

COMPARATIVE EVALUATION OF EMERGING TECHNOLOGY ADOPTION FOR WORKPLACE SAFETY IN MANUFACTURING COMPANIES IN NIGERIA, CHINA AND USA

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ABSTRACT

This paper compared the adoption of emerging technologies for workplace safety in manufacturing industries across Nigeria, China and USA. Six emerging technologies were explored. Technological, and Organizational factors were used to express adoption determinant factors. Cross-sectional research design was adopted. Stratified random sampling technique was used. Sample sizes were 449, 440 and 345 for USA, China, and Nigeria respectively determined using Taro Yamane’s sample size determination formula. Data were collected using checklist and structured questionnaire based on 2-point and 5-point Likert scale respectively. SPSS version 24 was used for data analyses; percentages and weighted mean scores (WMS) were computed using descriptive statistics. Results revealed that availability of emerging technology was high in China (84.86%) and USA (87.86%) and low in Nigeria ((24.64%), emerging technology adoption was high in USA (WMS=4.46>3.00) and China (WMS=4.26>3.00) and low in Nigeria (WMS=2.94<3.00). The determinant factors were predominant in China (WMS=4.32 and 4.24 >3.00) and USA (WMS=4.53 and 4.57>3.00) but moderate in Nigeria (WMS=3.13 and 3.21 > 3.00). it was concluded that, emerging technology adoption is dominate and high in developed countries like USA and China due to improved technological and organizational infrastructures and readiness and low in developing countries due to lack of technological and organizational infrastructures. Hence. stakeholders in manufacturing sector in developing countries like Nigeria should provide infrastructure and regulatory framework required to meetup with the required standard and level of emerging technology for workplace safety in the manufacturing sector.

KEYWORDS

Emerging Technology, Adoption, Workplace Safety, Manufacturing Companies Nigeria, China And USA.

Introduction

Emerging technologies encompass new and innovative advancements that hold the potential to revolutionize industries and societal aspects. These technologies, such as artificial intelligence, blockchain, quantum computing, biotechnology, and renewable energy sources, are at the forefront of scientific progress and development (Yusuf, 2024) (Shalender et al., 2023). They play a crucial role in driving organizational and national development, offering opportunities for automation, enhanced product quality, secure transactions, and sustainable energy solutions. By adopting a collaborative approach and addressing challenges like infrastructure limitations and regulatory gaps, these technologies can pave the way for sustainable development, new business opportunities, and increased efficiency across various sectors. As game-changers in the business landscape, emerging technologies require proactive preparation from stakeholders to harness their full potential and ensure seamless integration into operational frameworks (Shalender et al., 2023).

Emerging technologies are increasingly recognized as crucial for enhancing safety in various industries, particularly construction. Building Information Modeling (BIM), wearable devices, artificial intelligence (AI), and robotics are identified as the most impactful technologies for improving safety performance (Dobrucali et al., 2022; Yap et al., 2021). These technologies enable better hazard identification, safety planning, inspection, monitoring, and awareness (Yap et al., 2021). To identify emerging safety technologies, researchers have employed methods such as topic modeling and diversity analysis of futuristic data (Jang & Seol, 2018). However, implementing new technologies in hybrid or mixed-generation systems poses challenges in predicting human error and behavior (Boring et al., 2022). Despite these challenges, studies have shown a positive and significant relationship between emerging technologies and construction safety performance (Dobrucali et al., 2022). As the manufacturing industry moves towards Manufacturing 4.0, the adoption of safety technologies is crucial for transforming it into a robustly developed industry with high safety standards (Yap et al., 2021).

The growth of emerging safety technologies is characterized by rapid development and an increasing rate of adoption (Myers, 2006). The rapid advancement and widespread adoption of emerging safety technologies is a testament to the significant investments in research and development, as well as the growing recognition of the critical role these technologies play in ensuring the safety and well-being of individuals, communities, and the environment (Nawaz et al., 2019) (Abbott, 2013). As these technologies continue to evolve, they often experience a period of exponential growth, transitioning from theoretical concepts to practical applications at a remarkable pace (Rotolo et al., 2015). This pattern of growth is characterized by radical novelty, relatively fast growth, coherence, prominent impact, and an inherent uncertainty and ambiguity (Rotolo et al., 2015). Researchers have sought to develop a more fundamental understanding of this technical emergence, proposing measures such as Novelty, Persistence, Community, and Growth as key indicators of a technology's evolution (Suominen & Newman, 2017). Some growth observed in emerging technology are Wearable Safety Devices: The market for wearable devices like smartwatches and fitness trackers, which monitor vital signs and alert users to potential health issues, has grown significantly (Brophy et al., 2021). Cybersecurity Solutions: With the increasing threat of cyber-attacks, the demand for advanced cybersecurity measures such as AI-driven threat detection and blockchain-based security has surged (Shahana et al., 2024). Smart Home Security Systems: The adoption of smart home technologies,

including security cameras, smart locks, and intrusion detection systems, has increased rapidly (Touqeer et al., 2021).

Emerging safety technologies have the potential to profoundly impact various facets of our society, from public health and workplace safety to overall security and beyond. Their impact can be transformative, enhancing the way we protect lives, property, and information. This influence extends beyond mere technological advancements, reshaping entire industries, creating new business models, and driving societal change. The intricate relationship between safety and sustainability has become increasingly evident, with experts highlighting the need to consider the safety-sustainability nexus. Technology innovation is recognized as a crucial driver of sustainability, as it can influence prosperity, consumption patterns, lifestyle, and social relations. (Huang, 2021). Automated Emergency Response: Technologies like AI and robotics can enhance emergency response by providing faster, more accurate information and assistance during disasters (Abid et al., 2021). Health Monitoring Systems: Advanced health monitoring technologies can detect early signs of illness or distress, leading to timely medical interventions and improved patient outcomes (Albahri et al., 2018). Industrial Safety Solutions: Innovations in industrial safety, such as IoT-enabled machinery that monitors and predicts failures, can prevent accidents and reduce downtime (Misra et al., 2022).

The use of technology significantly enhances workplace safety by improving monitoring and response capabilities (Yap et al., 2024). Implementing safety management software allows for real-time tracking of safety incidents, compliance with regulations, and management of risk assessments (Carbonari et al., 2011). Wearable safety devices, such as smart helmets or vests equipped with sensors, can monitor vital signs, detect hazardous conditions, and provide alerts to both employees and supervisors (Nnaji et al., 2021). Automated machinery, when properly integrated, can reduce human error and minimize exposure to dangerous tasks (Tatic & Tesic, 2017). By leveraging these technological solutions, organizations can gain more accurate data, streamline safety processes, and respond more swiftly to potential risks, ultimately creating a safer and more efficient work environment.

The evolution of workplace safety technologies reflects a profound journey from rudimentary practices to sophisticated systems designed to protect workers in various industries. Historically, workplace safety relied heavily on manual oversight and basic protective equipment, with limited means to detect and prevent hazards proactively (Hofmann et al., 2017; Walters et al., 2011). Early innovations, such as hard hats and safety goggles, marked significant advancements, yet they were often reactive measures responding to evident risks (Narain et al., 2021). As industrialization progressed, the complexities of workplace environments necessitated more advanced safety solutions. The introduction of regulatory bodies and safety standards in the early 20th century catalyzed the development and adoption of new technologies (Wang, 2011). Innovations in machinery safety, electrical protections, and fire prevention systems began to emerge, gradually shaping a more structured approach to workplace safety.

