

**DETERMINANTS OF OCCUPATIONAL SAFETY, HEALTH
MANAGEMENT, INDUSTRIAL PRODUCTION IN TANZANIA:
EVIDENCE OF TWIGA CEMENT COMPANY**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
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CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by the Open University of Tanzania a dissertation entitled: *“Determinants of Occupational Safety and Health Management on Industrial Production in Tanzania: Evidence of Twiga Cement Company”* in partial fulfilment of the requirement for the Degree of Master of Science in Economics (MSc-Econ).

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(Supervisor)

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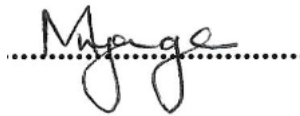
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I, **Maria Lyimo Nyange**, do hereby declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people's works have been used, references have been provided. It is in this regard that I declare this work as originally mine. It is hereby presented in partial fulfilment of the requirement for the Master's Degree of Economics.

A handwritten signature in black ink, appearing to read 'M. Nyange', is written over a horizontal dotted line.

Signature

04/10/2023

.....
Date

DEDICATION

This work is dedicating to my late father Mr Elinaja A. Lyimo and my late Mother Mrs Beatrice M. Kiwelu. They played a big role in bringing me up and supporting my studies.

ACKNOWLEDGEMENT

In the first place, I would like to thank God for his endless love and support for the whole time I was undertaking my Masters studies and writing my research work. I passed through lot of challenges, but God stood on my side supporting me and strengthen my heart to move on. In the second place, I would like to send my thanks and appreciation to my family members who in one way or another supported me to accomplish my study.

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ABSTRACT

The Cement manufacturing industry is one of the most important industries for infrastructure development in many countries. However it is shown that cement manufacturing process involves hazardous operations that have potential to affect the health of employees, community and ecosystemm at large. In this regard, OSH management systems are seemed to be important in order to protect safety and health of employees as well as environment. Thus, the current study examined the impacts of OSH management system on production in Tanzania manufacturing sector particularly cement industries. The study guided by three theories namely: Human factor theory of Accident; Domino's theory of Accident; and Solow-Swam model of production. A sample size of 73 respondents applied and a case study design was adopted. Data collection conducted through questionnaires, interview, documentary review and physical observation and findings presented in form of means, percentages, frequencies and inferential statistics using binomial test. The findings indicated that the OSH management system OSH input cost OSH programmes such as trainings, inspection and health testing and OSH administration such as involvement of employees and the use of proper personal protective equipment have effect on production. The study concludes that, both OSH input cost, OSH programmes and OSH administration have effects on production in Twiga Cement Company. The study recommends effective implementation of these requirements as they have positive impact on production and employee's health in general.

Keywords: *Management Programs, Inputs Costs, Industrial production, Occupational Health and Safety.*

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LIST OF ABBREVIATIONS

ILO	International Labour Organization
OSH	Occupational health and safety
OSHA	Occupational Safety Health and Authority
SHARP	Safety and Health Achievement Recognition Program
URT	United Republic of Tanzania
US	United States
GDP	Gross Domestic Product
VPP	Voluntary Protection Program

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter presents general introduction of the study that generates the problem studied. The chapter comprised of the background of the study, problem statement and research objectives. The chapter further provided the hypotheses the study sought to test, significance of the study, scope of the study and organization of the study.

1.2 Background of the study

The growing cements production industry and associated health and safety issues have increased concerns considering a global policy to address potential challenges posed by the industry. An effective global policy can only be found if different actors cooperate. Being a capital-intensive industry that utilizes scarce resources to operate (such as fuel) means that management need to keep some sort regulations on production. Even though cement is locally produced the impact of the production is global and the presence of lucrative opportunities to shift production sites makes the industry an attractive one for governmental regulation. The cement industry is one of the most important industries for infrastructure development, it is this interaction between the economic (efficiency) and the political (institutional) that calls for finding a framework for evaluating solutions that takes into account both ends (UNDP, 2013).

Cement manufacturing is one of the key industries in global economy and it play significant role in supporting infrastructure development in many countries.

Globally, about 162 countries with cement industry comprising of about 3000 cements manufacturing plants. Study revealed that, in 2022, cement industry generated 363.4 billion USD worth of revenue in the global market. In this case, China was a leading cement producer of about 2.1 billion tons, following with India producing 370 million tons. On the other hand, Egypt is among the leading African country with production of 51 million tons of cement (Statista, 2023). In Tanzania cement industry produce more than 11 million tons of cement in 2022. Currently, the consumption of cement is on increase due to developmental activities within the country (NBS, 2022). Therefore, cement industries are forced to expand its production to suit the market demands.

However, studies show that cement manufacturing process involves hazardous operations that have a potential to cause adverse effects to employees, neighborhood and the ecosystem (Patel & Mishra, 2019). Most of the industrial processes are associated with generation of hazardous substances such as dusts, fumes and toxic gases which are integral causes of safety and health issues to the workers (Zaatout, Elhisadi & Lairaj, 2022). The operational activities also cause enormous noise, chemicals waste and even harmful radiations. Therefore, the industry has been engulfed with safety and health issues that affecting workers health and physical conditions and even death (Guardado & Ziebarth, 2014).

Globally, it has shown that, more than 340 million occupational accidents and 160 million of victims suffer work-related illness annually due to hazardous operation in various industries (ILO, 2022). Following these 2.3 million workers died due to occupational accidents and 2 million deaths were caused by work related diseases

(ILO 2022). In Tanzania, manufacturing industry was reported to cause more than 2628 occupational accidents and 68 occupational diseases. Out of these 57 were fatal. Despite that, more than 24 employees from cement manufacturing industries encountered occupational accidents and diseases by year 2016-2020 (NBS, 2022). In these cases, the cost of inaction due to occupational injuries and illness is on increase.

Employing health and safety programs in industrial human resources is imperative to the organizational productivity and reductions (Segbenya & Yeboah, 2022). Moreover, organizational growth, development and production are influenced on how the firm manages and implement OSH management programs in workplace (Zaatout et al., 2022). In this regards, health and safety at workplace is geared to create conditions, capabilities, and habits that are supportive to employees in performing their tasks efficiently (Iskamto, Ghazali, Asraf, Afthanorhan & Narti, 2020).

In some of Africa countries, s workplace health and safety conditions are worsen due to inadequate attention given by the employers and government officials (Katsuro et al., 2019). Yet, this is attributed by inefficient regulatory frameworks in supporting and administering OSH management systems activities and poor culture in implementing health and safety programs. Similarly, governments' political, social and eco-economic interests showed to ruins the capacity of OSH management systems to operate effectively (Segbenya & Yeboah, 2022). Hence, the implication of inefficient OSH management systems in the workplace has increased health and safety issues that affects both individual workers and organizations productivity of

which workers are the most victimized (Katsuro, et al., 2019).

On the hand, the Government of Tanzania under the Prime Minister's Office has established the Occupational Safety and Health Agency (OSHA) as a competent institution to spear head the commitment of stakeholders to promote a safe and healthy working environment. This will include the ratification of the Occupational Safety and Health Convention, No. 155 and the Promotional Framework for Occupational Safety and Health Convention, No. 187. Likewise, the Agency has a responsibility of raising awareness among stakeholders in matters related to safety and health (Mrema et al., 2015). Similarly, the Agency has a mandate to, establish standards that guides the safety and health measures in workplace with objectives of reducing work related accidents, injuries and illness (Mrema, Ngowi & Mamuya, 2015).

The significance of OSH management system has led to positive outcomes in many production industries through its programs (Sklad, 2019). These programs help organizations in avoiding indirect costs; prevent workplace accidents, wastage of time, replacing injured workers, damages to assets (URT, 2010). Since then, OSHA has decreased 60 percent of work-related death and 40 percent of injuries and illnesses across all industry in the economy (OSHA Tanzania, 2021).

Despite various authors documented on the significance of safety and health management system in reducing the workplace injuries and diseases, the impacts of the OSH management system on the industry productions are not given enough attention locally. In this case, most stakeholders perceived OSH system deals with

employees' safety and health affairs only whereas the impacts on industry productivity overlooked. Therefore, it is crucial to address the positive contribution of OSH to the organizations production in Tanzania. Currently, there is insufficient data to discourse the aforementioned gap. This has motivated the need to shade light on this area of interests hence conduction of this study.

1.3 Statement of the Problem

The industrial sector in Tanzania plays a crucial role in economic growth and development (Katsuro, et al., 2019). The productivity and performance of this sector is largely influenced by the quality of employees, the quality of which lie on health and physical wellbeing (Zaatout, et al., 2022). Many organization including cement manufacturing companies have implemented various OSH management programs in ensuring that their workplace is sustainable and safe for their workforce (Patel & Mishra, 2019). However, there is a pressing concern regarding the effectiveness of these programs due to sharply increase in number of injuries and illness due to work (Katsuro, et al., 2019). Therefore, the workers' health and the organizations production goals are at risks.

As many workers are injured or get ill and incapable to work, the organization is affected in many ways including compensating workers and hospitalized victims, increases costs of sourcing new workers, training costs for new employees, losing more skilled, competent and productive workers who may left big gap for organization operations (Segbenya & Yeboah, 2022). Based on functional requirements of OSH management systems, proper executions and administration of these programs within the companies will assist on lowering the rate and extent of

occurrence of safety and health problems (Patel & Mishra, 2019).

Studies documented on the impacts of OSH management system in manufacturing industry, highlighting the organizations responses to the OSH provisions and effects to the organizations performance (Iskamto, et al., 2020; Segbenya & Yeboah, 2022; Katsuro et al., 2019; Patel & Mishra, 2019; Zaatout, et al., 2022). It has shown that, many countries including Tanzania has limited information on the influence of OSH management system and productivity in cement manufacturing industries due to inadequate studies (Kessy & Raymond, 2021; Mrema, et al., 2015; Sklad, 2019), this has creating a gap of knowledge among stakeholders. Understanding how OSH contributes to industrial production in cement manufacturing companies, it is important to enhancing safety and health programs in manufacturing sector. Therefore, this study sought to examine the impacts of OSH management system on production in Tanzania manufacturing sector particularly cement industries.

1.4 Objectives of the Study

The overall objective of this study was to determine the occupational safety and health management on industrial production in Tanzania.

1.4.1 Specific Objectives

The specific objective of this study was;

- i. Determine the effects of OSH input costs on cement production at Twiga Cement Company.
- ii. Examine the effects of OSH management programs on cement production at Twiga Cement Company.

- iii. Assess the effects of OSH management administration on cement production at Twiga Cement Company.

