopted the quantitative research approach using the survey research design. Data were collected from 127 professionals of construction firms operating in Abuja and listed in the Abuja Business Directory online, at a response rate of 96.85%. Analysis of data was carried out with the use of both descriptive statistics such as frequency count, percentage and Mean Item Score (MIS) and inferential analytical techniques such as Spearman Rank Correlation analysis. The results of the analysis revealed that the severe barrier to the adoption of 4IR technologies for effective H&S practices in construction projects is "Insufficient electricity" (MIS = 4.55). The most significant driver for the adoption of 4IR technologies for effective H&S practices in construction projects is "Getting ready to adopt Digital drivers" (MIS = 4.16). It was also revealed that there exists a strong, positive and significant relationship between the adoption of 4IR technologies for H&S practices of workers and the drivers for the adoption of 4IR technologies for effective H&S practices in construction projects (r = 0.611; p = 0.000). The study concludes that the effect of adoption of 4IR technologies on the H&S practices of workers in construction projects is significant and can enhance the safety performance of employees at construction workplace. The study recommends that in order for construction firms to enhance the adoption of 4IR technologies and to sustain it, there is a need to develop a mechanism which will be made up of both proactive and reactive measures based on the drivers for the adoption of 4IR technologies for effective H&S practices in construction projects identified in this study.

Keywords: *Adoption, construction, fourth industrial revolution technologies, health and safety practices.*

1.0 Introduction

Health and Safety (H&S) practices are vital elements of construction project management, requiring cooperation among individuals from diverse backgrounds and disciplines to complete the project with minimal incidents [1]. Health and Safety (H&S) encompass systematic protocols and initiatives designed to mitigate workplace accidents and minimise exposure to hazardous conditions and toxic substances. The health and safety practices program seek to reduce potential workplace hazards by establishing suitable protocols and guaranteeing a safe working environment. The intrinsic hazards and complexities of construction sites make accidents inevitable, as the intricacies of construction operations present numerous challenges to worker safety and well-being. [5], [6], [7].

As a result, countless occupational accidents, fatalities, and injuries transpire annually across various industries. Diverse techniques have been used globally to improve workplace safety protocols, due to the complex nature of construction activities that pose various risks to workers' safety and welfare [11]. Numerous methods are traditional and TSM approaches to health and safety protocols, offering several strategies to improve health and safety measures on building sites.

Conventional approaches have been considered less effective in reducing the frequency of accidents and fatalities on construction sites [12], [13], [14], [15]. As a result, despite several steps suggested by traditional ways to enhance construction site safety, the construction industry continues to encounter ongoing challenges in activities that pose diverse risks to workers' safety and well-being. To address this challenge, research has suggested using Fourth Industrial Revolution technologies to enhance safety management at construction sites. The emergence of this disruptive paradigm shift in the Fourth Industrial Revolution is marked by innovative technologies that integrate the physical, digital, and biological domains, impacting several sectors, including construction and economic development.

The Fourth Industrial Revolution exemplifies innovative approaches to technology integration inside civilisations and daily human activities. It demonstrated how technology and labour automation supplant jobs formerly performed by individuals [17], [11]. This presents further risks and obstacles for labourers on construction sites, associated with the use of novel equipment and technologies. The most efficacious strategy to tackle this growing threat and concern is to use technological breakthroughs to improve health and safety. This necessitates assessing the influence of Fourth Industrial Revolution (4IR) technologies on the health and safety (H&S) protocols for construction workers in Abuja to enhance employee safety outcomes at construction sites. The study sought to identify the barriers to the implementation of Fourth Industrial Revolution (4IR) technologies in health and safety (H&S) practices within construction projects, analyse the enablers for their adoption, and evaluate the effects of such adoption on the H&S practices of construction workers.

In order to gain more insights into the theme of the aim and objectives of the study, extant review of relevant literature was undertaken. This review of literature is highlighted in the following sub-sections.