In recent decades, technological advancements have revolutionized safety practices, integrating sophisticated tools such as safety management software, wearable devices, and automated machinery (Podgorski et al., 2017). These technologies have enabled real-time monitoring, predictive analytics, and immediate response capabilities, significantly reducing the incidence of workplace injuries and fatalities (Rajendran et al., 2021). The historical progression of workplace safety technologies highlights the continuous quest for safer working conditions, driven by technological ingenuity and a

deepening understanding of occupational hazards. The concept of workplace safety has ancient roots, with early civilizations recognizing the need to protect workers from environmental dangers. Throughout history, workplace hazards and occupational medicine have been shaped by social evolution, changing production modes, and economic shifts. The development of safety practices can be traced back to prehistoric times, with evidence of protective structures like caves and feudal castles. As industries expanded, new hazards emerged, prompting the application of science and engineering to address safety concerns. The mid-1800s saw the emergence of factory laws and basic worker compensation (Hofmann et al., 2017). Over time, the focus of occupational safety research shifted from individual workers to broader organizational contexts, including safety-related training and leadership studies (Hofmann et al., 2017). This evolution of workplace safety practices reflects the ongoing efforts to mitigate occupational hazards throughout history (González-Hernández et al., 2021). The Industrial Revolution marked a transformative period in human history, ushering in unprecedented economic and technological progress. However, this era also witnessed the emergence of significant safety concerns in the workplace, which would ultimately lead to the development of modern safety regulations (Rikhotso et al., 2022). Prior to the Industrial Revolution, work was typically carried out in small, community-based settings, where the risks were relatively low and well-understood by the workers. The transition to the factory system, with its large-scale operations, powerful machinery, and crowded, poorly ventilated spaces, introduced a host of new hazards that were often poorly understood (Rikhotso et al., 2022). The expansion of the industrial sectors, including manufacturing, brought about advancements in machinery and production processes (Rikhotso et al., 2022). These advancements, while enabling mass production, also created unsafe work conditions that directly exposed workers to various occupational health hazards (Rikhotso et al., 2022). Musculoskeletal disorders, exposure to dangerous chemicals, and the risk of accidents from unguarded machinery were just a few of the challenges faced by industrial workers (Muthukumar et al., 2019).

While the adoption of emerging technologies offers the promise of transformative improvements in workplace safety, different countries have the different level of adoption based on some question raised about the long-term sustainability of such initiatives as well as technological readiness of different countries Sustainability considerations encompass a broad spectrum of factors, including economic viability, social equity, environmental impact, and ethical stewardship. Economically, sustainability entails evaluating the return on investment, total cost of ownership, and scalability of technology deployments, ensuring that safety initiatives remain financially viable and resilient to economic fluctuations. Social sustainability necessitates attention to the broader societal implications of technology adoption, including its impact on employment, community well-being, and social cohesion. From an environmental perspective, organizations must assess the ecological footprint of emerging technologies, considering factors such as energy consumption, resource utilization, and waste management throughout the technology lifecycle. Ethical sustainability, meanwhile, requires adherence to ethical principles, human rights standards, and corporate values in the development and deployment of emerging technologies, safeguarding against potential harms and fostering trust among stakeholders. By adopting a holistic approach to sustainability that considers environmental, economic, social, and ethical dimensions, organizations can future-proof their safety initiatives and create lasting value for both their employees and society as a whole. Therefore, this current study focused on comparative evaluation of emerging technologies adoption for workplace safety for manufacturing

sector across Nigeria, China and USA. The study identified the types of emerging technologies commonly adopted for workplace safety in the manufacturing industries across the selected countries, determine the level of adoption of emerging technologies for workplace safety across different industries across the selected countries and investigate the determinant factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across the selected countries

1.0 Methodology

2.1 Research Design

The study employed cross-sectional design. The cross-sectional design involved using descriptive technique based on percentages and weighted mean scores to quantify the types of emerging technologies adopted by manufacturing companies—in the selected countries for workplace safety protocols, the level of adoption of the emerging technologies for workplace safety protocols and the determinant factors influencing the adoption of the emerging technologies for workplace safety protocols

2.2 Study Area

The study is designed to gather data from manufacturing industries across multiple global locations, including Lagos and Port Harcourt in Nigeria, as well as selected industries in China, and the United States of America (USA). These locations have been strategically chosen to offer a broad and comprehensive view of how emerging technologies are being utilized in workplace safety protocols. By analyzing data from diverse cultural, economic, and regulatory environments, the study aims to provide a nuanced understanding of the global trends and regional variations in the adoption and impact of these technologies.

2.2.1 Nigeria

In this study, the major cities in Nigeria most populace states were sampled, namely Lagos city of Lagos state and Port Harcourt city in Rivers state. The most populous city in Nigeria, is a bustling hub of industrial activity, encompassing a diverse range of sectors including manufacturing, oil and gas, telecommunications, and financial services. (Ogundare, 2020) The city's industrial diversity presents a unique opportunity to assess the implementation and impact of emerging safety technologies across different sectors. However, Lagos also faces significant workplace safety challenges, driven by rapid industrialization, a high population density, and varying levels of regulatory compliance. (Afolabi et al., 2018). These factors combine to create a complex environment where the effectiveness of safety technologies can be critically evaluated. Port Harcourt, a critical hub for Nigeria's oil and gas industry, presents both opportunities and challenges in workplace safety. The hazardous nature of the oil and gas sector, coupled with the presence of other high-risk industries such as manufacturing and logistics, underscores the importance of adopting advanced safety technologies to protect workers (Nwankwo et al., 2020). The regulatory environment in Port Harcourt plays a pivotal role in shaping the adoption and enforcement of these safety technologies. Previous studies have highlighted the prevalence of health risks among workers in oil and gas facilities, stemming from factors such as the high

toxicological qualities of oil and gas components and the complex nature of exploration, extraction, and processing (Attih et al., 2022).

