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PERCEPTION OF INFLUENCE OF DIGITAL TECHNOLOGY ON OCCUPATIONAL HEALTH SAFETY TRAINING AMONG ACADEMIC STAFF IN NIGERIAN UNIVERSITIES

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Abstract

Academic are busy to participate in physical OHS training because of many engagements with their students, administrative work and community service. As a result, they hardly find time to give proper attention to germane issues as their safety and health. This then calls for the use of digital technology to organise OHS training as it is expected to help these busy group of people incorporate the training alongside their busy schedule. The study examined the perceived influence of digital technology on occupational health safety training among academic staff in Nigerian universities. Five specific objectives with corresponding research questions were achieved and answered. Descriptive survey research design was employed and convenience sampling technique through on-line questionnaire was used to obtain information from the targeted respondents. One hundred well filled on-line surveys were analysed with the aid of descriptive statistics. The empirical findings indicated that the respondents expressed adequate knowledge about the occupation health hazard associated with their profession but had low exposure to the application of digital technology such as 3D visualization and Virtual Reality (VR). The study revealed that the digital technology influenced Occupational Health and Safety (OHS) training, but the academic staff encountered hindrances with the use of digital technology training for OHS training. It is concluded that digital technology played a vital role towards OHS training and there is a need for regular capacity programmes using digital technology tools which aimed at helping management to address OHS needs of academic staff.

Keywords: Digital technology, Occupational Health and Safety, Safety Training, University Academic Staff, Nigerian Universities

Introduction

Academic staff are workers in Colleges of Education, Polytechnics and Universities whose primary responsibility is to teach, carry out research and engage in community service. They are important in the economic development of any nation because they form the bedrock of production for human capital resources. The efficiency of a nation's workforce depends to a great extent on how the academic staff deliver their services. They are relevant to individuals and the nation as a whole. Solutions to challenging situations are expected to emanate from researches carried out by these workers.

For academic staff to perform optimally, they ought to operate in a safe and healthy work environment because the performance of workers may be related to their health status. The work schedule of the academic is fraught with occupational hazards. They are exposed to subtle but severe bodily pains and injury which manifest in visual/auditory strains as well as psychosocial hazards. This has been compounded by prevalent economic situation in Nigeria and non-enforcement of existing safety laws in various universities. There is also increasing psychosocial risks emanating from high workloads and pressure of meeting deadlines. Adequate facilities needed to perform their duties are not readily available because of lack of fund from the Nigerian government. Lecture halls, offices, safety equipment are not adequately provided by the government. This, no doubt, has exposed academic staff members to occupational risks and hazards. The situation is made worse in these educational institutions where the risks and hazards may not be feasible but potentially harmful, and where adequate sensitisation and training awareness programmes are inadequate. Most of the workers are, therefore, ignorant of the risks surrounding their workplace. They may not be able to mitigate against the risks with appropriate precautionary measures to further enhance their safety at work.

Psychosocial risks, work-related stress and non-communicable diseases among workers are preventable. About two million occupational fatalities occur annually around the world and the highest proportion of workplace deaths are caused by work-related diseases (ILO, 2003). Besides, there are 270 million fatal and nonfatal occupational accidents in the world (Hämäläinen, et al., 2006).

Similarly, employers report about 2.8 million nonfatal workplace injuries and illnesses in 2017, and this account for over 100,000,000 production days lost due to work-related injuries (Vuoto, 2019). In addition, recent World Health Organisation's (WHO) estimates the fraction of the global disease burden in the general population resulting from deaths and disability is about 2.7 per cent (WHO, 2018).

Most recent figures suggest that ergonomic factors, injury risk factors, particulate matter, gases, fumes and noise make the largest contributions to the total global burden of occupational disease (Driscoll, 2018). Twenty per cent of lower back and neck pain, and 25 per cent of hearing loss in adults are caused by occupational hazard exposures (WHO, 2018). This suggests both that occupational exposures to traditional and well-known harmful physical, chemical, and biological agents continue to occur on a large scale, and that there is still some way to go before the trend of increasing levels of occupational exposure to such risk factors is reversed globally.