1.1 Barriers to adoption of 4IR technologies for H&S practices in construction projects

According to [11], several problems are associated with the use of Fourth Industrial Revolution technical instruments in the realm of building safety inside emerging nations. [19] said that the use of 4IR technologies in managing construction health and safety procedures has several advantages; nevertheless, some variables must be evaluated prior to their integration into building processes. [20] said that privacy responsibility, laws, rules, and hazards associated with construction-related enterprises are considerations that construction companies must evaluate before to integration. [21] identified the constraints of using 4IR technologies in the construction sector as stemming from safety issues, technical difficulties, the need for qualified operators, substantial training prerequisites, and liability and legal considerations. [19] further proposed comprehending the issues linked to general applications, safety-related applications, technological specifications and characteristics, and obstacles in using 4IR-enabling technologies for safety-related operations. [22] posited that costly technology, insufficient necessary skills, the absence of training facilities, a deficiency of adequacy, and adverse views, including fear of job displacement among construction professionals, impeded the adoption of 4IR technologies in the construction sector.

1.2 Drivers enhancing adoption for 4IR technologies for H&S practices in construction projects

Several studies have suggested that the construction industry, just like other industries, will adopt the use of 4IR technologies if particular factors or drivers are in place. Rapid digitization, as well as automated jobs, as part of the 4IR will have great consequences on the career aspirations of individuals [23]. Therefore, a high level of skills will be required for upcoming digital economies, which will be driven by advanced ICT infrastructures. Digital literacy is a highly valuable skill in such economies [24]. Hence, people's ability to use and understand these sophisticated innovations will eventually facilitate their adoption. Additionally, governments and regulators must quickly become familiar with the rapidly changing 4IR landscape to provide the supportive atmosphere, protections, venture capital, and oversight necessary to educate and direct on future building projects [25]. To unleash and expand innovation in potentially revolutionary new technologies and global solutions, support and collaboration will be necessary. To avoid unexpected outcomes and safeguard public interest, consideration, public policy, and technology governance will be necessary [26]. As a result of this attention given to training and guidance, the adoption of 4IR innovations will eventually increase.

1.3 Effects of adoption of 4IR technologies on H&S practices of workers in construction projects

Researchers in current studies have perceived the impact of adopting Fourth Industrial Revolution technology on health and safety practices of workers in building projects in varying ways. This study has extensively studied the varied perspectives of scholars and has comprehensively identified the strategies. The first group of researchers characterised these outcomes as "Sustainable health and safety." The use of technology improves construction sustainability via preventative measures that diminish worker injuries and accidents [27], [28], [29]. These new solutions possess the capability to address health and safety concerns by identifying and mitigating dangers during the planning phase, while also providing alerts about potential risks. The subsequent group of authors recognised the impacts as "Enhance safety checks." Inspections must be performed on construction sites to guarantee compliance with rules [30], [31], [32]. The third group of researchers designated these effects as "Mitigating injuries with wearable technology." Reports indicate that wearable technologies and devices used by workers function using electrical and computational technologies to gather data and identify when a certain body part is moving incorrectly [33], [34], [35].

Some other sects of researchers identified theirs as "Informatization of manufacturing process" [36]. Researchers also identified the effect names "Customization of products" [37]. The other effects of adoption of 4IR technologies on H&S practices identified by researchers are "Networking of production lines"; "Business mode adjustment"; "Shortage of innovative human resource"; "Great development opportunity"; "Acceleration of economic restructuring"; "Shifting of global value chains"; "Creation of new positions"; "Creation of new positions"; "Broadening of social inequity"; "Generation of structural unemployment"; and

"Increase in production efficiency" [37], [38], [39], [34], [31]. On a general note, these effects were summarised under three (3) groups. These are: Sustainable Health and Safety; Improve Safety Inspections; and Reduce Injuries through Wearable Technologies.

2.0 Materials and Methods

2.1 Research design

This research used a quantitative methodology. A systematic questionnaire was used to collect data. Data analysis was performed using both descriptive and inferential statistics.