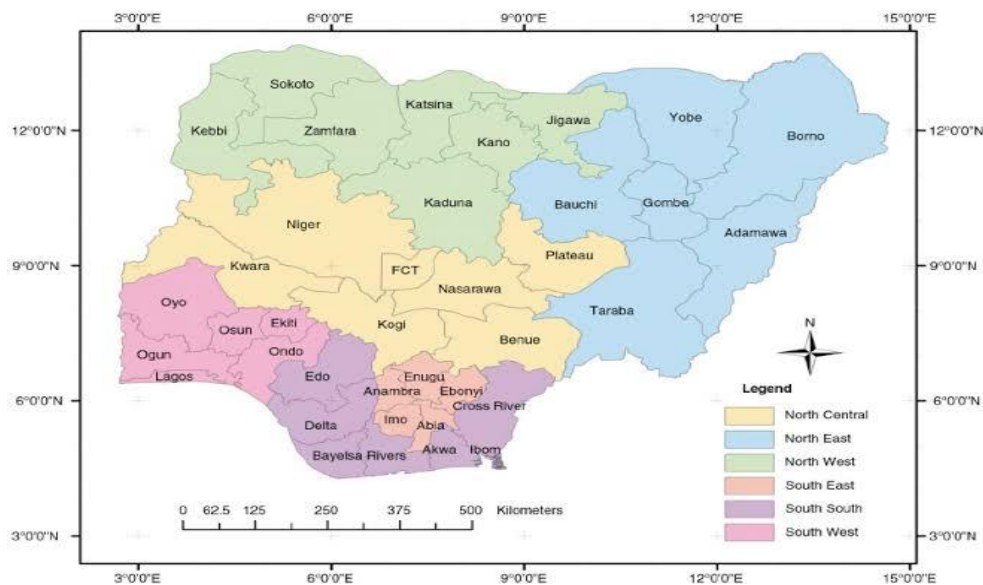


Figure 1: Map of Nigeria showing Lagos and Rivers State Source: Afolabi et al (2018)

2.2.2 China

The rapid industrialization and technological advancements in China present a unique opportunity to explore the integration of cutting-edge safety technologies into workplace practices (Arnold et al., 2020). China's industrial landscape is marked by its fast-paced growth and complex regulatory environment, offering a multifaceted perspective on the challenges and best practices associated with adopting new safety technologies. See Figure 2



Figure 2: Map of China showing distribution of Manufacturing firms Source: Berkeley sourcing group, 2016

2.2.3 USA

The United States, as a global leader in technological innovation, offers valuable insights into the development and implementation of advanced safety solutions across various industries (Hou et al., 2020; Nawaz et al., 2019; Babalola et al., 2023). The United States, with its comprehensive regulatory framework for workplace safety, enforced by agencies like OSHA, provides a benchmark for evaluating safety standards and practices (Xu & Moreu, 2021) see Figure 3

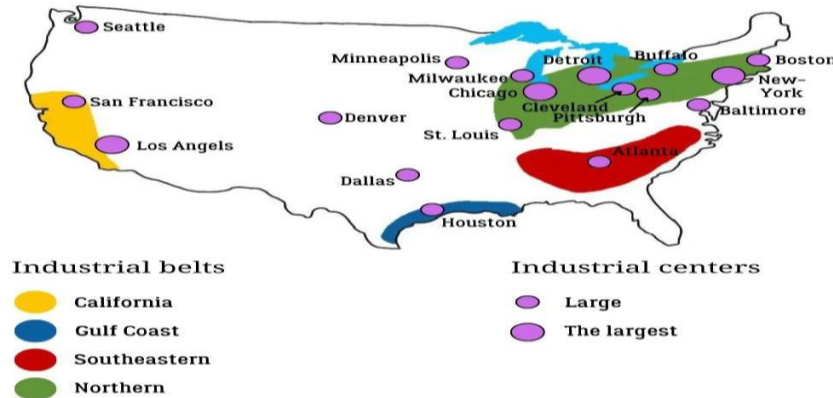


Figure 3 Map of USA showing manufacturing Industry distribution Source: Xu & Moreu, 2021

This paper focused on comparative evaluation of emerging technologies adoption for workplace safety in these three distinct countries, aiming to identify the types of emerging technologies commonly adopted for workplace safety in the manufacturing industries across these countries, determine the level of adoption of emerging technologies for workplace safety across different industries across these countries and investigate the determinant factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across these countries using Lagos and Port Harcourt in Nigeria, as well as in China and the USA. By collecting data from these varied geographical and industrial contexts, the study aims to provide a comprehensive assessment of the use and influence of emerging technologies in workplace safety protocols. This cross-cultural analysis will yield valuable insights into global trends, challenges, and best practices in the implementation of advanced safety technologies. The findings are expected to contribute significantly to the development of more effective and universally applicable safety strategies, ultimately enhancing workplace safety on a global scale.

2.3 Population for the study

The population of this study comprises manufacturing industries where workplace safety protocols and emerging safety technologies are critical. Given the relevance of safety in the manufacturing sector, a significant proportion of the firms in this sector are likely to require and implement advanced safety measures. According to the U.S. Census Bureau's 2020 County Business Patterns, there were approximately 38,583 establishments in industries where workplace safety protocols are essential. Similarly, China's National Bureau of Statistics reported that, as of the end of 2019, there were approximately 29,000 industrial enterprises above a designated size (defined as those with main business revenues of 20 million RMB or more). These enterprises encompass large-scale manufacturing and related sectors that heavily emphasize safety compliance.

Specific data for Lagos and Port Harcourt is limited; however, the Nigerian Bureau of Statistics (NBS) reported that, as of 2018, there were approximately 11,543 manufacturing establishments across Nigeria. Lagos, as the country’s commercial hub, and Port Harcourt, known for its dominance in the oil and gas sector, host a substantial number of these establishments. Based on industrial activity concentration, it is reasonable to estimate that around 10,000–15,000 companies in these cities operate in sectors requiring robust workplace safety measures. From the available statistics, the estimated total population size (N) of companies in the study is approximately 1,050,000 establishments across the United States, China, and Nigeria. This figure was derived by aggregating the following estimates: United States: 38,583 establishments, China: 29,000 industrial enterprises and Nigeria (Lagos & Port Harcourt): Estimated 5,000 companies on average

2.4 Sampling technique and sample size determination

The study adopts a stratified random sampling technique to ensure adequate representation of various facets of manufacturing sector across the countries selected for the study. Stratified sampling was chosen in this study because it allows for proportional representation of establishments based on their size. The stratification was done across three major countries, United States, China, and Nigeria, with further segmentation into different manufacturing firms. After stratification, a simple random sampling method was employed to select the actual participants within each stratum. This approach minimizes bias and enhances the generalizability of the findings.

The sample size was determined using Taro Yamane’s formula are presented in e Equation (3.1) below.

$$n = \frac{N}{1+N \times (e^2)} \tag{3.1}$$

Where: n is the sample size, N is the population size, and e is the sampling margin of error (0.05)

For China, the sample size of respondents was determined using Yemane’s formula: N= population size is 29,000, e = sampling error (0.05)

Substituting into equation: $n = \frac{29,000}{1+29,000 \times (0.05^2)}$, n = 399.85 ≈ 400, n = 400

However, 10% of the sample size which is 40 is added to the sample size to cover for possible non-returned and incorrectly filled question during the survey process. Thus, the sample size for the study is 440

For Nigeria, the sample size is evaluated as follows; N is population size is 5000 and e is the sampling error (0.05)

Substituting into equation: $n = \frac{5,000}{1+5000 \times (0.05^2)}$, n = 312.5 ≈ 313

However, 10% of the sample size which is 32 is added to the sample size to cover for possible non-returned and incorrectly filled question during the survey process. Therefore, the sample size for the study is 345

For USA, the sample size is calculated as follows: N is the population size is 38,583, e is the sampling error (0.05)

Substituting into equation: $n = \frac{38583}{1+38583 \times (0.05^2)}$, n = 408.5 ≈ 408

However, 10% of the sample size which is 41 is added to the sample size to cover for possible non-returned and incorrectly filled question during the survey process. Hence, the sample size for the study

is 449. Thus, the calculated sample sizes were 440, 345 and 449 respondents for China, Nigeria and USA.