As a result, there is need for regular OHS training in the universities to raise the awareness and provide precautionary measures against the occupational hazards. With the busy nature of work schedule of Nigerian universities academics, organising regular OHS training has been a challenge. The recent outbreak of COVID-19 epidemic has hampered the gathering of a large number of people. Most of the Nigerian universities have been using on-line teaching to deliver their lecture in a bid to reduce possible spread

of the deadly virus. The use of digital technology for safety training has become imperative to achieve the aim of keeping the busy academic abreast of germane issues pertaining to their safety and health at work.

Digital technology has been described as a branch of scientific or engineering knowledge that deals with the creation and practical application of digital or computerised devices, methods, or systems. This can be used to ensure safety at workplace. Occupational Health and Safety as a discipline with a wider scope aims to promote and maintain highest degree of physical, mental and social well-being of workers in all occupations including academic within the universities. This involves prevention of health-related workplace accidents, the protection of workers from risks, and creation of safe working environment to enhance physical and mental health of workers (ILO, 2003).

Occupational health can be premised on three different objectives. These include the maintenance and promotion of workers' health and working capacity, the improvement of working environment and work to become conducive to safety and health, and development of work organizations and working cultures in a direction which supports health and safety at work. This promotes a positive social climate and smooth operation and may enhance productivity of the undertakings (Kendall, 2006). Technology in the workplace promotes safety and provides better working conditions to increase workers' productivity. Workplace injuries are still frequent, and organizations need to take responsibility to ensure employees are safe at work. Using technology to ensure employee safety is not only fundamental to comply with; it is also important to reduce accidents at work and fatalities (Melo, 2018).

Statement of the Problem

There is little or lack of consideration for occupational health and safety in Nigerian universities because it is not associated with popularly recognised occupational hazards, diseases and injuries like some other occupations such as mining, oil and gas extraction, construction, manufacturing, health care and highly industrialised environment. However, there are inherent risks and hazards, which are often not recognised, which can pose as threats to health and safety of academic. These need to be given consideration to achieve effective delivery of services. Academic staff die slowly because of occupational risks and hazards such as visual strain, vocal strain, psychological trauma, hypertension and musculoskeletal disorder. There is a need to increase workplace safety and health of academic staff in Nigeria as they struggle to contribute to the economy of the nation.

Preventive and precautionary measures need to be regularly disseminated and activities geared towards raising the awareness and knowledge level of the academic about workplace hazards must be put in place. How can digital technology help in ensuring regular safety training for academic in Nigerian universities? Several studies have examined the importance of training in improving occupational health and safety of Nigerian workers, but little has been done on the importance of digital technology for safety training and also to focus on service delivery institutions like Nigerian universities

with perceived low occupational risks and hazards. Hence, the need for this study to examine the perceived influence of digital technology on OHS training of academic Staff in Nigerian Universities.

Objectives

The main objective of this study is to examine the influence of digital technology on the Occupational Health Safety of Academic Staff in Nigerian Universities while the specific objectives are to:

1. assess the awareness level of the academic staff about their occupational health hazards;
2. examine the level of awareness of academic staff about digital technology for OHS training in Nigerian universities;
3. assess the frequency of usage of digital technology for OHS training among academic staff in Nigerian universities;
4. evaluate the influence of digital technology on OHS training of academic staff in Nigerian universities;
5. identify some of the challenges of the use of digital technology training on academic staff in Nigerian universities.

Research Questions

1. What is the awareness level of academic staff about their occupational health hazards?
2. What is the level of awareness of academic staff about digital technology for OHS training in Nigerian universities?
3. What is the frequency of usage of digital technology for OHS training in Nigerian universities?
4. Do academic staff perceive the influence of digital technology on OHS training in Nigerian universities?
5. What are the challenges of the use of digital technology training on academic staff in Nigerian universities?

