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FACULTY OF ENVIRONMENTAL SCIENCE

AN ASSESSMENT ON WORKPLACE ERGONOMICS AND THEIR HEALTH IMPLICATIONS, AT AN ELECTRONIC MANUFACTURING INDUSTRY. A CASE STUDY OF RADIO SOLUTIONS ZIMBABWE.

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JUNE 2024

DECLARATION

The undersigned certify that they have read this research project and have approved its submission for marking to the department's guidelines and regulations

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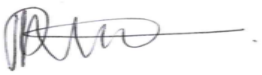
Signature 

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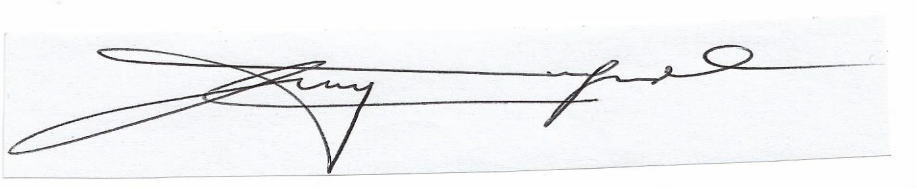
Signature 

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DEDICATION

This research project is dedicated to the hard-working and dedicated employees of Radio Solutions Zimbabwe, whose willingness to share their experiences and perspectives has made this study possible. l would also like to extend my gratitude to my family and friends for their unwavering support and encouragement throughout the research process.

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Finally, l would like to thank my family, friends, and loved ones for their unwavering support, encouragement, and prayers. Your continued belief in me has been a constant source of inspiration and motivation.

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ABSTRACT

This research study investigates the ergonomics of workplace conditions and their health implications for employees at Radio Solutions Zimbabwe. The study uses a mixed-methods approach, combining semi-structured interviews and surveys to collect data from a sample of 16 participants for the interview component and 33 participants for the survey component. The target population for the study consists of 55 employees at Radio Solutions Zimbabwe, comprising both technicians and office workers. The findings suggest that ergonomic workplace conditions have a significant impact on employee health and well-being. Workers who reported poor ergonomic conditions were more likely to experience work-related musculoskeletal disorders, carpel tunnel syndrome, tendinitis eye strain, and mental fatigue. Additionally, employees who had received training and education on ergonomics had a better understanding and awareness of the importance of ergonomic conditions in the workplace. The study also found that a majority of employees reported experiencing musculoskeletal pain while performing their duties. The commonly affected body parts were the neck, back, and shoulders. The leading causes of musculoskeletal pain were poor postures, repetitive motions, and excessive force exertion on the muscles. The study's recommendations include conducting a comprehensive ergonomic audit, the implementation of ergonomic programs, providing ergonomic tools and equipment, establishing an ergonomic committee, and developing an educational and training program. Overall, this study highlights the significance of ergonomics in the workplace and its impact on employee health and well-being. The findings provide

insights that can inform workplace policies and promote the well-being of workers in the electronic manufacturing industry. The study's recommendations call for a comprehensive approach to address ergonomic challenges in the workplace, which will likely improve employee comfort, safety, and productivity.

KEY-WORDS: Ergonomics, Musculoskeletal disorders (MSDs), Workplace Safety, Employee health, Electronics industry, Office workers, Technicians, Interviews, Surveys, Health implications, Risk factors, public health

LIST OF ACRONYMS

WMSDs	Work Related Musculoskeletal disorders
CTS	Carpal Tunnel Syndrome
MSDs	Musculoskeletal Disorders
PPE	Personal Protective Equipment

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CHAPTER ONE

INTRODUCTION

The study assesses workplace Ergonomics and their health implications, at Radio Solutions Zimbabwe which is an electronic manufacturing industry. Millions of people are employed worldwide in one of the world's biggest and fastest-growing businesses, electronic manufacturing. The business confronts particular difficulties in maintaining the health and safety of its employees due to the rising demand for electronic gadgets, which result in work-related musculoskeletal disorders (WMSDs).

1.1 Background of the study

The electronics industry is one of the largest global industries and is known for its rapid technological innovation, global competition, and labour intensity (Chu, Shen, Wu, & Ku, 2021). High ergonomic risks include high load, repetition, awkward posture, and monotonous work in the workplace. Previous studies have reported a high prevalence of work-related musculoskeletal disorders (WMSDs) in the electronics industry, ranging from 35.7% to 80.5% on different body parts (Daneshmandi, 2019).

Several authors have defined ergonomics as the science of designing work environments and tools that fit the human body and its cognitive and physical abilities, to improve worker safety, health, comfort, and performance In the electronic manufacturing industry, ergonomics involves designing workstations and processes that minimize repetitive motions, awkward postures, and excessive force, while optimizing visual perception and mental workload (Jonnalagadda, Taylor, Williams, & Lambeck, 2018). The electronics manufacturing industry usually comprises of continuous flow and small batch size processes for a variety of products that change quickly with time. A group of diseases known as WMSD have implications on the body's joints, muscles, and bones, especially, back pain and carpal tunnel syndrome, are common among workers who perform physically demanding tasks or work in awkward or uncomfortable positions.

In 2018, a survey was conducted in thirty electronics manufacturing factories in China using an interview-based questionnaire. The study included 7,307 workers from different regions, and the results showed that the prevalence of work-related musculoskeletal disorders (WMSDs) within 12 months was 40.6%. The most commonly affected body sites were the neck, shoulder, upper back, and lower back. This prevalence rate was similar to another study

conducted in Beijing, but lower than the rates reported in studies from Iran. Overall, the study emphasizes the importance of addressing WMSDs in the electronics manufacturing industry in China. (Daneshmandi, 2019; Aghilinejad & al., 2016; Chee & Rampal, 2004)

Work-related musculoskeletal disorders (WMSDs) have become a significant issue for the occupational population, leading to the decline of the workforce. According to research from the United States of America, lower back pain is the fourth most common cause of disability-adjusted life years among the 25-49-year population worldwide (Diseases and Injuries Collaborators, 2019). To address this issue, an electronics assembly plant in the United States implemented an ergonomics program, focusing on evaluating work areas and identifying jobs with the most significant likelihood of contributing to WMSDs. The program aimed to recommend modifications to reduce the risk and evaluate the changes' effectiveness in reducing the incidence of WMSDs (American Conference of Governmental Industrial Hygienists., 2001).

Electrical and computer manufacturing is projected to decrease in the U.S. by 7% over the next 10 years (Bureau of Labour Statistics 2006-07) but manufacturing worldwide is likely to increase dramatically. The potential risk factors associated with manual assembly of electronic components are repetition, localized mechanical stress, forceful exertions and poor working posture Helander & Burri (1995) which led to discomfort primarily in the hands, wrists, shoulders, neck and upper back Chee & Rampal (2004) and potentially leading to work related musculoskeletal disorders (WMDs).

A group of researchers conducted a survey in 2017 among workers from various industries, including manufacturing, in Nigeria to evaluate their workplaces' ergonomic conditions and the prevalence of work-related musculoskeletal disorders. The results of the survey showed a high frequency of musculoskeletal disorders in Nigerian workers, with many of them being exposed to various ergonomic risk factors (Ogan, 2017). Furthermore, South African studies found that workers are at risk of musculoskeletal disorders due to ergonomic risk factors in their workplaces (Jones & Thomas G, 2020). In their study Jones et al. 2020 found that the most common ergonomic risk factors among the workers were awkward postures, repetitive movements, and vibrations. These risk factors were found to be associated with musculoskeletal disorders, such as pain in the neck, shoulders, and lower back. Additionally, the study found that workers had limited knowledge of ergonomic and lacked training on how to avoid ergonomic risk factors.

Radio Solutions, an electronic manufacturing industry, security, and ICT systems company based in Zimbabwe, faces several ergonomic risks that could endanger the health and safety of its workers. Smallwood (2004) argues that the manufacturing process is inherently challenging in terms of ergonomics. Although safety and health programs have been implemented at Radio Solutions, there is currently no baseline information on workplace ergonomics and health implications, which creates a significant problem since there is no data on which to develop control measures to ensure the employees' safety. Therefore, this study aims to assess workplace ergonomics and health implications in an electronic manufacturing, security, and ICT company located in Harare, specifically in Milton Park.

1.2 Problem statement

The electronic manufacturing industry faces significant challenges related to ergonomics and worker health, as the demand for electronic products has significantly impacted the production and safety of workers worldwide. At Radio Solutions Zimbabwe, workers are exposed to a variety of ergonomic hazards due to technological advancements and increased demand for electronic products. The lack of appropriate ergonomic practices and control measures, coupled with high workloads and production targets, has contributed to a significant increase in reported ergonomic injuries and musculoskeletal disorders among employees.

On average, the company has seen a 37% increase in reported ergonomic injuries over the past five years, with a total of 45 injuries reported in the past year alone. Further, employee surveys suggest that workload and production levels have increased by 25% over the same period, exacerbating the risks associated with ergonomic hazards. These challenges underscore the urgency and importance of developing and implementing effective ergonomic interventions and safeguarding worker health for a sustainable and successful company at Radio Solutions Zimbabwe.

1.3 General objectives

- To assess workplace ergonomics and health implications in an electronic manufacturing industry

1.3.1 Specific objectives

- To identify workplace ergonomics and health implications in the electronic manufacturing industry.
- To determine the level of risk associated with identified hazards.
- To evaluate the effectiveness of mitigation measures in place

1.4 Hypothesis

H_0 -Workplace ergonomics and health implications have an impact at electronic manufacturing industries.