2.5 Nature of Data

The study utilized both primary and secondary data sources to ensure a comprehensive analysis: Primary Data: Data was collected through structured questionnaires distributed among safety managers, compliance officers, and operations personnel from the sampled companies as well as checklist.

Secondary data used in this study were relevant literature, industry reports, regulatory documents, and previous research studies were reviewed to provide contextual insights and support the primary data findings. These secondary sources were obtained from journal articles, safety compliance reports, and publications from international regulatory bodies.

2.6 Methods of Data Collection and Instrument

To assess the adoption of emerging technologies for workplace safety protocols, a survey data collection approach was employed. The survey focused use of two research instrument, namely, checklist designed based on 2-point scale (available and not available) and structured questionnaire designed based on 5-point Likert-scale (Strongly Agree was assigned 5, Agree assigned 4, Neutral assigned 3, Disagree assigned 2 and Strongly Disagree assigned 1) with critical threshold of 3.00. The checklist was used to examine the type of emerging technology adopted the sampled manufacturing firms across the study areas. The questionnaire is subdivided into five main section; namely; Section A, which contain the socio-demographic of the sampled respondents in the sampled manufacturing firms across the study areas, Section B, which contain questionnaire items used to operationalize the response of the respondents on the level of adoption of emerging technologies for workplace safety in the sampled manufacturing firms and Section C which contain questionnaire items on determinant factors influencing the adoption of emerging technology for workplace safety in the sampled manufacturing firms. This section is further subdivided into section C1, C2 and C3 to capture Technological factors, Organizational factors and Environmental Factors as stated in TOE model. The questionnaire was distributed electronically, with follow-up reminders to ensure a high response rate, and validated through pre-testing.

A total of four hundred and forty-nine (449) questionnaires were served to respondents in USA, out of which four hundred and twenty-three (423) were completed and returned representing 94.05% return rate. A total of four hundred and forty (440) questionnaires were served to respondents in China, out of which four hundred and twenty-seven (427) were completed and returned representing 97.21% Likewise, a total of three hundred and forty-five (345) questionnaires were served to respondents in Nigeria, out of which three hundred and thirty (330) were completed and returned representing 97.97%. Generally, 96.30 of respondents participated in the research survey exercise and provided necessary information, which formed the basis for data presentation, and questionnaire response analysis presented in next section.

2.6 Method of Data Analysis

The data collected using the checklist were analyzed using descriptive statistics particularly percentage. Descriptive statistics based on percentage and weighted mean score (WMS) was used to analyses the questionnaire parts designed based on Likert scale. Thus, research objectives were fulfilled using descriptive statistics (percentage and weighted mean score. ANOVA and Post-hoc Tukey Multiple Comparison Test were used to test the hypothesis rained in the study. The results were presented in Charts and Tables. Statistical Package for Social Sciences (SPSS) was used for the analysis.

3.0 Results and Discussion

3.1 The types of emerging technologies commonly adopted for workplace safety in the manufacturing industries across the selected countries

In this study, checklist was used to assess the availability of different types of emerging technologies used in the manufacturing firms for workplace safety across the three countries selected for the study. The emerging technologies considered were; Internet of Things (IoT) sensors (for Real-time monitoring of hazardous conditions such as gas leaks, temperature, and humidity levels), Artificial Intelligence (AI) (for hazard detection (Predictive analytics for accident prevention, automated risk assessment, and incident analysis), Wearable safety devices (Smart helmets, exoskeletons, and smart vests to monitor vital signs and prevent fatigue-related accidents), Augmented Reality (AR)/Virtual Reality (VR) training tools (Simulated safety training scenarios for high-risk environments such as construction sites and chemical plants), Robotics and automation for hazardous tasks (Use of robotic arms and automated machinery to reduce human exposure to dangerous conditions), Drones for safety monitoring (Aerial surveillance of work sites for compliance checks and emergency response assessments) and Blockchain for safety compliance tracking (Secure and tamper-proof recording of safety inspections, audits, and compliance records.

Descriptive statistics analysis was carried out on the data obtained using the checklist. The analysis was done using percentage availability of the emerging technologies for workplace safety in the manufacturing sector in Nigeria, China and USA. Figure 4.1 present the results and revealed that in Nigeria, China and USA manufacturing firms respectively, there is 12%, 63% and 75% availability of Internet of Things (IoT) sensors for real-time monitoring of hazardous conditions, 15%, 84%, and 78% availability of Artificial Intelligence (AI) for hazard detection and predictive analytics for accident prevention, automated risk assessment and incident analysis, 22%, 93% and 88% availability of Wearable safety devices to prevent fatigue-related accidents, 12%, 85% and 87% availability of Augmented Reality (AR)/Virtual Reality (VR) training tools for simulating safety training scenarios in high-risk environments, 18%, 95% and 98% availability of Robotics and automation for hazardous tasks, 55%, 98% and 98% availability of Drones for safety monitoring and Arial surveillance and 38%, 85% and 82% availability of Blockchain for safety compliance tracking in the workplace.

These results showed that the manufacturing industries in USA and China have high level of availability of the emerging technologies for workplace safety and they are closely tied as concern the use of these current and emerging technologies for workplace safety in their manufacturing firms while Nigeria has very low level of availability of these emerging technologies except for drones which implied that Nigeria is lagging behind in area of provision of these emerging technologies for

workplace safety. In comparison, the overall average percentage availability of emerging technologies considered in this study for Nigeria, China and USA were 24.64%, 84.87% and 87.87% which showed that USA has the highest level of availability closely followed by China while Nigeria has very low level of availability