1.5 Research Hypothesis

The research Hypotheses tested in this study were:

H₀₁: OSH inputs costs have no effects on cement production at Twiga Cement Company

H₀₂: OSH management programs have no effects on cement production at Twiga Cement Company

H₀₃: OSH management administrations have no effects on cement production at Twiga Cement Company.

1.6 Significance of the Study

The findings of this study extended the knowledge on OSH programs and administrations in relation to cement production and suggest area of future study that serve as bench mark to conduct further research on this area. The findings may be beneficial to the Twiga cement company on how implementation of OSH programs may affects the company productivity. The findings may be beneficial to the OSHA Tanzania on area regarding implementation of OSH administration to support the company production while maintain employees' health and safety. The findings of the studies may be useful for further decision making by enhancing OSH management on industrial activities.

1.7 Scope of the Study

The study focused on the OSH management system incorporated in the company operations and the impacts they have brought to Twiga Cement Company Ltd in Dar

es Salaam Tanzania. The three variables including; management input costs, management programs, and management administrations were the basis of discussions in this study. The study sample was selected from the company employees both subordinate and management team, where 73 employees were involved. Twiga Cement was selected because it was a manufacturing company with chemical and machinery-intensive production operations and has activities associate with high risks of health and safety issues.

1.8 Organization of the Study

The study was organized in five chapters. Chapter one presents the introduction of the study and consisted of background of the study, problem statement, purpose and objectives of the study, hypothesis of the study, justification of the study, scope of the study and the organization of the study. Chapter two discussed the empirical literature. Chapter three presented the methodology adopted for the study including the conceptual framework, econometric model specification, data source, variable description and estimation procedure. Chapter four presented the empirical findings of the study and their discussion. Chapter five comprised of summary of the study conclusions and recommendations. This dissertation also contains reference and the list of appendices.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review of the study based on the past studies on the subjects related to the current study. The chapter discussed literature on the basis of theories and empirical studies. The chapter comprised of; definitions of key terms theoretical framework, empirical review, research gap and conceptual framework.

2.2 Definitions of Key Terms

2.2.1 Occupational Health and Safety (OSH)

OSH refers to a multidisciplinary practice that encompassed the aspects of health and safety issues in the workplace aimed to prevent work related hazards (Institute of health and safety journal, 2018). OSH aimed to prevent and reduce the risk of accidents and occupational diseases by working out with the causes and generation of accidents in workplace. In this study, OSH is the term involving prevention of all sorts of injuries, diseases and other health issues that are related to the workplace.

2.2.2 Industrial production

Industrial production refers to measures of outputs of industry processes and operations resulted from converted inputs. OSH of industrial workers is directly related with productivity in workplaces (Oxenburgh et al. 2004). In this study, Industrial production was referred to outputs generated from industrial activities and processes.

2.2.3 Inputs Costs

Inputs Costs refers to allocated set of costs used in production of product or service

including costs of direct materials, direct labour and factory overheads (Gerhard, 2002). In this study, input costs are cost incurred in meeting needs for the organizational productions.

2.2.4 Management Programs

In regards to OSH, Management Programmes are actions and mechanisms employed in workplace with an intention of reducing workplace related accidents (Amponsah-Tawiah & Mensah, 2016). In this regards, the programmes may be employees training, rehabilitation of injured workers, health testing and creation of awareness among workers on safety and health issues (Mrema et al., 2015). In this study, management programs are all designed activities undertaken at the workplace with intention of ensuring safety and health environment.

2.2.5 Management Administration

In regards to OSH, Management Administration is activities and mechanisms usually undertaken at management levels which focus to address safety and health situation in the workplace for further actions (Rahman, et al., 2018). These includes; workplace inspections, controlling working tools, employees involvement in safety and health plans and establishment of OSH committees (Sklad, 2019). In this study, Management Administration are strategic activities undertaken by the company management to enforce implementation of safety and health conditions in the workplace.

2.3 Theories and Models of the Study

This section discusses various theories applied in the study and how they are going to be applied in the current study. The theories of the study include; Human Factor

theory of Accident, Domino's theory of accident and Solow-Swan Model.

2.3.1 Human Factor theory of Accident

The Human Factor theory of Accident was developed by Petersen (1996) from Arizona USA. Human Factor theory of Accident provides that, accident is caused by chain of events associated with consistent human errors. According to the theory, human being is subjected under certain conditions which cannot easily be managed and controlled and is likely to make errors and lead to accident. The errors which lead to occurrence of the accident is caused by many factors including; excessive workload or use of equipment not well mastered, poor responses to the fault or error, inappropriate activities.

The theory focuses on workers job performance and how they interact with working equipment, systems and procedures in relation to maintaining safety and improve performance. OSH programs are essential in enhancing employees capacity to enhance their safety hence maintain their health and safety that enable their productivity. To achieve this effective OSH administration is imperative to keep the program effective and progressive for better working environment. well administered OSH management help workers to keep focus on the organization's production goals.

In relation to the current study, Human Factor theory of Accident is relevant in the context of explaining the role of OHS management system in enhancing employees' ability to maintaining safety in their workplace. This is associated with the OHS guidelines on addressing safety and health issues as well programs that support

employees to eliminated accidents elements. The company workers attitudes and habits on their safety in their workplace can be enhanced by implementation of guidelines and acquiring training programs from OSH. This can enable them to be able to eliminate human related errors and avoid accident.

2.3.2 Domino's Theory of Accident

Domino's theory of accident was proposed by Heinrich (1931) in his work on the causative of accidents and how to address them. Domino's theory states that, injury occurrence is triggered by interdependence series of factors including accident. The theory describes various factors diving occurrence of accident in a given palace. According to Domino theory the key causative of accidents in workplace are employees and organizations' management.

The theory provides that, workers are the key drivers to occupational related accidents. The management on the other hand is the creator of environment for occurrence of accidents. This implies that, management facilitates employee to cause accident. The ability of workers to adhere on safety measures in the workplace is determined by awareness of hazards and risks associated with performed tasks. Management is obliged to create environment favourable for preventing accidents. in this address the problems and enhance safe and healthy environment, OSH programs and management administration are the key tool to prevention of accidents and health related problems.

Relevance to the current study, Domino's theory of accident helped to explain the OSH administration function and programs in supporting organization to lower

safety and health problems among employees hence increase productivity. OSH administration focuses on the roles of management in preventing accidents.

2.3.3 Solow-Swan Model

The key component of the Solow-Swan model is the production function, given below, which relates output to capital and labour (Romer, 1996). It is the starting point of all theories of growth in that all growth theories are best understood with comparison to this model. In this model, labour and capital do not determine long run growth because they are constrained by diminishing returns to scale. Rather, growth is driven by technological progress which is exogenously determined. The fact that technological advancement is not explained by the Solow model creates a need to explore other theories of growth.

$$Y = (K, L) \dots\dots\dots (1)$$

Where, Y is output, K is capital and L is labour. In its intensive form, the production function is given by:

$$y = (k) \text{ or } y = kx \text{ assuming a Cobb Douglas production function } \dots\dots\dots (2)$$

According to Solow this opposition between the natural rate of growth and the warranted rate of growth derives from the fact that labour and capital are combined under ‘fixed proportions’. The Solow analysis culminates in a single differential equation expressible as follows but which allows for changes in the supply of labour and the introduction of the crucial variable of ‘technological change’. Thus we have:

$$\frac{dk}{dt} = sf(k) - \delta \text{ according to which } dk/dt \text{ signifies the growth of capital stock per}$$

worker over time, $sf(k)$ which represents the investment rate (i) as a function of the

existing capital stock and δ represents the rate of depreciation also a function of the capital stock.

According to Solow, the neoclassical economy would grow smoothly given labour and capital flexibility but would be necessarily affected by the depreciation of the existing capital stock per worker. The so called 'steady state' according to Solow represents the equilibrium point at which depreciation costs just equal investments. Thus there would be no basis for the economy to progress beyond that point-except under conditions of technological change. This would cause the $sf(k)$ curve to shift upwards thereby intersecting the line $(n + g + \delta)k$ [where n represents population, g represents growth and δ represents depreciation] at a higher point. The following diagram offers the basic structure of the Solow growth model.

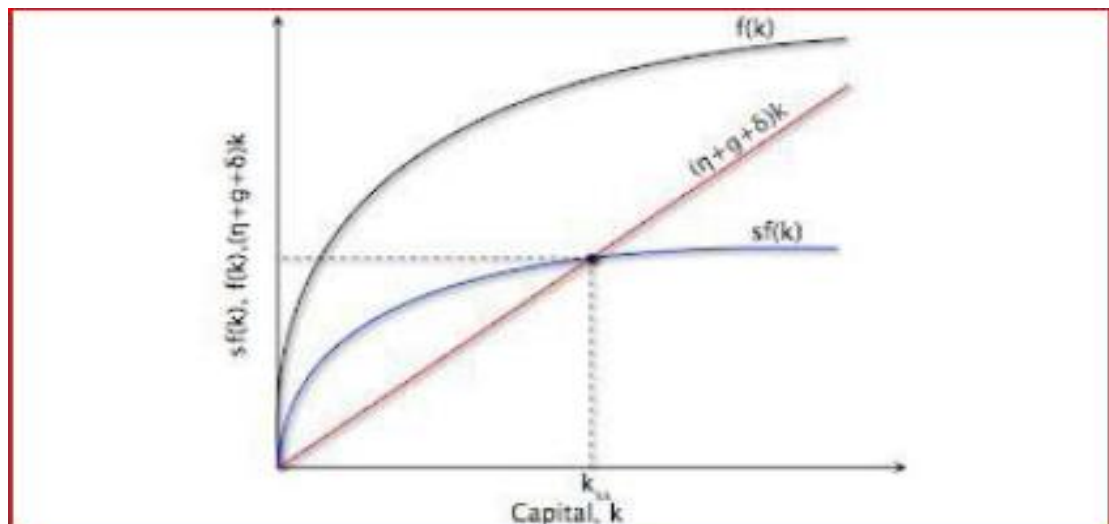


Figure 2.1: Basic Structure of the Solow Growth Model

2.4 Theoretical Review

Accidents and health challenges leads to economic and social damage to workers and the organizational operations (Iskamto et al., 2020). The consequence of such accidents is deteriorated health and safety conditions in workplace and repercussions

on organizations productivities and performance (Zaatout et al., 2022). Most of accidents occurring in manufacturing industry among employees are associated with risks of severe injuries, body parts' deformation and sometimes may even lead to death. Safety and health issues have led many organizations to lose potential workers through injuries and illness (Iskamto, et al., 2020).