H_1 – Workplace ergonomics and health implications have no impact at electronic manufacturing industries.

1.5 Significance of the study

To promote employee safety and well-being, it is essential to evaluate the impact of workplace ergonomics and health implications in the electronics manufacturing industry (Lim et al., 2014; Low et al., 2013). The industry has a high incidence of musculoskeletal disorders (MSDs) which are related to several risk factors. MSDs are the most common work-related health problems globally and contribute to the majority of work-related absenteeism (Briggs, et al., 2018; EU-OSHA, 2017). Work-related musculoskeletal disorders can cause individuals to experience pain, stiffness, muscle tightness, and swelling, which can result in and possible permanent disability (Janga & Elangovan, 2012). Since WMSDs are a major challenge to public health, they are the source of growing international focus as they have a burden on the healthcare system, employers, and employees (Sultan-Ta et al., 2017).

This study will help Radio Solutions workers by providing information on ergonomics hazards present in the workplace, and the associated health risk. By identifying these hazards and assessing their impacts, we can help to develop and implement controls that will reduce the risk of injury and improve the health and safety of workers. In addition, this study can also help to raise awareness of ergonomics and its importance in the workplace. The electronic manufacturing industry often involves repetitive task, prolonged sitting or standing and exposure to potential hazards such as noise and vibration. Assessing ergonomics allows for the identification of ergonomic risk factors that may contribute to musculoskeletal disorders and other work-related injuries. By addressing these risk factors, Radio Solutions can proactively prevent injuries, reduce absenteeism, and lower healthcare cost associated with work related injuries.

1.6 Area of the study

Radio Solutions Zimbabwe is located in Milton Park in the region of Harare. Its geographical coordinates are 17° 48’ 53” South, 31° 1’ 29 East. The facility is outfitted with state-of-the-art equipment and technology. The building itself is an older structure, but it has been well-maintained and updated over the years. It has a more utilitarian design, with a concrete and

brick exterior, but the inside is bright and functional. The company's manufacturing facilities are at the back, while the office space is on the front. The company's location outside of the CBD provides easy access to highways and transportation hubs, making it convenient for the company's employees and suppliers.

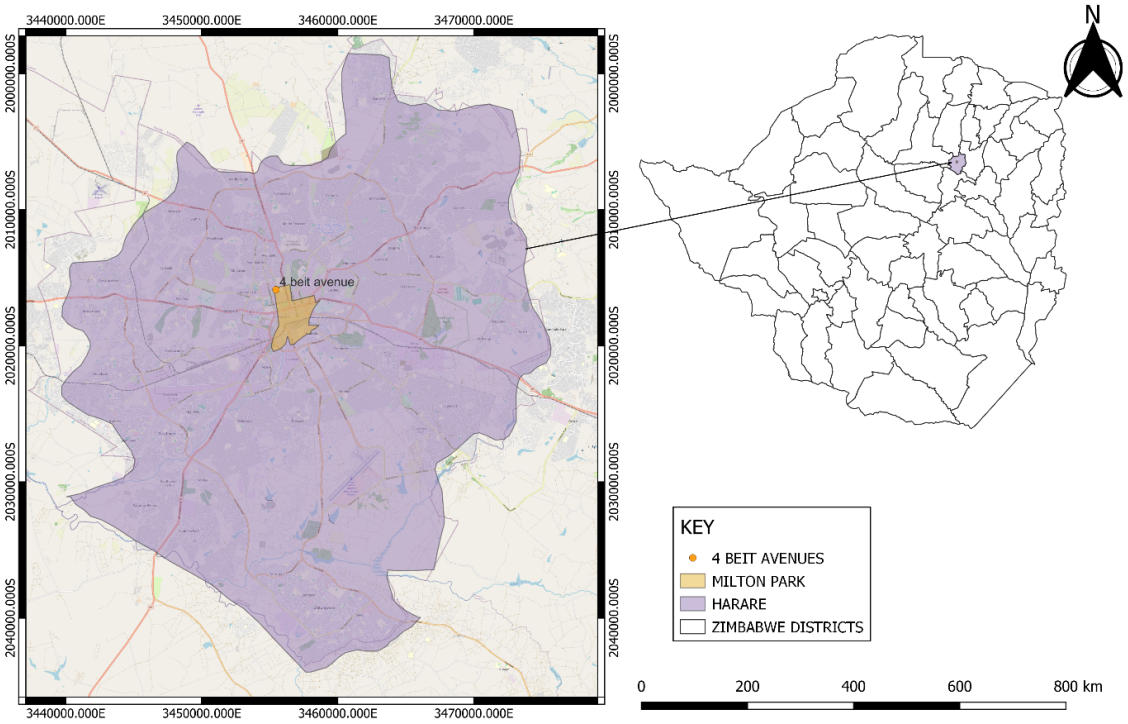


Figure 1.1: Study area map

Milton Park is a district situated in Harare, Zimbabwe, that experiences a highland tropical climate with a dry winter period. The average yearly temperature for this district is 22.53 degrees Celsius, which is slightly cooler than the country's average. Milton Park typically receives an average of 110.13mm of rainfall per year and has around 188.57 rainy days. This suburb is densely populated and known for its mixed-use character, unique diversity, and rich history. It is often likened to other suburbs like the Avenues, Greendale, Eastlea, and Highlands. Separated from the central business district by the A1 highway to the east, Milton Park boasts various trees, flowers, and greenery that enhance its aesthetic appeal and provide a serene environment.

In Milton Park, a residential area adjacent to Harare City centre, the minimum subdivision in most plans remains at 1000 square meters (Battersby, 2018). However, the situation in the area is presaging disaster when it comes to water bodies.

1.6.2 Socio-economic characteristics

Radio Solutions Zimbabwe has fifty-five employees who work at the organisation. It is a male-dominated workplace with eighteen females and thirty-seven males. Radio Solutions workers are especially technicians between the ages of 24 and 40, some being married and some not yet. Radio Solutions employees ensure that their customers receive assistance when needed. Whether it is troubleshooting, installation, or maintenance. Workers at Radio Solutions have been provided with training and development opportunities which is helping them to further their careers in the electronic industry.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

Introducing ergonomic practices in the workplace is essential in enhancing human performance, safety and minimising the risk of injuries and illnesses in the electronic manufacturing industry (Kumar & Kumar, 2017). Ergonomic practices involve the science of designing workstations, equipment, and systems to fit the people who use them, to enhance human performance and safety while minimising the risk of injury and illness (International Ergonomics Association, 2021). Therefore, this chapter reviews the literature on ergonomics in the workplace and its health implications exclusively in the electronic manufacturing industry. The chapter will begin by defining ergonomics and its importance in the workplace. It then discusses various aspects of ergonomics, including ergonomic risk factors, musculoskeletal disorders, and occupational health hazards. Lastly, this chapter evaluates the effectiveness of mitigation measures employed to mitigate the associated hazards (Karwowski, Handbook of human factors and ergonomics, 2018). The review aims to provide an in-depth analysis of how ergonomics affects workplace health and safety, the different occupational hazards, and the mitigation measures that can be employed.

2.1 Ergonomics in the Workplace

Ergonomics is essential in the workplace because it can affect workers' health, safety, and productivity (Kumar & Kumar, 2017). Ergonomic practices involve the science of designing workstations, equipment, and systems to fit the people who use them, with the aim of enhancing human performance and safety while minimizing the risk of injury and illness (International Ergonomics Association, 2021). This definition underscores the significance of ergonomics in workplaces and the adoption of ergonomic practices in the electronics manufacturing industry.

Human factors are vital considerations in designing ergonomics in the workplace. These include anthropometric factors such as height, weight, and body dimensions, which influence how workers interact with equipment and affect their safety and health (Kumar & Kumar, 2017). In the electronic manufacturing industry, workers perform various tasks and operations, such as assembling electronic components, which can be repetitive and prolonged. Therefore, ergonomic designs must fit their morphology to reduce the risk of exposure to ergonomic hazards.

Apart from physical factors, ergonomic practices must also account for cognitive, social, and organisational factors. These involve work's mental and emotional demands, worker relations, and the work culture (Karwowski, Handbook of human factors and ergonomics, 2018). In the electronic manufacturing industry, cognitive factors such as concentration, decision-making, and stress can affect workers' performance and safety. Social and organizational factors such as teamwork, communication, and autonomy can influence workers' motivation and satisfaction.

Effective ergonomic practices require the application of interdisciplinary knowledge, including human factors, engineering, and management, to design workplaces, products, and systems that fit workers and enhance their performance, safety, and well-being (Karwowski, Handbook of human factors and ergonomics, 2018). It is therefore critical for electronic manufacturing companies to adopt ergonomic principles and practices to reduce the ergonomic risks associated with the industry and the associated health hazards.

2.2 Ergonomic Risk Factors

The electronic manufacturing industry involves various risk factors that affect workplace ergonomics, which can, in turn, lead to occupational health hazards. According to Costello & Edmonds (2018), these risk factors include exposure to vibrations, rigorous exertions, uncomfortable postures, repeated actions, and unfavourable working conditions. Workers in the industry typically work long hours, handle small and sensitive components, use specialized tools, and perform repetitive tasks, which can adversely impact their well-being and productivity. These risk factors can also lead to the development of musculoskeletal disorders (MSDs) and other occupational health issues

Repetitive motions in electronic manufacturing industries refer to frequent movements requiring workers to perform the same task repeatedly. Working on an assembly line, which involves continuous and repetitive motions, can lead to various health issues such as carpal tunnel syndrome (CTS), tennis elbow, and trigger fingers (Lynn, 2020). CTS is a painful condition that typically affects the hands, fingers, and wrists, often caused by holding a small tool or gadget for extended periods. Awkward postures, on the other hand, involve working at odd angles, which puts a strain on the body. Electronic manufacturing workers are required to use computers, sit for long periods, or work on an assembly line, leading to poor posture. Poor posture can eventually result in discomfort, which could lead to severe ergonomic injuries.