2.2 Research population

The research population consisted of professionals from construction enterprises in Abuja, FCT, as published on the Nigeria Directory Online website (www.directory.org.ng). The list comprises 201 construction enterprises, of which only 25 fall under the heading of "Construction and Renovation." These are the businesses pertinent to this research. A visit to the companies revealed a total of 669 construction specialists across the 25 enterprises. Therefore, the population size is 669.

2.3 Sampling frame

The study's sample frame consists of a roster of professionals from building firms in Abuja, as recorded in the Abuja Business Directory online, including Architects, Builders, Civil Engineers, Services Engineers, and Quantity Surveyors. The respondents' characteristics were obtained from the sample frame, from which samples were later chosen.

2.4 Sample size

The sample size of this research comprises the actual number of professionals selected based on the following criteria: knowledge of 4IR technology, participation in construction site safety decision-making, and years of professional experience. Only 127 professionals met these requirements, resulting in a sample size of 127.

2.5 Sampling technique

This study used purposive sampling, a kind of non-probability sampling, in which respondents were mandated to meet certain criteria. The prerequisites include comprehension of Fourth Industrial Revolution technologies, involvement in construction site decision-making, and requisite years of professional experience.

2.6 Method of data collection

A questionnaire was used to gather data for this investigation. The questionnaire was constructed with a five-point Likert scale style. The questionnaire had four parts (A - D), in addition to the accompanying cover letter. The first portion (portion A) of the questionnaire gathered data about the profiles of the professionals selected for the research. Sections B through D of the questionnaire pertained to the study's aims, accordingly. During this research, 127 questionnaires were sent to construction professionals from businesses operating in Abuja, as listed in the online Abuja Business Directory, of which 123 were collected and used for analysis. Consequently, the response rate was 96.85%.

2.7 Method of data analysis

Prior to initiating data analysis, a reliability test was conducted to evaluate the study instrument. Cronbach's alpha values over 0.700 indicate exceptional internal consistency dependability for the scale. This is considered satisfactory for data to be reliable. The reliability assessment revealed a Cronbach's Alpha value of 0.927, above the required threshold of 0.70 according to [40]. As a result, both the research questionnaire and the data it evaluates are reliable. Data analysis was then performed using descriptive statistics, such as percentages, frequency counts, and Mean Item Score (MIS), with inferential statistics, particularly correlation analysis. Frequency counts and percentages assessed the respondents' profiles, while Management Information Systems (MIS) and correlation analysis examined data relevant to the research objectives.

The MIS is evaluated on a scale ranging from 1.00 to 5.00, with the decision criteria for the MIS analysis detailed in Table 1. The procedure for calculating MIS in data analysis is outlined in Equation 1. The decision rules for the Spearman Rank correlation indicate that a correlation coefficient (r) of 0.10 to 0.29 reflects a small correlation; a r value of 0.30 to 0.49 represents a medium correlation; and a r between 0.50 and 1.0 indicates a strong correlation between the variables, as noted by [40]. $MIS = \frac{\Sigma W}{N}$--------------------- (1)

Where: Σ = Summation, W = Weight, and N = Total

Table 1: Decision rule for MIS analysis

Scale	MIS Cut-Off Point	Interpretation		
		Level of Severity	*Level of Significance*	*Level of Effectiveness*
5	4.01 - 5.00	Extremely Severe	Extremely Significant	Extremely Effective
4	3.01 - 4.00	Very Severe	Very Significant	Very Effective
3	2.01 - 3.00	Severe	Significant	Effective
2	1.01 - 2.00	Severe	Less Significant	Less Effective
1	0.01 - 1.00	Least Severe	Least Significant	Least Effective

Source: Adapted and Modified from [41]

3.0 Results and Discussion

3.1 Analysis of respondents' profile

Table 2 presents the profile of the survey respondents. Table 2 indicates that the respondents possess sufficient education to comprehend the issues posed and provide accurate data essential for the research. The professionals involved have shown sufficient experience to provide the dependable data necessary for this investigation. Furthermore, the profile delineated in Table 2 indicates that the experts possess the necessary expertise to provide the accurate data required for this investigation.