Methodology

The study adopted the descriptive survey research design. The population of the study comprised all the academic members of staff in the Nigerian universities. A convenience sampling method was chosen by sending on-line survey to all the universities. A total of 100 academic staff respondents were used as sample from Federal, State and private universities. Data were collected with the aid of research instrument developed and validated by the researcher tagged 'Digital Technology and Occupational Health Safety Training among Academic Staff in Nigerian Universities Scale' (DTOHSTASNUS). The scale was face validated by three educational researchers, while the test-retest technique using 10 academic staff that were not part of the study sample yielded a reliability coefficient of 0.72. The questionnaire sought demographic information, hazard knowledge, usage of digital technology awareness, frequency of usage and the influence

of digital technology on occupational health safety training. Descriptive statistics comprised simple percentage was used to analyse research questions one, two, three and five while correlation analysis was employed to answer research question four.

Results

Research Question 1: What is the awareness level of academic staff about occupational health hazards?

Table 1: Descriptive statistics showing the academic staff level of occupational health hazard awareness (in percentage).

Items	True	Very True	Not Sure	Not True
Vocal strains, injuries and discomfort	42.6	34	17	6.4
High work load	36.2	59.6	4.2	0
Performance targets	48.9	44.7	4.4	2.0
Visual Strain due to long hours of exposure to computer screen	36.2	59.6	2.1	2.1
Fire hazards	14.9	12.7	36.2	36.2
Hot-desking	44.7	12.8	31.9	10.6
Potential high stress environment	40.4	51.1	4.25	4.25
Musculoskeletal Disorder (MSD)	48.9	27.7	17	6.4
Repetitive or Sustained Awkward and/or Static Postures	59.6	23.4	14.9	2.1

Table 1: Empirical findings indicated that the majority of the respondents had high level of awareness of the occupation health hazard associated with their profession, considering the sum of the responses within the purview of true and very true, 76.6, 95.8, 93.6, 95.8, 57.8; 91.5, 76.6 and 8.3 which are majority reiterated awareness of vocal strains, injuries and discomfort; high work load; performance targets; visual strain due to long hours of exposure to computer screen; hot-desking; potential high stress environment; Musculoskeletal Disorder (MSD); and repetitive or sustained awkward and/or static postures respectively. While 72.4 which was a majority of the respondents were not sure and not true that about the fire hazard in academic environment. This may be because the academic environments do not use heavy equipment that may expose academic staff into this kind of hazard unlike industrial firms where production is a function of advance electrical gadgets where workers prone to fire hazard. This finding concurs with the previous studies where full awareness of both physical, occupational safety and health hazards among workers was acknowledged (Reis *et al.* 2019; Abdi Zarrini , *et al.,* 2018; Prajwa, *et al.,* 2020; Atakora and Stenberg, 2020).

Research Question 2: What is the level of awareness of academic staff about digital technology for OHS training in Nigerian universities?

Table 2: Descriptive statistics showing the level of awareness of academic staff about digital technology for OHS training in Nigerian universities (in percentage).

Items	Aware	Very Aware	Not Aware	Not Sure
Awareness of the various digital technology on Occupational Health and Safety Training	38.3	12.8	23.4	25.5
Awareness of training on 3D visualization and Virtual Reality (VR) software to create virtual work environment promoting OHS	38.3	2.2	10.6	48.9
Familiarity with training on Satellite phones and messengers to reduce risks of long journeys and track the location of workers for potential safety risk	29.8	19.1	17.1	34
Familiarity with training on wearable technology accessories which monitor the health and safety of workers	27.7	12.8	8.5	51.0
Awareness of training on Radio Frequency Identification (RFID) to transmit, retrieve, and store data to identify the status of workers and objects is a digital technology on OHS in my university	27.7	4.2	21.3	46.8
Awareness of training on 3D CAD visualization software for safety planning, accident investigation and facility maintenance safety used for OHS	21.3	6.4	23.4	48.9
Awareness of training on on-line systems to improve construction health and safety including safety training and education, risk identification, safety monitoring and evaluation and safety inspections	31.9	10.6	14.9	42.6
Knowledge of training on people technologies as digital tools applied to ensure the health and safety of workers by what they wear.	31.9	17	17	34.1
Awareness of training on Apps like DataScope to create OHS checklist, hazard identification, and record information from mobile device for crisis management.	21.3	2.2	19.1	57.4
Awareness of training on robotics, AI (Artificial Intelligence), and automation to reduce repetitive tasks causing musculoskeletal disorders or mental health risks	38.3	10.6	10.6	40.5
Awareness of training on cloud computing and communications networks on OHS	51.1	8.5	8.5	31.9
Awareness of training on quantum computing on OHS	19.1	4.3	25.5	51.1
Awareness of training on e-retail and e-waste on OHS	27.7	2.1	17	53.2

