EARTHING HAZARDS ON CONSTRUCTION SITES: HEALTH AND SAFETY PROGRAMME FRAMEWORK FOR SMALL-SCALE CONSTRUCTION FIRMS

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ABSTRACT

A review of most of the studies related to injuries, accidents and work-related diseases on construction sites revealed the causes, effects, and steps to be taken towards ensuring workers' health and safety and profitable project delivery. These studies reveal that the major means of achieving a healthy and safe workplace is through the identification of workplace hazards and the reduction of safety risks. Consequently, this study examines the type of hazards on construction sites and proposes a framework of health and safety programme (a subset of the health and safety management system) for small scale indigenous firms. These objectives were achieved through focus group discussions and interviews with 17 construction stakeholders, in Lagos. It was revealed that the most frequent hazard was tripping and falling, with the risks of sprains, fractures or sometimes death. Besides, the workers were not aware of the factors that could lead to injuries and accidents, not to mention the minimization of such occurrences. The framework consists of recommended practises for safety culture, and this will be instrumental to the firms' management in the identification of the various hazards, evaluation of risks inherent and assessment of the control measures that would be required. This will, eventually, improve the firm's bidding technique, enhance quality delivery, aid client satisfaction while earning the firm a good image. On the part of the workers, the use of the framework through its introduction during induction or toolbox talks will equip the workers with what is required and thus be able to improve health and safety in the workplace.

Keywords: framework, hazard, health, model, safety.

1.1 INTRODUCTION

The construction sector plays a major role in any country's socio-economic development. Its contributions to the gross domestic product (GDP), employment creation, the production of infrastructure and assets required by other sectors of the economy are well emphasized (Durdyey and Ismail, 2012; Osei, 2013). Despite this importance, the industry is among those that are topmost with high injury, accident rates, and poor safety record, hence it is identified as one of the most unsafe and most hazardous in the world (Colak, Etiler and Bicer, 2004). The International Labour Organisation (ILO, 2005) reported a multitude of injuries and accidents, globally. Accidents occur as a result of the interaction of several factors. Defects in the work system, hazards, errors in behaviour are inferred by Amponsah-Tawiah, Jain, Leka, Hollis and Cox (2013). Abdelhamid and Everett, (2000), as well as Egbu (2017), opined that accidents on construction sites occur due to failure to identify any unsafe condition, decision to proceed with a work activity in an unsafe condition and decision to act unsafely, regardless of pre-existing conditions in the work environment. Accidents and injuries are to be avoided due to the negative consequences such as pain and ill-health, decrease in productivity, downtime and increase in overall cost. In most developing countries, therefore, health and safety considerations are given priority (Albert, Alex, Hallowell and Kleiner, 2014), by ensuring that the risks associated with jobs are managed, reasonably (Hughes and Ferrett, 2012).

Construction health and safety management, as a multidisciplinary field,centres on workers' physical and psychological well-being through the creation of a productive work environment that reduces disruption, increases brand value and goodwill (Neale, 2013). As part of the review on health and safety management (HSM), Idoro (2011) inferred that an increase in mechanization increases the rate of injuries and the occurrence of accidents. Similarly, Agwu (2012) submitted that a lack of integration of total safety management, as part of the organisational policy, led to a lack of safety practices. Kolawole (2014) revealed the significance of safety training and recommended the training/re-training of workers on the relevance of safety practices. Consequently, a high level of awareness, precautions, safety intelligence, capacity building on safety programme and policy was highlighted by Akinwale and Olusanya (2016). To corroborate this, Ezeokonkwo, Ezeokoli and Okoye (2016) emphasized health and safety knowledge, enactment, implementation and compliance with safety acts to reduce injuries and accidents.