Table 2: Respondents' profile

PROFILE	STATISTICS	
Respondents' Profession	**Frequency**	**Percentage (%)**
Architect	20	16
Builder	12	10
Civil Engineer	17	14
Services Engineer	11	9
Quantity Surveyor	28	23
Others	35	28
Respondents' Highest Academic Qualification	**Frequency**	**Percentage (%)**
Higher National Diploma (HND)	11	9
Bachelor's Degree (BSc/B.Tech)	46	37
Master's Degree (MSc/MTech)	64	52
Doctoral Degree (PhD)	2	2
Respondents' Professional Qualification	**Frequency**	**Percentage (%)**
MNIA/ARCON	18	15
MNIOB/CORBON	12	10
MNSE/COREN	26	21
MNIQS/QSRBN	45	37
ISPON	7	6
Others	15	12
Respondents' Years of Experience	**Frequency**	**Percentage (%)**
1-5 Years	9	7
6-10 Years	21	17
11-15 Years	50	41
16-20 Years	24	20
Above 20 Years	19	15
Involvement in construction site safety management decision-making in the organisation	**Frequency**	**Percentage (%)**
YES	109	89
NO	14	11
TOTAL	**123**	**100**

3.2 Examination of barriers to adoption of 4IR technologies for H&S practices in construction projects

An analysis was conducted to evaluate respondents' perceptions of the severity of impediments to the use of Fourth Industrial Revolution technology for health and safety practices in building projects in Abuja, using Management Information Systems. The findings of the MIS study are shown in Table 3. Table 3 reveals

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that the main obstacle to the use of Fourth Industrial Revolution technology for health and safety standards in building projects is "Insufficient electricity" (MIS = 4.55). The least significant obstacle to the use of Fourth Industrial Revolution technologies for health and safety practices in building projects is the "incompatibility of technology with existing practices and present construction operations" (MIS = 3.27). The average severity of all identified obstacles to the implementation of Fourth Industrial Revolution technology for health and safety practices in building projects in Abuja is high (MIS = 3.74).

The results of this study align with those of previous research. Previous studies have indicated that the adoption rate of new technologies remains comparatively low in the construction sector, especially for addressing occupational safety and health risks, which is conventionally a labour-intensive endeavour in developing nations, consuming limited non-productive management resources. This is mostly ascribed to inadequate energy, scarcity of financial resources, limited access to wireless broadband networks, and insufficient expertise to run the technology. Regrettably, the construction sector exhibits a lack of enthusiasm in adopting Fourth Industrial Revolution technologies, concluding that these technologies are too costly [22]. Consequently, it is essential to identify the catalysts for the adoption of Fourth Industrial Revolution technologies in building.

Table 3: Barriers to the adoption of 4IR technologies for H&S practices in construction projects