The risk situation in industrial production has decreased workforce, draining organizations skills, led to additional costs in the firms, damage workers morale, affects the company levels of productivity, increase turnover and tarnishes the company reputations on sustainability productions operations (Segbenya & Yeboah, 2022). Always accidents increases organizations costs and lower financial performance as some expenses such as compensation for injuries, medical covers and other related costs ruin financial resources of the company (Zaatout et al., 2022). In addition, sick or injured workers led to absenteeism hence effects on job performance.

2.4.1 Importance of Industrial Production in Tanzania

Industrial productions have played different important roles in Tanzania through economic development. The following are the ways industrial production is importance in Tanzania. It has helped in Diversification of the country economy expanding the scope of economic activities to include non-agricultural activities which have helped the country to avoid depending on few activities for its economic development. Industrial production has helped the country to generate employment opportunities to its citizens which on the other hand improved their wellbeing. Industrial production has led to availabilities of different products and reduces the

country dependence on common imports especially consumable products. Industrial production has help to enhance export outputs and reduces the volume of imported goods in the country hence generation of foreign exchange necessary for the country purchases from foreign markets (Lugina Mwakalobo andLwesya, 2022).

Industrial production has helped the country to add value to its products from different sectors, hence reduces the rate of exporting valuable raw materials at cheap price. Industrial production has been the driving forces for Infrastructure Development such as roads, ports and railways as well growth of towns. Infrastructure Development has played major role in stimulating infrastructure growth and improvement in some area hence support community economic activities. It has helped in technology transfer through importing technology which on the other hand, it helps other sectors to and the society to enhance their productivity. The government increased its revenue through tax collection and other levies from the industries. In general industrial production is important to development of Tanzania (Mbelle, 2016).

2.4.2 Industrial Development for Economic Growth in Tanzania

Tanzania has many industries that support economic growth through contribution to GDP and generation of employment. Industrial production has multiplicative impacts on the economy trough supply chains of raw materials and other essentials and markets of products (Ismail and Lwesya, 2021). Industrialization particularly manufacturing industry has been considered as driver to economic growth of Tanzania through different sectors of the economy (Page, 2015). Various manufacturing and processing industries have been the key sources of government

development as they contribute to the country's economies.

The industries are increasingly becoming the backbone of national economic growth and contribution to GDP and employment (Ismail and Lwesya, 2021). They have helped the country to become mid-level economy and improve economic development hence individual income. Study by Lugina et al. (2022) noted that despite slow growth of industrialization, productions resulted from the industries have regarded as the key sector for boosting economic growth in Tanzania. This has been attributed by the government policies to attract investments through Foreign Direct Investment (FDIs) that come with technologies and innovations which also supported other sectors (EAC, 2017).

The increased presence of FDIs has been supporting government efforts in enhancing industrial production. Furthermore, the government industrial production is not well developed like other low income countries and it employs less than 3 percent of labour force (Mbelle, 2016). Regarding the sectors contributing to the growth of industrial growth in Tanzania includes; construction sector which largely depends on other sector including cement production industry. Many cement production companies have been the sources of supply for construction industry that is mainly contributed to infrastructure development.

2.5 Empirical Literature Review

Studies (Patel and Mishra, 2019; Iskamoto, et al., 2020; Segbenya & Yeboah, 2022; Katsuro et al., 2019; Kessy and Raymond, (2021), have highlighted different issues resulted from safety and health incident in various industry, the causes, the effects

and how they influence organizational productions and performance. In this part different studies from different countries are discussed.

2.5.1 Studies in Global Level

Patel and Mishra (2019) conducted a study to identify employees-related health risks in cement factories in India. To meet the objectives of the study, cross-sectional research design was adopted where a sample of 100 employees from the factories were determined and engaged to provide data. Questionnaire and interview guide were administered to collect data from respondents. Data was analyzed descriptively and qualitatively based on data from study field. The findings of the study indicated that, the risk of worker's injury was proportional with the duration of exposure. The study concluded that, the presence of health related issues in the factories have ruined employees wellbeing as they are subjected to problems which cost their health wellbeing. Based on the findings, the study lacked explanations of OSH management system such as programs and administration of OSH activities of which the current study addressed.

Iskamto, et al., (2020) investigated the effect of occupational safety and health on performance of Islamic hospital in Riau Indonesia. The study was based on variables include; safety, health and performance in relation to specific objectives. The study adopted descriptive research design with quantitative approach. A sample of 50 respondents was selected from the hospital population staff and used to obtain data through questionnaire. Data was analyzed using descriptive and inferential statistics analysis where regression analysis method was employed to test hypothesis. The findings of the study show that, both occupational safety and health dimensions have

significant effects on the performance of the hospital under study. The study focused on general performance of the entity due to implementation of OSH. However, it did not address issues of programs and administrations related to OSH, the gap which the current study filled.

2.5.2 Studies in sub Saharan African

Segbenya & Yeboah (2022) explored the influence of occupational health and safety (OSH) on construction workers' performance in Ghana. Descriptive research design was adopted in data collection, management and analysis with the study based on quantitative approach. The study sampled a total of 120 workers from the given population and used them to collect data. The questionnaire was employed to gather data from study respondents and the data was analyzed using descriptive statistics and regression analysis. The findings of the study indicated that, OSH policies employed in the sector has statistical significant impacts on workers performance. The study further revealed that, the construction sector in the country lack regular training program for skills enhancement among its employees. The study discussed effects of OSH on employees' performance, the current study focus on effects of OSH on industrial productions facilitated by OSH programs and management.

Katsuro et al. (2019) conducted a study on the impact of occupational health and safety on worker productivity in commercial food industry in Zimbabwe. The study employed descriptive case study and action research strategy in data gathering and analysis. A total of 123 respondents were selected using stratified and random sampling procedures. Data were gathered from respondents using questionnaires, interviews and observations.

Moreover, study used documentary review to gather data from archives. The findings of the study indicate that OSH related problems have negative effects on the industry employees' productivity. The study also found that, existing OSH in the food industry contribute to development of employees' negative attitude and decreased morale towards assigned job tasks. The study shows how implementation of OSH leads to workers productivity. Current study focused on how OSH programs and administrations lead to industrial production.

2.5.3 Studies in Tanzania

Kessy and Raymond, (2021) conducted a study to assess the roles of occupational health and safety management system in reducing workplace hazards in Tanzania. The study involved 5 large manufacturing firms in Dar es Salaam where 285 respondents were selected using simple random and purposive sampling methods from, the company workers. A questionnaire was used to gather data from selected workers and Partial Least Square-Structural Equation Modeling (PLS-SEM) was employed in analysis primary data from the field of study.

The study found that, the occupational health and safety management system has managed to reduce hazards in the company working environment by employing three dimensions including; OSH input costs, programme and administration. The study focused on the effects on implementation of OSH leads to hazards reduction among employees. Current study has extended the knowledge to focus on the effects of application of OSH system on enhancement of industrial production.

Table 2.1: Summary of Empirical Literature Review

1. Studies in Global level				
Author(s) and Country	Focus of Study	Objective	Methodology & Models	Findings
Patel and Mishra (2019)	Health risks Employees Wellbeing	To identify employees-related health risks in cement factories in India.	Questionnaire and interview guide cross-sectional research design	The risk of worker's injury was proportional with the duration of exposure
Iskamto et al. (2020)	Safety, Health and Performance	The effect of occupational safety and health on performance of Islamic hospital in Riau Indonesia.	Descriptive research design with quantitative approach Descriptive and inferential statistics analysis Questionnaire	Occupational safety and health dimensions have significant effects on the performance of the hospital under study
2. Studies in sub Saharan African				
Author(s)	Focus of Study	Objective	Methodology & Models	Findings
Segbenya & Yeboah (2022)	OSH policies	The influence of occupational health and safety (OSH) on construction workers' performance in Ghana	Descriptive research design Questionnaires Descriptive statistics and regression analysis	Accountability, ICT OSH policies employed in the sector has statistical significant impacts on workers performance
Katsuro et al. (2019)	Employees' Productivity	the impact of occupational health and safety on worker productivity in commercial food industry in Zimbabwe	Descriptive case study Stratified and Random Sampling Questionnaires, Interviews and Observations	OSH related problems have negative effects on the industry employees' productivity.
3. Studies in Tanzania				
Author(s)	Focus of Study	Objective	Methodology & Models	Findings
Kessy and Raymond, (2021)	Workplace Hazards	To assess the roles of occupational health and safety management system in reducing workplace hazards in Tanzania	simple random and purposive sampling methods Partial Least Square-Structural Equation Modeling (PLS-SEM) Structured Questionnaires	The occupational health and safety management system has managed to reduce hazards in the company working environment by employing three dimensions including

2.6 Research Gap

The literature discussed above, focus on various issues related to OSH issues in different industry and the impacts of OSH operations in preventing accidents in workplace. The studies also focused on the causes of accidents in workplace, while

others highlight importance of maintaining OSH. Most of the industries focused in the study are process intensive industry except few (Patel and Mishra, 2019; Segbenya & Yeboah, 2022; Zaatout et al., 2022). However, studies have not linked OSH and organizations productivity in general. To bridge this gap, this study intends to evaluate the determinants of occupational safety and health management on cement industrial production in Tanzania.

2.7 Conceptual Framework

Conceptual framework in this study used to depict the relationship between dependent and independent variables pictorially. Figure 2.1 show the Conceptual framework.

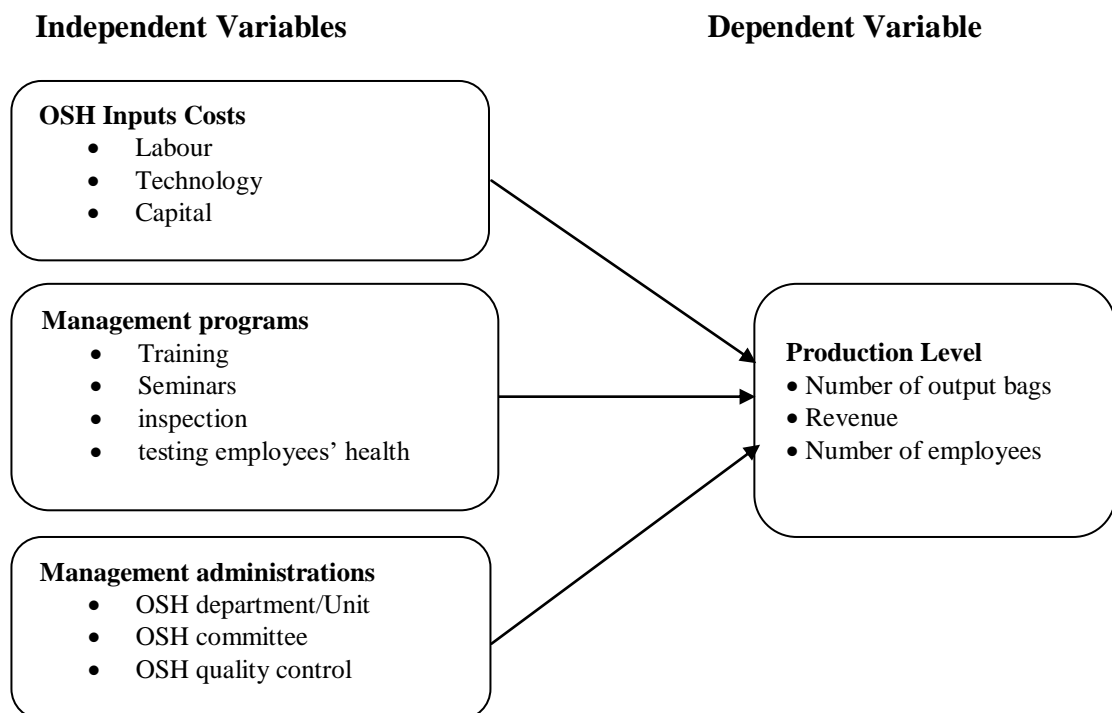


Figure 2.2: Conceptual Framework of the Study

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents methodology part of the study which described and discussed the methods and materials employed in collection and analysis of the data. It comprised of different sections systematically in order including; study area, research approach, research design, target population, sampling methods, sample size, data types, data collection methods, and data analysis techniques.

