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DEPARTMENT OF ENVIRONMENTAL SCIENCE

AN ANALYSIS OF FACTORS CONTRIBUTING TO OCCUPATIONAL ACCIDENT OCCURRENCES AT PRODAIRY PRIVATE LIMITED.

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DEDICATION

I devote this study to my treasured parents, Mr. and Mrs. Sayimani, and my siblings in appreciation for their continuous support during my academic endeavors.

DECLARATION

Registration number B201468B

I Wisdom D. Sayimani do hereby affirm that this work is entirely the product of my findings and has never existed or been presented to any academic institution. Any reference to previously published work has been indicated. This dissertation is suitable for submission to the faculty and has been checked for conformity with faculty guidelines.

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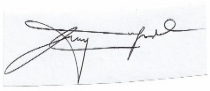

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ABSTRACT

Manufacturing industry accidents continuously occur because the actual causes of the accidents remain unknown. The manufacturing industry contributes significantly to the frequency and severity of accidents. The extent of injuries sustained by the workers ranges from permanent injuries to deaths, and long periods of absence from work. No study has been conducted to identify the causes of accidents at PROdairy Private Limited. A descriptive cross-sectional study was used for this research with self-administered questionnaires and interviews combining both closed-ended and open-ended questions. Questionnaires focused on collecting data on demographic information of study participants, most common types of accidents and their causes, measures to reduce occupational accidents as well as the barriers to effective implementation of strategies to reduce accidents from an employee view. At the same time, interviews with department heads were utilised in addition to questionnaires to generate and produce data in more depth on the major types and causes of accidents occurring at PROdairy as well as barriers to effective implementation strategies to reduce accidents from an employer's view. This approach aimed to gather unbiased and accurate information on the most common types of accidents and their causes within the organisation, measures to reduce occupational accidents as well as the barriers to effective implementation of strategies to reduce accidents from an employer's view. The SPSS version 27 The SPSS Windows program was used to process and analyse the questionnaire and interview responses to produce descriptive statistics like frequencies and percentages of the most common types of occupational accidents that occur at PROdairy Private Limited. This analysis revealed patterns and trends in accident occurrences, shedding light on the specific hazards that employees are exposed to, further, data were also presented using graphs, pie charts, and tables. The primary type of accidents in the manufacturing industry were First Aid Cases, with the leading causes being unsafe acts (24.6%) and overexertion (13.1%). Inadequate employee safety awareness and engagement, coupled with insufficient resources and budget allocated to safety measures, were identified as major obstacles to effective safety management. Consequently, there is a pressing need for the manufacturing company to prioritize and invest in developing a robust safety culture.

LIST OF ABBREVIATIONS AND ACRONYMS

PPE/C : Personal Protective Equipment/Clothing

SPSS : Statistical Package for Social Sciences

NSSA : National Social Security Authority

SHE : Safety, Health, and Environment

QC : Quality Control

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Worldwide, there is an alarming rate of work-related accidents and deaths in industries (Takala, 2019). According to Fuentes et al. (2023), global statistics reveal that in Spain, on average, a worker dies every 15 seconds from work-related accidents or illnesses, and 153 workers suffer from work-related incidents during the same period. Every day, 6,300 people tragically lose their lives as a result of work-related accidents or illnesses in Pakistan leading to over 2.3 million fatalities annually (Khahro et al., 2020). Every year, 317 million accidents occur at work in Turkey, and many of these lead to prolonged absences from work (Ceylan and Kaplan, 2024). As cited by(Pereira et al., 2024), for both the higher-income and lower to middle-income countries, including Russia, China, and India, the financial cost and human cost of work-related injuries are enormous, approximately 4% of the global economic output. This study aims to delve into the underlying factors causing occupational accidents at PROdairy, encompassing incidents such as machinery-related accidents, falls from heights, and chemical exposure.

According to Takala (2019), global indications show that the number of occupational accidents is growing. This is despite the successful reduction in the high-income regions through conducting safety talks, and safety audits and by implementing ISO standards, ISO 45001, ISO 14001 and ISO 9001(Kineber et al., 2023). In reality, the officially recorded figures for workplace accidents may be underestimating the true level of accidents, as they only capture incidents reported in formally registered workplaces, potentially missing a significant number of unreported accidents in other work environments. Particularly in African countries like Zimbabwe which is mostly controlled by unofficial and small-to medium-sized businesses.

Between 2009 and 2013, 20,641 injuries were reported among workers across various sectors in Zimbabwe, which include mining, manufacturing, and agriculture, and the injuries accounted for over 400 deaths recorded during the same period (Sanhokwe and Takawira, 2023). According to the International Labor Office, the majority of occupational accidents and diseases are caused by the work environment, the nature of the work itself, the machinery used in the workplace and other factors related to the worker (Chikwanka and Chiluba, 2020).

The issue of dealing with a serious occupational injury is never easy because it can have ripple effects that extend far beyond the injured worker. If the primary breadwinner in a

family stops working due to a serious injury, this may cause a great deal of stress and anxiety for the employee regarding how to support loved ones. Besides, the injured worker may need help with everyday tasks such as cooking and cleaning. Thus, the family may need to hire outside help or change their lifestyle. In addition, if the injured employee had not been registered with NSSA, it can be devastating to the family through the costs of medical care and rehabilitation. Occupational accidents can also lead to permanent injuries and disabilities for employees (Senthanar et al., 2020).

PROdairy is a dairy industry that specialises in the production and distribution of dairy products and beverages. Workers are exposed to the risks of work-related accidents. These include cuts and fractures as a result of workers being exposed to uncovered parts of a moving conveyor belt or due to slips and falls. The company has electronic machines that may cause serious injuries in their day-to-day operations for example electrocution of employees since they use electricity as the power source. Besides, hazardous chemicals, including caustic, ox-acid and peroxide are used in the plant for cleaning milk holding tanks, posing a risk of causing eye damage. At PROdairy, injuries are categorised in this way;

1. First Aid Cases (FAC) - where an injured worker receives on-site care from a first aid professional before returning to work.
2. Medical Treatment Cases (MTC) - where the injured employee requires treatment by a more competent person such as a medical doctor.
3. Road Traffic Accidents (RTA) - where an employee is injured as a result of a road accident resulting in an injury that may require surgery.
4. Lost time injuries (LTI) - any injuries sustained at work, including fatalities, that cause time missed from regularly scheduled work activities after the accident date.

Between 2019 and 2023, employees in the PROdairy manufacturing industry reported various types of accidents, encompassing FACs, MTCs, RTAs, and LTIs. The way accidents are occurring at this company shows that there is a need to dig deep into the underlying factors causing these accidents.