These reviews and other related ones showed that the high rate of injuries and accidents in Nigeriais attributable to a lack of appropriate consideration of health and safety (HandS)|management practices, lack of enforcement of construction health and safety regulations, unsafe attitude/acts, low priority to health and safety budget amongst others (Idoro, 2011; Okoye and Okolie, 2014; Kadiri, et., al., 2014;AyininuolaandOlalusi, 2016).To create and maintain a healthy and safe work environment and improved project delivery, therefore, health and safety management (HSM) is paramount of which the health and safety programme (HSP) is a subset. This study thus examines hazard types, measures and proposes a health and safety programme framework with a specific focus on small scale firms whose HSM system is limited by funds, leadership style, culture, structure and contractual experience. In recent times, the Lagos state government has witnessed tremendous infrastructural development in which some indigenous firms are involved. Besides, the Federal Government's N-Power-Build empowerment programme for construction artisans, with the Lagos State Urban and Regional Planning and Development Law (CAP U2) as well as the Lagos State Building Control Agency Regulations (2019) that has just been passed into law, presents the need for safe sites (Afuwape, 2019). Therefore, the identification of hazards and development of a health and safety framework will be instrumental in reducing injuries, accidents and promoting safe workplaces.

2.1. INDIGENOUS CONSTRUCTION FIRMS PERFORMANCE AND THE NEED FOR HEALTH AND SAFETY PROGRAMME

The construction industry in Nigeria comprises building and civil engineering construction sectors (Mudi, Bioku and Kolawole, 2015), with the firms operating mainly as foreign and indigenous companies (Idoro, 2007; Ogbu, 2011; Mudi et al., 2015). While there are large numbers of indigenous contractors handling small jobs, the multinational contractors are few and execute most of the major infrastructural works in the country. Nevertheless, the indigenous construction firms contribute immensely to the attainment of national development aim of providing infrastructure, creation of employment and implementation of construction projects, despite the myriad of challenges mitigating its performance (Osei, 2013; Ibrahim, Daniel,and Ahmad, 2014). Towards the attainment of improved performance and in preparing the sector for changes and development in the 21st century, eight thematic areas are highlighted based on an industry forum review. According to Castagnino, Buehler and Odeh (2017), the eight

major ways to redefining the 21st-century business models are: rejuvenating organisational culture, redefining corporate image, collaborating systematically, creating incentives, prioritising talent management, investment in multicultural team and diversity, leverage technology and innovation as well as fostering continuous learning and career development.

These thematic areas are important in strategic planning especially in construction where projects are characterised by historical, social and institutional contexts and their management undertaken by a team of diverse backgrounds (Ogbonnaand Harris, 2000). Much synergy is thus required to plan, recruit, retain and train skilled workers and organise task packages with consideration for technology and emerging industry trends (Ekpenyong and Inyang, 2014), based on changes in the business environment (Baiden, Price and Dainty, 2006; Beyene, Shi and Wu, 2016). According to Castagninoet. al. (2017), the seven actions require sufficient time for implementation, but a take-off point is necessary, thus; the firms and the workers have to work hand in hand. This is imperative as newer technologies, newer and more fluid relationships, short contract periods/project-based engagement,ageing andproneness to diseases call for greater efforts on health and safety management (Liira, 2000; Khan, Liew,and Ghazali, 2014). Though reliable data that provide the exact numbers of construction accidents are lacking, evidence abounds that indigenous firms have not done well in health and safety performance (Idoro, 2011; MuiruriandMulinge, 2014; Muhammad et. al., 2015).Small scale indigenous construction firms thus need to develop HSP to curtail significant disruptions that could lead to a reduction in productivity, morale, turnover or further dent on the image of the firm. From the literature, one of the key components to reducing accidents is preventing them from occurring. Occurrences are minimized through hazard identification and riskassessment to put control measures in place. Identification, assessment, and controls are enhanced when a framework that stipulates what is to be done is available (Albert et. al., 2014; Muiruri and Mulinge, 2014; (Muhammad, Abdulateef and Ladi, 2015) and improved on continually.