3.2 Study Area

The study was conducted at Twiga Cement Company Limited located at Tegeta area in Dar es Salaam Region. It is one of the oldest and popular Cement manufacturing industries in Tanzania started in 1966. The Company is located about 25km north of the Dar es Salaam city at Wazo Hill. Twiga Cement Company is located within latitudes 6034' and 7010' and longitudes 39023' and 39025' of the area. It is the only industry in Tanzania which produce both pozzolan and non-pozzolan substances. Pozzolan is commonly used as supplementary cementations material in production of concrete and cement.

The industry has employed more than 257 workers working in different sections. The company operations are associated with heavy duty machines and processes as well use of variety of chemicals in its productions. Workers are performing their tasks in well-coordinated processes associated with generation of fumes and dusts. Hence there possibility of experiencing accident of health related problems among workers.

Therefore, the study is considered appropriate due to nature of operations and the existing safety culture. Figure 3.1 presents the geographical description of the Study Area.



Figure 3.1: A Map of Twiga Cement Company Location
Source: TPCPLC (2023).

3.3 Research Approach

The study applied mixed research approach. The choice of this approach was based on the study's purpose, objectives, and nature (Creswell, 2012). The mixed research approach is a 'problem-driven' approach geared towards providing practical solutions to real-world problems (Creswell, 2018). It hinges on collecting and analyzing qualitative and quantitative data within a single study. Its central premise is that

using both approaches together provided a better understanding of research problems than using either approach alone. Integrating quantitative and qualitative data in this study facilitated the triangulation of data, methods, and tools, which offered a fuller address of the research problem and enriched the study's conclusions (Pardede, 2019). Therefore, the approach deemed to be appropriate because it support or complement the weakness of the other.

3.4 Research Design

The design encompassed the methods, tools and techniques employed in conducting the study which helped the researcher in addressing the problem under study. In this regard, the study applied descriptive research design by employing quantitative research approach in entire process of data collection and analysis. The design enabled the research to determine what, when, how and where in regard to the study problem. According to Creswell (2018) the case study design is suitable when a researcher intends to gain deeper understanding of the constructions held by people in a particular context due to its flexibility that allows multiple sources of evidence about a particular phenomenon within its real life. The research design of this study was a cross sectional survey which deemed to be so appropriate due to the fact that it widens scope of the study in data collection and analysis.

3.5 Population

The targeted population of this study was workers employed in Twiga Cement Company. It included medium-ranked staff members of the company under consideration, Twiga Cement Company. The population of Twiga Cement Company is 257 employees in total (2022).

3.6 Sampling Procedures and Sample Size

3.6.1 Sampling Procedures

This study employed two different types of sampling procedures including purposive and simple random sampling procedures. With regards to purposive sampling respondents selected purposely based on their roles. Purposive sampling used to select sample from participants whom the researcher believed that they have relevant data for the study. These included management staff from TWIGA Cement Company including, departmental officers, supervisors and line managers.

Additionally, simple random sampling was used to select respondents from lower and middle levels. Simple random sampling was preferred over other sampling methods for two reasons. First, the method ensured the likelihood of any individual element in the population having an equal chance of being selected and being represented and, hence, it minimizes the sampling biases (Creswell, 2018). The second reason for the selection of the sample is because simple random sampling is considered to be simpler and more cost-efficient system than other sampling techniques (Cohen et al., 2011).

3.6.2 Sample Size

The study consisted of a sample size of 73 respondents involving operators, supervisors and representative from top management. The sample size was obtained based on the Yamane's (1976) formula as seen below.

$$n = \frac{N}{1 + N(e^2)} \quad \text{Where, } n = \text{sample size,}$$

N = Total number of Workforce at Twiga Industry and e^2 given the error

$$\text{deviation (e =0.1), } n = \frac{257}{1+257(0.1)^2} = 71.9 \text{ approximately } 72$$

Therefore, the sample size (72) was considered appropriate due to nature of work and the role played by each stakeholder. Saunders and Thornhill (2003) noted that a minimum number of thirty (30) for statistical analysis provide a useful rule of thumb.

3.7 Types of data sources and Data collection instrument

This study used cross-section data sources whereby primary data obtained through questioners, interview and observation. Also, secondary data attained through documentary reviews.

3.7.1 Questionnaire

Questionnaire was used to gather information from the respondents to answer the research questions. The questionnaire was used to obtain quantitative data from respondents who were be middle-level employees from Twiga cement. Information on input costs, OSH programs and OHS management administration was gathered by the questionnaire. A questionnaire is said to be a very convenient way of collecting information from a large number of sampled populations and it assures confidentiality and it save time and cost effective (Creswell, 2012). The use of questionnaires also helped to keep the respondents to the point related to the objectives of the study (Creswell, 2018).

3.7.2 Interview Guide

Face-to-face interview techniques were used to collect data from key participants. This tool will be used to gather data from various officials from Twiga Cement and

OSHA management staff. The information on all dimensions of the study including; input costs, OSH programs and OHS management administration was sought from participants. It is among the best techniques to plead information that can be considered to be very sensitive. Also, helped to minimize non response and maximize the quality of the data collected.

3.7.3 Documentary Review

The study used secondary data method, by reviewing company reports, studies, manuals and other information material from various sources. The documentary review helped to provide data on input costs that meet the first objectives. Documentary method helped to develop a hypothesis, answer the research question, reduce study bias and it cost effectively.

3.7.4 Physical Observations

The researcher conducted physical visits in order to observe and record events and objects in the study area. Physical visits were planned by the researcher in collaboration with Twiga Cement Management. This helped to observe how various activities related with occupational safety and health is being implemented at the industry.

3.8 Data Analysis Techniques

The study employed Statistical Package of Social Sciences (SPSS) version 27 in processing and analyzing obtained data. In this techniques data analysis conducted using descriptive and inferential statistics, where frequency, percentage and mean applied in descriptive form of information. For inferential statistics the study applied

probit model to test hypothesis on the the influence of independent variables on dependent variable. Data presented using tables and figures generated from SPSS. OSH Inputs costs was measured based on various costs including labour costs, capital investment and technology costs. OSH Programs was measured based on employees training, inspections and testing of workers health status. Osh Administration was measured based on activities at departments, committees on OSH issues and the company quality control activities. Dependent variable which was company cement production was measured based on revenue from sales and number of output bags of cement annually.

3.8.1 Model Specification

The study used applied regression econometric approaches for the purpose of estimating the significance of OSH input costs, OSH management program and management administration economic factors on industrial production. The study applied a simplified models based on the model used in Mundlak, Butzer, and Larson (2008). This model is built on assumption that at any time there are multiple techniques of production and that producers choose one technique together with the choice of inputs and outputs. The production function is therefore a function of output, state variables of inputs as specified below (Nkoro and Uko, 2016).

Model I: $IPR_{OSH} = (INC_{OSH}, MAPR_{OSH}, MAAD_{OSH},)..... (1)$

$\ln IPR_{OSHi} = \beta_0 + \beta_1 \sum \ln INC_{OSH} + \beta_2 \sum \ln MAPR_{OSH} + \beta_3 \sum \ln MAAD_{OSH} + \epsilon_0.....(2)$

Where;

IPR_{OSH} = Production Level

INC_{OSH} = Input Costs,

$MAPR_{OSH}$ = Programs,

$MAAD$ = administration,

β = constant coefficients and

ε = Error

3.8.2 Probit Model

The econometric analysis assumes that cement production capabilities depend on the firm's own basic structural characteristics (e.g., inputs, management). Formally, the model is written as;

$$y_i = \beta X_i + \varepsilon_i, \varepsilon_i \sim N(0,1), i=1 \dots N \dots \dots \dots (5)$$

where y_i^* is firm i 's OSH factors to cement production and is unobservable, x_i is an observable vector of explanatory variables, β the associated vector of parameters to be estimated and ε_i the unobservable variables affecting firm i 's OSH factors to cement production its main product. The dependent variable y_i is observed to be 1 if the firm exports, and otherwise.

3.8.3 Validity and Reliability Tests

Test for internal consistency reliability was conducted to ensure if the items of instrument measures the similar characteristics of individual. The Cronbach's Alpha was used. Moreover, to ensure if the instrument/construct measures what is intended, construct validity (discriminant and convergent validity) was conducted. The study applied the principal component analysis (PCA). These measures are preferred over others more complex estimators of reliability and validity since they are widely used and easy to compute (Taherdoost, 2016).

3.9 The Diagnostic Tests for OLS Regression (Data Accuracy)

In order for the results of the above OLS regression estimation technique to be reliable, the assumptions of the BLUE (Best Linear Unbiased Estimates) must hold. Violation of these properties leads to spurious regression and hence incorrect conclusions (Gujarati and Porter, 2010:74). Therefore to ensure the adherence to the BLUE properties the following estimation diagnostic tests was performed.