1.2 PROBLEM STATEMENT

Among its targets in Occupational Health and Safety, PROdairy Company has a goal to achieve zero harm in terms of illness and workplace accidents. However, this has not been achieved despite the execution of various workplace Safety and Health Management Systems, such as the Safety Health and Environmental Policy, the food safety cardinal rules,

the emergency response plan, and the emergency preparedness procedure. The accident statistics show that injuries continue to occur. In 2019 there were 4 FACs, 3 MTCs, 1 RTA, and 0 LTIs. In 2020, a total of 5 FACs, 3 MTCs, 0 RTAs, and 2 LTIs were recorded. In 2021 the company recorded 7 FACs, 2 MTCs, 2 RTAs, and 3 LTIs. Then, in the year 2022, accidents increased in number from 14 to 17 with 6 FACs, 6 MTCs, 0 RTAs, and 5 LTIs. In 2023 by July which marks the end of the production quarter, 3 FACs, 3 MTCs, 5 RTAs, and 4 LTIs had been reported. Each year, this has led to increased lost production time and lower productivity as well as high labour turnover due to serious injuries. Consequently, this research sought to analyse the underlying factors contributing to accident occurrences in the PROdairy Food Manufacturing industry to suggest sound health and safety strategies for lowering this excessive accident prevalence.

1.3 AIM

To examine factors contributing to occupational accident occurrences at PROdairy Private Limited.

1.4 RESEARCH OBJECTIVES

1.4.1 To determine the common types and the causes of occupational accidents at PROdairy Private Limited.

1.4.2 To examine the control measures implemented to reduce occupational accidents at PROdairy Private Limited.

1.4.3 To assess barriers to the effective implementation of strategies to reduce accident occurrences at PROdairy Private Limited.

1.5 RESEARCH QUESTIONS

1.5.1 What are the common types and causes of occupational accidents at PROdairy Private Limited?

1.5.2 Are there any control measures in place to reduce work-related accidents at PROdairy Private Limited?

1.5.3 What are the major barriers to the effective implementation of accident reduction strategies at PROdairy Private Limited and how can they be overcome?

1.6 JUSTIFICATION

PROdairy Private Limited is a company that specialises in the production and distribution of dairy products and beverages. The increasing accident occurrences within this organisation is

a critical issue that needs to be dealt with. The purpose of this study is to analyse the factors underlying accident occurrences at this company. This process is essential in many ways.

The health, safety and well-being of employees will be greatly improved. High accident rates can lead to injuries, disabilities, or even fatalities among workers. By being aware of the factors that lead to these accidents, the company can implement preventive measures to ensure a safer working environment for its employees.

This research will also enhance the management of the company to come up with a strategic plan to reduce the high rate of accidents. Analysing the factors leading to accidents at this company can help to identify areas where they may be non-compliant with safety standards and take corrective actions to avoid legal repercussions.

The organisation will also benefit through cost reduction associated with workplace accidents which include medical expenses, compensation claims, productivity losses, and potential fines for non-compliance. Addressing the root causes of accidents at PROdairy can reduce these financial burdens and improve operational efficiency.

This research will also enhance a reputable company image. Public perception is essential to the success of any company. Being known for poor safety standards can deter potential customers, investors, and partners. The organisation's unwavering devotion to ameliorating occupational safety standards can serve to augment its reputation as a conscientious and ethically-minded corporate entity.

CHAPTER TWO: LITERATURE REVIEW

2.1 COMMON TYPES AND CAUSES OF OCCUPATIONAL ACCIDENTS

According to Akdeniz (2023), a workplace accident is an unexpected and unforeseen event that takes place during work or work-related activities, resulting in physical or mental injury to an employee. Lyon et al. (2018) assert that factors leading to accidents can be categorised into immediate, basic, and underlying causes. The immediate causes comprise unsafe conditions in the working environment as well as unsafe behaviors by the employee. Basic causes include inadequate training and the underlying causes include loss of management control.

The literature indicates that many researchers have been interested in studying the factors that influence the frequency of incidents (Gebresilassie et al, 2020). Kyriakaki et al. (2021), indicated that eye injuries in South African and Indian workplaces are frequently caused by the presence of foreign objects and abrasions. High-risk occupations comprised manufacturing, metal workers, and grinders as well as construction workers (Brboric et al, 2020). Migueles and Zanini (2024), findings indicate that the primary causes of accidents in Brazil were multifaceted, stemming from issues with management, worker training and knowledge, equipment quality, worker attitudes, and lack of proper operational protocols. Inadequate safety awareness and training among management, insufficient skills and expertise of workers, use of substandard equipment, a lack of diligence among employees, and absence of well-defined operational procedures all contributed to the accident rate in Brazil.

Falls from height represent one of the most prevalent types of accidents across various industries (Choi et al., 2019). Factors contributing to falls include inadequate fall protection, lack of training, improper use of equipment, and unstable working surfaces leading to injuries, disabilities, and fatalities. Syron et al. (2019), highlighted that being struck by objects is another common occupational accident across different industries. Workers face the danger of being struck by tools falling from heights, moving machinery or displaced objects. Poor housekeeping, lack of protective barriers, and inadequate personal protective equipment (PPE) are contributing factors to these accidents (Fasinu, 2023).

Overexertion is also a prevalent type of accident in physically demanding occupations (Odebiyi and Okafor, 2023). Overexertion injuries often arise from lifting, pushing, pulling, or carrying heavy objects. Overexertion may be due to improper lifting techniques, repetitive

motions, and lack of rest breaks (Sarker, 2022). Musculoskeletal disorders and fatigue are common consequences of overexertion accidents.

Accidents involving machinery are a significant concern in manufacturing industries (Maldonado, 2020). Workers may face hazards such as entanglement, crushing or amputation due to unguarded moving parts, lack of lockout tagout procedures or inadequate machine maintenance. Machinery accidents often result from human error, lack of training or mechanical failures (Duarte et al., 2021).

Chemical exposures are a critical occupational health hazard across various industries and cleaning services (Pant et al., 2023). Accidents involving chemicals can lead to acute or chronic health effects, including burns, respiratory problems and occupational diseases. Chemical exposure accidents include inadequate ventilation, improper handling and insufficient personal protective equipment (Muzamwese, 2023).

2.2 ACCIDENT CAUSATION THEORIES

The domino and human factors theories are two prominent accident causation theories that delve into the intricate factors contributing to accidents. By analysing the chronological sequence of occurrences that led to an incident, the domino theory highlights the importance of addressing each stage to prevent future occurrences. Conversely, the human factors theory emphasises the role of human error, perception, and decision-making in accident causation, underscoring the need for improved training, procedures, and workplace design to mitigate risks. A comprehensive understanding of these theories can gain valuable insights into accident causation, paving the way for effective preventative measures and a safer working environment.