Table 2: Empirical findings reveal that 51.1 of them said that the awareness of the various digital technology on OSH training was true and very true of them, 25.5 were not sure while the remaining ones were not aware about the statement. On aware of training on 3D visualizati*on and Virtual Reality (VR) software for creating virtual work environment in promoting OHS, 38.3 and 48.9 were aware and not sure of their

familiarisation with it. Besides, 17.1 and 34 of the respondents said that they were not aware and not sure of their familiarity with training on Satellite phones and messengers to reduce travel risks and track the location of workers for potential safety risk. While, only handful of them, that is, 29.8 and 19.1 attested that they were aware and very aware respectively. Moreover, 51.0 which is majority were not sure of their familiarity with wearable technology accessories as a training gadget towards OHS.

Also, 21.3 and 46.8 were not aware and not sure of the existence of training on Radio Frequency Identification (RFID) to transmit, retrieve, and store data to identify the status of workers and objects. 23.4 and 42.6 were not aware and not sure regarding the awareness of training on 3D CAD visualization software for safety planning, accident investigation and facility maintenance safety used for OHS. Awareness of training on Apps like DataScope to create health and safety checklist, hazard identification, and record information from mobile device for crisis management was disagreed by 76.8 of the respondents as being not aware and not sure, respectively.

In addition, 59.6 which was majority concurred that they aware of training on cloud computing and communications networks as well as quantum computing on OHS. It is clear to deduce that academic staff's familiarity with the OHS training facilities was not encouraging as majority opined that they were not aware and even not sure about the awareness of the applications needed to acquire OHS knowledge. This could be because of low level of availability and lack of accessibility to these packages in tertiary institutions in Nigeria.

Research Question 3: What is the frequency of usage of digital technology for OHS training in Nigerian universities?

Table 3: Descriptive Statistics showing the frequency of usage of digital technology for OHS training in Nigerian universities (in percentage).

Items	Whenever needed	Often	Seldom	Not at all
Virtual Reality (VR) software	6.4	6.4	23.4	63.8
3D visualization software	8.5	0	23.4	68.1
Satellite phones, GPS and GPS messengers.	23.4	19.1	34	23.4
Wearable technology accessories	10.6	14.9	31.9	42.6
Radio Frequency Identification (RFID)	10.6	12.8	21.3	55.3
Smart Sensors and Wireless Network	12.8	29.8	23.4	34
GIS and Global Position Systems (GPS)	23.4	10.6	23.4	42.6
3D CAD visualization software	6.5	2.0	29.8	61.7
Building Information Modelling (BIM)	4.3	8.5	23.4	63.8
on-line Systems	34	29.8	21.3	14.9
on-line Databases	23.4	38.3	23.4	14.9
People Technologies	12.8	21.3	34	31.9
Drones	6.5	2.0	31.9	59.6
DataScope apps	5.1	5.5	29.8	59.6
Robotics, AI (Artificial Intelligence) and automation	6.4	0	21.3	72.3
Cloud computing and communications networks	10.6	14.9	42.6	31.9
Quantum Computing	5.3	1.1	25.5	68.1
E-retail and E-waste	12.8	4.2	27.7	55.3

Table 3: Empirical findings reveal that majority of them had never used some of these digital technology for OHS training such as Virtual Reality (VR) software (63.8); 3D visualization software (68.1); Wearable technology accessories (42.6) Radio Frequency Identification (55.3); 3D CAD visualization software (61.7); Building Information Modelling (63.8); Drones (59.6); Robotics, AI (Artificial Intelligence) and automation (72.3); Quantum Computing (68.1) and E-retail and E-waste (55.3), while, handful of them make use of these platform whenever it is needed. For the remaining items, 42.6, 34, and 34, which is majority seldomly used cloud computing and communications networks, Satellite phones, GPS and GPS messengers, and people technologies, respectively. Giraldo (2014) argued that effectiveness of digital technology on occupational safety and training depend on lecturers' attitudes and their capacity to make use of the tools. This may require post-training support (Zhao and Bryant 2006). Gautreau, (2011) suggested that the motivation of faculty members has a considerable impact on their technology integration and practice for occupational health and safety.