3.9.1 Test for Linearity

Before a successful OLS regression can be run, the nature of the measure the normality by the normal probability plot was examined. In particular, the data set needs to clearly exhibit some linear patterns. This reduces the chances of running a spurious regression on the collected times series data (Gujarati, 2003:100-101). As a result, the study employed the asymmetry of the distribution by the skewness in order to show linear patterns between each of the explanatory variables (exogenous) and the dependent variable (endogenous).

$$\hat{\alpha}_3 = \frac{1}{n} \sum_{i=1}^n \left(\frac{x_i - \bar{x}}{\hat{\sigma}} \right)^3$$

3.9.2 Test for Multicollinearity

Multicollinearity simply refers to the existence of a very high degree of correlation between variables. Paradoxically though, Multicollinearity is not a serious problem since even in the presence of Multicollinearity the OLS estimators are still BLUE. Nevertheless, it becomes a problem when the value of the pair wise correlations between the explanatory variables exceeds 0.80 (Gujarati, 2003:341). To test the presence of Multicollinearity in the equation the Explanatory Variables Correlation

Matrix was used.

$$VIF_k = \frac{1}{1-R^2}$$

3.9.3 Pearson's Coefficient of Correlation

Correlation analysis among the variables shows the “strength and direction of the relationship between two or more variables. In this study, Pearson’s correlation was used to find a correlation between the dependent and independent variables. Generally, the value of Pearson’s correlation falls between 0.00 (no correlation) and 1.00 (perfect correlation). A correlation coefficient value of more than 0.5 is considered a strong correlation, while a correlation coefficient below 0.5 is considered a” weak correlation.

3.9.4 Coefficient of Determination

The R-Square Test will be used to test for the goodness of fit of the models. The value of the R-square will show how much of the variability in the outcome is explained by the model. Thus if the value was 0.5 for instance it would mean that 50 percent or half of the variability is explained by the model.

3.10 Ethical Consideration

In order to ensure ethical issues, the researcher obtained the research clearance from The Open University of Tanzania. Additionally, the University introductory letter was submitted to TPCPLC Management to seek for permission and support to conduct the study in within TPCPLC factory. The data collection exercise was conducted through filling questionnaires, conducting interview with key informants, reviewing various documents and physical observation was then conducted after

obtaining research permit. During data collection the respondents were assured confidentiality. In doing so, the collected information was handled with extreme care by the researcher whom was the only one with access the study data obtained from all research tools.

CHAPTER FOUR

FINDINGS AND DISCUSSIONS

4.1 Introduction

The study examined the impacts of OSH management system on production in Tanzania manufacturing sector particularly cement industries. Specifically, the study covered three objectives, namely (i) to examine the effects of OSH input costs on cement production at Twiga Cement Company, (ii) to examine the effects of OSH management programs on cement production at Twiga Cement Company and (iii) to assess the effects of OSH management administration on cement production at Twiga Cement Company. The chapter starts by presenting the response rate and respondents' background information followed by presentation of findings and lastly discussion of findings based on study objectives.

4.2 Response Rate

The researcher distributed 76 to targeted respondents. Out of 76 questionnaires, 73 were filled correctly and returned to the researcher. Thus, the responses rate was 96%.

4.3 Respondents' Background Information

This section provides the respondents' background information including gender, age, education level, working experience and type of work of respondents.

Table 4.1: Respondents' Background Information

S.No	Categories	Frequency	Percent
1	Gender		
	Male	53	72.6
	Female	20	27.4
	Total	73	100
2	Age		
	Between 18-30 years	43	58.9
	Between 31-44 years	19	26
	Between 45-60 years	10	13.7
	More than 60 years	1	1.4
	Total	73	100
3	Education Level		
	Primary Level	8	11
	Secondary Level	30	41.1
	Diploma Level	15	20.5
	Degree Level	20	27.4
Total	73	100	
4	Working Experience		
	Below 5 years	39	53.4
	Between 5 and 10 years	24	32.9
	Between 10 and 20 years	5	6.8
	More than 20 years	5	6.8
Total	73	100	
5	Type of work		
	Building and construction	16	21.9
	Administration	14	19.2
	Operation	34	46.6
	OHS	7	9.6
	Electrical	2	2.7
Total	73	100	

Source: Study data (2023).

Results from Table 4.1 above indicate that out of all respondents who participated in the study, 27% were females and 73% were males. The high number of males compared to that of females was due to the fact that most of the activities conducted at the industry engage more men as compared to women. As for age, the majority (59%) were youths aged between 18 and 30 years, which is an economic productive group. This is indicative that engagement of youths in industry activities is high as compared to other age group. The data also show that respondents between 31-44 years constituted 26% of total respondents followed by 45-60 years (14%) and lastly

above 60 years (1%). These statistics are indicative that industrial activities require individuals who are still energetic.

Regarding education, the respondents had mixed levels of education. On average the data show that majority (41%) had secondary education, followed by university degree (27%), diploma (21%) and lastly primary education (11%). As for working experience the results indicated that most of the respondents (53%) had less than 5 years of working experience. Additionally, table 4.1 indicates that individuals with working experience between 5 and 10 years were 33% while individuals with working experience above 10 years constituted 14%. The data indicates that the most of employees have lower working experience and the number decrease as the number of working experience increase which may imply that individuals employed in production industries stay for short period of time due to various reasons including nature of the tasks that requires energetic persons who are mostly youths. Findings from the study indicated that more respondents with few years of experience are from operation as well as building and construction types of work.

4.4 Respondents awareness of OSH Operations in Workplace

The study aimed to determine respondents' awareness on OSH policies and laws, programs and administrations in relation to their workplace. The following were outcomes from the study area.

4.4.1 Respondents Awareness of OSH Policies

The researcher assessed the awareness of respondents regarding to Occupational Safety and Health related matters. The findings are presented in Figures 4.1.

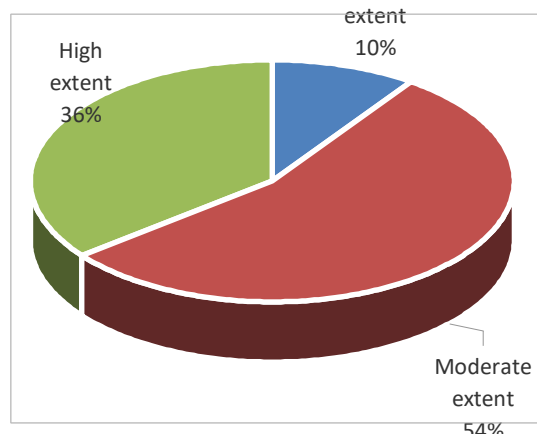


Figure 4.1: Respondents' Awareness on OSH Policies

Figure 4.1 indicates that the level of awareness on OSH policies among individuals' ranges between moderate to high as 91% of respondents indicated moderate to high degree of awareness on OSH policies. This implies that respondents were well aware of OSH policies regarding their workplace. Also, the high level of awareness was due to availability of OSH programmes at their work place such as trainings, inspections and health testing conducted.

4.4.2 Respondents Awareness of OSH Laws

The study determined to understand respondent's awareness of OSH Laws in relation to their workplace. The results are presented in 4.2.

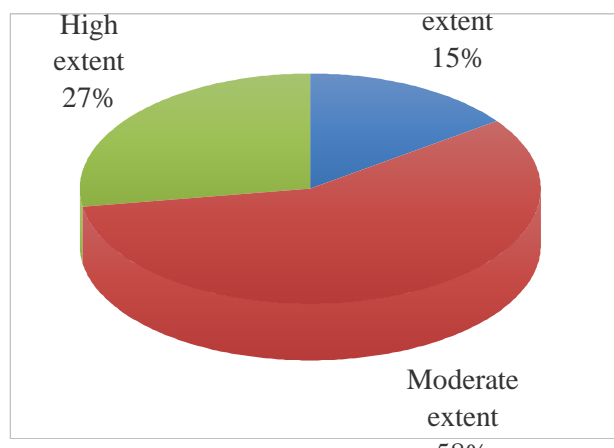


Figure 4.2: Respondents' awareness on OSH Laws

Figure 4.2 indicates results of the level of awareness OSH laws. The high level of awareness among individuals was due to the fact that most of them (89%) had the level of education at secondary and above. This implies that respondents were well aware of OSH laws regarding their workplace.

4.4.3 Respondents' Responses on OSH Programmes

The study sought to determine the respondents' responses towards OSH Programmes in relation to their workplace. The results are presented in Table 4.2 below

Table 4.2: Respondents' Responses on OSH Programmes

Extent	Training		Inspection		Health Testing	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Low	0	0	9	12.3	10	13.7
Moderate	41	56.2	33	45.2	31	42.5
High	32	43.8	31	42.5	32	43.8
Total	73	100.0	73	100.0	73	100.0

Source: Study findings (2023).

Table 4.2 indicates that most of respondents were generally agreeable that OSH programmes have been implemented at their work place. Specifically, views of respondents on the extent of trainings conducted range between moderate to high. This is indicative that most of them have been experiencing trainings. With regard to inspection and health testing the data indicates that majority of respondents indicated moderate to high extent. This also confirms that these programmes have been conducted.

4.4.4 Respondents' Responses on OSH Administration

The study sought to determine the respondents' responses towards OSH administration in relation to their workplace. The researcher analyzed the

respondents' awareness on the extent of OSH administration. The results are presented in Table 4.3.

Table 4.3: Respondents' Awareness on OSH Administration

Extent	OSH department		OSH committee		OSH quality control	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Low	11	15.1	21	28.8	14	19.2
Moderate	33	45.2	31	42.4	37	50.7
High	29	39.7	21	28.8	22	30.1
Total	73	100	73	100	73	100

Source: Study data (2023).

As indicated in table 4.3 the respondents were generally agreeable that they have been interacted with OSH Administrations. The results show that 85% of respondents indicated moderate to high extent of interaction with OSH department, while 71.2% indicated moderate to high level of interaction with OSH committee. With regard to OSH quality control, findings indicate that 80.8% of respondents indicated moderate to high level of interaction. Generally, the findings indicate that OSH Administration was satisfactory as majority of respondents indicated moderate to high level of its implementation.

4.5 Preliminary Analysis

Before conducting further analysis, the items for determinants of Occupational Safety and Health (OSH) management on industrial production were subjected to exploratory factor analysis by using Varimax rotation so as to identify if all items underlie in similar components.

4.5.1. Factor Loadings for Input Cost Factors

The factor analysis was conducted to determine factor loadings components of inputs cost factors. The score ranges from -1 to 1 where -1 means highly negative

correlation ‘0’ indicates no correlation and 1 means highly correlated. A value greater than 0.5 indicate good correlation hence, constructs with value score below 0.5 is eliminated. Tables 4.4 present the results for analysis.

Table 4.4: Factor Loadings for Input Cost Factors

S.N	Items	Component
1	Cost of materials for manufacturing production is high	.620
2	Direct labour cost in production is influenced by OSH	.848
3	Factory overheads in the company is influenced by OSH	.868
4	Cost of technology in production is influenced by OSH	.848
5	Invested capital in production process is influenced by OSH	.883

Source: Study data (2023).