2.2.1 THE DOMINO THEORY BY HEINRICH

According to the Domino theory of accident causation, the majority of accidents, specifically 88%, are caused by unsafe acts, while 10% are attributed to unsafe conditions, and only 2% are considered as acts of God. (Busch, 2021). Figure 2.1 illustrates that accidents occur due to a series of five consecutive events that can be likened to a chain reaction, similar to how Dominoes fall in succession. The collapse of the first Domino sets off a chain reaction leading to the collapse of the entire row.

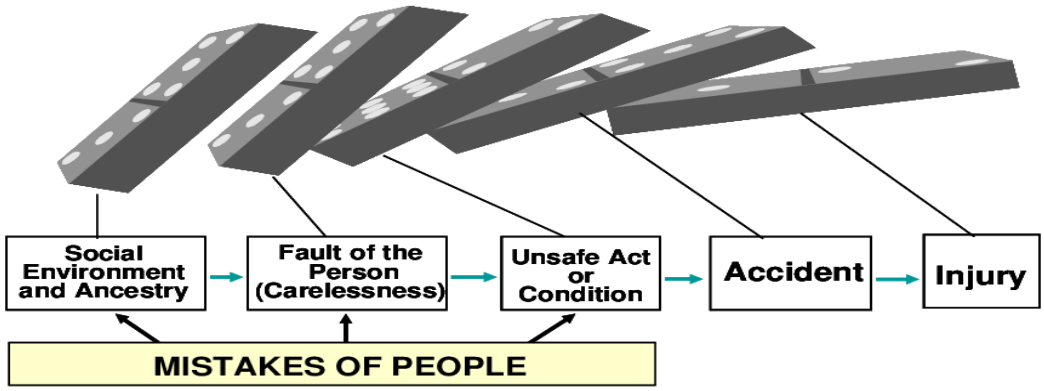

Figure 2.1:Domino Theory by Heinrich (1931) Source: Hosseinian and Torghabeh 2012.

The initial Domino focuses on undesirable or unfavorable personal traits and traits passed on from the environment that may lead to accidents recklessness and stubbornness being triggered by beliefs, relationships and choices. This is followed by the carelessness of the workforce including ignoring signs, failure to report near misses or failing to follow safety procedures.

The third Domino is regarded as major, unsafe acts. Removing them results in a reduction in most accidents. Instances of unsafe acts involve starting a machine without notice or forgetting to lockout before performing maintenance service on a machine and standing under suspended loads. Moreover, other workers tend to multiply tasks by using a drilling machine whilst attempting to maintain an ongoing conversation. If adequate safety precautions are not implemented, the falling of a line of dominoes can potentially lead to accidents resulting in injuries to individuals (Xu et al., 2023).

2.2.2 THE HUMAN FACTORS THEORY

The human factors theory suggests that accidents occur due to three main factors: overload, inappropriate activities, and inappropriate responses (Yilmaz and Turan, 2023). Overload refers to situations where individuals are given tasks or responsibilities that exceed their capacity or skills. Inappropriate activities involve engaging in tasks for which a person lacks the necessary knowledge or training, such as operating machinery without proper instruction. Lastly, inappropriate responses occur when individuals fail to address identified hazards or risks in the workplace, like not replacing torn personal protective equipment despite recognising the need for it.

2.3 CONTROL MEASURES TO REDUCE WORK-RELATED ACCIDENTS

Eliminating the hazard completely from the workplace is the most effective way to control occupational health and safety risks. In dairy industries, hazards that can be eliminated

include outdated machinery prone to malfunctions, slippery floors, inadequate ventilation leading to poor air quality and improper storage of chemicals (Ozbakir, 2023). By eliminating these hazards, the risk of accidents such as slips, trips, falls, machinery-related injuries and chemical exposures can be significantly reduced.

In a study by Driscoll et al. (2022), it was found that implementing elimination strategies in dairy farms led to a notable decrease in occupational accidents such as traps by unguarded rotating parts of machines. By replacing old machinery with newer models equipped with advanced safety features, the risk of injuries decreased substantially. Furthermore, according to OSHA (Occupational Safety and Health Administration), dairy industry employers should prioritize hazard elimination over other control measures whenever feasible. This approach aligns with the principle of addressing risks at their source to ensure a safer work environment for employees.

When complete elimination is not possible substitution method can be implemented. It involves replacing hazardous materials or processes with safer alternatives. In dairy industries, this could involve using non-toxic cleaning agents instead of harsh chemicals or switching to automated processes to reduce manual handling risks. As discussed by Prasad et al. (2022), substituting traditional cleaning agents with environmentally friendly alternatives in dairy processing plants resulted in a decline in skin irritations and respiratory issues among workers. This substitution strategy not only improved worker health but also contributed to a more sustainable work environment.

Engineering controls play a vital role in preventing work-related occupational accidents in dairy industries. Several studies have highlighted the effectiveness of engineering controls, such as machine guarding, equipment automation and ergonomic design in reducing accidents. For instance, Landi et al. (2023) found that the installation of machine guards resulted in a significant decrease in accidents caused by contact with moving parts. Moreover, Karimi et al. (2020) emphasized the importance of engineering controls in preventing occupational accidents in dairy farms and by retrofitting milking parlors with anti-slip flooring and incorporating ergonomic milking equipment designs, instances of falls and repetitive strain injuries were significantly reduced among farm workers.

Administrative controls refer to the use of policies, procedures and practices aimed at reducing work-related occupational accidents by top management. The reviewed studies emphasized the importance of implementing administrative controls in dairy industries.

Safety protocols, regular inspections, and hazard identification procedures were identified as effective measures. According to Adamopoulos et al. (2023), there can be a significant reduction in accidents after implementing a comprehensive safety program that includes regular inspections and employee training. This study aligns with the findings of Dyreborg et al. (2022) who reported a substantial decrease in accidents after implementing a comprehensive training program that focused on hazard recognition and safe handling techniques

Personal Protective Equipment (PPE) serves as the last line of defense in safeguarding individuals from occupational accidents when all the above measures fail to adequately mitigate workplace risks. A study by Verde et al. (2023) assessed how the frequency of work-related accidents is affected by PPE. The results revealed a significant reduction in injury rates among workers who consistently used PPE compared to those who did not. While PPE is effective, its efficacy relies heavily on proper selection, use and maintenance. A study conducted by Górny, (2024) analysed the impact of inadequate PPE selection on occupational injuries. The research highlighted, that proper assessment of hazards, careful selection of appropriate PPE, and employee training are essential to guarantee maximum efficiency. Baye et al. (2022) conducted a study to examine the influence of training programs on PPE compliance and hazard reduction. The findings indicated that workers who received comprehensive training were more likely to use PPE correctly and consistently.