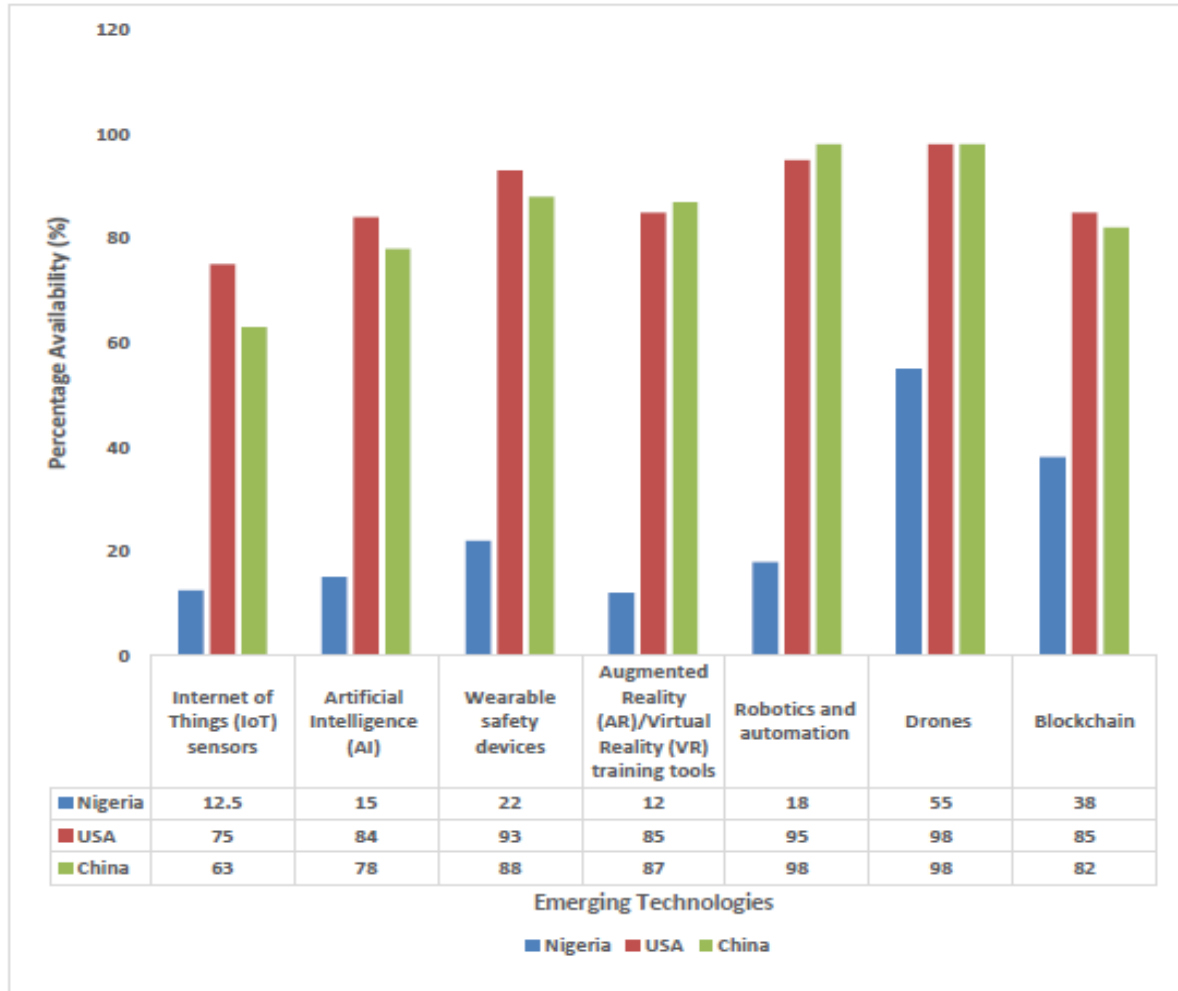


Figure 1 Type of Emerging Technologies for Workplace Safety available for manufacturing industries in Nigeria, China and USA.

3.2 The level of adoption of emerging technologies for workplace safety in the manufacturing industries across Nigeria, China and USA

Table 1, 2 and 2 showed the results of the descriptive statistics carried out to investigate the level of adoption of the emerging technologies for workplace safety in Nigeria, China and USA based on the response of the study respondents using weighted mean score. Eight questionnaire items were used to explore the opinion of the respondents of the level emerging technologies adoption specifically for workplace safety in their various manufacturing firms across the Nigeria, China and USA.

From Table 1, it was observed that out of the eight questionnaire items capturing the level of adoption of emerging technologies for workplace safety in Nigerian manufacturing firms, the respondents agreed to only three items; 5th, 7th and 8th, because their weighted means were greater than critical

value 3.00, they disagreed on four item; 1st, 2nd, 4th and 6th, because their weighted means were less than critical value 3.00 and undecided on one item. 3rd because the weighted means is equal to critical value 3.00. These results suggest that the respondents disagreed to majority of the questionnaire items capturing level of adoption of emerging technology for workplace safety showing low level of adoption. However, the overall weighted mean score (WMS=2.94) which summarizes the eight questionnaire items is also less than 3.00 which confirmed that majority of the sampled workers in the manufacturing firms in Nigerian concurred to the notion that there is low level of adoption of emerging technologies for workplace safety in their various firms.

From Table 2. it was observed that out of the eight questionnaire items capturing the level of adoption of emerging technologies for workplace safety in Chinese manufacturing firms, the respondents agreed to all the eight items because their weighted means were all greater than critical value 3.00. These results suggest that the respondents agreed to virtually all the questionnaire items capturing level of adoption of emerging technology for workplace safety showing high level of adoption. Also, the overall weighted mean score (WMS=4.26) which summarizes the eight questionnaire items is also greater than 3.00 which confirmed that most of the sampled workers in the manufacturing firms in China agreed to the supposition that there is high level of adoption of emerging technologies for workplace safety in their various firms.

Lastly, from Table 3. it was observed that out of the eight questionnaire items capturing the level of adoption of emerging technologies for workplace safety in USA manufacturing firms, the respondents agreed to all the eight items because their weighted means were all greater than critical value 3.00. These results entailed that the respondents agreed to virtually all the questionnaire items capturing level of adoption of emerging technology for workplace safety showing high level of adoption. Also, the overall weighted mean score (WMS=4.42) which summarized the eight questionnaire items is also greater than 3.00 which confirmed that most of the workers sampled in the study across the manufacturing firms in USA agreed to the notion that there is high level of adoption of emerging technologies for workplace safety in their various firms.

Table 1 level of emergency technologies adoption in manufacturing firms across Nigeria

| S/N | Level of Emergency Technologies Adoption | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|------------------|------------------|-----------------|------------------|------------------|-------------|------------------|
| 1 | I currently use recent technology in my regular work for safety purposes | 141.00 39.30% | 31.00 10.47% | 40.00 12.12% | 42.00 13.87% | 76.00 22.75% | 2.61 | Disagreed |
| 2 | Using technological equipment for safety purposes has become a routine for me in the workplace. | 126.00 35.60% | 40.00 12.12% | 40.00 12.12% | 58.00 18.06% | 66.00 20.16% | 2.69 | Disagreed |
| 3 | A substantial part of the safety requirement for my daily work depends on the technology. | 110.00 30.31% | 20.00 6.60% | 70.00 22.68% | 20.00 6.60% | 110.00 30.31% | 3.00 | Undecided |
| 4 | The daily safety of my work operations depends on the technology | 75.0 22.72% | 51.00 15.45% | 84.00 25.45% | 120.00 36.36% | 0.00 0.00% | 2.75 | Disagreed |
| 5 | I would gladly expand the use of the technology for safety purposes in my work activities | 70.00 21.21% | 30.00 9.09% | 0.00 0.00% | 200.00 60.60% | 30.00 9.09% | 3.27 | Agreed |
| 6 | I feel confident in using the technology for safety purposes in my workplace | 160.00 48.48% | 0.00 0.00% | 0.00 0.00% | 115.00 34.85% | 55.00 16.67% | 2.71 | Disagreed |
| 7 | My colleagues and supervisors encourage me to keep using the technology for safety purposes | 30.00 9.09% | 100.00 30.30% | 0.00 0.00% | 130.00 39.39% | 70.00 21.21% | 3.33 | Agreed |
| 8 | My safety outcome and productivity have noticeably improved due to the use of the technology | 100.00 30.30% | 30.00 9.09% | 30.00 9.09% | 70.00 21.21% | 100.00 30.30% | 3.12 | Agreed |
| Overall Weighted Mean Score | | | | | | | 2.94 | Disagreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