Forceful exertions in the electronic manufacturing industry involve the use of hands, shoulders, or back muscles to exert a substantial amount of force repeatedly. Continuous force exertion can cause back strains and other musculoskeletal disorders (MSDs) which are a significant concern as they are the most common workplace injuries worldwide (National Institute for Occupational Safety and Health (NIOSH)., 2021). In addition to forceful exertions, other ergonomic risk factors in the industry include vibration exposure and poor environmental conditions such as excessive heat and cold. Workers in electronic manufacturing use vibrating power tools to assemble and disassemble components, putting them at risk of suffering from hand-arm vibration syndrome. The machinery and equipment used in the industry often generate significant heat, which could lead to heat stress and heat exhaustion, which are serious health conditions (National Institute for Occupational Safety and Health (NIOSH)., 2021).

2.3 Musculoskeletal Disorders

Musculoskeletal disorders (MSDs) are a common problem affecting employees in the electronic manufacturing industry. MSDs are injuries that affect the musculoskeletal system, which includes muscles, tendons, and nerves, causing pain and discomfort. Workers in this industry often engage in repetitive movements, awkward postures, and exertions causing prolonged stress and strain to these areas (Mojumder, 2019).

One common type of MSD affecting employees in the electronic manufacturing industry is shoulder pain. This is primarily caused by long periods of standing, awkward postures, and repetitive upper limb work. Additionally, the problem can be exacerbated by manual material handling, work pressure, and a lack of newer or ergonomic equipment (Fitriana S, Nasution M, & M, 2018).

Another common MSD affecting electronic manufacturing workers is neck pain. Neck pain usually results from prolonged sitting, looking down, tilting the head for long periods, and working under fluorescent lighting conditions. In addition, work stress, work-family conflict, low job satisfaction, and lack of rest breaks have been associated with an increased risk of neck pain (Mojumder, 2019).

Additionally, low back pain is a common type of MSD affecting workers in the electronic manufacturing industry. It is mostly associated with manual material handling, lifting of heavy loads, and prolonged standing. Low back pain results in lost work hours, decreased productivity, and significantly threatens the quality of life. Ergonomic interventions, including the provision of ergonomic chairs, workstations, and adjustable desks, have been identified as

effective control methods to alleviate low back pain in workers in the electronics industry (Nganga & Ochieng, 2019)

2.4 Occupational Health Hazards

The electronic manufacturing industry exposes workers to several occupational health hazards. These hazards can result in a wide range of occupational diseases, acute injuries, and chronic illnesses, among other adverse health effects.

One common occupational health hazard in this industry is exposure to hazardous chemicals. Electronic devices contain a wide variety of materials and chemicals, including lead, cadmium, mercury, and flame retardants, which pose significant health risks to workers. Exposure to these chemicals can occur through inhalation, ingestion, or skin absorption. Lead exposure, for instance, can lead to anemia, kidney damage, and central nervous system impairment, while cadmium exposure can cause lung and prostate cancer (Gulipalli, Nandi, & Patra, 2018).

Another significant occupational health hazard is noise exposure. Many workers in the electronic manufacturing industry operate loud machinery that can cause noise-induced hearing loss over time. Prolonged exposure to high noise levels has been linked to tinnitus, hearing loss, stress, and cardiovascular disease (Davis, Smith, & Ferguson, 2017).

In addition, the electronic manufacturing industry poses a risk of ergonomic hazards, which can result in musculoskeletal disorders. Work practices such as prolonged sitting, awkward postures, and manual material handling can lead to back pain, neck pain, and carpal tunnel syndrome (CTS). CTS is a painful condition caused by a repetitive motion of the wrist that can lead to numbness, tingling, and weakness (Serrano, Santos, & Cardoso, 2018).

Radiation exposure is another significant occupational health hazard in the electronic manufacturing industry. Electronic devices often rely on radiation-emitting sources such as X-rays, fluorescent lamps, and microwave ovens. Exposure to ionizing radiation can lead to various adverse health effects, including cancer, genetic mutations, and reproductive problems (Orji, Fashina, & Okonkwo, 2019)

2.5 Effectiveness of Mitigation Measures

Several mitigation measures can be utilized to reduce the risk of exposure to occupational health hazards in the electronic manufacturing industry. These measures are implemented by

employers to prevent musculoskeletal disorders, hazardous chemical exposure, noise-induced hearing loss, and radiation exposure. The effectiveness of these mitigation measures depends on their ability to reduce exposures to hazardous agents in the workplace.

One effective mitigation measure used to reduce hazardous chemical exposure is the substitution of hazardous materials with less harmful ones. This method is effective in reducing workers' exposure to hazardous substances, including lead, mercury, and cadmium. For instance, replacing lead-based solder with lead-free solder can help reduce worker exposure to lead, which can cause significant health risks (Taheri, Heydari, Kashefi, Latifi, & Pourakbar, 2015).

Another effective mitigation measure is administrative controls, such as work rotation and rest breaks, which can help to reduce the risk of musculoskeletal disorders caused by prolonged sitting or repetitive motions. Other administrative controls, such as job rotation, can offer a diverse range of work tasks, reducing the risk of ergonomic hazards associated with performing the same repetitive task every day (Burgel & Kordek, 2017).

Providing personal protective equipment (PPE) is crucial in reducing exposure to occupational health hazards in the electronic manufacturing industry. PPE such as gloves, goggles, respirators, earplugs, or earmuffs can protect workers from hazardous chemicals and noise-induced hearing loss. Nevertheless, the effectiveness of PPE depends on proper usage by workers and proper selection and maintenance by employers. Employers must maintain PPE after each use and replace defective equipment immediately (Ajayi & Afolabi, 2019).

2.6 Conclusion

This literature review aimed to identify workplace ergonomics and health implications at an electronic manufacturing industry, specifically Radio Solutions Zimbabwe. The review highlighted the importance of workplace ergonomics, ergonomic risk factors, musculoskeletal disorders, and occupational health hazards. Furthermore, this review explored several mitigation measures, such as administrative controls, substitution of hazardous materials, and personal protective equipment, which can be used to reduce workers' exposure to occupational health hazards.

From this review, it is evident that workplace ergonomics plays a crucial role in reducing the incidence of work-related injuries and illnesses in the electronic manufacturing industry. The adoption of ergonomic practices can help reduce musculoskeletal disorders and other occupational health hazards such as exposure to noise, hazardous chemicals, and radiation.

The effectiveness of mitigation measures used in the industry depends on their implementation and compliance by employers and employees. Employers must regularly assess the workplace for hazards and implement appropriate mitigation measures to protect worker health and safety. Employees must also adhere to safety protocols, properly use protective equipment, and report safety concerns promptly**.**

CHAPTER 3: RESEARCH METHODOLOGY

3.0Introduction

The electronic manufacturing industry poses significant health and safety risks to its workers due to the nature of the tasks involved. Therefore, it is essential to assess the ergonomic

workplace conditions of employees in this industry to prevent health implications caused by poor ergonomics. This research aims to identify workplace ergonomics and health implications in the electronic manufacturing industry and evaluate the effectiveness of mitigation measures already in place. The study will use a mixed-methods research design, featuring questionnaire surveys, and interviews with employees working in the electronic manufacturing industry.

The study will focus on Radio Solutions Zimbabwe and identify the hazards present in the workplace environment, such as poor lighting, excessive noise levels, and inadequate ventilation. The study will also assess the effectiveness of control measures in place, including regular workplace health and safety assessments and employee training programs. This research will provide valuable insight into the health implications of poor ergonomics in the electronic manufacturing industry and assist in the development of comprehensive strategies to improve the safety and well-being of employees.

3.1 Research design

The research design for this study is a mixed-method design consisting of a combination of qualitative and limited quantitative methods. Qualitative research will be used to conduct interviews with employees in Radio Solutions Zimbabwe to understand their experiences and perceptions of ergonomic workplace conditions and health implications. The study will use a purposive sampling method to select participants from two groups: technicians and office workers. The interview data will be analysed by identifying cultural themes and ideas present within the data.

Quantitative research will be used to evaluate the effectiveness of mitigation measures by distributing a questionnaire survey to the same two groups, technicians and office workers. The survey data will then be analysed using simple statistical techniques to understand employee perceptions of the workplace. This research design will provide a comprehensive view of workplace ergonomics and health implications in Radio Solutions Zimbabwe for the two main groups of employees, technicians, and office workers, and recommend strategies to improve employee safety.

3.2 Target population

The target population for this study is the employees working at Radio Solutions Zimbabwe, an electronic manufacturing company specializing in the assembly and repair of electronic devices. The company has a total of 55 workers in various roles, including technicians and office workers. The sample size of the study will be determined based on the proportion of

employees in the technicians and office workers groups. A purposive sampling method will be used to select participants for the interview and survey components of this study.

Approximately, 30% of the target population, or 16 employees, will be selected for the interview component of the study. The sample will include technicians and office workers to obtain a comprehensive understanding of workplace ergonomics and health implications. For the survey component of the study, a sample size of 60% of the target population, or 33 employees, will be selected. The sample group will comprise both technicians and office workers. The sample size for the study is sufficient to provide reliable data on workplace ergonomics and health implications at Radio Solutions Zimbabwe.