Code No.	Barriers to the Adoption of 4IR Technologies for Effective H&S Practices in Construction Projects	MIS	Rank	Interpretation
C4	Insufficient electricity	4.55	1st	Extremely Severe
C17	Lack of top management and leadership support	4.17	2nd	Extremely Severe
C2	Lack of specialised professionals and technical skills	4.16	3rd	Extremely Severe
C24	Privacy of workers personal data is not guaranteed	4.10	4th	Extremely Severe
C23	No assurance of data security	3.98	5th	Very Severe
C3	Clients do not insist on the implementation of the processes	3.85	6th	Very Severe
C10	Poor technical capacity with no policy and regulation	3.81	7th	Very Severe
C25	4IR technologies are too expensive	3.81	7th	Very Severe
C8	Lack of capability to handle large size projects by SME construction firms	3.78	9th	Very Severe
C22	Ageing workforce resistant to change	3.78	9th	Very Severe
C1	Professionals are afraid to change the traditional way and adopt the new technologies and most importantly employ digital trainings	3.77	11th	Very Severe
C16	Lack of government regulation	3.76	12th	Very Severe
C12	Level of interest	3.71	13th	Very Severe
C5	Unavailability of financial resources	3.68	14th	Very Severe
C18	Creates liability concerns	3.67	15th	Very Severe
C7	Lack of sufficient skills to operate the technologies	3.65	16th	Very Severe
C6	Lack of access to the wireless broadband powered network	3.61	17th	Very Severe
C11	Lack of innovation in the construction industry	3.60	18th	Very Severe
C14	Fear of job losses	3.59	19th	Very Severe
C13	Lack of access to the wireless broadband powered network	3.58	20th	Very Severe
C15	Slim profit margins in the industry	3.54	21st	Very Severe
C21	Decision to use differs from client requirements	3.53	22nd	Very Severe
C9	The construction industry lacks growth for dynamic capabilities for detecting extensive grip of technologies	3.33	23rd	Very Severe
C20	Culture of the construction industry	3.30	24th	Very Severe
C19	Incompatibility of technology with current practices and current construction operations	3.27	25th	Very Severe
	Average MIS	***3.74***		***Very Severe***

3.3 Examination of the drivers for the adoption of 4IR technologies for effective H&S practices in construction projects

The findings of the MIS analysis conducted to evaluate respondents' perceptions of the factors influencing the adoption of 4IR technologies for effective health and safety procedures in building projects in Abuja are shown in Table 4. Table 4 indicates that the primary catalyst for the adoption of Fourth Industrial Revolution technologies in enhancing health and safety standards within building projects is "Preparing for the Adoption of Digital Drivers" (MIS = 4.16). The least important factor influencing the adoption of Fourth Industrial Revolution technology in health and safety procedures within construction projects is the "Provision of venture capital and supervision essential for educating and guiding future building initiatives" (MIS = 3.22). The average significance of all identified motivations for the implementation of Fourth Industrial Revolution technology in enhancing health and safety procedures in building projects in Abuja is substantial (MIS = 3.72).

The results of this study corroborate the conclusions of prior research. Past research has shown that the catalysts for the adoption of the Fourth Industrial Revolution (4IR) are crucial for accelerating digitisation and automating employment, which significantly impact people' career goals [23]. Moreover, it culminates in a high-level competency essential for emerging digital economies, which are propelled by sophisticated ICT infrastructure, making digital literacy an invaluable asset in these contexts [25], [24], [26]. Consequently, individuals' capacity to use and comprehend these advanced advances will ultimately promote their acceptance.

Table 4: Drivers for the adoption of 4IR technologies for effective H&S practices in construction projects

Code No.	Drivers for the Adoption of 4IR Technologies for Effective H&S Practices in Construction Projects	MIS	Rank	Interpretation
D10	Getting ready to adopt Digital drivers	4.16	1st	Extremely Significant
D17	More attention and investment for training and guidance	4.02	2nd	Extremely Significant
D13	Employment of high level of skilled manpower with digital literacy	4.02	2nd	Extremely Significant
D11	Getting ready to adopt Big data and cloud computing; Digital platform); Physical drivers (Autonomous Cars; 3D printing)	3.94	4th	Very Significant
D8	Provision of consideration, public policy, and technology governance	3.89	5th	Very Significant
D5	Provision of protections by the Government	3.86	6th	Very Significant
D9	Focusing more attention to attention given to training and guidance	3.81	7th	Very Significant
D16	Support and collaboration between government and other stakeholders	3.80	8th	Very Significant
D2	Training in advanced ICT infrastructures	3.79	9th	Very Significant
D4	Provision of supportive atmosphere by the Government	3.63	10th	Very Significant
D14	Acquisition of advanced ICT infrastructure	3.61	11th	Very Significant
D1	High level of skills acquisition for upcoming digital economies	3.59	12th	Very Significant
D7	Support and collaboration with relevant stakeholders	3.59	12th	Very Significant
D3	Government regulatory agencies' ability to be familiar with the rapidly changing 4IR landscape	3.47	14th	Very Significant
D15	Governments and regulators quickly becoming familiar with the rapidly changing 4IR landscape	3.41	15th	Very Significant
D12	Getting ready to adopt Biological drivers (Genetic Engineering; Neurotechnology)	3.35	16th	Very Significant
D6	Provision of venture capital, and oversight necessary to educate and direct on future building projects	3.22	17th	Very Significant
	Average MIS	**3.72**		***Very Significant***