Research Question 4: How do academic staff perceive the influence of digital technology on OHS training in Nigerian universities

Table 4: Descriptive Statistics showing the academic staff perception towards the influence of digital technology on OHS training in Nigerian universities (in percentage).

Items	SA	A	SD	D
Improves work-life balance due to telework	31.9	55.3	2.2	10.6
Reduction of stress associated with commuting	36.2	55.3	4.5	4.0
Reduced need for work-related travel	38.3	53.2	4.5	4.0
Real-time monitoring of exposure to hazard	40.4	46.8	12.8	0
Increased worker control over work-life balance	25.5	57.4	0.1	17
Reduced need for real-world trial of prevention measures	27.7	48.9	4.3	19.1
Increased understanding of human behaviour and its underlying mechanisms	29.8	48.9	6.4	14.9
Cost-effective way for developing countries to keep pace with progress in OSH	34	48.9	2.2	14.9
Improved and widened access to education and training on OHS	46.8	44.7	8.5	0
Improved collection and sharing of accurate OSH record	31.9	55.3	0	12.8
New opportunities for OSH research, development and learning	36.2	51.1	2.1	10.6
Improved communication of OSH practice	36.2	51.1	0	12.7
ICT and other new technologies to spread health and safety knowledge and improve workers OSH skills and training	46.8	44.7	0	8.5
ICT could help to improve workplace safety and health outcomes by improving OSH inspection	48.9	44.7	0	6.4
Digital technologies can advance OSH allowing the removal of workers from hazardous working situations, through innovative ways of monitoring exposure	38.3	55.3	0	6.4
Digital technologies improve the quality of work by relieving workers of repetitive or routine tasks	44.7	48.9	0	6.4
Digitalization also offers opportunities for more effective OSH training, advanced workplace risk assessment, communication and OSH inspection	38.3	53.2	0	8.5
Digital technologies may also permit workers to benefit from higher levels of autonomy and flexibility.	44.7	48.9	0	6.4
Digital technologies facilitate the access of a more diverse workforce to the labour market, in particular vulnerable groups such as disabled people, ageing workers and those with care duties at home	36.2	57.4	0	6.4
Improved automated prevention measures and increased understanding of risk-taking behaviour.	40.4	51.1	0	8.5

Strongly Agree (SA); Agree (A); Disagree (D) and Strongly Disagree (SD)

Table 4: Empirical findings indicated that it has enhanced in improving work-life balance due to telework (31.9, 55.3); reduction of stress associated with commuting (36.2, 55.3); reducing need for work-related travel (38.3, 53.2); ensuring real-time monitoring of exposure to hazard (40.4, 46.8); increasing worker control over work-life balance (25.5, 57.4); reducing need for real-world trial of prevention measures (27.7, 48.9); increasing understanding of human behaviour and its underlying mechanisms (29.8, 48.9);

improving and widening access to education and training on OHS (46.8, 44.7); improving collection and sharing of accurate OSH record (31.9, 55.3). Others include creating new opportunities for OSH research, development and learning (36.2, 51.1); improving communication of OSH practice (36.2, 51.1); improving workplace safety and health outcomes by improving OSH inspection (48.9, 44.7); allowing the removal of workers from hazardous working situations, through innovative ways of monitoring exposure (38.3, 55.3); improving the quality of work by relieving workers of repetitive or routine tasks (44.7, 48.9); offering opportunities for more effective OSH training, advanced workplace risk assessment, communication and OSH inspection (38.3, 53.2); permitting workers to benefit from higher levels of autonomy and flexibility (44.7, 48.9); facilitating the access of a more diverse workforce to the labour market, in particular vulnerable groups such as disabled people, ageing workers and those with care duties at home (36.2, 57.4); and improving automated prevention measures and increased understanding of risk-taking behaviour (40.4, 51.1) as having majority strongly agreed and agreed to the statements as shown in the brackets. Gegenfurtner *et al.,* (2020) acknowledged that webinar-based training programs was effective for occupational safety of the employees. Also, Dowling-Hetherington et al. (2020) suggested that the most commonly used digital technology tools to support learning on occupational health and safety included clouds for files sharing and internet in searching for information.