2.2 HAZARD TYPES, RISK FACTORS AND MEASURES

Ferret and Hughes (2008) defined health as the protection of bodies and minds from diseasethrough the reduction of workplace hazards and injuries. A common root cause of workplace injuries and illnesses is the failure to identify or consider actual or expected hazards. Identification of hazards should, therefore, be a critical component of any effective health and safety programme(Williams, Hamid andMisnan, 2018). The complexity of construction and its highly interrelated activities result in the manifestation of hazards from different conditions. According to Williams et. al. (2018), the limitation in human knowledge by experience and the intrinsic property of hazard infer that hazard is bound to happen, nonetheless, by risk assessment and adherence to rules and procedures, the risk posed by its occurrence can be reduced (Tak, et., al 2011;Umeokafor,et. al., 2014). For identification, somehazard types in the industrial areas are presented:

- chemical hazards, arising from liquids, solids, clouds of dust, fumes, vapours and gases;
- physical hazards, such as noise, vibration, radiation and extreme temperatures;
- biological hazards, such as bacteria, viruses and infectious/contaminated waste;
- psychological hazards resulting from stress and strain and
- ergonomics hazards that could be physical such as poor site design and layout, poor task design, repetitive or motion, prolonged sitting position, improper lifting and handling,

improper seating and workstation design; or environment such as work cycles and crest, violence, discrimination extraneous stress, poor work relationship.

Other hazards with their risk factors and measures are hereby described:

2.2.1 Hazards from Movement on Sites, Working at Height, Mechanical Equipment and Manual Handling

Hazards originating from movement occur when people walk around building sites, coming into contact with vehicles on or around the site. Typical examples are slides, falls and drops on the same point or at a height, collisions with moving vehicles, a static or flying object (Halperin and McCann 2004; Guercanli, MüngenandAkad, 2008).Falls from height, elevated platforms or scaffolding are also associated with demolition exercises (Hamid, Yusofand Singh, 2003; ILO, 2005). Falls from heights can lead to fractures, significant injury or death.Risk hazards from using hand, power tools or mechanical handling equipment such as excavators and cranes. Unsecured loads or objects from lifting equipment can result in serious harm to construction workers or members of the public (Abbe, Harvey, Ikumaand Aghazadeh, 2011). Apart from physical injury or accidents, hazards from movement on sites, working at heights and manual handling often result in fatigue, poor quality delivery and drug abuse (Methner, 2000; Kulkarni, 2007; Gálvez-Martos, Styles, SchoenbergerandZeschmar-Lahl, 2018), with repetitive movement and prolonged periods of use of vibrating tools resulting to musculoskeletal disorders. These forms of hazards can be minimized through clear communication, training, use of the right equipment, scheduling and management by competent individuals (Methner, 2000; Kulkarni, 2007; Gálvez-Martos, et. al., 2018).

2.2.2 Hazards from Electricity, Chemical and Biological Substances

Electric shock, burns, fires and explosions are products of electrical hazards, mostly occurring either as a result of misuse of equipment or defective ones. Fire hazards are rare on construction sites, but if it occurred often result in damages or disruptions with dire consequences. Fires on sites can emanate from poor storage of highly flammable gases, damaged cables, improper fuses or failure of safety devices, excessive loading, open burning of rubbish or smoking (Suárez-Cebador, Rubio-Romero and López-Arquillos, 2014). Prolonged exposure to most of the chemicals used in the industry can result in acute and chronic respiratory challenges, as a result of toxic chemicals originating from clouds of dust, fumes, gases, mist, vapours, and liquids. Thus, the rate of exposure should be regulated (Verma, Kurtz, Sahai and Finkelstein, 2003). Dust, fumes, poisonous gases are also associated with demolition works and operations in confined spaces (e.g. manholes, sewers, caves, pits, ducts, etc.)(Brown, 2002; Yeheyis, Hewage, Alam, Eskicioglu and Sadiq, 2013). Most of these toxic substances have specific ill-health issues. Skin infections are traceable to cement dust and wet cement; tuberculosis to silica dust; constipation, abdominal pain, and weak musclesto lead metal hazards; thoracic problems to wood dust and dermatitis linked with algae (Kaskutas, Dale, Nolan, Patterson, Lipscomb and Evanoff, 2009; McAleenan, et.al, 2015;Vitharana, De Silva and De Silva, 2015). Hazards from chemicals and biological substances can be reduced by ensuring all workers and supervisors are properly trained and conversant with workplace hazardous materials information (WHMIS) and material safety data sheets (MSDSs) (Vitharana, De Silva and De Silva, 2015; Gálvez-Martos, Styles, Schoenberger and Zeschmar-Lahl, 2018).