Table 2 level of emergency technologies adoption in manufacturing firms across China

| S/N | Level of Emergency Technologies Adoption | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|---------------|------------------|------------------|------------------|------------------|-------------|---------------|
| 1 | I currently use recent technology in my regular work for safety purposes | 0.00 0.00% | 50.00 12.05% | 50.00 12.05% | 115.00 27.71% | 200.00 48.18% | 4.12 | Agreed |
| 2 | Using technological equipment for safety purposes has become a routine for me in the workplace. | 0.00 0.00% | 50.00 12.05% | 100.00 24.10% | 65.00 15.66% | 200.00 48.18% | 3.52 | Agreed |
| 3 | A substantial part of the safety requirement for my daily work depends on the technology. | 0.00 0.00% | 115.00 27.71% | 100.00 24.10% | 0.00 0.00% | 200.00 48.18% | 3.40 | Agreed |
| 4 | The daily safety of my work operations depends on the technology | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 200.00 48.18% | 215.00 51.82% | 4.52 | Agreed |
| 5 | I would gladly expand the use of the technology for safety purposes in my work activities | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 100.00 24.10% | 315.00 75.9% | 4.76 | Agreed |
| 6 | I feel confident in using the technology for safety purposes in my workplace | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 115.00 27.71% | 300.00 72.29% | 4.72 | Agreed |
| 7 | My colleagues and supervisors encourage me to keep using the technology for safety purposes | 0.00 0.00% | 00.00 0.00% | 100.00 24.10 | 65.00 15.66% | 250.00 60.24% | 4.36 | Agreed |
| 8 | My safety outcome and productivity have noticeably improved due to the use of the technology | 0.00 0.00% | 0.00 0.00% | 30.00 7.23% | 70.00 16.87% | 315.00 75.90% | 4.69 | Agreed |
| Overall Weighted Mean Score | | | | | | | 4.26 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

Table 3 Level of emergency technologies adoption in manufacturing firms across USA

| S/N | Level of Emergency Technologies Adoption | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|---------------|----------------|------------------|------------------|------------------|-------------|---------------|
| 1 | I currently use recent technology in my regular work for safety purposes | 0.00 0.00% | 0.00 0.00% | 100.00 24.69% | 100.00 24.69% | 205.00 50.62% | 4.26 | Agreed |
| 2 | Using technological equipment for safety purposes has become a routine for me in the workplace. | 0.00 0.00% | 0.00 0.00% | 150.00 37.04% | 55.00 13.58% | 200.00 49.38% | 4.12 | Agreed |
| 3 | A substantial part of the safety requirement for my daily work depends on the technology. | 0.00 0.00% | 0.00 0.00% | 205.00 50.62% | 0.00 0.00% | 200.00 49.38% | 3.99 | Agreed |
| 4 | The daily safety of my work operations depends on the technology | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 200.00 49.38% | 205.00 50.62% | 4.51 | Agreed |
| 5 | I would gladly expand the use of the technology for safety purposes in my work activities | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 50.00 12.35% | 355.00 87.65% | 4.88 | Agreed |
| 6 | I feel confident in using the technology for safety purposes in my workplace | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 105.00 25.93% | 300.00 74.07% | 4.70 | Agreed |
| 7 | My colleagues and supervisors encourage me to keep using the technology for safety purposes | 0.00 0.00% | 00.00 0.00% | 100.00 24.70 | 55.00 13.58% | 250.00 61.73% | 4.37 | Agreed |
| 8 | My safety outcome and productivity have noticeably improved due to the use of the technology | 0.00 0.00% | 0.00 0.00% | 100.00 24.70% | 0.00 00% | 305.00 75.30% | 4.51 | Agreed |
| Overall Weighted Mean Score | | | | | | | 4.42 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

3.3 The determinant factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across the selected countries

Based on the Technology, Organization and Environment model for adoption. there are three major determent factor that decides the level of adoption of technology at organizational level. These factors are technological factors, organizational factors and environmental factors. This section explored the role played by the element of Technology and Organization factors in adoption of emerging technologies for workplace safety in the manufacturing firms operating in Nigeria, China and USA.

The results of the descriptive statistics carried out on the response of the study respondents based on weighted mean scale for the determinant factors are presented below.

3.3.1 Technological factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across Nigeria, China and USA

Table 4, 5 and 6 showed the results of the descriptive statistics carried out to investigate the role of the technological factors in deciding the adoption of emerging technologies for workplace safety in manufacturing firms operating in Nigeria, China and USA. Six questionnaire items were used to explore the opinion of the respondents of the role of technological factor in encouraging the adoption of emerging technologies particularly for workplace safety in their various manufacturing firms across the Nigeria, China and USA.

From Table 4, it was observed that out of the six questionnaire items capturing the role of the technological factors in adoption of emerging technologies for workplace safety in Nigerian manufacturing firms, the respondents agreed to four items; 1st, 4th 5th and 6th item, because their weighted means were greater than critical value 3.00, they disagreed on one item; 2nd item, because the weighted mean was less than critical value 3.00 and undecided on one item. 3rd because the weighted means is equal to critical value 3.00. These results implied that the respondents agreed to most of the questionnaire items which opined that technological factors played crucial role in adoption of emerging technology for workplace safety. Moreover, the overall weighted mean score (WMS=3.13) which summarizes the six questionnaire items is also greater than 3.00 which confirmed that majority of the workers in the manufacturing firms in Nigerian concurred to the notion that technological factors actually played roles in the adoption of emerging technologies for workplace safety in their various firms.

From Table 5. it was observed that out of the six questionnaire items capturing the role of technological factors in adoption of emerging technologies for workplace safety in Chinese manufacturing firms, the respondents agreed to all the six items because their weighted means were all greater than critical value 3.00. These results mean that the respondents agreed to virtually all the questionnaire items suggesting that technology-based factors played crucial part in the adoption of emerging technology for workplace safety. Also, the overall weighted mean score (WMS=4.32) which summarizes the six questionnaire items is also greater than 3.00 which confirmed that most of the workers in the manufacturing firms in China agreed to the supposition that technological factors played important part in the adoption of emerging technologies for workplace safety in their various firms.

Lastly, from Table 6. it was observed that out of the six questionnaire items capturing role of technological factors in adoption of emerging technologies for workplace safety in USA manufacturing firms, the respondents agreed to all the six items because their weighted means were all greater than critical value 3.00. These results supposed that the respondents agreed to virtually all the questionnaire items suggesting that technology-related factors are crucial determinant of emerging technology adoption for workplace safety. Also, the overall weighted mean score (WMS=4.53) which summarized the six questionnaire items is also greater than 3.00 which confirmed that most of the workers sampled in the study across the manufacturing firms in USA agreed to the notion that technological factors are crucial determinants factors of emerging technologies adoption for workplace safety in their various firms.