Table 4.4 indicates that 5 Occupational and Safety and Health items for management programs showed factor loading above 0.5. The closeness of factor loading values to each other indicates that the data were reliable and valid.

4.5.2 Factor Loadings for Management Programs

The factor analysis was conducted to determine factor loadings components of management programs. The score ranges from -1 to 1 where -1 means highly negative correlation ‘0’ indicates no correlation and 1 means highly correlated. A value greater than 0.5 indicate good correlation hence, constructs with value score below 0.5 is eliminated. Tables 4.5 present the results for analysis.

Table 4.5: Factor Loadings for Management Programs

S.No	Items	Component
1	Supervisors are coordinating compliance program effectively	.586
2	Employees have received regular trainings on OSH	.759
3	Proper use of PPE is conducted regularly and is well applied	.818
4	Employees are trained on risks due to hazardous substance	.699
5	There are effective and regular Medical Examination Programs	.724
6	The workplace inspection program has helped to reduce	.674

Source: Study Data (2023).

Table 4.5 indicates that 6 Occupational and Safety and Health items for management programs showed factor loading above 0.5. The closeness of factor loading values to each other indicates that the data were reliable and valid.

4.5.2 Factor Loadings for Management Administration

The factor analysis was conducted to determine factor loadings components management administration. The score ranges from -1 to 1 where -1 means highly negative correlation '0' indicates no correlation and 1 means highly correlated. A value greater than 0.5 indicate good correlation hence, constructs with value score below 0.5 is eliminated. Tables 4.6 present the results for analysis.

Table 4.6: Factor Loadings for Management Administration

S.No	Item	Component
1	Health and safety responsibility is effectively monitored	.949
2	Employer has an effective and workable emergency action plan	.849
3	There is active employees participation on OSH committee	.508
4	Protective equipment are available and sufficient for employees	.935
5	The existing unit dealing with safety issues is effective	.909
6	There is regular risk assessment programs in the work site	.922
7	Most accidents are reported to the safety management unit	.779

Source: Study data (2023).

Table 4.6 indicates that 7 Occupational and Safety and Health items out of 10 for management administration showed factor loading above 0.5. The three items (OHS Management has increased employees commitment at work, OHS Management has improved working conditions and OHS Management has improved quality of machines by lowering faults) showed loadings less than 0.5 hence they were not used in final analysis.

Finding from the actual study also confirmed that the reliability test for 18 items for determinants of Occupational Safety and Health (OSH) management on industrial

production were appropriate. Table 4.7 presents findings from the study.

Table 4.7: Results for Reliability Tests

Variable	Number of Items	Cronbach's Alpha	Interpretation
Determinants of OSH	18	.796	Accepted

Source: Study data (2023).

Table 4.7 shows that the Cronbach's Alpha was 0.796 for all 18 items. These findings revealed that the research tool was appropriate to provide the intended results.

4.6 Descriptive Statistics

The descriptive statistics conducted in order to summarize and describe the study data in a meaningful way. Table 4.8 presents the mean, standard deviation minimum and maximum value of the study variables.

Table 4.8: Descriptive Statistics of Study Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Input Cost Factors	73	1	5	3.04	1.003
Management Programmes Factors	73	1	4	1.58	.538
Management Administration Factors	73	1	4	1.32	.562

Source: Study data (2023).

Table 4.8 indicates that OSH management administration factors have the lowest mean as compared to OSH management programmes and OSH input costs factors. The table indicates that the influence of OSH management administration factors and OSH management programme factors have high influence on production as compared to OSH input costs.

4.7 Estimation Diagnostic Tests Results

This section presents the results from some diagnostic tests including normality test, Multicollinearity, correlation test and coefficient of determination.

4.7.1 Normality Test

In order to understand whether the variables are normally or not normally distributed, the test for normality was conducted. This test helps to identify the appropriate inferential statistics tests that fit the data. Table 4.9 indicates the results for the normality tests.

Table 4.9: Results from Normality Test

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
PDN	.350	73	.000	.636	73	.000
INPUTCOST	.138	73	.002	.945	73	.003
OSH Programme	.234	73	.000	.829	73	.000
OSH Administration	.264	73	.000	.783	73	.000

a. Lilliefors Significance Correction

Source: Study data (2023).

The results show that both statistics from the Kolmogorov-Smirnov and Shapiro-Wilk tests reject the null hypothesis “that the data is normally distributed. Therefore, the data form linear pattern before used for further analysis in order to avoid violation of classical linear regression assumption of normal distribution.

4.7.2 Multicollinearity Test

Moreover the study conducted Multicollinearity test in order to identify if there exist correlation between the independent variables. Findings from the study indicated that the assumption of zero correlation between the independent variables was not violated. Table 4.10 provides results from Multicollinearity Test.

Table 4.10 Results from Multicollinearity Test

Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
INPUTCOST	.984	1.016
OSHProgramme	.928	1.078
OSHAdministration	.921	1.086

Source: Study data (2023).

Table 4.10 indicates that the value of VIF for all variables were less than 10. This implies that there is no correlation between the independent variables. Thus, these results proved the main assumption for conducting hierarchical multiple regressions fulfilled.

4.7.3 Correlation Analysis

In further analysis the study conducted correlation analysis in order to determine if the data suffer from serial correlation. Correlation analysis among the variables shows the “strength and direction of the relationship between two or more variables. In this study, Spearman’s correlation was used to find a correlation between the dependent and independent variables. Generally, the value of Spearman’s correlation falls between 0.00 (no correlation) and 1.00 (perfect correlation). A correlation coefficient value of more than 0.5 is considered a strong correlation, while a correlation coefficient below 0.5 is considered a” weak correlation. Table 4.11 presents the results from correlation analysis.

Table 4.11: Correlation Analysis

Coefficient Correlations ^a					
Model			OSHAdministration	INPUTCOST	OSHProgramme
1	Correlations	OSHAdministration	1.000	.116	-.265
		INPUTCOST	.116	1.000	-.077
		OSHProgramme	-.265	-.077	1.000

a. Dependent Variable: PDN

Source: Study data (2023)

Table 4.11 indicates that the variable do not suffer from serial correlation as the values are less than 0.8. Generally, it becomes a problem when the value of the pair wise correlations between the explanatory variables exceeds 0.80 (Gujarati, 2003:341).

4.7.4 Coefficient of Determination

The study conducted regression analysis to generate the model summary that was used to analyze Coefficient of determination. Tables 4.12 present the model summary of the study.

Table 4.12 Model Summary

Model	R	R Square	Adjusted Square	R Std. Error of the Estimate	Durbin-Watson
1	.815 ^a	.664	.650	.29769	2.029

Source: Study data (2023).

Table 4.12 indicates that the R square was 0.66 indicating that 66% of the variation in dependent variable was explained by the model. The remaining 34% of the variation was explained by other factors not covered in the current study.

4.7.5 Analysis of Variance (ANOVA)

The study conducted ANOVA analysis to determine variation of the variables. Tables 4.13 present the ANOVA Results.

Table 4.13: ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.104	3	4.035	45.528	.000 ^b
	Residual	6.115	69	.089		
	Total	18.219	72			

a. Dependent Variable: PDN

b. Predictors: (Constant), OSHAdministration, INPUTCOST, OSHProgramme

Source: Study data (2023).

The findings in table in table 4.13 indicate that the model was statistically significant. Based on the results in the table, p-value was below 0.05 as indicated in the table.

4.8 Determinants of OSH Management on Industrial Production

This section presents the study findings on the effect of input costs, management programmes and management administration on industrial production. The findings are presented using both descriptive and inferential statistics. Descriptive statistics presented using frequencies, percentages and means while inferential statistics presented by using binomial test results.

4.8.1 The Effects of input Costs on Company Production

This objective intended to analyze the impacts of input Costs on Company Production. The data to address this objective collected by using questionnaires, interview and documentary review methods. The findings presented by using percentages and frequencies based on score of responses from the respondents on the effect input cost items on company production. The responses from the respondents reduced from five to three levels (Significant, Insignificant and Neutral). In doing this, the levels very significant, significant and less significant were merged to form one level (Significant). The other levels remained as Insignificant and Neutral. Findings from the study are presented in Table 4.14.

Table 4.14: Ranking of input Costs on Company Production

Extent of Agreement	Percent (%)			Rank
	Significant	Insignificant	Neutral	
Cost of materials for manufacturing production is high	58.9	5.5	35.6	1
Direct labour cost in production process is influenced by OSH	57.5	12.3	30.2	2
Factory overheads in the company production is influenced by OSH	52.1	8.2	39.7	3
Cost of technology in production operations is influenced by OSH	58.9	12.3	28.8	1
Invested capital in production process is influenced by OSH	52.1	13.7	34.2	3

Source: Study data (2023).

Table 4.14 shows that the items: cost of materials for manufacturing production is high (58.9%), cost of technology in production operations is influenced by OSH (58.9%) and direct labour cost in production process is influenced by OSH (57.5%) were rated the top most prioritized factors affecting company production. Generally, findings from table 4.14 indicate that more than 50% of respondent agreed that the input cost items have significant effects on cement production at Twiga Cement Company.

The data from documentary review also indicated that regardless of high input costs that are influenced by OSH, the performance of industry in terms of revenue has been improving. Figure 4.3 presents the trend of revenue for three years from 2020 to 2022.

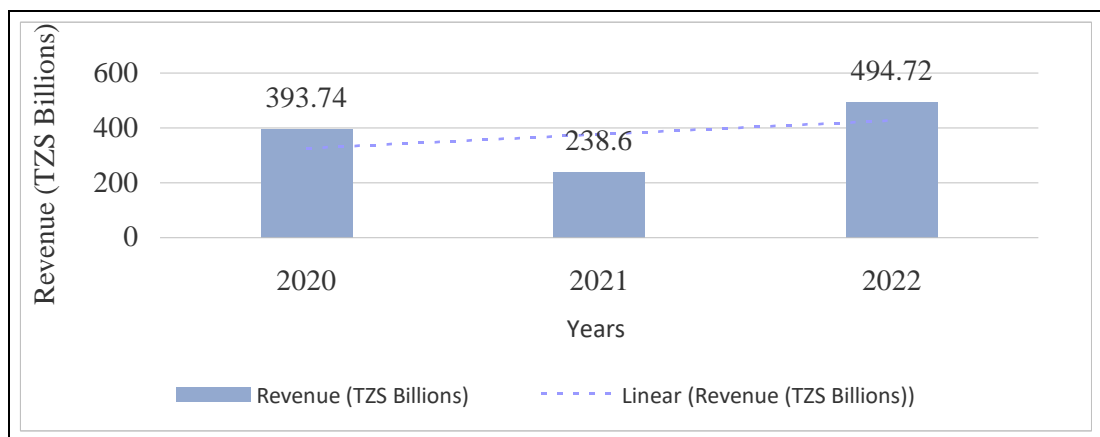


Figure 4.3: The Trend of Revenue for Three Years from 2020 to 2022.