3.3 Sample size determination

The sample size for this study will be determined based on the proportion of employees in the technicians and office workers groups. The sample size calculation takes into account a margin of error of 5% with a confidence level of 95%. For the interview component of the study, we will select 16 participants, which is approximately 30% of the target population. This number is sufficient to provide in-depth information on the experiences and perceptions of employees regarding ergonomic workplace conditions and health implications. For the survey component of the study, a sample size of 33 employees, which is approximately 60% of the target population, will be selected. This number provides a reasonable margin of error and allows us to obtain reliable data on workplace ergonomics and health implications in Radio Solutions Zimbabwe.

Based on the proportion of employees in the technicians and office workers groups, a sample size of 33 employees was selected for the survey component of the study. Although the initial sample size calculation suggested a sample size of 33 for this study, it's important to note that increasing the sample size would provide more reliable data and better representativeness of the population. Nevertheless, we collected valuable data from the sample size of 33 employees to gain insights into the ergonomic workplace conditions and health implications in Radio Solutions Zimbabwe. It's worth reiterating that the response rate could have been due to chance, and a larger sample size may be required for future studies.

The purposive sampling method will be used to select participants for the interview and survey components of the study. Purposive sampling has been chosen because it allows researchers to select participants based on their characteristics and ability to provide detailed information.

3.4.0 PRIMARY DATA SOURCES

3.4.1 Questionnaire survey

A questionnaire survey will be used to evaluate the effectiveness of mitigation measures in place. The survey will be distributed to a sample of 33 employees, which includes both technicians and office workers. The survey will be designed to assess employee perceptions about ergonomic workplace conditions and health implications in Radio Solutions Zimbabwe.

3.4.2 Interview

The interview will be conducted with employees in Radio Solutions Zimbabwe to understand their experiences and perceptions of ergonomic workplace conditions and health implications. A purposive sample of 16 employees, including technicians and office workers, will be selected for the interview. The interview will be semi-structured and will be conducted face-to-face.

3.5.0 RESEARCH ETHICS

Researchers must follow ethical research practices to protect the dignity, rights, and welfare of human subjects in their studies. Singleton, Jr, & Straits (2010) define research ethics as the moral principles that guide researchers in their behaviour, ensuring credibility and transparency. Ethical research practices are vital for establishing public trust in research findings. This study will adhere to the principles of research ethics to ensure appropriate research conduct. Considerate steps will be taken to uphold ethical practices, such as informed consent and confidentiality of participants, to protect their privacy and respect their autonomy.

3.5.1. Informed consent:

All participants will be provided with a written informed consent form and will be informed about the study's objectives, their right to anonymity, and their right to withdraw from the study at any time

3.5.2. Confidentiality and anonymity:

The data collected will be kept confidential, and the identities of the participants will be kept anonymous. The confidentiality and anonymity of participants will be assured by assigning unique identification numbers to participants.

3.5.3 Voluntary participation:

Participation in the study will be voluntary, and participants will be free to withdraw from the study at any time without any adverse consequences.

3.5.4. Data protection:

All data collected during the study will be securely stored, and access will be restricted to the research team. Data will be destroyed after the study is completed.

3.5.5. Minimization of harm:

The study will comply with all necessary health and safety regulations to minimize participant's harm. Participants will not be exposed to any risks beyond the normal hazards associated with their work.

3.5.6. Ethical approval:

This study will receive ethical approval from the Institutional Review Board before the study starts.

3.6 Data analysis and presentation

The data collected in this study will be analysed using both quantitative and qualitative research methods. The prevalence of ergonomic issues and their impact on employee health and well-being will be presented using tables and figures. Additionally, in-depth interviews will be analysed through content analysis to identify patterns, themes and quotes, which will be presented in the form of a descriptive narrative. The findings will be interpreted with reference to the theoretical framework guiding the study and will provide a comprehensive understanding of the relationship between ergonomic issues, employee health and well-being, and organizational performance.

3.7 Limitations of the study

The study has several limitations that may affect its generalizability, internal validity, completeness, and scope. Firstly, the study's sample size may be small, making it difficult to generalize the study's findings to the entire electronic manufacturing industry. Secondly, the data collected through questionnaires and interviews may be subjected to social desirability bias, reducing the data's accuracy. Additionally, there may be incomplete data due to questions that participants may have missed or inadequate responses. The study's scope and depth may also be constrained due to time, resource constraints, and access to relevant data. Finally, the study's case study approach focusing on Radio Solutions Zimbabwe may limit its generalizability to the entire industry in Zimbabwe. However, these limitations will be acknowledged and discussed in the final report and considered for further studies for improving workplace ergonomics and health implications in the electronic manufacturing industry

CHAPTER 4: RESULTS

4.0 Introduction

This chapter presents the findings of our study on workplace ergonomics and their health implications in the electronic manufacturing industry, using Radio Solutions Zimbabwe as a case study. Our study aimed to achieve the following objectives:

- To identify workplace ergonomics and health implications at an electronic manufacturing industry.

- To determine the level of risk associated with identified hazards.

- To evaluate the effectiveness of mitigation measures in place.

This study aimed to investigate ergonomic workplace conditions and health implications in Radio Solutions Zimbabwe. The study utilized a mixed-methods approach, consisting of in-depth interviews and surveys, to examine employees' experiences and perceptions of ergonomic issues in the workplace. The target population of the study was the technicians and office workers at Radio Solutions Zimbabwe, and the sample size for the interviews and surveys was determined based on the proportion of these groups in the target population. The study findings present insights into the prevalence and severity of ergonomic issues, the impact of these issues on employee health and well-being, and the effectiveness of current mitigation measures. Overall, this study contributes to the ongoing conversation surrounding workplace ergonomics, employee health, and job performance in Zimbabwe.

4.1. Demographic characteristics of study participants

The table provides a summary of the demographic characteristics of the study participants in Radio Solutions Zimbabwe. Of the 33 participants, 50% were aged 21-30, with no one over the age of 50. 66.7% of participants were male, and 33.3% were female. Job titles were split between 60.6% technicians and 39.4% office workers. In terms of length of employment, 56.3% had worked for 1-5 years, while no participants had worked over 20 years. Educational level showed that all participants had some college or higher, with 48.5% holding a bachelor's degree and 24.2% having a master's degree or higher. These demographic characteristics provide insight into the potential risks and needs of the workforce.

Table 4.1: Demographic characteristics of study participants

Age Group	**Number of participants**	**Percentage of total**
21-30	15	50.0%
31-40	10	33.3%
41-50	6	18.8%
51+	0	0%
Gender		
Male	22	66.7%
Female	11	33.3%
Job Title		
Technicians	20	60.6%

Office workers	13	39.4%
Length of employment		
1-5 years	18	56.3%
5-10 years	8	24.2%
10-15 years	7	21.9%
15-20	0	0%
20+	0	0%
Educational Level		
High school or less	0	0%
Some college/technical school	9	27.3%
Bachelor's degree	16	48.5%
Master's degree or higher	8	24.2%

4.2. Ergonomic Issues in the Workplace

Based on the responses to the survey questions, the most commonly reported ergonomic issues among employees at Radio Solutions Zimbabwe were repetitive strain injuries and awkward postures, with 29 respondents (90.6%) and 30 respondents (93.6%), respectively. Manual handling or lifting tasks were less commonly reported, with 17 respondents (53.1%) indicating they had experienced this issue. Noise exposure was reported by 12 respondents (37.5%), and exposure to high or low temperatures was reported by 3 respondents (9.4%). the findings suggest that repetitive strain injuries and awkward postures may be significant risk factors for employees at Radio Solutions Zimbabwe, as the majority of respondents reported experiencing these issues. While manual handling or lifting tasks were less frequently reported, they still represent a concern for just over half of the respondents and should not be ignored. Exposure

to noise and temperature extremes were reported by a smaller proportion of employees, but may still pose a risk to those who are affected

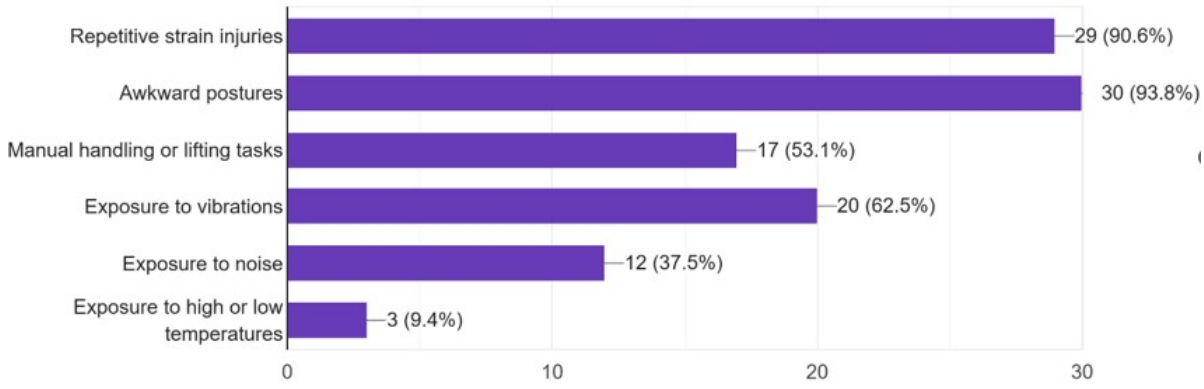


Figure 4.1: Ergonomic Issues in the Workplace

4.2.1 Most Commonly Reported Ergonomic Issues

The graph shows the percentage of employees who reported experiencing various ergonomic issues in the workplace. The three most commonly reported issues were musculoskeletal disorders (97%), carpal tunnel syndrome (90.9%), and tendinitis (75.8%). Other reported issues included stress or mental health issues (42.4%), eye strain or fatigue (48.5%), and hearing loss (9.1%). Additionally, some respondents reported experiencing other types of injuries due to ergonomic issues (12.1%).