2.4 BARRIERS TO EFFECTIVE IMPLEMENTATION OF STRATEGIES TO REDUCE ACCIDENT OCCURRENCES

Insufficient safety training has been identified as a major barrier to effective accident prevention in dairy industries. A study by Nyambura et al. (2021), shows that inadequate training on safety procedures and protocols such as the emergency preparedness procedure, firefighting techniques and proper chemical handling, could prevent employees from fully understanding preventive measures, leading to an increased risk of accidents. This was supported by Ghahramani and Amirbahmani (2022), who mentioned that workers who lack proper training may not be aware of potential hazards or the appropriate measures of mitigation. Inadequate safety training programs can also contribute to low safety awareness and poor compliance with safety protocols.

Studies have highlighted a lack of safety culture, where safety is not prioritized or valued for example improper disposal of waste, avoidance of safety toolbox talks by employees as well

as lack of compliance to ISO standards, for instance, ISO 45001, can hinder the successful implementation of accident reduction strategies (Claxton et al., 2022). The blame should be on a safety culture that focuses on individual errors rather than systemic issues that can discourage reporting and learning from accidents (Small et al., 2023).

The commitment and allocation of resources by organisational leadership can greatly influence the implementation of strategies aimed at reducing accidents. Limited financial resources may hinder the adoption of safety technologies, equipment upgrades, and maintenance programs (Achouch et al., 2022). Insufficient labour resources like low staffing levels can lead to increased workloads and fatigue, which can contribute to occupational accidents (Cunningham et al., 2022).

Tessema et al. (2022) investigated the barriers to PPE utilization in the manufacturing industry. The research identified factors such as discomfort, lack of training, and inadequate supervision as key challenges that hindered the consistent use of PPE. Additionally, PPE may not eliminate the risk of injury or illness. According to Niwas et al. (2023), PPE provides a certain level of protection but does not guarantee absolute safety. PPE is most effective when used in conjunction with other control measures.

Resistance to change among workers and management for instance purchase of new equipment followed by revised procedures can hinder the adoption of new safety protocols aimed at reducing occupational accidents in dairy industries (Rahman et al., 2024).

2.5 OCCUPATIONAL HEALTH AND SAFETY LAWS APPLICABLE IN DAIRY MANUFACTURING INDUSTRIES

The following are laws that are very crucial in helping to reduce the occurrence of work-related accidents. The occupational health and safety laws in Zimbabwe require all companies and industries to comply.

2.5.1 NSSA ACT CHAPTER 17:04 SI .68 (1990)

This Statutory Instrument (SI) pertains to the compensation procedures for workers in Zimbabwe. It mandates that all employees in Zimbabwe make monthly contributions to the National Social Security Authority (NSSA) from their salaries. In cases where a worker sustains injuries due to an accident or contracts a work-related illness, NSSA utilises this instrument to provide compensation. The SI also emphasises the importance of promoting accident prevention programs within workplaces and ensures that the occupational safety

and health of all employees are safeguarded through the workers' compensation insurance fund. Workers who experience work-related injuries are entitled to receive compensation as well as rehabilitation services.

2.5.2 FACTORIES AND WORKS ACT (CHAPTER 14: 08)

The Factories and Works Act addresses the registration of factories and the authority of workplace inspectors. Individuals involved with a facility meeting the Act's factory criteria should familiarise themselves with this legislation and its eight regulations. Under Regulation 263 of 1976, employers are mandated to supply and maintain appropriate protective gear, such as gloves, footwear, and face shields, at no cost and in good working condition as specified by inspectors. Furthermore, Regulation 302 of 1976 stipulates that any worker who observes any abnormality related to machinery that could pose a risk must promptly report it to the relevant authority.

2.5.3 INTERNATIONAL LABOUR ORGANISATION (ILO) CONVENTION 155

This legislation clearly defines the responsibilities of employers in ensuring a safe work environment and providing appropriate protective gear and attire for employees. It also emphasises the importance of collaboration between employers and workers' representatives in matters of health and safety, ensuring that they receive sufficient information, training, and have the right to refuse hazardous conditions. The legislation further asserts the necessity of upholding safety and health regulations consistently.

2.5.4 THE PNEUMOCONIOSIS ACT (CHAPTER 15:08)

This section discusses respiratory system infections caused by inhaling dust during dusty operations. Employees must undergo regular examinations and receive certificates. It also forbids the hiring or employment of employees who are suffering from pneumoconiosis to work in dust environments. It is an offense to hire someone to work in dust occupations and those who violate this law face penalties including fines up to level 7 or imprisonment terms not exceeding one year (Shabani et al., 2023).

CHAPTER THREE: METHODOLOGY

3.1 STUDY AREA DESCRIPTION

The study was undertaken at PROdairy Private Limited with geographic coordinates, latitude of -17.8775 and longitude of 31.1492, located in the Ruwa industrial area in Goromonzi district. Ruwa is a small town in Mashonaland East province, Zimbabwe. The town is situated 22 km southeast of Harare along the Harare-Mutare highway. Figure 3.1 shows the location of PROdairy Private Limited which is found in Ruwa, Goromonzi District.

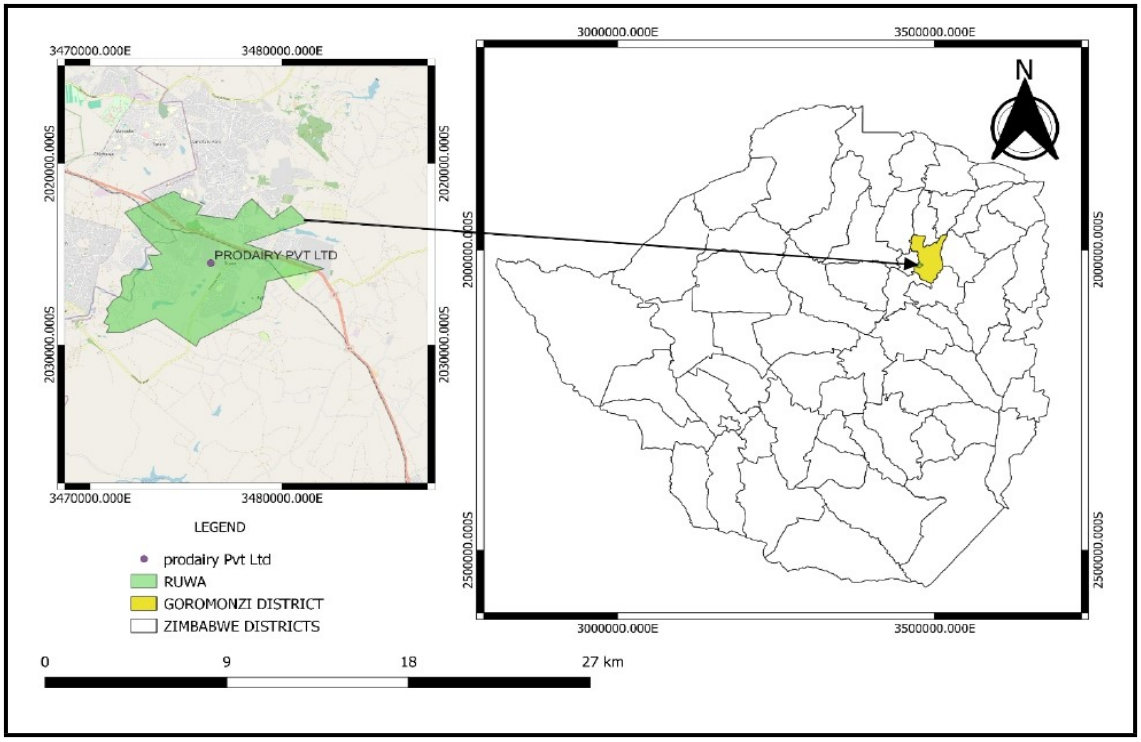

Figure 3.1:Map of PROdairy Pvt Ltd Company in Ruwa, Goromonzi District.