Source: Study Data (2023).

Figure 4.3 indicates an increase in revenue in the year 2022 as compared with the previous years. The increase in revenue indicates an increase in production. Regardless of increase in revenue, findings from the key informants identified that implementation of OSH guidelines is associated with high cost. During an interview

the key informant explained that:

“Our management has been implementing these requirements because they are not hard to fulfill depending on financial position and management commitment. It’s due to high cost some of industries fail to comply because costs of some safety gear and equipment are too expensive” (Interview, Key Informant, 2023).

Moreover, during interview with another informant from administration department who preferred to be anonymity noted that:

"Always our company makes sure that enough financial resources are set aside financing safety and health matters under the supervision of head of safety and health at workplace. For us it does not matter how costly it is because safety of our employees is the first priority (Interview, Key Informant, 2023).

During interview another key informant reported that;

"The sustainability of the factory depends on its workforce. Therefore, our responsibility is to increase production without causing injures to our workers. We believe that safety in workplace facilitates production but also, it brings a positive image to our stakeholders when number of accidents is minimized. I believe even our shareholders during annual meetings, they do not want to hear incidence of death/injuries/accidents because it portrays bad image to the public” (Interview, TPCPLC official, 2023)

The information above reveals that implementation of OSH guidelines is somehow costly. However, the findings indicated that regardless of high cost of inputs, the implementation of OSH guidelines at work places is very essential for improving corporate image as well as increasing company shareholders and investment capital in general.

4.8.2 The Effects of Management Programmes on Company Production

Under this objective, the study intended to examine the effects of OSH management programs on cement production at Twiga Cement Company. The data to address

this objective was collected by using questionnaires, documentary review and interview methods. Table 4.15 presents the study findings obtained through questionnaire method.

Table 4.15: Ranking of Management Programmes on Company Production

Extent of Agreement	Percent (%)			Rank
	Significant	Insignificant	Neutral	
Supervisors are coordinating compliance program effectively	90.5	2.7	6.8	3
Employees have received regular trainings on OSH	94.5	1.4	4.1	1
Proper use of PPE is conducted regularly and is well applied	91.8	1.4	6.8	2
Employees are trained on risks due to hazardous substance	84.9	4.1	11.0	4
There are effective and regular Medical Examination Programs	75.3	4.2	20.5	5
The workplace inspection program has helped to reduce accidents	91.8	4.1	4.1	2

Source: Study data (2023).

Table 4.15 shows that the variables: employees have received regular trainings on OSH (94.5%), proper use of PPE is conducted regularly and is well applied (91.8%) and the workplace inspection program has helped to reduce accidents (91.8) were rated the top most three factors influencing the company production. In further analysis, the data collected through documentary review also indicated that the number of occupational accident and diseases have been decreased from 3 in 2020 to 0 in 2022.

Moreover, the study findings indicated that issues of occupational safety and health are managed through weekly management meetings, monthly safety meetings, OH&S representative meeting, ad hoc reporting of incidents, safety conversation and near miss report, engagement in truck inspection of which police force are

invited to inspection of trucks aimed at mitigating risk associated with transportation of goods, engagement in safety week with focus on trainings, health and safety awareness training, traffic management, defensive driver's training, plant safety inspection and Safety conversation, basic fire fighting awareness training and basic first aid training (TPCPLC, 2022).

Furthermore, during interview, one of the company officials informed that this achievement was due to management commitments on implementation of OSH policies. In support of these views, the key informant noted that:

“The company complies with relevant safety laws, regulations and guidelines. For instance, we have developed our Safety Management Systems based on internationally recognized standard in order to ensure compliance. Also we assess its effectiveness through periodic audits and the results are communicated to the company’s Board of Directors” (Interview, TPCPLC official, 2023).

Another informant from OHS department also reported that:

“Our department in collaboration with other external stakeholders such as OSHA has been providing frequent trainings especially on first aiders; use of PPEs in workplace by employees; observe fire regulations; keep specific place to keep hazardous equipment; and observance of staff uniforms” (Interview, Informant, 2023).

During interview with another key informant from administration department also noted that:

“We always comply with OSH requirements both at national and international safety standards. However, for implementing international standards, automatically we comply with local requirements such as provision of PPEs; medical check-ups; inspections; attending trainings such as first aid and fire. Apart from OSH inspections, we are inspected by international auditors such as ISO.” (Interview, key informant, 2023).

Generally, the study findings indicated that implementation of OSH programmes at Twiga Company was satisfactory. However, during interview it was identified that

the company incur high cost for implementation of OSH programmes due to high importation fee. This cost includes cost of purchasing good quality of personal protection equipment (PPE) such as helmets, safety glasses and dust mask.

4.8.3 The Effects of Management Administration on Company Production

This objective intended to examine the effects of Management Administration on Company Production. The data to address this objective collected by using questionnaires, interview and physical observation methods. Table 4.16 presents the results obtained through questionnaires.

Table 4.16: Ranking of Management Administration on Company Production

Extent of Agreement	Percent (%)			Rank
	Significant	Insignificant	Neutral	
Health and safety responsibility is effectively monitored	94.5	2.7	2.8	2
Employer has an effective and workable emergency action plan	91.8	4.1	4.1	3
There is active employees participation on OSH committee	94.5	2.8	2.7	2
Protective equipment are available and sufficient for all employees	94.5	2.7	2.8	2
The existing department or unit dealing with safety issues is effective	95.9	2.7	1.4	1
There is regular risk assessment programs in the work site	95.9	2.7	1.4	1
Most accidents are reported to the safety management unit	90.4	2.8	6.8	4

Source: Study data (2023).

Table 4.16 indicates that the items: there is regular risk assessment programs in the work site; the existing department or unit dealing with safety issues is effective; health and safety responsibility is effectively monitored; there is active employees participation on OSH committee; and protective equipment are available and sufficient for all employees were rated the top most five OSH determinants by

respondents. These findings indicated that implementation of OSH Administration at Tanzania Portland Cement Company Ltd (TPCPLC) was satisfactory as the respondents indicated high degree of compliance. In support of these views, the data collected through documentary review confirmed implementation of TPCPLC OH&S Management System that covers various areas including operations; raw material handling, processing, dispatching and the support services performed within and outside the factory. Additionally, during interview with one of TPCPLC officials noted that:

“We have been taking various measures such as implementation of our environmental management plan, OH&S45001:2018 ISO Standard as well as conducting training and awareness seminars to our employees” (Interview, TPCPLC official, 2023).

The views from TPCPLC indicated that the company had been taking occupational Safety and Health means at a remarkable rate. Responding on the role of the company on improving health and safety performance, one of the key informant from Company management added that:

“Our company has been implementing various measures because we believe that these improvements are good business practices and contribute to our shareholders’ confidence. Generally, our commitment has been always providing a safe and healthy environment in the workplace for our employees and visitors” (Interview, TPCPLC official, 2023).

On the other hand, the TPCPLC added that:

“It is the commitment of the company to devote all necessary effort and resources towards the provision of a healthy and safe working environment and safe systems of work since our target is Zero hurt. This target makes safety to be our first value and in any way we do not expect any occupational accident affecting either personal safety or the environment” (Interview, TPCPLC official, 2023).

The information collected through questionnaire and interview methods confirmed that implementation of OSH administration. Through physical observation, the

researcher also confirmed implementation of some requirements such as provision of PPE to all employees and visitors.

4.8.4 Results from Probit Model

The researcher applied the probit model in order to prove or disapprove the study hypotheses: H_{01} that stated that OSH inputs costs have no effects on cement production at Twiga cement company; H_{02} that stated that OSH management programs have no effects on cement production at Twiga cement company and H_{03} that stated that OSH management administrations have no effects on cement production at Twiga Cement Company. In order to address the study objectives three independent variables including Cost input factors, Management Programme factors and Management Administration were used in final analysis while Level of Production was applied as dependent variable. Table 4.17 presents the study findings.

Table 4.17: Probit T Model Results

Parameter Estimates		95% Wald Confidence Interval		Hypothesis Test			
Parameter	B	Std. Error	Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	9.955	2.5572	4.943	14.967	15.154	1	.000
In COST	-8.389	1.9885	-12.286	-4.491	17.797	1	.000
Programme	-1.555	.7406	-3.006	-.103	4.406	1	.036
ADMIN	1.466	.6633	.166	2.766	4.886	1	.027

Dependent Variable: PDN

Model: (Intercept), InCOST, Programme, Admin

Source: Field Data (2023).

Table 4.17 indicates that the impact of input cost on production is negative and statistically significant ($p < 0.05$). *Thus, the null hypothesis (H_{01}) that stated that OSH inputs costs have no effects on cement production at Twiga Cement*

Company was rejected. The study findings indicate that implementing OSH guidelines may lead to high cost of production in cement factories. The study findings concur with findings in the study by Kessy and Raymond (2021) that found out that occupational safety and health practices has not been implemented effectively due to high cost which affects production negatively. Moreover, some of the investors have been not adequately implementing these requirements because they consider profits than to incur costs in provision of such safety measures. In another study Kessy (2016) also identified that it requires significant resources to develop, implement, maintain and review occupational health and safety policies, procedures and guidelines at work place in order to ensure safe, efficient and productive workplace organization.

With respect to the second hypothesis *H₀₂ that stated that OSH management programs have no effects on cement production at Twiga Cement Company,* findings indicated a negative and significant effect between the variables, hence the null hypothesis was rejected ($p < 0.05$) indicating that the results are statistically significant. These findings indicate that OSH management programmes such as OSH trainings, inspections and health test have negative effect on production. In support of these results, Mrema et al. (2015) indicated that increase in employees' awareness and training on occupational health and safety has negative impact on production although it facilitates on improving employees health. In this particular study Mrema et al. (2015) recommended to increase training courses and establishing a specialized department in safety and occupational health in all manufacturing industries in order to improve production and performance of

workers. In another study Ndengwa (2015) also supported that training of workers in safety and health is very essential to ensure that workers are undertaking their job tasks to meet production targets. Similarly, In India, Patel and Mishra (2019) indicated that the absence of health related programs in the factories affects employees' wellbeing as they are subjected to problems which lead to low production.