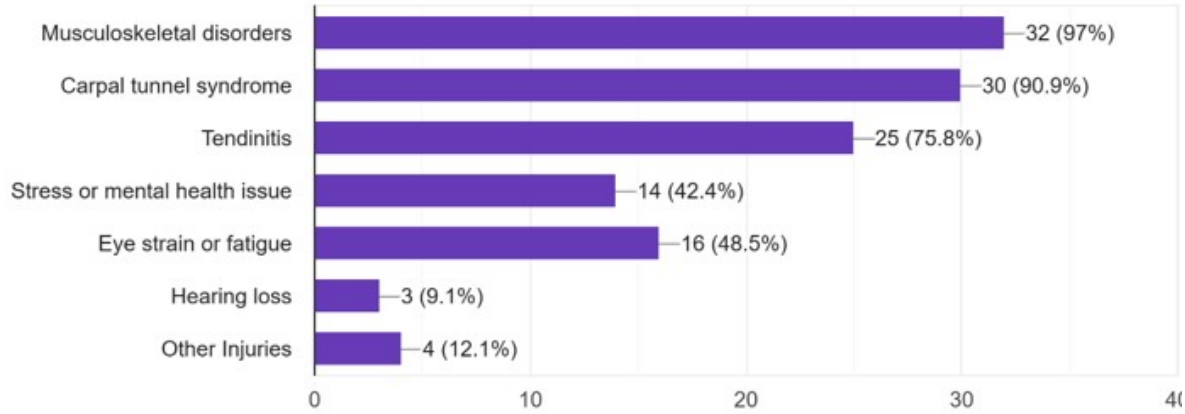


Figure 4.2: Most Commonly Reported Ergonomic Issues

4.3 identification of Hazards

Based on the responses to the question regarding potential hazards in the workplace, it was found that 60.6% of respondents reported observing potential hazards that could lead to discomfort or injury, while 39.4% did not identify any potential hazards. These findings suggest that a majority of employees recognize the presence of potential hazards in the workplace, which may require further attention and action to ensure employee safety and well-being.

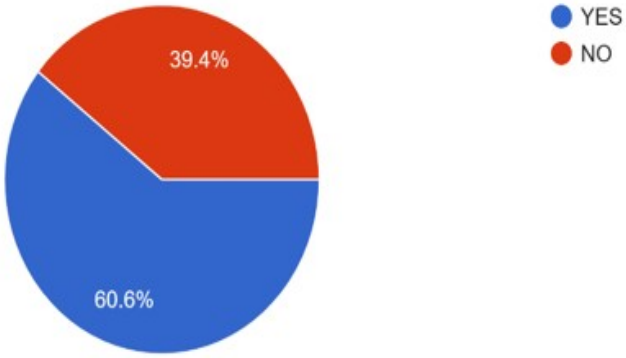


Figure 4.3: identification of Hazards

4.3.1 Awareness of Reporting Procedures

Centered around the responses to the question regarding the awareness of reporting procedures for hazards or potential safety issues in the workplace, it was found that 90.3% of respondents reported being aware of the company's procedures, while 9.7% were not aware. These results suggest that the majority of employees know how to report hazards or potential safety issues, which may reflect the effectiveness of communication and training strategies implemented in the workplace. However, the small percentage of employees who are unaware of the reporting procedures highlights the need for continuous training and communication to ensure that all employees are knowledgeable about safety protocols.

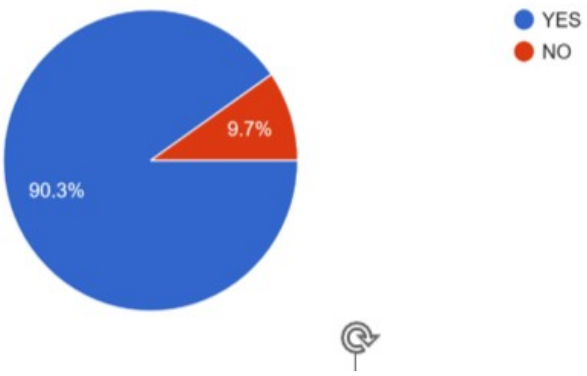


Figure 4.4: Awareness of Reporting Procedures

4.3.2 Severity of Hazards

Based on the responses to the question on how employees rate the severity of identified hazards in terms of their potential risk to employee health and safety, it was found that 59.4% of respondents rated the severity as low, 31.3% rated it as moderate, and 9.4% rated it as high. It's worth noting that none of the respondents rated the severity as very high. These findings suggest that while most employees may not perceive the identified hazards as having a significant threat to employee health and safety, there are still a significant number of respondents who rated the potential risks as moderate or high. Therefore, the company needs to take measures to mitigate these potential risks regardless of the apparent severity.

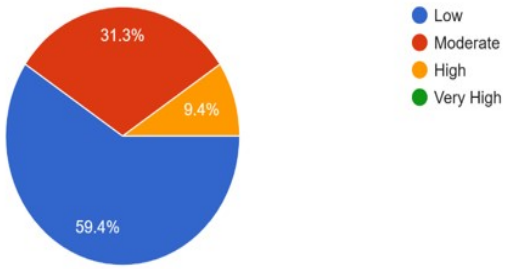


Figure 4.5: Severity of Hazards

4.3.3 Incidents Resulting from Hazards

Based on the responses to the question regarding incidents resulting from the identified hazards in the workplace, it was found that 77.4% of respondents reported that there have been incidents

resulting from the identified hazards, while 22.6% said there have not been. These results suggest that there is a real risk of workplace injuries or discomfort arising from the identified hazards, which underscores the importance of implementing effective measures to mitigate potential risks and promote employee safety.

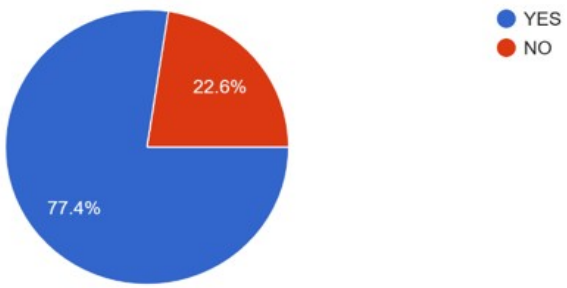
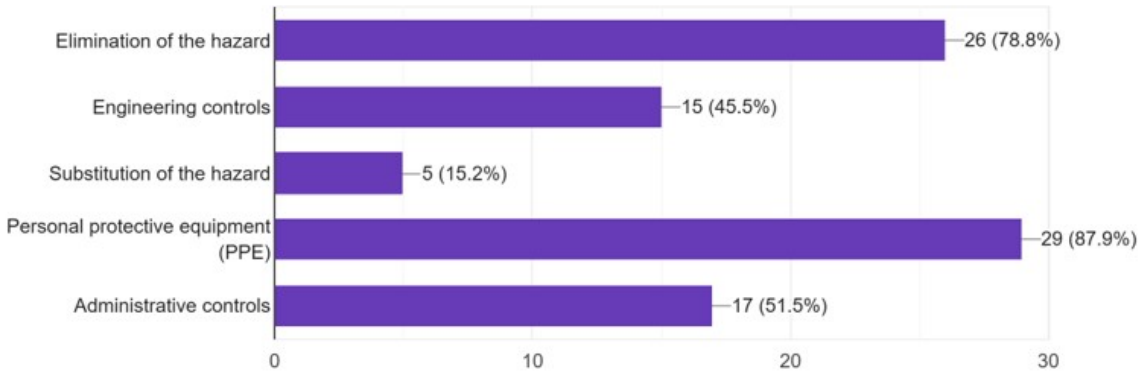


Figure 4.6: Incidents Resulting from Hazards

4.3.4 Mitigation Measures

The study asked what steps have been implemented to mitigate the risks associated with identified hazards. The majority of respondents reported using personal protective equipment (87.9%) and a significant proportion had eliminated the hazard (78.8%) and used administrative controls (51.5%). A smaller percentage of respondents had used engineering controls (45.5%) or substituted the hazard (15.2%). These results suggest that a variety of mitigation measures are being used to address workplace hazards, with personal protective equipment being the most common approach and hazard elimination and administrative controls also frequently utilized.



4.4.0 Effectiveness of Current Mitigation Measures

The study asked participants to rate the effectiveness of current mitigation measures in reducing ergonomic-related issues in the workplace. One respondent rated the measures as "very effective," while 27.3% responded with a neutral rating. None of the respondents rated the measures as "very ineffective," while 33.3% rated them as "slightly ineffective" and 36.4% rated them as "slightly effective." Overall, these results suggest that there is some room for improvement in the effectiveness of current mitigation measures, with a significant proportion of respondents expressing a neutral or negative view of their efficacy.