3.2 RESEARCH DESIGN

This research employed a cross-sectional research design, where data were collected at a single point in time (Saleh and Bista, 2017). Self-administered questionnaires and interviews combining both closed-ended and open-ended questions were used for this study. Questionnaires focused on collecting data on demographic information of study participants, most common types of accidents and their causes, measures to reduce occupational accidents as well as the barriers to effective implementation of strategies to reduce accidents from an employee view. Interviews were conducted with department heads to minimise influenced responses of employees. This approach aimed to gather unbiased and accurate information on the most common types of accidents and their causes within the organization, measures to

reduce occupational accidents as well as the barriers to effective implementation of strategies to reduce accidents from an employer's view. By engaging directly with department heads, who hold key insights into operational processes and safety protocols, the interviews provided a more comprehensive understanding of the factors contributing to workplace accidents. This research design was selected because it gave room for an in-depth description of the topic of the study. In addition, it was efficient with time and budget for the researcher.

3.3 STUDY POPULATION AND SAMPLING

There are 510 employees at PROdairy Private Limited, of which 500 are all other employees and 10 are the departmental heads. The target population for the questionnaire comprises the 500 employees at PROdairy Private Limited, excluding the 10 departmental heads. A stratified random sampling method was used to select the questionnaire respondents. Participants sampled for the questionnaire were subdivided into ten strata based on departments at the organisation, which include, the Administration department, SHE and QC department, Warehouse and Distribution department, Finance department, Engineering department, Human resource and Canteen department, Sales and Marketing department, Production department, Procurement department and the Information and Technology department. Within these departments, respondents were randomly selected. Using Yamane's simplified formula for sample size (see Yamane's formulae in Appendix 1), the sample size was 61 participants as shown in Table 3.1 below.

A total of 61 questionnaires (see the questionnaire in Appendix 2) were distributed to all the questionnaire respondents to collect actual data on the major types and causes of occupational accidents, measures to reduce accidents and the barriers to the effective implementation of strategies and gaps that exist within the factory.

The target population for interviews were the departmental heads at PROdairy, with each department having a single head. The selection of interview participants was based on census research due to the small and manageable population size. Thus, 10 interviews were conducted, one with each head of department. (see interview guide in Appendix 3). Interviews with department heads were conducted to gather unbiased information on common workplace accidents and their causes, measures to reduce occupational accidents as well as the barriers to effective implementation of strategies to reduce accidents from the employer's view.

Table 3.1: Number of participants sampled for questionnaires.

Department	Population	% Sampling Intensity	Sample
Administration	35	7	4
SHE & QC	25	5	3
Warehouse & Distribution	100	20	12
Finance	25	5	3
Engineering	55	11	7
Human Resources & Canteen	12	2.4	2
Sales & Marketing	16	3.2	2
Production	214	42.8	26
Procurement	9	1.8	1
Information Technology	9	1.8	1
Total	**500**	**100**	**61**

3.4 DATA COLLECTION INSTRUMENTS

Questionnaires and interviews were employed to gather qualitative and quantitative data among workers from different departments at PROdairy. Using questionnaires as a data collection method can be an effective method of gathering information from a multitude of employees efficiently as well as ensuring that all employees are actively engaged in providing their insights and experiences. Interviewing department heads provides a unique and crucial perspective. Typically, department heads have a broader view of operations within their respective departments. They are often privy to strategic decisions, resource allocations, and overarching goals that influence safety practices and accident prevention measures. These tools were distributed across all the ten departments. Participants of the study involved both males and females to avoid gender inequality.

3.4.1 QUESTIONNAIRES

The primary methods employed to gather information for this research were self-administered questionnaires comprising a blend of closed-ended and open-ended questions. The questionnaire was structured into four distinct sections. Section A includes questions about sociodemographic information. Section B contains questions regarding the most

prevalent types of accidents occurring at PROdairy Private Limited. Section C contains questions on the control measures implemented to reduce work-related accidents at PROdairy Private Limited whereas Section D contains questions on the barriers to effective implementation of strategies to reduce accident occurrences at PROdairy Private Limited.

3.4.2 INTERVIEWS

Face-to-face interviews with department heads were utilised in addition to questionnaires to generate and produce data in more depth on the number of employees at the factory, major types and causes of accidents occurring at PROdairy (see interview guide in Appendix 3). Interviews were undertaken because they provide the researcher with an opportunity to delve deeply into the issue to unearth fresh information and reveal aspects of the problem that need closer examination. One clear benefit of in-person interviews is that they allow the researcher to build a relationship with participants and win their cooperation.

3.5 STATISTICAL ANALYSIS

The SPSS (Statistical Package for the Social Sciences) version 27 Windows program was used to process and analyse the questionnaire and interview responses to produce descriptive statistics like frequencies and percentages of the most common types of occupational accidents that occur at PROdairy Private Limited. This analysis revealed patterns and trends in accident occurrences, shedding light on the specific hazards that employees are exposed to. Descriptive statistics were also used to show the effectiveness of control measures implemented by PROdairy Private Limited to reduce occupational accidents. This analysis highlighted which strategies have been successful in mitigating risks and improving workplace safety. Lastly, descriptive statistics were used to assess the barriers that hinder the effective implementation of strategies aimed at reducing accident occurrences. Graphs, tables, and pie charts were used to clearly and effectively communicate the information in an easy-to-understand format.

3.6 ETHICAL CONSIDERATIONS

Principles applicable in research ethics were considered for the study participants: confidentiality, anonymity, voluntary participation and informed consent of shared information (Cullen and Walsh, 2020). A letter of approval to collect data at PROdairy Private Limited was granted in writing from the organisation (see research permission letter in Appendix 4). The aim of the study was elucidated to every participant before verbally granting their informed consent to participate. The identities of participants are not included in the questionnaire and interview responses. Participation was voluntary and there was

freedom for participants to withdraw anytime if there was any discomfort caused by the study.