Table 1shows some hazards and measures for mitigation.

Table 1: Hazard Types and Control Measures on Construction Sites

Nature	Types	Control Measures
Airborne	Particulate (dust, fumes, mists, aerosols, fibers), Gas or vapour. Dust-solid particle generated by handling, crushing, grinding, heating (in)organic materials).	PPE: masks and respirators. Administrative/Engineering: ventilation systems, reduce time spent with airborne hazards.
Biological	Exposures to fungi, bacteria, viruses and other living organisms can result in acute or chronic infection by entering the body either directly or through cuts/breaks in the skin.	PPE: gloves, masks, protective clothing, safety goggles. Administrative/Engineering: labeling and caution/warning signs, safety cabinets, ventilation systems, biohazard bags, isolation, training on the safe handling of biological materials.
Ergonomics	Exposures to mechanical equipment and tools (lifting, holding, walking, pushing, handling, moving) resulting in irritation, inflammations, strain.	Administrative/Engineering or Redesigning: provision of manual handling training, lifting equipment, trolleys, changing layout of the job, changing the size and shape of loads, teaching correct work practices.
Chemicals	Harmful chemical compounds (solid, liquid or gas), injurious when inhaled, ingested or in contact with (nature, potency and magnitude) irritant gases (NH_3,NO_2, N_2O, H_2S, Cl_2,SO_2).	PPE: gloves and protective clothing. Administrative/Engineering: labeling and caution/warning signs, washing facilities, training on safe handling.
Noise, Sun, Vibration, Ionisation, Wet work	Physical hazards (excessive levels of noise, vibration, temperature, illumination, ionizing and non-ionizing electromagnetic radiation)	PPE: ear muffs/plugs, acoustics booths or Administrative: training on how to prevent hearing damage, rotating jobs, sound-barriers, placing noisy equipment in an isolated room, purchasing quieter machinery, replacement of worn-out parts/maintenance and signage.
Sun	Physical hazards (excessive sun rays),	PPE:sunscreen, protective clothing, hat or sunglasses Administrative: re-organising work outside peak UV hours, providing covered areas and re-organising tasks/timing/location.
Vibration	Physical hazards (excessive level of vibrations),	Administrative/Engineering: dampeners, vibration absorbing seats, adoption of products with less vibration and training.
Ionisation	Physical hazards (excessive level of ionisation),	Administrative/Engineering: Shielding, reducing exposure, increasing distance
Wet work	Physical hazards,	PPE: gloves, barrier, cream/moisturizers. Administrative/Engineering: limit the time spent with hands immersed in water or liquids, provide labelling and warning signs, training.
Psychosocial	Stress, boring, low pay, low self-esteem, lack of recognition,	Training/Counseling: an anti-stress/anti-bullying policy.

2.3 HEALTH AND SAFETY PROGRAMME MODEL

A large number of the laws and legislation on occupational safety and health such as the Labour Act of 1974, the Factories Act of 1987 and the Workman's Compensation Act of 1987 are taken from the British legal system. Though slightly modified, there are issues in applications and enforcement (Ogundipe, 2017). To some extent, these regulations have been instrumental in

improving the health and safety performance of construction firms, but there is the need to do more on instilling a safety culture by making the standards specific and improving compliance (Kaskutas, et al., 2009; (Idoro, 2011; Osei, 2013).Compliance is embedded in health and safety culture as health and safety culture emphasizes the need for the provision of and commitment to so that safety becomes part of the strategic planning. To instill safety culture, therefore, construction firms need a framework that describes safety commitment amongst other factors.

The occupational health and safety administration (OSHA, 2016) recommends seven basic steps for a health and safety programme as a means through which injuries and accidents can be minimized on construction sites. The seven key elements are as follows: management leadership, worker participation/engagement, education and training, hazard identification and assessment, hazard prevention and control, programme evaluation and improvement as well as communication and coordination for employers on multi-worksites (OSHA, 2016). These elements, as explained below, can be used as the basics for health and safety programmes and updated according to job requirements. With policies that stipulate firms' commitment, workers and management responsibilities, standards that summarize what requirements are to be met as well as safety and health programmes that describe the recommended practices, a construction firm will do better on health and safety management performance. The seven key elements and the action points are as presented in Table 2.