Table 4 Technological factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across Nigeria.

| S/N | Technological Factors | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|------------------|-----------------|-----------------|------------------|------------------|-------------|---------------|
| 1 | The technology use in my workplace for safety purposes are reliable and trustworthy. | 75.00 22.75% | 31.00 10.47% | 40.00 12.12% | 42.00 13.87% | 141.00 39.30% | 3.42 | Agreed |
| 2 | The technology use in my workplace for safety purposes ensure company secrets are secured and privacy maintained. | 126.00 35.60% | 40.00 12.12% | 40.00 12.12% | 58.00 18.06% | 66.00 20.16% | 2.69 | Disagreed |
| 3 | The technology use in my workplace for safety purposes are technically and operationally attractive | 110.00 30.31% | 20.00 6.60% | 70.00 22.68% | 20.00 6.60% | 110.00 30.31% | 3.00 | Undecided |
| 4 | The technology use in my workplace for safety purposes are highly desirable by other firms. | 0.00 0.00% | 51.00 15.45% | 84.00 25.45% | 120.00 36.36% | 75.00 22.75% | 3.36 | Agreed |
| 5 | The technology use in my workplace for safety purposes allow my company to customize their usage to our company current needs | 70.00 21.21% | 30.00 9.09% | 0.00 0.00% | 200.00 60.60% | 30.00 9.09% | 3.27 | Agreed |
| 6 | The technology use in my workplace for safety purposes gives my company room for variety of service providers rather than being locked into a single supplier | 160.00 48.48% | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 170.00 51.52% | 3.06 | Agreed |
| Overall Weighted Mean Score | | | | | | | 3.13 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

Table 5 Technological factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across China.

| S/N | Technological Factors | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|---------------|-----------------|------------------|------------------|------------------|-------------|---------------|
| 1 | The technology use in my workplace for safety purposes are reliable and trustworthy. | 0.00 0.00% | 50.00 12.05% | 50.00 12.05% | 115.00 27.71% | 200.00 48.18% | 4.12 | Agree |
| 2 | The technology use in my workplace for safety purposes ensure company secrets are secured and privacy maintained. | 0.00 0.00% | 50.00 12.05% | 100.00 24.10% | 65.00 15.66% | 200.00 48.18% | 3.52 | Agreed |
| 3 | The technology use in my workplace for safety purposes are technically and operationally attractive | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 200.00 48.18% | 215.00 51.82% | 4.52 | Agreed |
| 4 | The technology use in my workplace for safety purposes are highly desirable by other firms. | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 115.00 27.71% | 300.00 72.29% | 4.72 | Agreed |
| 5 | The technology use in my workplace for safety purposes allow my company to customize their usage to our company current needs | 0.00 0.00% | 00.00 0.00% | 100.00 24.10 | 65.00 15.66% | 250.00 60.24% | 4.36 | Agreed |
| 6 | The technology use in my workplace for safety purposes gives my company room for variety of service providers rather than being locked into a single supplier | 0.00 0.00% | 0.00 0.00% | 30.00 7.23% | 70.00 16.87% | 315.00 75.90% | 4.69 | Agreed |
| Overall Weighted Mean Score | | | | | | | 4.32 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

Table 6 Technological factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across China.

| S/N | Technologies Factors | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|---------------|----------------|------------------|------------------|-------------------|-------------|---------------|
| 1 | The technology use in my workplace for safety purposes are reliable and trustworthy. | 0.00 0.00% | 0.00 0.00% | 100.00 24.69% | 100.00 24.69% | 205..00 50.62% | 4.26 | Agreed |
| 2 | The technology use in my workplace for safety purposes ensure company secrets are secured and privacy maintained. | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 200.00 49.38% | 205.00 50.62% | 4.51 | Agreed |
| 3 | The technology use in my workplace for safety purposes are technically and operationally attractive | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 50.00 12.35% | 355.00 87.65% | 4.88 | Agreed |
| 4 | The technology use in my workplace for safety purposes are highly desirable by other firms. | 0.00 0.00% | 0.00 0.00% | 0.00 0.00 | 105.00 25.93% | 300..00 74.07% | 4.70 | Agreed |
| 5 | The technology use in my workplace for safety purposes allow my company to customize their usage to our company current needs | 0.00 0.00% | 00.00 0.00% | 100.00 24.70 | 55.00 13.58% | 250.00 61.73% | 4.37 | Agreed |
| 6 | The technology use in my workplace for safety purposes gives my company room for variety of service providers rather than being locked into a single supplier | 0.00 0.00% | 0.00 0.00% | 100.00 24.70% | 0.00 00% | 305.00 75.30% | 4.51 | Agreed |
| Overall Weighted Mean Score | | | | | | | 4.53 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

3.3.2 Organizational factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across Nigeria, China and USA

Table 7, 8 and 9 showed the results of the descriptive statistics carried out to investigate the role of the organizational factors in deciding or encouraging the adoption of emerging technologies for workplace place safety in manufacturing firms operating in Nigeria, China and USA. Five questionnaire items were used to explore the opinion of the respondents of the role of technological factor in encouraging the adoption of emerging technologies particularly for workplace safety in their various manufacturing firms across the Nigeria, China and USA.

From Table 7, it was observed that out of the five questionnaire items capturing the role of the organizational factors in adoption of emerging technologies for workplace safety in Nigerian manufacturing firms, the respondents agreed to four items; 1st, 3rd, 4th, and 5th, because their weighted means were greater than critical value 3.00 and undecided on one item. 2nd because the weighted means is equal to critical value 3.00. These results implied that most of the respondents agreed significant part of the questionnaire items which opined that organizational-related factors like large company size and favorable top management decision played crucial role in adoption of emerging technology for workplace safety. Moreover, the overall weighted mean score (WMS=3.21) which summarizes the five questionnaire items is also greater than 3.00 which confirmed that majority of the

workers in the manufacturing firms in Nigerian concurred to the supposition that organizational-related factors really played roles in the adoption of emerging technologies for workplace safety in their various firms.

From Table 8, it was observed that out of the five questionnaire items capturing the role of organizational factors in adoption of emerging technologies for workplace safety in Chinese manufacturing firms, the respondents agreed to all the five items because their weighted means were all greater than critical value 3.00. These results mean that the respondents agreed to virtually all the questionnaire items suggesting that organizational-based factors played crucial part in the adoption of emerging technology for workplace safety. Also, the overall weighted mean score (WMS=4.24) which summarizes the five questionnaire items is also greater than 3.00 which confirmed that most of the workers in the manufacturing firms in China agreed to the supposition that organizational factors like level of human and physical resources and company size in terms of finances and reach played important part in the adoption of emerging technologies for workplace safety in their various firms.

Lastly, from Table 9. it was observed that out of the five questionnaire items capturing role of organizational factors in adoption of emerging technologies for workplace safety in USA manufacturing firms, the respondents agreed to all the five items because their weighted means were all greater than critical value 3.00. These results supposed that the respondents agreed to virtually all the questionnaire items suggesting that organization-related factors such as company size, management decision and company infrastructure are crucial determinant of emerging technology adoption for workplace safety. Also, the overall weighted mean score (WMS=4.53) which summarized the six questionnaire items is also greater than 3.00 which confirmed that most of the workers sampled in the study across the manufacturing firms in USA agreed to the notion that organizational factors are crucial determinants factors of emerging technologies adoption for workplace safety in their various firms.