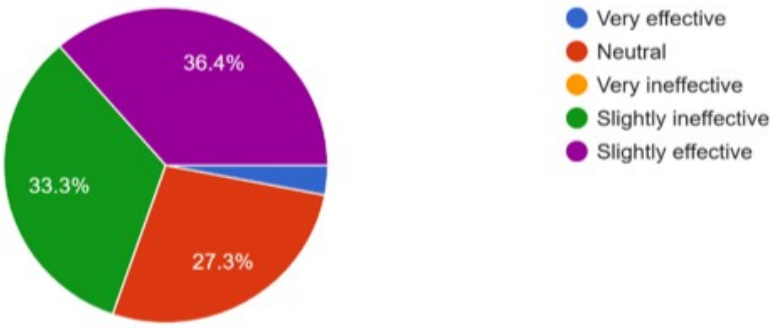


Figure 4.8: Effectiveness of Current Mitigation Measures

4.4.1 Perception of Ergonomic Conditions Following Mitigation Measures Implementation

The study asked employees at Radio Solutions Zimbabwe about their perceptions of the workplace's ergonomic conditions following the implementation of mitigation measures. Most respondents (66.7%) indicated that their perception had improved slightly, with one respondent indicating that there had been a significant improvement. A minority of respondents (27.3%) reported no change in their perception, while none reported a worsening of conditions. These findings suggest that while the mitigation measures have had a positive impact for some employees, there is still room for improvement in terms of addressing ergonomic concerns in the workplace.

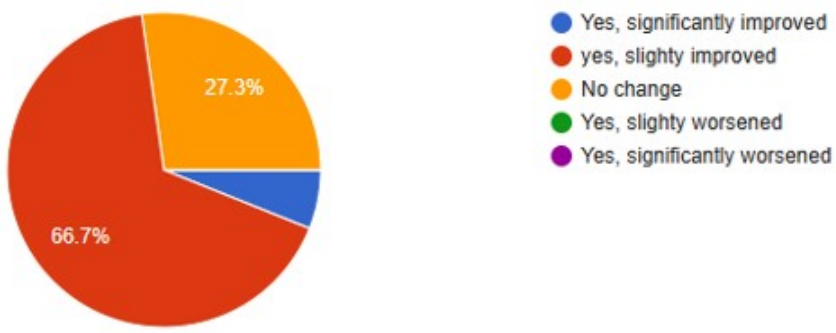


Figure 4.9: Perception of Ergonomic Conditions Following Mitigation Measures Implementation

4.4.2 Changes in Job Satisfaction Following Mitigation Measures Implementation

The study investigated changes in job satisfaction among employees at Radio Solutions Zimbabwe following the implementation of mitigation measures to address ergonomic-related hazards. Out of 33 employees surveyed, the majority (72.7%) reported a slight increase in job satisfaction, while 6.1% reported a significant increase. A total of 51.5% reported no change in their job satisfaction, and only 3% reported a slight decrease. No employees reported a significant decrease in job satisfaction. These results suggest that the implementation of mitigation measures had a positive impact on employees' job satisfaction, although some employees did not experience any changes.

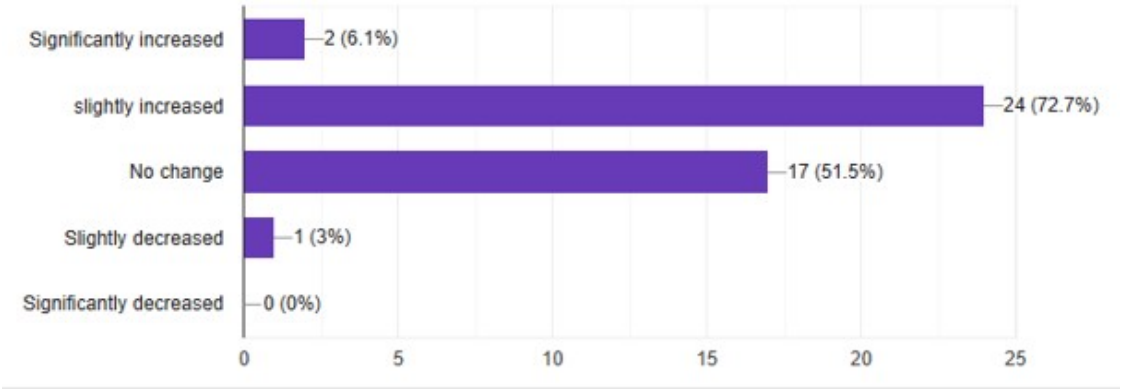


Figure 4.10: Changes in Job Satisfaction Following Mitigation Measures Implementation

4.4.3 Impact of Existing Mitigation Measures on Ergonomic Health of Employees

According to the responses of employees at Radio Solutions Zimbabwe, the existing mitigation measures implemented to address ergonomic hazards in the workplace were rated by employees to have a moderate impact on the ergonomic conditions and health of employees. Out of the respondents, 10 (30.3%) rated the impact as good, 23 (69.7%) reported moderate impact, 21 (63.6%) indicated slight impact, while 5 (15.2%) reported no impact on their ergonomic health. Therefore, the study suggests that the already implemented measures have had some positive effect on the ergonomic health of employees, but there is a need for further improvements to enhance the working conditions and health of workers.

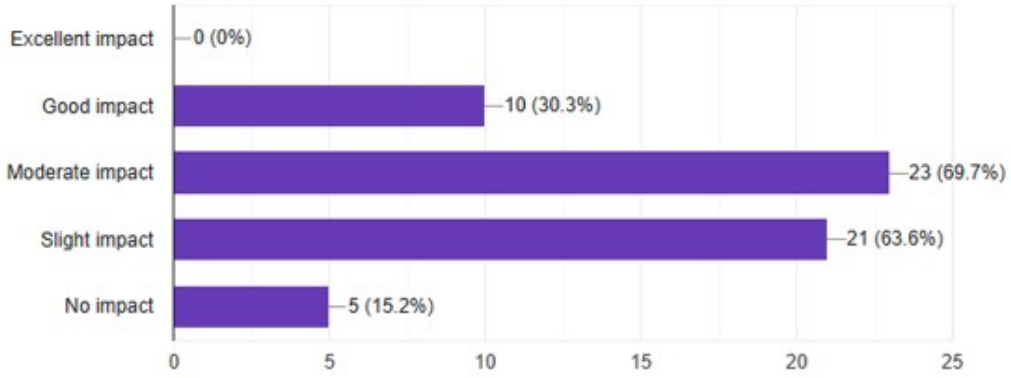


Figure 4.11: Impact of Existing Mitigation Measures on Ergonomic Health of Employees

4.5.0 Interview Participants

As part of the study, in-depth interviews were conducted with 16 employees at Radio Solutions Zimbabwe. Eight of these participants were office workers, while the other eight were technicians. The interviews allowed to gather detailed information on the experiences and perceptions of employees regarding ergonomic workplace conditions and health implications. The interview participants were all volunteers who were selected based on their willingness to participate and their availability to be interviewed. Confidentiality and anonymity were ensured throughout the study to protect the privacy of the participants.

4.5.1 Employee Experiences and Perceptions

The interview component of the study involved 16 participants sharing their experiences and perceptions regarding ergonomic workplace conditions and health implications. Analysis of the interview data revealed several themes, including employees' perceptions of the prevalence and severity of ergonomic issues in the workplace, the impact of these issues on their health and well-being, and their views on the effectiveness of current mitigation measures.

4.5.2 Prevalence and Severity of Ergonomic Issues

Employees who participated in the interviews described the prevalence of ergonomic issues in the workplace in detail, with many reporting experiencing discomfort and pain while performing certain tasks, particularly those that involve sitting or standing for long periods. Participants shared how ergonomic issues impact their work performance, with some reporting decreased productivity as a result of pain and discomfort.

4.5.3 Impact on Health and Well-being

The study found that ergonomic issues in the workplace can have a significant impact on employee health and well-being, as reported by the interview participants. Many participants described how ergonomic issues have led to physical health problems such as back pain, carpal tunnel syndrome, and neck pain. The study also found that ergonomic issues can have an impact on mental health and well-being, with some participants reporting increased stress and decreased job satisfaction as a result of ergonomic-related issues.

4.5.4 Effectiveness of Current Mitigation Measures

According to the interview participants, current mitigation measures implemented to address ergonomic-related hazards in the workplace have had varying levels of effectiveness. While some participants reported feeling that the measures had alleviated some discomfort and pain, others expressed scepticism about the efficacy of these measures. Furthermore, some participants felt that more could be done to address ergonomic issues in the workplace beyond the current mitigation measures being used.

CHAPTER 5: DISCUSSION

5.0 Introduction

The aim of this study was to identify workplace ergonomics and health implications among employees at Radio Solutions Zimbabwe, and to evaluate the effectiveness of existing mitigation measures in reducing ergonomic-related issues. The study was conducted through surveys and interviews, and the results revealed the prevalence of ergonomic issues, such as repetitive strain injuries and awkward postures, as well as potential hazards that could lead to discomfort or injury. While the implementation of mitigation measures had a positive impact on employee perceptions and job satisfaction, the study highlighted the need for ongoing evaluation and improvement of workplace ergonomic interventions. The findings provide insights into potential risks and needs of the workforce and call for tailored interventions to address workplace ergonomics and health implications in Radio Solutions Zimbabwe.

5.1 Demographic characteristics of study participants

The demographic characteristics of the study participants provide insight into potential risks and needs of the workforce. The finding that 50% of the participants were aged 21-30 is consistent with previous research that found younger workers are at higher risk of occupational injuries and illnesses (Boden & Ozonoff, 2008). Additionally, the overrepresentation of participants with higher levels of education may reflect the importance of education and training in promoting workplace safety and health (Bishop, Huebner, & Kelkar, 2018); (Nourouzi, et al., 2016).