Table 2: Recommended Practices for Safety and Health in Construction

MAIN/CORE ELEMENTS	ACTION POINTS/SUB-ELEMENTS
MANAGEMENT LEADERSHIP	Commitment to eliminate the hazards.
	Mission and vision statements on all aspects of safety performance.
	Making health and safety a core organisational value.
	Tangible and intangible support and leading by example.
WORKERS PARTICIPATION	Workers (or their representatives) determine priorities, recognise and report risks, investigate accidents and monitor progress.
	Workers' roles and responsibilities within the programme are explicit and well understood.
	Open communication between workers and management and liberty to report all issues of concern on health and safety.
	All barriers and obstacles to workers' engagement and participation are minimized.
HAZARD IDENTIFICATION AND ASSESSMENT	Procedures to continually identify workplace hazards risk identification and evaluation procedures.
	Identification and assessment of hazards from routine, non- routine sources and emergency safety in place.
	Periodic inspection and reassessment of new hazards.
	Investigation of incidences to identify the root causes.
HAZARD PREVENTION AND CONTROL	Cooperation between workers to identify and select methods for workplace hazards elimination, prevention, and control.
	Selection of controls based on the hierarchy of engineering, administrative and personal protective equipment.
	Development of plans that facilitate and ensure the implementation of control, protection, tracking of progress and verification of control effectiveness.
EDUCATION AND TRAINING	An understanding of how the programme works and how to carry out the responsibilities assigned through training.
	All managers are to understand safety concepts through training.
	Training on managers' rights and responsibility and be able to respond to workers ' reports and concerns.

	Training of workers on workplace hazard recognition and the necessary control measures.
PROGRAMME EVALUATION AND IMPROVEMENT	
	Periodic evaluation of control measures for effectiveness.
	Establishment of processes for program performance monitoring, verification, shortcomings identification and improvement opportunities.
	Strategic actions for program improvement and overall safety and health performance.
COMMUNICATION AND COORDINATION FOR EMPLOYERS ON MULTIEMPLOYER WORKSITES	
	Commitment to the provision of an equal level of safety and health to all workers.
	Communication of hazards at the worksite and hazards the work of subcontractors may bring.
	Establishment of specifications and qualifications for contractors and subcontractors.
	Before the commencement of work, all factors that may impact safety and health are to be reconciled through planning, coordination and scheduling.

2.3.1 Management Leadership

Construction firms' leadership is to ensure that the decisions that support health and safety outcomes in all aspects are made and are committed to it. With this in place, an enduring configuration of tasks and activities that will lead to project objectives achievement will be made possible through employees' participation and cooperation (Baidenand Dainty, 2006).). Some of the recommended safety and health programme factors that relate to management or leadership include a commitment to eliminate hazard, mission and vision statement with strategic intent on all aspects of safety performance.

2.3.2 Worker Participation/Engagement

Workers engagement impact on safety and health quality, and the overall performance. SHP thrives in an organisational environment that is strongly supported by management belief, firm structure and strategy (Stare, 2012). There is strong evidence in the literature that workers engagement is supportive of profit (Hare, Maloney, Cameron and Duff, 2005), therefore, workers and, if applicable, their representatives must participate in developing and implementing every element of the safety and health programme (OSHA, 2016). The involvement of workers, or their representatives, in setting goals, hazards identification/reporting, incidents investigation, tracking processes, open communication, to mention but a few will lead to improved safety and health performances. Thus, the contributions of workers should be sought and enhanced.