3.4 *Determination of effects adoption of 4IR technologies on the H&S practices of workers in construction projects*

The data study conducted to assess the impact of 4IR technology adoption on the health and safety behaviours of construction workers used Spearman Rank correlation analysis. This was accomplished by examining the correlation between the use of Fourth Industrial Revolution technology and the health and safety practices of workers in building projects. Before doing the Spearman Rank correlation analysis, a preliminary assessment was conducted to evaluate the appropriateness of the data for this study. The reliability test conducted on the relationship between the adoption of Fourth Industrial Revolution (4IR) technologies and the health and safety (H&S) practices of construction workers, as well as the drivers for adopting 4IR technologies for H&S practices in Abuja, reveals no evidence of outliers. The scatterplot displays data points widely dispersed, indicating a strong correlation. This indicates that the dataset is suitable for Spearman Rank correlation analysis. Figure 1 illustrates the scatterplot depicting the correlation between the adoption of Fourth Industrial Revolution (4IR) technology and the health and safety (H&S) practices of workers in construction projects, as well as the motivators for using 4IR technologies for H&S practices in construction projects in Abuja.

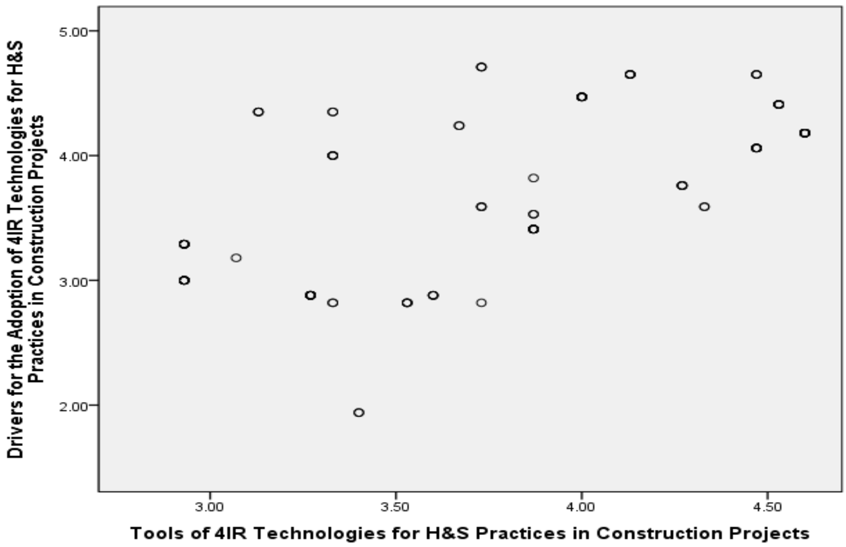

Figure 1: Scatterplot between adoption of 4IR technologies and drivers for adoption of 4IR technologies for H&S practices of workers in construction projects

Following the validation of data appropriateness, the Spearman Rank Correlation analysis was performed. The findings of the Spearman Rank Correlation study, which assesses the link between the use of 4IR technologies and the health and safety behaviours of workers in building projects, are presented in Table 5. The Spearman Rank Correlation analysis indicated a robust, positive, and significant relationship between the adoption of 4IR technologies and the health and safety practices of workers in construction projects, as well as the factors driving the adoption of 4IR technologies for effective health and safety practices in construction projects in Abuja.