However, the absence of participants over 50 in this study may limit the generalizability of the findings to older workers who may be at increased risk of occupational injuries and illnesses (Wagner, 2019). Similarly, the absence of participants with a high school education or less may limit the ability to generalize to workers with lower levels of education who may also face unique workplace hazards (Faisel, Shaikh, Lodhi, Nafees, & Fatima, 2019).

Comparing these results to previous studies on workplace demographics could provide insight into how workplace safety and health interventions may need to be tailored to different populations. For example, a study by Nourouzi, et al. (2016) found that hospital workers with lower levels of education were more likely to report exposure to physical and chemical hazards in the workplace. Similarly, research by Boden & Ozonoff, (2008) found that older workers had higher rates of occupational injuries and illnesses, emphasizing the importance of considering age in designing intervention strategies.

Overall, the demographic information gathered from the participants in this study provides a starting point for understanding potential risks and requirements of employees in the workplace. However, additional research is necessary to determine the extent to which these factors may impact safety and health outcomes and how interventions can be customized to cater to different groups.

5.2 Identifying Workplace Ergonomics and Health Implications

This study aimed to identify workplace ergonomics and health implications among employees at Radio Solutions Zimbabwe. The data were collected through surveys and interviews, and the results suggest that employees commonly experience ergonomic issues such as repetitive strain injuries and awkward postures, as well as manual handling or lifting tasks. Exposure to noise and temperature extremes were less commonly reported but may still pose a risk to workers.

The prevalence of ergonomic issues in the workplace is consistent with previous research on the topic. For instance, Lagerström, (2018) found that awkward postures and repetitive movements were significant risk factors for musculoskeletal symptoms among office workers, Kuijer et al. (2014) identified manual handling tasks as a major contributor to work-related musculoskeletal disorders. However, the types of ergonomic interventions that are most effective may differ depending on the industry and specific job tasks.

Our study's findings underscore the need for tailored interventions to address workplace ergonomics and health implications in Radio Solutions Zimbabwe. It is important to consider the specific context of the workplace when designing interventions, as the types and severity of ergonomic issues may vary depending on the industry and job tasks involved.

5.3 To determine the level of risk associated with identified hazards

The results of our study on workplace risk and hazard identification in Radio Solutions Zimbabwe suggest that while many employees are aware of potential hazards and risks in their workplace, there is room for improvement in terms of hazard reporting procedures, severity of identified hazards, and the variety of mitigation measures used.

One of the key findings of our study is that the majority of respondents (60.6%) reported observing potential hazards that could lead to discomfort or injury. This suggests that there is

a degree of awareness among employees regarding the risks and hazards in their workplace. However, a significant minority (39.4%) did not identify any potential hazards, indicating the need for ongoing hazard assessment and communication in the workplace. This finding is consistent with previous research conducted in a variety of industries, including construction, manufacturing, and healthcare (Babajide, Fagbenle, & Ajayi, 2018; Haapakangas, et al., 2016; Oudeh, Shatat, & Al-Shaer, 2017)

Additionally, our study found that the most commonly implemented mitigation measures in the workplace were personal protective equipment (87.9%), hazard elimination (78.8%), and administrative controls (51.5%). While these measures are important for preventing injuries and reducing risks, they should not be the only methods used. In particular, engineering controls and hazard substitution were used less frequently, indicating that there could be more emphasis on adopting a variety of mitigation measures to address potential hazards. This finding is consistent with previous research that has highlighted the importance of adopting a comprehensive approach to occupational health and safety (Loh & Tamrin, 2018; Allegrini, Santonico, Darnis, & Davico, 2019).

One notable finding is the severity rating of identified hazards, with the majority of respondents rating them as low (59.4%). This could suggest that employees are not fully aware of the potential risks associated with the hazards they observe, or that there is a lack of effective communication or training on hazard severity. This finding highlights the importance of ongoing hazard assessment and communication in the workplace, as well as ensuring that employees are aware of the potential risks associated with different hazards. This is consistent with the recommendations made by Haapakangas et al. (2016) for job and hazard-specific exposure assessments to prevent musculoskeletal pain.

It is worth noting that there may be variation in the distribution and severity of hazards across different job roles or workstations, as suggested by the 22.6% of respondents who reported no incidents resulting from identified hazards. Future research could explore these differences in more detail to identify areas for targeted interventions.

Overall, the findings of our study suggest that there is a need for ongoing hazard assessment, communication, and training in the workplace, as well as a greater emphasis on adopting a variety of mitigation measures to address potential hazards. By adopting a proactive approach

to workplace safety and addressing potential hazards and risks, organizations can promote a culture of safety and protect employee well-being.

5.4 To evaluate the effectiveness of mitigation measures in place for ergonomic hazards

Effective mitigation measures are essential in reducing the prevalence of ergonomic-related issues in the workplace. In Chapter 2, the effectiveness of interventions was emphasized in reducing such risks (Sherehiy, Karwowski, Marek, & Bloswick, 2014; Sjøgaard, Christensen, Justesen, Murray, & Dalager, 2020). The current study aimed to evaluate the effectiveness of existing mitigation measures in place at Radio Solutions Zimbabwe in reducing ergonomic-related issues and promoting worker safety and health.

The findings of the study regarding the effectiveness of current mitigation measures were mixed, with a majority of respondents rating them as neutral or slightly effective in reducing ergonomic-related issues. These findings are consistent with previous literature, which highlights the need for ongoing evaluations and improvements of existing interventions to ensure their effectiveness (Colligan, Higgins, & Chapman, 2014).

The implementation of mitigation measures had a positive impact on employees' perceptions of the workplace's ergonomic conditions and job satisfaction, consistent with previous studies showing how even small improvements in working conditions can have a positive effect on employee well-being (Demerouti et al., 2001). However, some employees did not report any changes in their perceptions of the working environment, such as ergonomic health, indicating a need for additional measures to improve working conditions.

The moderate impact of existing mitigation measures at Radio Solutions Zimbabwe on ergonomic conditions and health underscores the need for ongoing evaluation and improvement of workplace ergonomic interventions. The study's findings highlight the importance of worker involvement and follow-up assessments in promoting sustained changes in workplace ergonomics (Karwowski et al., 2019; Lusa et al., 2018), which can enhance the effectiveness of mitigation measures.

The current study adds to the body of knowledge about the effectiveness of mitigation measures in reducing ergonomic-related issues. Future research can explore the effectiveness of specific interventions and the reasons why some employees may not experience changes in their job satisfaction and perceptions of the working environment. Studies have shown that the

effectiveness of ergonomic interventions depends on various factors such as the comprehensiveness of the intervention, level of worker involvement, and use of follow-up assessments to track interventions and their impact (Lusa et al., 2018; Karwowski et al., 2019), which should be taken into consideration when evaluating the effectiveness of mitigation measures.

In conclusion, the findings of the study underscore the importance of ongoing evaluation and improvement of workplace ergonomic interventions to maintain their effectiveness, promote worker safety and health, and enhance job satisfaction. It is crucial to remain updated with existing interventions in place to determine its effectiveness and ensure a healthy work environment for employees.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

Chapter six concludes the study on workplace ergonomics and health implications among employees at Radio Solutions Zimbabwe, highlighting the crucial role of ergonomic workplace conditions in preventing musculoskeletal disorders, eye strain, and mental fatigue. The study identifies potential risks of poor workplace ergonomics, including decreased productivity, absenteeism, and increased healthcare costs, emphasizing the need for organizations to implement ergonomic policies and programs. The findings further suggest that employees who receive ergonomic training and education gain more awareness and knowledge, leading to better identification of ergonomic challenges and prevention of related injuries. Building on these conclusions, the chapter proposes six actionable recommendations that Radio Solutions Zimbabwe can implement to ensure their workplace is ergonomic-friendly and promote productivity and employee well-being, including conducting a comprehensive ergonomic audit, establishing an ergonomic committee, and developing a comprehensive educational and training program on ergonomic practices and strategies. These recommendations aim to foster a culture of safety, health, and well-being in the company, resulting in a healthier, more productive workforce.

6.1Conclusion

This study provides significant insights into the ergonomics of workplace conditions and their health implications for employees at Radio Solutions Zimbabwe. The research findings reveal that ergonomic workplace conditions are vital in the prevention of musculoskeletal disorders, eye strain, and mental fatigue among employees. Poor ergonomics can result in discomfort, physical pain, and injuries, leading to decreased productivity, absenteeism, and increased healthcare costs. Therefore, organizations must consider implementing ergonomic policies and programs to create safe, comfortable, and healthy workplaces for their employees.

The study findings also suggest that employees who received ergonomic training and education gained more awareness and knowledge of ergonomic workplace practices. Such employees are better equipped to identify ergonomic challenges in their workstations and can take action to prevent musculoskeletal disorders and other ergonomic-related workplace injuries. Additionally, workplace ergonomics can improve job satisfaction and employee morale,

resulting in better job performance, increased employee retention, and reduced employee turnover.