2.3.3 Hazard Identification and Assessment

To enhance workplace safety, provisions should be made for risk identification/assessment. This should be done to identify and eliminate existing or potential hazards. Workplace design should be done with the fundamental objectives of reducing errors, minimizing hazards, reducing injuries and accidents and improving productivity (Abbe, et. al., 2011; Anvari, Zulkifli and Yusuff, 2011).The procedures are to be instituted and practised on a regular and timely basis while ensuring all employees know and understand current hazard analyses for all jobs and processes (Hare, et., al., 2005). Whatever methods of inspection, whether supervisor

andmanagement daily walk-through, monthly committee-safety inspection among others, to be adopted should be documented and reviewed periodically to monitor trends and/discrepancies. It should be borne in mind that, adequate hazards identification requires the knowledge of operations and experience; therefore, documentation and record-keeping should be done both formally and informally using proven hazards identification tools (Albert, Hallowell andKleiner, 2014).

2.3.4 Hazard Prevention and Control

When hazards are identified and the risks assessed, the needed control measures will be fashioned out.Thus, hazard identification and assessment are paramount to catering for all hazards as long as it is practicable (Albert, et. al., 2014). Prevention and control of hazards are selected according to a hierarchy that uses engineering solutions, administrative controls and personal protective equipment-PPE (OSHA, 2016). In the hierarchy of controls, an engineering method can be adopted if the work environment can be physically changed to prevent employees' exposure to potential hazards. On the other hand, administrative control (work practice) is employed if the risk of hazards is lessened by an employee changing the work he does. Personal protective equipment (PPE)is the least and it behooves management/health and safety representatives to provide and maintain PPE (Brown, 2002). The items under this element include but are not limited to: action plans to ensure regular maintenance of equipment and vehicles, workers knowing how to use and maintain personal protective equipment (PPE) and training on monitoring for air quality, heat stress, noise, ergonomics or other job hazards (Ekpenyong and Inyang, 2014).

2.3.5 Education and Training

In all the four previously explained recommended practices, the impact of training is crucial. The management, therefore, needs to make available training provisions on work aspects with responsibilities assigned to workers. All workers should know the workplace, receive the instructions to protect their health at work, participate in identifying and solving workplace health and safety issues or refuse work that is believed to be dangerous to their health or that of any other worker in the workplace. Besides, employers, managers, and supervisors are to receive training on safety concepts and recognition of workplace hazards (OSHA, 2016).

2.3.6 Programme Evaluation and Improvement

To further enhance a good safety management system, the SHP should stipulate when and how evaluations and improvements are to be achieved. These should cover factors such as periodic control measures and their evaluation for effectiveness, established processes to monitor programme performance, verification and implementation programme as well the identification of shortcomings and opportunities for improvement. Generally, evaluation and improvement should promote overall health and safety (OSHA, 2016).

2.3.7 Communication and Coordination for Employers on Multiple Sites

Adequate information and communication through all recognizable modes are imperative for the attainment of health and safety objectives. Information and instructions are to be communicated on exactly what it is supervisors and workers are expected to do and how they are expected to do it. The greater the risk, the greater the degree of control and supervision that is required. Other items to be considered include: the provision of the same level of safety and

health protection to all employees, communicating hazards present at the worksite and the hazards that contract workers may create on sites, the establishment of specifications for contractors/subcontractors before work commencement, coordination of subcontracting work planning and scheduling to identify and resolve conflicts that could impact health or safety (Kulkarni, 2007; OSHA, 2016).

3.0 RESEARCH METHODOLOGY

The purpose of this study is to identify hazards that are present in construction sites and develop a health and safety programme for small scale indigenous construction firms, to enhance workplace safety. The study thus adopts a qualitative research approach, using a focus group discussion and oral interviews. A review of the literature was done for an overview of hazards types and measures as well as health and safety recommendation practices, to maintain the focus of the study. The focus group discussion was done with eight stakeholders in the construction industry at a workshop organised on industry transformation, in November 2019. Among the participants at the focus group discussions are four firm owners, two supervisors, and two construction artisans. Specific scenarios of injuries and hazards, as well as management and workers' roles/responsibilities in health and safety management (HSM), were discussed. Part of the questions asked the participants was a description of the hazards that most frequently occurred in the last six months of site operations. Based on some of the issues raised at the focus group discussion, an interview was also conducted with six firm owners and three workers that have been in the industry for over 15 years, to determine their views on hazards identification, the relationships between hazards and incidences as well as workers and management perceptions on injuries and accidents. The need to develop a framework came up as a result of the interview and the focus group discussion, as it was evident that the crops of the workers are neither aware of the degree of hazards and their long term effects nor the firm owners compelled to have a basis to enhance health and safety. The framework here describes the health and safety programme practices as a subset of the health and safety management system as depicted in Figure 1.