3.7 RELIABILITY AND VALIDITY

A pre-testing of the questionnaire was done with five employees. There was an indication that the instrument was easily understood by the participants and able to collect the required information. Respondent validation was carried out by the researcher, who asked a subset of participants to check and validate the accuracy of their responses. This supported the validity and dependability of the data.

CHAPTER FOUR: RESULTS

4.1 DEMOGRAPHIC CHARACTERISTICS OF RESEARCH PARTICIPANTS

The survey data reveals that the workforce composition in the PROdairy manufacturing industry was predominantly male, with 34, accounting for 55.7% of respondents, while females constituted the remaining 44.3%. The age distribution skewed towards younger employees, with 36.1% falling in the 18-25 age range, 26.2% in the 26-45 age group, 21.3% in the 46-65 age bracket, and 16.4% above 65 years old. The majority of employees, accounting for 82%, had 0-5 years of work experience, while only 18% had 6-10 years of experience (refer to Table 4.1).

Table 4.1: Demographic characteristics

Demographic Variable	**Category**	**n = 61**	**%**
Gender	Male	34	55.7
	Female	27	44.3
Age Groups	18-25 years	22	36.1
	26-45 years	16	26.2
	46-65 years	13	21.3
	>65 years	10	16.4
Work Experience	0-5 years	50	82
	6-10 years	11	18

4.2 COMMON TYPES AND CAUSES OF OCCUPATIONAL ACCIDENTS AT PRODAIRY PRIVATE LIMITED

All departments reported that the most common types of occupational accidents involve both minor and major incidents. First aid cases account for the highest percentage at 50.8%, indicating a significant number of minor accidents in the workplace. Following closely are medical treatment cases at 26.2%, highlighting the need for professional medical care due to more serious accidents. Lost time injuries make up 16.4% of the cases, demonstrating that some accidents result in employees missing work due to their severity. The presence of road traffic accidents at 6.6% also points to the risks associated with work-related driving or

commuting, emphasizing the importance of safety measures in these areas (refer to figure 4.1).

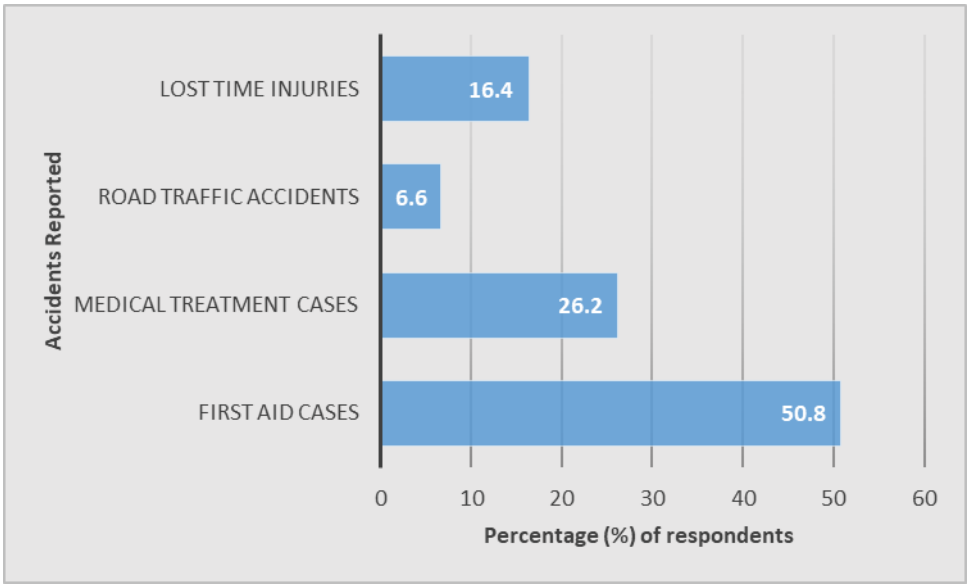

Figure 4.1: Common types of accidents at PROdairy.

The data on causal factors of occupational accidents reveals that the most prominent causal factor is unsafe acts, accounting for nearly a quarter (24.6%) of the total accidents. This suggests that worker behaviour and actions play a significant role in the occurrence of incidents at PROdairy. The next most influential factors are unsafe conditions and inadequate training, each contributing almost 10% to the overall accident frequency. This indicates that workplace safety and employee preparedness also require attention. Other noteworthy contributors include overexertion (13.1%), lack of awareness (8.2%), absence of proper operational procedures (8.2%), and lack of PPE/C (8.2%), pointing to the need for improved ergonomics, worker education, and personal protective equipment usage. The cumulative data shows that the top three factors - unsafe acts, unsafe conditions, and inadequate training makeup over a third (36.1%) of the total accidents, highlighting the need for a multifaceted approach to address the root causes of occupational incidents at PROdairy (refer to table 4.2).

Table 4.2: Causal factors of accidents at PROdairy.

Causal Factor	***Frequency***	***Percentage (%)***
Machine Failure	3	4.9
Human Error	4	6.6
Unsafe Acts	15	24.6
Unsafe Conditions	6	9.8
Inadequate Training	6	9.8
Lack of awareness	5	8.2
Overexertion	8	13.1
Lack of PPE/C	5	8.2
Foreign objects and abrasions	3	4.9
Absence of proper operational procedures	5	8.2
Inadequate fall protection/Safety harness	1	1.6
Total	***61***	***100***

The results from the data collected at PROdairy Private Limited indicated that the most common types of accidents were falling objects at 16.4% and slips and falls at 18%. Other notable incidents include exposure to sharp objects at 13.1%, chemical exposure at 9.8%, and accidents related to poor ergonomics at 13.3%. The data also shows lower percentages for accidents involving fire, medical issues, and unknown causes (refer to Figure 4.2 below).

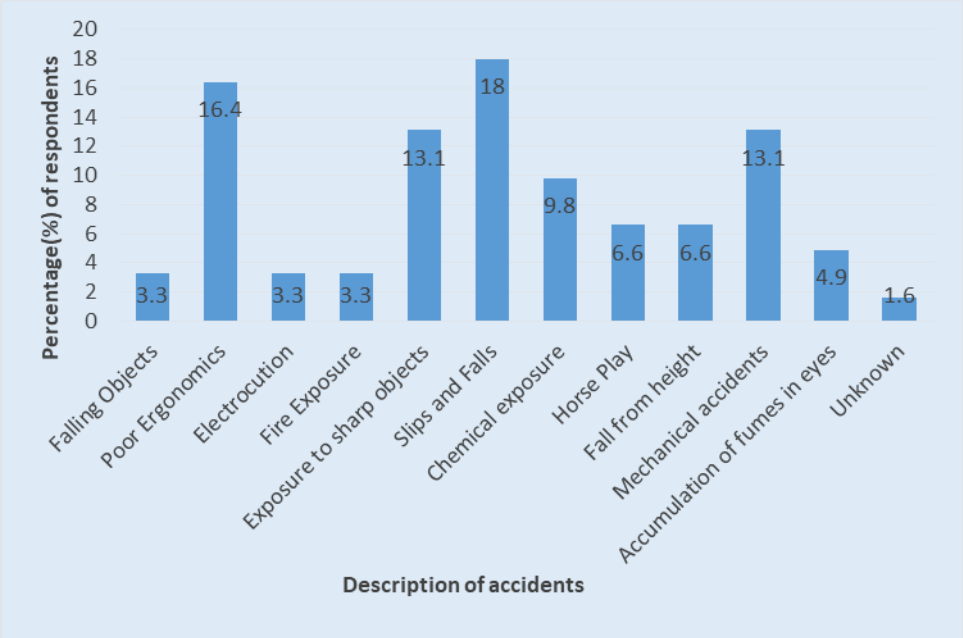

Figure 4.2: Description of the accidents.