6.1 Recommendations

Focusing on these findings, this study suggests several recommendations that Radio Solutions Zimbabwe can implement to ensure their workplace is ergonomic-friendly and promote productivity and employee well-being:

- Radio Solutions Zimbabwe should conduct a comprehensive ergonomic audit, which identifies ergonomic risk factors employees face in their workstations. It would include evaluating workstations, assessing job tasks if they pose ergonomic risks, and identifying workplace practices that contribute to conditions increasing musculoskeletal disorders. Assessments should lead to the development of interventions and strategies addressing the risks identified during the audits.
- Radio Solutions Zimbabwe should develop and implement an ergonomic program within the company. The program should consist of guidelines, policies, and procedures that promote a healthy and ergonomic-friendly workplace environment. It can also include tools, training programs, and educational resources to help employees work safely and avoid ergonomic-related injuries and illnesses.
- Radio Solutions Zimbabwe should invest in equipment, tools, and accessories that promote ergonomics, such as adjustable chairs, keyboards, and monitor risers. Providing these ergonomic tools and equipment to employees ensures they are comfortable and safe as they work, reducing the risk of work-related injuries.
- Radio Solutions Zimbabwe should establish an ergonomic committee or task force responsible for evaluating the workplace ergonomic conditions regularly. Members of the committee should come from different departments, ensuring a broad perspective on health and safety issues that may affect employees. The committee will foster a culture of safety, health, and well-being in the company, resulting in a healthier workforce that is productive.
- Radio Solutions Zimbabwe should develop a comprehensive educational and training program on ergonomic practices and strategies. The program should emphasize best practices for ergonomics and provide instructional information such as identifying ergonomic risk factors, healthy work habits, and workstation setup techniques. Investing in training and education programs promotes employee awareness and

encourages proper ergonomic practices, which reduces the incidence of employee injuries.

- Radio Solutions Zimbabwe should follow up with regular review of workplace ergonomics to ensure that policies, procedures, and practices remain effective and relevant. The reviews should assess the effectiveness of current ergonomic practices to establish areas requiring improvements.

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APPENDICES

APPENDIX A

QUESTIONNAIRE USED TO COLLECT DATA

Self-Introduction

Good morning/Afternoon. My name is Panashe Meke a student in the Department of Environmental Science (Reg number B201493B) at Bindura University of Science Education. I am currently carrying out research on" An assessment on workplace Ergonomics and health implications, at an electronic manufacturing industry. ". You are required to assist this research by completing this questionnaire and providing your views. The information you will provide is confidential and will be used for academic purposes only. The study findings will be used to make recommendations on an assessment on workplace Ergonomics and health implications, at an electronic manufacturing industry.

Questionnaire No..... Department.....

(Please fill in the following information)

Section 1: Demographic Information

1) Age group:

Below 20 ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ 51+ ☐

2. Gender:

Male ☐ Female ☐ Prefer not to say ☐

3. Job Position

Technician ☐ office worker ☐

4. Years of Experience in Electronic Manufacturing Industry:

1-5 ☐ **5-10** ☐ **10-15** ☐ **15-20** ☐ **20+** ☐

5. Have you ever received any ergonomic training?

Yes ☐ **No** ☐

6. Education Level:

☐ High school or less

☐ Some college or technical school

☐ Bachelor's degree

☐ Master's degree or higher

7. Average Number of Working Hours per day:

☐

8. Do you have any pre-existing medical conditions that may impact your ability to perform work tasks?

Yes ☐ No ☐

8b. If yes, please specify:

……

Section 2: Workplace Ergonomics and Health Implications

Please answer the following questions by marking (√) in the appropriate boxes:

1. What type of ergonomic issues have you experienced in the workplace? Check all that apply:

☐ Repetitive strain injuries ☐ Awkward postures

☐ Manual handling or lifting tasks ☐ Exposure to noise

☐ Exposure to vibrations ☐ Exposure to high or low temperatures

☐ Exposure to high or low temperatures ☐ Poor lighting conditions

Other (specify): ……

2. How often do you experience discomfort or pain while performing work tasks?

☐ Never ☐ Rarely (less than once a week)

☐ Sometimes (1-2 times a week) ☐ Often (3-4 times a week)

☐ Always (daily)

3. Have you received any ergonomic training or guidance on how to properly perform your work tasks?

Yes ☐ No ☐

4. Do you have any concerns about the potential health effects from any of your work tasks or activities?

Yes ☐ No ☐

4b. If yes, please specify

……

5. Are there any observed health implications caused by poor ergonomics in the workplace? Check all that apply:

Musculoskeletal disorders ☐ Carpal tunnel syndrome ☐

Tendinitis ☐ Eye strain or fatigue ☐

Eye strain or fatigue ☐ Hearing loss ☐

Stress or mental health issues ☐ other injuries ☐

Other (specify): …….....

Section 3: Workplace Hazards

Please answer the following questions by marking (√) in the appropriate boxes:

1. Have you observed any potential hazards in the workplace that could lead to discomfort or injury?

Yes ☐ No ☐

1b. If yes, please describe:

……

2. Are you aware of the company's procedures for reporting hazards or potential safety issues?

Yes ☐ No ☐

3. How would you rate the severity of the identified hazards in terms of their potential risk to employee health and safety?

Low ☐ Moderate ☐

High ☐ Very High ☐

4. Have there been any incidents resulting from the identified hazards?

Yes ☐ No ☐

5**. What steps have been implemented to mitigate the risks associated with identified hazards?**

Elimination of the hazard ☐ Engineering controls ☐

Substitution of the hazard ☐ Personal protective equipment (PPE) ☐

Administrative controls ☐

Other measures (specify)…….

Section 4: To evaluate the effectiveness of mitigation measures in place.

***Objective**: To evaluate the effectiveness of mitigation measures in place.*

Please answer the following questions by marking (√) in the appropriate boxes:

1. How effective do you think the current mitigation measures implemented in the workplace are in reducing ergonomic-related issues?

☐ Very effective ☐ Neutral

☐ Slightly effective ☐ Slightly ineffective

☐ Very ineffective

2. Has the implementation of mitigation measures changed your perception of the workplace's ergonomic conditions?

☐ Yes, significantly improved ☐ Yes, somewhat improved

☐ No change ☐ Yes, somewhat worsened

☐ Yes, significantly worsened

3. Have you noticed any changes in your job satisfaction since the implementation of mitigation measures to address ergonomic-related hazards?

☐ Significantly increased ☐ Somewhat increased

☐ No change ☐ Somewhat decreased

☐ Significantly decreased

4. If you had to rate how far the existing mitigation measures have impacted the ergonomic conditions and health of the employees, what rating would you give?

☐ Excellent impact ☐ good impact

☐ Moderate impact ☐ Slight impact

☐ No impact

THANK YOU FOR YOUR COOPERATION

APPENDIX B

RADIO SOLUTIONS INTERVIEW GUIDE

Objective 1: ***To identify workplace ergonomics and health implications in the electronic manufacturing industry.***

1. Can you describe your typical work tasks and activities?
2. Have you experienced any physical discomfort or pain while performing your tasks? If so, can you describe this discomfort/pain and the area affected?
3. Are you aware of any ergonomic risks associated with your work tasks? If so, can you describe them?
4. Have you ever received training on ergonomics or how to prevent injuries in the workplace?

Objective 2*:* ***To determine the level of risk associated with identified hazards.***

1. Can you describe any potential hazards or risks you face while performing your work tasks?
2. How often do you encounter these hazards?
3. How severe do you perceive the risks to be?
4. Are there any tasks or activities that you consider to be particularly risky or hazardous?

Objective 3: To evaluate the effectiveness of mitigation measures in place

1. Are there any mitigation measures in place that you are aware of? If so, can you describe them?
2. Have these measures reduced your exposure to risks or hazards? If so, can you describe how?
3. Are there any gaps or areas for improvement in the current mitigation measures?
4. Have you ever reported a hazard or concern related to your work environment? If so, can you describe your experience with reporting and resolution of the issue?

APPENDIX C

REQUEST FOR PERMISSION TO COLLECT DATA

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE
DEPARTMENT OF ENVIRONMENTAL SCIENCE

P. Bag 1020
BINDURA, Zimbabwe
Tel: 263 - 71 – 6505
Cell : 0778371588
Email : tnyamugure@buse.ac.zw

BINDURA UNIVERSITY OF SCIENCE EDUCATION

14 March 2024

Dear Sir/Madam

REQUEST FOR PERMISSION TO COLLECT DATA FOR ACADEMIC RESEARCH PROJECT

This letter serves to inform you that **Panashe Meke (B201493B)** is a fourth-year student at Bindura University of Science Education, in the Department of Environmental Science. During his fourth year of study, he is supposed to do a research project in his area of specialisation.

Please assist in any possible way. Data collected will be used for academic purposes only and will not be published without your prior consent.

Thank you for your assistance.

Yours faithfully.

Mr .T .Nyamugure
Chairperson - Department of Environmental Science

CHAIRPERSON
Department Of Environmental Science
Faculty Of Agriculture And Environmental Science
Bindura University Of Science Education
P. BAG 1020, BINDURA
ZIMBABWE
OFFICIAL

APPENDIX D

APPROVAL LETTER TO COLLECT DATA

RADIO SOLUTIONS

4 Beit Avenue
Milton Park
P.O. Box CY1832, Causeway
Harare, Zimbabwe

Tel: +263-4-796052, 764370, 764399 Fax: +263-4-793387
Mobile: +263-773-465 819 Email: office@radiosolutions.co.zw

19 April 2023

Dear Sir/Madam

TO WHOM IT MAY CONCERN

Re: LETTER OF CONSENT

We are Radio Solutions Zimbabwe do hereby give our consent that PANASHE MEKE student number B201493B, ID number 63-2166190 M63 perceive, an assessment on workplace Ergonomics and their health implications, at an electronic manufacturing industry. A case study of Radio Solutions Zimbabwe.

Feel free to contact us if you require any further information.

Looking to your favourable response.

Yours Faithfully

Annie Mvere
SHEQ Officer

RADIO SOLUTIONS (PVT) LTD
4 BEIT AVENUE
MILTON PARK, HARARE, ZIMBABWE
19 APR 2024
TELEPHONE: 0242-796052 / 764370
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CELL: 0772 186 695/6