4.1THE HEALTH AND SAFETY PROGRAMME FRAMEWORK

Health and safety management (HSM) system is the overarching theme in occupational health and safety. The HSM system consists of a health and safety programme (HSP), health and safety policies, standards and records. While the policies provide the manual for the firm's policy statement, roles and responsibilities of workers and management; the standards stipulate the level of safety attainment required. The SHP, on the other hand, expresses the practices that are needed to instill the policy statement and encourage the standards. The HSP above adopted the OSHA (2016) seven recommend practices for health and safety. These practices are interrelated and impact on the policies and the standards. From the focus group discussion and the interview, the participants submitted that hazards resulting from working at heights, use of mechanical equipment and hand-held tools are frequent, but the workers are not aware of the effect on their health. A particular respondent submitted that the workers are prone to the behaviour of 'that is the way we do it" rather than 'this is the best way to do it". A particular manager explained how a plank gave way and fell on an operative with a hard hat. Had it not been that the operative had a hat on, his head could have been shattered. A supervisor narrated his experience on how a part of scaffolding gave way thereby resulting in a fractured limb. On the part of the workers, it was gathered that there is no information on dangers lurking on sites

or how to avoid such. However, if a programme stipulates how thingsshould be done, for instance, in the case of scaffolding, how it should be installed and inspected by a competent person, followed by checks on the strength and rigidity of the scaffolding, at the beginning of each work session and with punitive measures in place, such incidents will be minimized.

The need for greater awareness of hazards, the implications and provisions of control measures through a platform that can be evaluated and updated is also required. Based on the information gathered, the proposed HSP framework is as shown in Figure 1, embedded within the HSM system. For small scale construction firms, the HSM system is limited by funds as it was gathered that health and safety as a cost unit is not recognised by most clients. Also based on the number of employees, the firm's culture, structure, and strategies are not elaborate; yet the significance of HSM cannot be overruled. The content of the HSP provides a starting point to health and safety, hence compliance with the national and state enacted laws and regulations. This study emphasizes the HSP using the OSHA (2016) seven-interrelated recommended elements namely management leadership; workers engagement; workers training; hazards identification and assessment; hazards prevention and control; programme evaluation and improvement as well as communication and coordination on multiple sites. Each firm develops the key items for each subset based on experience; along the line, as the firm expands, other subsets are added. The two arrows on the sides of the framework indicate some of the merits and demerits of having or not having a health and safety management system in place. Having an effective management system improves a firm’s ability to continuously review and update the contents as the circumstances demand.