Research Question 5: What are the challenges of the use of Digital Technology Training on academic staff occupational health and safety?

Table 5: Descriptive Statistics showing the challenges of the use of digital technology Training on academic staff occupational health and safety.

Items	SA	A	SD	D
Perceived need to be 'available' at all times, poorer work-life balance	27.7	44.7	4.2	23.4
Isolation (remote working and lack of social interaction)	25.5	51.1	6.4	17
Cyber-bullying, -aggression and -attacks	27.7	38.3	2.1	31.9
Job insecurity	25.5	51.1	6.4	17
Increased risk to security and privacy from the collection and recording of sensitive personal information	23.4	53.2	0	23.4
The loss of jobs and roles	17	55.3	4.3	23.4
Increased ergonomic risk from increasing use of mobile devices and sedentary work leading to increased risk of associated health problems (MSDs, visual fatigue, obesity, and heart disease.	29.8	51.1	2.1	17
Increased risk of incidents and exposures from lack of risk assessment in remote workspaces, particularly public places (cafes, transport systems) OSH	23.4	48.9	4.3	23.4

Strongly Agree (SA); Agree (A); Disagree (D) and Strongly Disagree (SD)

Table 5: Considering the respondents' perspective, the empirical outcomes reveal that some of the hindrances facing the use of digital technology training on academic staff occupational health and safety comprised; perceived need to be available at all times, poorer work-life balance (27.7, 44.7); isolation in terms of remote working and lack of social interaction (25.5, 51.1); cyber-bullying, -aggression and –attacks (27.7, 38.3); job insecurity (25.5, 51.1), increased risk to security and privacy from the collection and recording of sensitive personal information (23.4, 53.2); loss of jobs and roles (17, 55.3); increased ergonomic risk from increasing use of mobile devices and sedentary work leading to increased risk of associated health problems (MSDs), visual fatigue, obesity, heart disease and so on (29.8, 51.1) and increased risk of incidents and exposures from lack of risk assessment in remote workspaces, particularly public places (cafes, transport systems etc.) OSH (23.4, 48.9) respectively.

Ilaonisi and Osuagwu (2010) indicated that there were factors limiting the infusion of digital technology towards occupational safety and training in educational institutions in Nigeria. These include paucity of digital technology infrastructure and lack of access; high enrolments, inadequate funding, and absence of funding allocation to technology; prohibitive cost of ownership and cost to the consumer and policy implications of the mismatch between the advertised capabilities of digital technology and the aims of individual educational institutions

Conclusion and Recommendations

The study concluded that academic staff of universities had adequate knowledge of occupational health hazard associated with the practice of their profession. The academics were aware and use some digital technology tools for OHS training. It also submitted that the application of digital technology influenced OHS training but not without challenges. As a result of this, the following recommendations were raised.

i. Nigerian government and University management need to develop, update and implement applicable laws, regulations, policies and processes to enhance the occupational safety and health of university lecturers in Nigeria.
ii. Management should organise regular capacity building programmes on the use of digital technology tools to help academic staff address occupational safety and health needs of their academic staff.
iii. There is need for International Labour Organisation to strengthen advocacy, awareness and research on university lecturers' vulnerability to occupational hazards and risks, and how the application of digital technological tools can help to reduce and if possible, eliminate them.
iv. Concerned stakeholders like management, trade unions and the academic staff members should put machinery in place to ensure that challenges emanating from using digital technology for occupational safety and training are addressed promptly.

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