The positive association suggests that enhancements in the factors promoting the use of 4IR technologies for effective health and safety practices in construction projects would lead to an increase in the adoption of these technologies in Abuja's construction sector. The observed correlation coefficient (r value) was 0.611, suggesting a significant relationship between the variables. Therefore, the correlation between the variables is substantial [40]. The measured P-value of 0.000 was below the significance threshold established for the research (0.01). This indicates a substantial correlation between the variables. The impact of using 4IR technology on the drivers for implementing excellent health and safety procedures in building projects in Abuja is substantial.

Consistent with the conclusions of this study, previous research has shown that digital technology is the primary catalyst for the Fourth Industrial Revolution (4IR). Almost all discoveries and advancements associated with the Fourth Industrial Revolution are facilitated and amplified by digital technology. This technological hub is rendering the whole planet digitally interconnected. Consequently, the Fourth Industrial Revolution emerges as the prevailing reality, introducing paradigm adjustments that will influence the management of Occupational Health and Safety.

Table 5: Relationship between adoption of 4IR technologies and H&S practices of workers in construction projects

VARIABLES		OBSERVATIONS		INFERENCES		
X_1	X_2	*r*	LOS	P_{value}	Strength of Relationship	Remark
Adoption of 4IR Technologies	Drivers for the Adoption of 4IR Technologies for H&S Practices	0.611	0.01	0.000	Strong	SS

KEY:
SS = Statistically Significant
r = Correlation Coefficient
LOS = Study's Level of Significance
P_{value} = Calculated Probability Value

4.0 Conclusion

Various strategies have been used worldwide to enhance workplace safety procedures, owing to the intricate nature of construction operations that present diverse hazards to workers' safety and well-being. This study used a quantitative research technique. A systematic questionnaire was used to gather data. Data analysis was conducted using both descriptive and inferential statistics. The primary obstacle to the use of Fourth Industrial Revolution technology for good health and safety standards in building projects is "Insufficient power." Overall, the highlighted obstacles to the use of Fourth Industrial Revolution technology for effective health and safety procedures in building projects in Abuja are quite significant. The study's findings indicated that the primary catalyst for the adoption of Fourth Industrial Revolution technologies in effective health and safety standards within building projects is "Preparing for the adoption of digital drivers." Overall, all discovered factors influencing the adoption of Fourth Industrial Revolution technology for effective health and safety procedures in building projects in Abuja are very important. Ultimately, it was disclosed that a robust, positive, and substantial correlation existed between the implementation of Fourth Industrial Revolution technologies for health and safety practices among workers and the motivators for adopting these technologies for effective health and safety practices in construction projects in Abuja. It may therefore be stated that the use of 4IR technologies significantly impacts the health and safety practices of workers in building projects, hence improving employee safety performance at construction sites.

In the light of the findings of this study, the following recommendations have been made:

i. In order to ensure good H&S practice at construction sites, construction firms should ensure that proactive measures are put in place to prevent the barriers to the adoption of 4IR from manifesting, especially with respect to "Insufficient electricity"; "Lack of top management and leadership support" and "Lack of specialised professionals and technical skills". This will increase the rate of readiness of construction firms to adopt 4IR technologies.
ii. In order for construction firms to enhance the adoption of 4IR technologies and to sustain it, there is a need to develop a mechanism which will be made up of both proactive and reactive measures based on the drivers for the adoption of 4IR technologies for effective H&S practices in construction projects identified in this study such as "Getting ready to adopt Digital drivers"; "More attention and investment for training and guidance"; and "Employment of high level of skilled manpower with digital literacy".
iii. In order to continually sustain a positive and significant relationship between the adoption of 4IR technologies and the H&S practices of workers in construction projects, construction firms should develop a policy that will bring about sustainability of improved level of adoption of 4IR technologies using the drivers for the adoption of 4IR technologies as a basis.

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