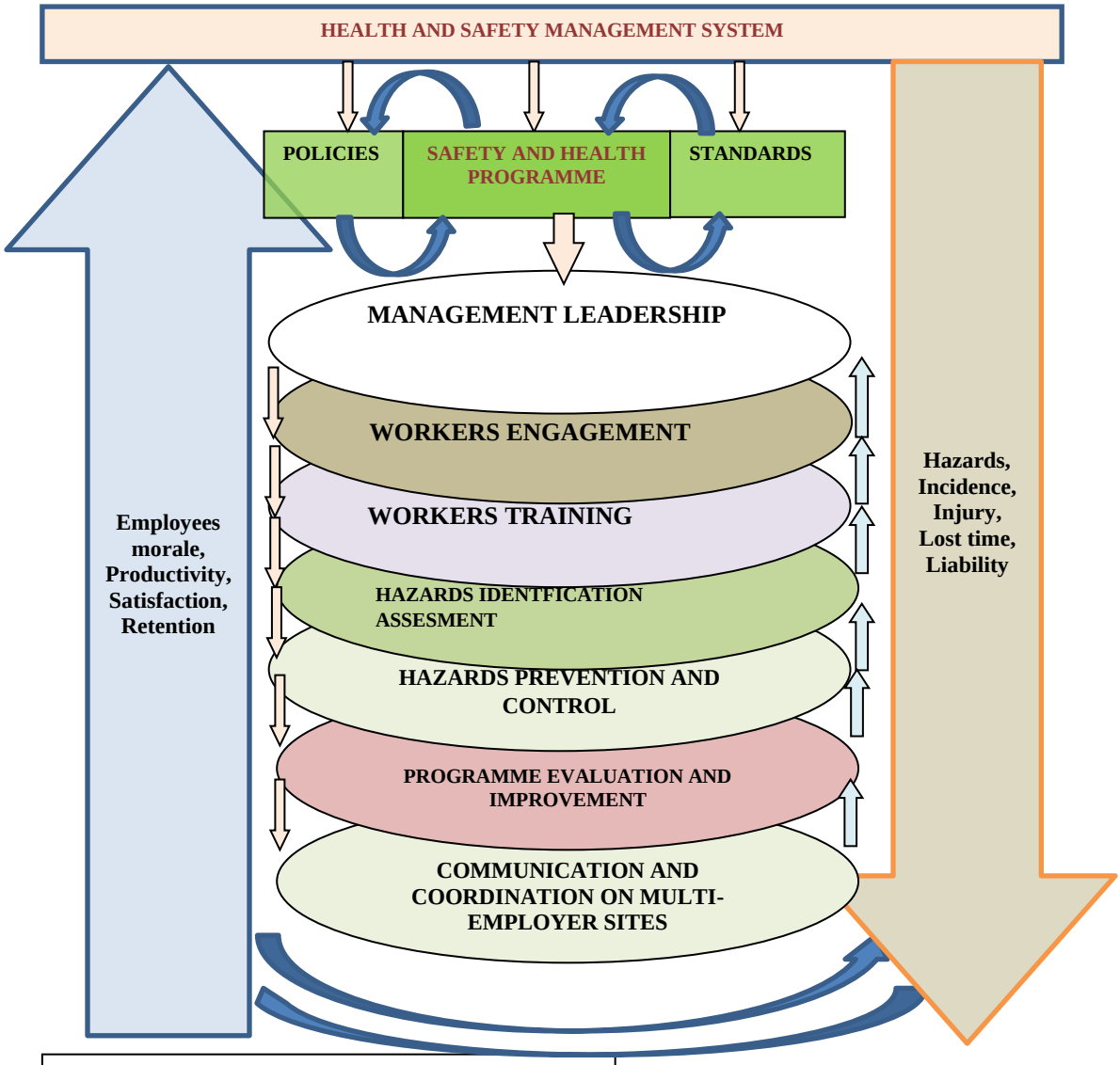

Figure 1: Health and Safety Programme

5.0 CONCLUSION AND RECOMMENDATIONS

This study aimed to assess hazard types, the control measures and propose a health and safety programme for indigenous construction firms. This was achieved through a focus group discussion and structured interviews. The study highlighted hazards from tripping and falling as the most frequent on construction sites with the use of personal protective equipment asthe control measure. In addition, it was established that firms' managements do not provide health and safety manuals or give workers tips on health and safety during induction. The study, therefore, concluded that both the management and the workers need a framework that will serve as a linkage between the laws and regulations on health and safety and the implementation. The adoption of the proposed framework would thus act as a starting point for compliance with health and safety laws and regulations. This will be achievable when the firms adopt the 7 key components and the action points. For instance, within management leadership, the firm will be able to state its commitment through its mission and vision statements and

earmark plans for safety within the overall strategic goal. By taking each of the recommended steps one after the other, the firm will have a robust plan through which health and safety issues are assessed. When adopted, the proposed programme will provide a proactive approach to identifying and dealing with workplace hazards, by mitigating the risk and thereby reduce injuries and accidents. An overall improvement in health and safety will be insightful in improving quality, which will generally improve the corporate image of the firms.

It is therefore recommended that the policy makers should do more on health and safety regulations enforcement, by punishing those that fail to comply, while the firms should adopt the framework to realize factors that deserve stringent attention as far as occupational health and safety are concerned. This study is limited to the numbers of construction firms' stakeholders that were interviewed or discussed with. Further studies are recommended with a larger sample size in the built environment.

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