4.3 CURRENT OCCUPATIONAL ACCIDENT CONTROL MEASURES AT PRODAIRY

PROdairy Private Limited has a multifaceted approach to accident control. Largest portion at 52.5% of the respondents indicated that administrative procedures were the mostly used. This indicates a strong focus on policies, training, and safety protocols as the primary means of mitigating risks. The study respondents also indicated that there is a significant emphasis on elimination (23%) and substitution (13.1%) strategies, working to design out hazards and replace dangerous elements with safer alternatives. Engineering controls make up 9.8% of the overall approach, demonstrating investments in physical modifications and technological solutions, and Personal protective equipment (PPE/C) represents the smallest portion at 1.6% (refer to Figure 4.3).

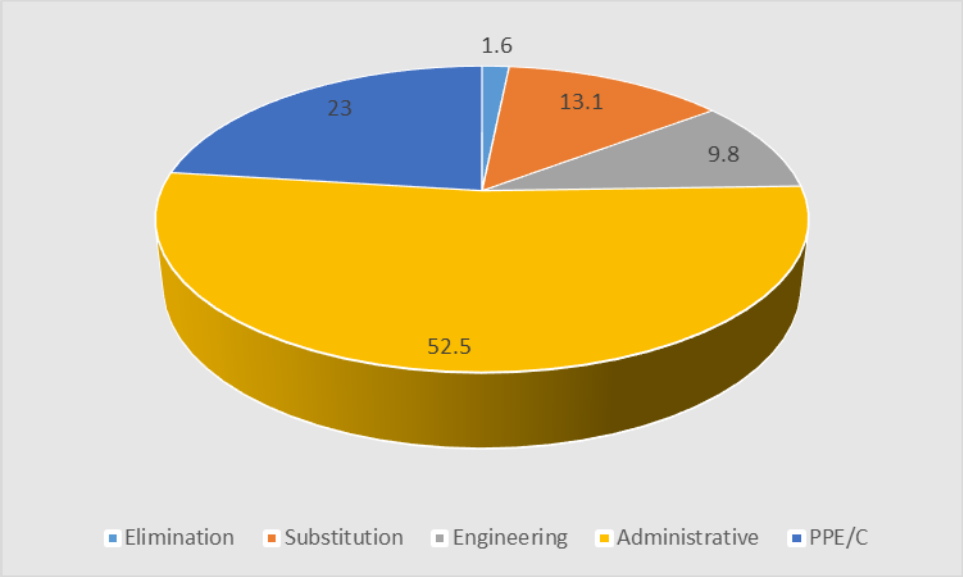

Figure 4.3: Current Accident Control Measures at PROdairy.

Despite the successful implementation of different accident control measures at PROdairy, the persistence of accidents as reported by the study participants indicates that there may be limitations or gaps in the current safety protocols. Out of 61 participants, only 6 (9.8%) observed improvements, while a significant majority of 55 participants (90.2%) did not notice any changes (Table 4.3). This discrepancy suggests that the current measures may not be adequately addressing the causes of accidents or engaging all members of the workforce in safety initiatives.

Table 4.3: Improvements from the implementation of current control measures.

Improvements Observed	**Frequency**	**Percentage**
Yes	6	9.8
No	55	90.2
Total	61	100

4.4 BARRIERS TO EFFECTIVE IMPLEMENTATION OF STRATEGIES TO REDUCE ACCIDENT OCCURRENCES AT PRODAIRY PRIVATE LIMITED

The results of the study represented a comprehensive overview of the barriers hindering the successful implementation of safety strategies at PROdairy. The most significant obstacle identified is the “Lack of employee awareness and engagement,” which constitutes 29.5%

percent, indicating a critical area for improvement within the organization. This highlights the necessity for PROdairy to enhance employee engagement and foster buy-in for its safety initiatives. Following closely is the barrier of insufficient resources and budget for safety measures at 13.1%, emphasizing the need for increased allocation of dedicated resources and funding to bolster the implementation of effective safety strategies. Additionally, other notable barriers include inadequate communication and coordination among teams at 18.0%, resistance to change and non-compliance with safety protocols at 24.6% and lack of management support and commitment to safety initiatives at 14,8%. The data underscores the essential challenges that PROdairy must address to ensure the successful execution of its safety measures and safeguard its workforce (refer to table 4.4).

Table 4.4: Barriers to effective implementation of strategies.

Barrier	Barrier percentage (%)
Lack of employee awareness and engagement	29.5
Insufficient resources and budget for safety measures	13.1
Inadequate communication and coordination among teams	18
Resistance to change and non-compliance with safety protocols	24.6
Lack of management support and commitment to safety initiatives	14.8

4.4.1 APPROACHES TO OVERCOME BARRIERS TO THE EFFECTIVE IMPLEMENTATION OF STRATEGIES

PROdairy's employees have proposed a comprehensive set of measures to overcome the barriers to the effective implementation of safety strategies (refer to Figure 4.4). The primary focus, accounting for (39.3%) of the suggested approaches, is on implementing regular safety training sessions. Additionally, employees have recommended involving and engaging them in the decision-making process (9.8%), enforcing strict measures to address non-compliance and for managers to lead by example to demonstrate commitment (8.2%), utilizing communication platforms to streamline information sharing (13.1%), and allocating necessary resources for employee safety (13.1%). Reward employees who actively participate

in safety initiatives (4.9%) and only a few employees (3.3%) did not give their suggestions. These multifaceted strategies, combining training, engagement, enforcement, and resource allocation, indicate a concerted effort to address the various obstacles and ensure the successful execution of PROdairy's safety initiatives.