Finally, for the third hypothesis *H₀₃, which stated that OSH management administrations have no effects on cement production at Twiga Cement Company*, the results indicated a positive and significant relationship between the variables at 5% level of significance and hence the null hypothesis was, rejected ($p < 0.05$). These results indicate that OSH Management Administrative influence the company production. These findings supported by Sklad (2016) who pointed out that effective administration of health and safety activities is the key to ensure workers are in good conditions hence increased productivity. Organizations ensure that involvement of workers, create specific unit and formulate the committees that deal with all issues related to occupational health and safety in order to reduce workplace hazards.

In line with these views, Amponsah-tawiah and Mensah (2016) indicated that effective implementation of OSH administration helps to minimize workplace hazards and increase employees job performance that lead to increased production. These findings are indicative that occupational health and safety management system are important in reducing workplace hazards. This is due to the fact that in reducing workplace accidents, injuries and work-related diseases at manufacturing companies is a results of implementing effective occupational health and safety guidelines,

programmes and administration.

4.9 Hypotheses Summary

Testing Hypotheses was based on direct effects; the hypotheses related to the study model were tested with the support of the Ordinary Least Square (OLS) technique for the Multiple Linear Regression Model. The results of the testing the hypothesis are shown in the table 4.18.

Table 4. 18: Summary of Results for Hypotheses Testing

Hypotheses Statement	Result	Decision	Hypothetical Relationship
H₁ : Hypothesis (H ₁): OSH inputs costs have no effects on cement production	($\beta = -8.389$, p= 0.000)	Supported	Negative
H₂ : Hypothesis (H ₁): OSH management programs have no effects on cement production	($\beta = -1.555$, p= 0.036)	Supported	Negative
H₃ : Hypothesis (H ₁): OSH management administrations have no effects on cement production	($\beta = 1.466$, p= 0.027)	Supported	Positive

Source: Researchers' computations, (2023).

The research hypothesis that examines the relationship between OSH inputs costs to have no effects on cement production, OSH management programs have no effects on cement production and OSH management administrations have no effects on cement production.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of the study, conclusion and study recommendations for policy actions and areas for further studies.

5.2 Summary of the study

This study has examined the impacts of OSH management system on production in Tanzania manufacturing sector particularly cement industries. Specifically, the study covered three objectives, namely (i) to examine the effects of OSH input costs on cement production at Twiga Cement Company, (ii) to examine the effects of OSH management programs on cement production at Twiga Cement Company and (iii) to assess the effects of OSH management administration on cement production at Twiga Cement Company. The study applied both primary and secondary data.

The secondary data collected through questionnaires, interview and physical observation method while the secondary data gathered through documentary review. Analysis of quantitative data was conducted through SPSS and findings presented by using both descriptive and inferential statistics. Descriptive statistics presented in form of frequencies, mean and percentages while inferential statistics presented by using binomial test. The qualitative data was analyzed by using content analysis. The study findings are presented in the following section.

5.3 Conclusion

The study findings indicated that the OSH management system influences production in Tanzania manufacturing sector particularly cement industries. The result confirmed that both OSH input cost, OSH programmes and OSH administration have effects on production.

5.3.1 Effects of OSH input costs on production

With respect to the first objective, the study findings indicated the OSH input cost has effect on production. The study findings revealed that implementing OSH guidelines may lead to high cost of production in cement factories. The study findings concur with findings in the study by Kessy and Raymond (2021) that found out that occupational safety and health practices has not been implemented effectively due to high cost which affects production negatively.

5.3.2 Effects of OSH Management Programmes on production

The result confirmed that OSH Management Programmes have effects on production. The study findings support other previous studies. For instance, Hosseinian and Torghabeh, (2012) noted that occupational health and safety programmes such as training and inspection have direct impact on production. Likewise, the finding also revealed that OSH programmes such as trainings, inspection and health testing have effects on production. Generally, the findings indicated that awareness of respondents on OSH regulations and requirements was low.

5.3.3 Effects of OSH Management Administrations on production

The result confirmed that OSH administration have effects on production such as involvement of employees and the use of proper personal protective equipment in

working environment reduce workplace accidents, injuries and work related diseases which results to increase in production. In support of these findings Kelly (2017) also confirmed that effective implementation of occupational health and safety guidelines like policies, rules and standards contribute to the reduction of workplace accidents, injuries and work related diseases.

Generally, these studies insisted on having occupational health and safety guidelines in the organization and apply them as well as involving employees in order to reduce workplace hazards and increase the organization competitiveness. Finding from the current study confirmed that effective implementation of OSH guidelines as well as OSH administration help to increase workers' confidence and satisfaction while working without any fear of being harm. The results are supported by Mrema et al. (2015) who pointed out that a company which provides training to employees on how to handle and deal with health and safety issues like personal protective equipment and the use of machines protects employees against workplace hazards like accidents, injuries and work related diseases is likely to increase its performance.

Based on the study findings it can be concluded that OSH programmes and administration is very essential for growth of an industry as well as protecting employee health and safety. However, the findings revealed that implementation of OSH requirement is too costly but its poor implementation can affect the reputation of a company which can lead to decrease in capital as it cannot attract further capital from potential shareholders.

5.4 Recommendations

This section provides recommendation for both policy actions and further studies.

5.4.1 Recommendation for Policy Actions

- (i) The government is recommended to improve supervision on OSH requirements as some investors fails to comply due to high cost of inputs on the expenses of employees' health. Hence the government should find a proper mechanism of subsidizing some of inputs such as PPEs in order to reduce the burden to investors.
- (ii) There should be regular trainings to workplace management and workers on importance and relevance of OSH issues at workplace level and proper monitoring should be conducted. The OSH programs need to be enhanced in manufacturing industry
- (iii) Industries should develop systems that monitor implementation and effectiveness of the OSH requirements at their workplace. This must go in line with conducting regular inspection of the safety of the workplace and health of workers.

5.4.2 Recommendation for further studies

The researcher recommends a study to be conducted on assessment of implementation of the minimum OSH compliance requirements in other types of manufacturing industries. Also the further research will be for transportation and persistent raw material pressures have been playing a heavy strain on the cement and construction industry. Hence investors have to establish railway facilities jointly with Government that can at least connect major raw material and cement manufacturing sites with major cities and roads. Cement producers should participate in such projects through cost sharing and collaboration with government

as using railways for transportation will ultimately benefits them in terms of lower transportation costs.

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4. Your experience in working with the company

- a) Below 5 years ()
- b) Between 5 and 10 years ()
- c) Between 10 and 20 years ()
- d) More than 20 years ()

GENERAL OSH AND EMPLOYEES

Tick appropriate answer

Key 1-low extent 2- moderate extent 3- high extent

5. At what levels you understand following guidelines on OSH

- | | | | |
|--------------------|-----|-----|-----|
| a) Policies on OSH | [1] | [2] | [3] |
| b) Laws on OSH | [1] | [2] | [3] |

6. State at which level you have experienced the following programs

- | | | | |
|-------------------|-----|-----|-----|
| a) Training | [1] | [2] | [3] |
| b) Inspection | [1] | [2] | [3] |
| c) Health testing | [1] | [2] | [3] |

7. Indicate the level you have interacted with the following administration

- | | | | |
|------------------------|-----|-----|-----|
| a) OSH department | [1] | [2] | [3] |
| b) OSH committee | [1] | [2] | [3] |
| c) OSH quality control | [1] | [2] | [3] |

OSH MANAGEMENT SYSTEM DIMENSION (LIKERT SCALE)

Part II: Effects of input Costs on Company Production

Indicate your level of agreement by putting a tick (√) to the space of your best choice. Key: 1-Very significant, 2-Significant, 3-Less significant, 4-Neutral, 5-Insignificant.

Item	1	2	3	4	5
Cost of materials for manufacturing production is high					
Direct Labour cost in production process is influenced by OSH					
Factory overheads in the company production is influenced by OSH					
Cost of technology in production operations is influenced by OSH					
Invested capital in production process is influenced by OSH					

Part III: Effects of Management Programs on Company Production

Indicate your level of agreement by putting a tick (√) to the space of your best choice. Key: 1-Strongly agree, 2-Agree, 3-Neutral, 4-Disagree, 5-Strongly disagree

Item	1	2	3	4	5
Supervisors are coordinating compliance program effectively					
Employees have received regular trainings on OSH					
Proper use of PPE is conducted regularly and is well applied					
Employees are trained on risks due to hazardous substance					
There are effective and regular Medical Examination programs					
The workplace inspection program has helped reduce accidents					

Part IV: Effects of Management Administration on Company Production

Indicate your level of agreement by putting a tick (√) to the space of your best choice. Key: 1-Very important, 2-Important, 3-Less important, 4-Neutral, 5-Not important.

Item	1	2	3	4	5
Health and safety responsibility is effectively monitored					
Employer has an effective and workable emergency action plan					
There is active employees participation in OSH committee					
Protective equipment are available and sufficient for all employees					
The existing department or unit dealing with safety issues is effective					
There is regular risk assessment programs in the work site					
Most accidents are reported to the safety management unit					
OHS management has increased employees commitment at work					
OHS management has improved working conditions					
OHS management has improved quality of machines by lowering faults					

Part V: OSH Management System on Company Production

Item	2020	2021	2022
Tones of bags produced per year			
Revenue collected per year			
Number of employees per year			
Number of Occupational accident and diseases per year			
Number of resigned employees per year			
Number of absentees per year			

DR. Timothy Lyanga

Maria L. Nyange

SUPERVISOR

STUDENT

.....

.....

Date:

Date:

.....

.....



THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

THE OPEN UNIVERSITY OF TANZANIA

Ref. No OUT/ PG202001324

26th June, 2023

Director of Human Resource,
Twiga Cement Company,
P.O.Box 1950,
DAR ES SALAAM.

Dear Director,

RE: RESEARCH CLEARANCE FOR MS. MARIA LYIMO NYANGE, REG NO: PG202001324

2. The Open University of Tanzania was established by an Act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No.55 in the official Gazette. The Act was however replaced by the Open University of Tanzania Charter of 2005, which became operational on 1st January 2007. In line with the Charter, the Open University of Tanzania mission is to generate and apply knowledge through research.

3. To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance, on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology, to both its staff and students who are doing research in Tanzania. With this brief

background, the purpose of this letter is to introduce to you **Ms. Maria Lyimo Nyange, Reg. No: PG202001324** pursuing **Master of Science in Economics (MSc-ECONOMICS)**. We here by grant this clearance to conduct a research titled "**Determinants of Occupational Safety and Health Management on Industrial Production in Tanzania: Evidence of Twiga Cement Company**". She will collect her data at your office from 27th June to 30th July 2023.

4. In case you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O.Box 23409, Dar es Salaam. Tel: 022-2-2668820. We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

THE OPEN UNIVERSITY OF TANZANIA

Magreth S. Bushesha

Prof. Magreth S. Bushesha

For: **VICE CHANCELLOR**