Table 7 Organizational factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across Nigeria.

| S/N | Organizational Factors | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|--|------------------|------------------|-----------------|------------------|------------------|-------------|---------------|
| 1 | The size of my company in terms of financial capacity helps my company to use emerging technology for workplace safety | 0.00 0.00% | 51.00 15.45% | 84.00 25.45% | 120.00 36.36% | 75.00 22.75% | 3.36 | Agreed |
| 2 | The size of my company in terms of national or global reach helps us to adopt and use technology for workplace safety | 110.00 30.31% | 20.00 6.60% | 70.00 22.68% | 20.00 6.60% | 110.00 30.31% | 3.00 | Undecided |
| 3 | Top management personals encourage the use technology for workplace safety. | 70.00 21.21% | 30.00 9.09% | 0.00 0.00% | 200.00 60.60% | 30.00 9.09% | 3.27 | Agreed |
| 4 | The company has the necessary physical infrastructure needed to use technology for workplace safety | 30.00 9.09% | 100.00 30.30% | 0.00 0.00% | 130.00 39.39% | 70.00 21.21% | 3.33 | Agreed |
| 5 | The company has the necessary human resources and training needed to use technology for workplace safety | 100.00 30.30% | 30.00 9.09% | 30.00 9.09% | 70.00 21.21% | 100.00 30.30% | 3.12 | Agreed |
| Overall Weighted Mean Score | | | | | | | 3.21 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

Table 8, Organizational factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across China.

| S/N | Organizational Factors | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|---------------|-----------------|------------------|------------------|------------------|-------------|---------------|
| 1 | The size of my company in terms of financial capacity helps my company to use technology for workplace safety | 0.00 0.00% | 50.00 12.05% | 50.00 12.05% | 115.00 27.71% | 200.00 48.18% | 4.12 | Agreed |
| 2 | The size of my company in terms of national or global reach helps us to adopt and use technology for workplace safety | 0.00 0.00% | 50.00 12.05% | 100.00 24.10% | 65.00 15.66% | 200.00 48.18% | 3.52 | Agreed |
| 3 | Top management personals encourage the use technology for workplace safety. | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 200.00 48.18% | 215.00 51.82% | 4.52 | Agreed |
| 4 | The company has the necessary physical infrastructure needed to use technology for workplace safety | 0.00 0.00% | 00.00 0.00% | 100.00 24.10 | 65.00 15.66% | 250.00 60.24% | 4.36 | Agreed |
| 5 | The company has the necessary human resources and training needed to use technology for workplace safety | 0.00 0.00% | 0.00 0.00% | 30.00 7.23% | 70.00 16.87% | 315.00 75.90% | 4.69 | Agreed |
| Overall Weighted Mean Score | | | | | | | 4.24 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

Table 9, Organizational factors influencing the adoption of the emerging technologies for workplace safety in the manufacturing industries across USA.

| S/N | Organizational Factors | SD. | D. | N | A. | SA | WMS | Remark |
|------------------------------------|---|---------------|---------------|------------------|------------------|------------------|-------------|---------------|
| 1 | The size of my company in terms of financial capacity helps my company to use technology for workplace safety | 0.00 0.00% | 0.00 0.00% | 100.00 24.69% | 100.00 24.69% | 205.00 50.62% | 4.26 | Agreed |
| 2 | The size of my company in terms of national or global reach helps us to adopt and use technology for workplace safety | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 200.00 49.38% | 205.00 50.62% | 4.51 | Agreed |
| 3 | Top management personals encourage the use technology for workplace safety. | 0.00 0.00% | 0.00 0.00% | 0.00 0.00% | 50.00 12.35% | 355.00 87.65% | 4.88 | Agreed |
| 4 | The company has the necessary physical infrastructure needed to use technology for workplace safety | 0.00 0.00% | 0.00 0.00% | 0.00 0.00 | 105.00 25.93% | 300.00 74.07% | 4.70 | Agreed |
| 5 | The company has the necessary human resources and training needed to use technology for workplace safety | 0.00 0.00% | 0.00 0.00% | 100.00 24.70% | 0.00 00% | 305.00 75.30% | 4.51 | Agreed |
| Overall Weighted Mean Score | | | | | | | 4.57 | Agreed |

Note; SA is Strongly Agree, A is Agree, N is Neutral SD is strongly Disagreed, D is Disagreed, WMS is Weighted Mean Score

3.4 Hypothesis Testing

There is no statistically significant difference in the level of adoption of emerging technologies for workplace safety in the manufacturing industries across the selected countries

Table 10 and 11 showed the results of ANOVA and Post-hoc Tukey Multiple Comparison Test used to test hypothesis on level of adoption of emerging technologies among the three sampled countries namely Nigeria, China and USA. The result revealed that P-value is 0.000 which is less than 0.05 significance level, thus, null hypothesis is rejected while alternate hypothesis is failed to reject. This implies that there is significant different in level of adoption of emerging technologies for workplace safety in the three sampled countries. This mean that the difference observed in the level of adoption and availability of emerging technologies for workplace safety in the manufacturing sector cross the sampled countries is substantial.

Thus, Post-hoc Turkey multiple comparison test was carried out to identify the position of the difference as reported in the ANOVA analysis. Table 4.36 present the results of the Turkey multiple comparison test and it revealed that there are two groups of variation, group A which comprises of Nigeria only and group B which comprise of China and USA Hence, there is no significant variation among members in same group but there is significant variation among members in different groups. Therefore. There is no significant difference in level of adoption of emerging technologies for workplace safety in manufacturing firms in China and USA but there is significant difference between China and Nigeria as well as USA and Nigeria. This similarly between emerging technology adoption for workplace safety between China and USA is due to their similar level of infrastructural development in the manufacturing sector which widely differs from the infrastructural development in Nigeria being an undeveloped country.

Table 10 ANOVA Test results on Hypothesis one based on Adoption of emerging technology

| H1 | Sum of Squares | Df | Mean Square | F | P-value |
|----------------|----------------|-----|-------------|-------|---------|
| Between Groups | 0.010 | 3 | 2.003 | 6.021 | 0.000 |
| Within Groups | 26.436 | 327 | 1.153 | | |
| Total | 26.446 | 330 | | | |

Table 11: Post-hoc Tukey Multiple Comparison Test for Adoption of Emerging Technologies

| Category | Means | Groups |
|----------|-------|--------|
| Nigeria | 3.13 | A |
| China | 4.32 | B |
| USA | 4.53 | B |

3.0 Conclusions

Based on the findings of this study on comparative assessment of emerging technologies adoption for workplace safety in manufacturing industries across Nigeria, China and USA, the following conclusions can be drawn: one, there is high level of emerging technologies availability in USA and China, while Nigeria has very low level of emerging technologies availability, and this disparity is linked to wide difference in industrial and infrastructural development between developed and underdeveloped countries two, there is high level of adoption of emerging technologies for workplace safety in China and USA, while the level of adoption in Nigeria is low lastly, The study found that technological and organizational factors are strong and key indicators propelling and motivating adoption of emerging technologies for workplace safety in Nigeria, China and Nigeria. however, these factors strongly support the adoption of emerging technologies for workplace safety in USA and China but moderate in Nigeria.

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