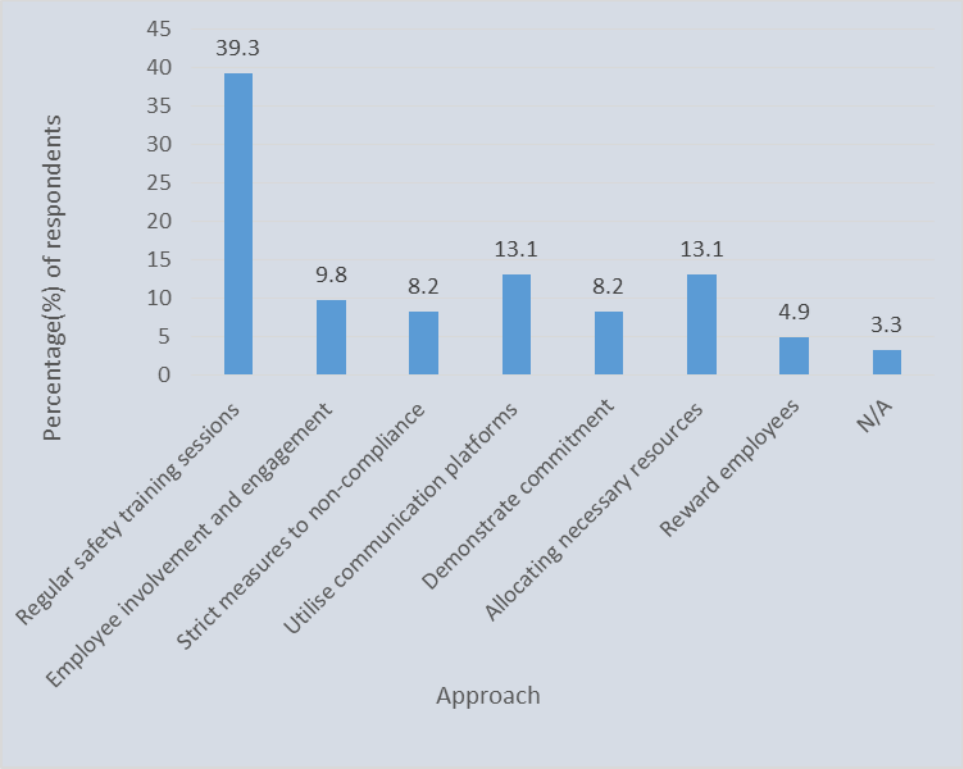

Figure 4.4: Approaches to overcome barriers.

CHAPTER FIVE: DISCUSSION

5.1 COMMON TYPES AND CAUSES OF OCCUPATIONAL ACCIDENTS AT PRODAIRY PRIVATE LIMITED

The results of PROdairy Company’s occupational accident report revealed that first-aid cases account for the highest percentage of accidents at 50.8%.The high proportion of first-aid cases indicates a strong emphasis on workplace safety and a proactive approach to incident reporting involving identifying and addressing potential hazards before they escalate into more serious accidents. This finding is in line with research done by Kodithuwakku et al. (2021), who reported that over half of all workplace injuries are classified as minor, attributing this to factors such as slips, trips, and falls, as well as contact with objects.

However, a more recent study by Kyriakaki et al. (2021) found that medical treatment cases are the most occurring in South African and Indian workplaces. This discrepancy was attributed to differences in industry types, safety protocols, and cultural factors influencing the reporting and classification of workplace accidents.

The findings of the current study also indicate that the most significant causal factor of occupational accidents in the PROdairy manufacturing industry is unsafe acts, mainly being caused by taking shortcuts and failing to follow safety protocols by employees. This is in line with previous research. For instance, research by Gebresilassie et al. (2020) discovered that unsafe acts by the workforce were the most common cause of workplace incidents in the manufacturing sector in Ethiopia. Similarly, an investigation by Brboric et al. (2020) conducted on the reasons behind occupational injuries within the metal sector in Bosnia and Herzegovina found that unsafe acts were the leading cause of incidents, followed by inadequate training.

In addition to unsafe acts, the data also highlights other significant contributing factors to occupational accidents in the manufacturing industry, such as overexertion, lack of awareness, absence of proper operational procedures, and lack of personal protective equipment (PPE) , showing that they have a direct causal link to accident outcomes. Overexertion can result from various physical activities, including lifting, pushing, and pulling, as well as repetitive motions. A study by Koppelaar et al. (2019) on occupational accidents in the food industry found that overexertion was the leading cause of musculoskeletal disorders and recommended implementing ergonomic interventions to reduce the risk of overexertion injuries.

Lack of awareness and the absence of proper operational procedures at PROdairy occured due to inadequate training and communication among workers and supervisors. A study by Mohammed et al. (2020) on occupational safety and health in the construction industry in Saudi Arabia discovered that ignorance and unawareness among workers and supervisors contributed significantly to the incidence of accidents and recommended providing regular safety training and promoting a safety culture in the workplace.

Lack of PPE also resulted from several reasons, including inadequate supply, uncomfortable equipment, and workers' non-compliance. A study by Tang and Tjin (2019) on the use of personal protective clothing among Chinese construction workers found that employees' perception of the effectiveness of PPE and their willingness to wear it could significantly

influence their compliance. The authors recommended providing appropriate PPE that meets workers' needs, increasing workers' awareness of the importance of PPE, and conducting inspections and monitoring to ensure PPE compliance.

5.2 CURRENT OCCUPATIONAL ACCIDENT CONTROL MEASURES AT PRODAIRY

The results of the PROdairy study showcase a multifaceted approach to accident control in the manufacturing industry. The emphasis on administrative procedures (52.5%) highlights the importance of training and safety protocols in mitigating risks. This approach is consistent with previous research in the field. For instance, research by Koppelaar et al. (2019) on musculoskeletal-related occupational health and safety for meat industry employees emphasised the importance of training programs to promote safer work practices. Hasan et al. (2019) recommend conducting routine inspections of machines and equipment, providing sufficient personal protective equipment, and training employees on the safe operation and maintenance of machinery.

The focus on elimination (23%) and substitution (13.1%) strategies is also consistent with previous research advocating for a proactive approach to safety, wherein potential hazards are identified and eliminated before they can cause injury or illness. Research by Mohammed et al. (2020) on occupational health and safety in the construction industry in Saudi Arabia discovered that the application of elimination and substitution strategies significantly reduced the number of accidents.

The lower proportion of engineering controls (9.8%) and personal protective equipment (1.6%) in the PROdairy study can be interpreted as a mirror of the company's commitment to a more proactive approach to safety. Nevertheless, research has shown that engineering controls and PPE are essential components of an effective safety program. For example, Tang and Tjin (2019) discovered that wearing personal protective equipment was essential in protecting Chinese construction workers from work-related injuries. Similarly, to prevent machine-related incidents, proper machine guarding and maintenance procedures must be implemented.

In terms of different comparisons between 2019 and 2020, the literature suggests a continuation of the trend towards a more proactive approach to safety. However, recent scenarios such as the COVID-19 pandemic have highlighted the importance of PPE and engineering controls in protecting workers' health. A study by Hasan and Rahman, (2019)

emphasises the need for PPE and engineering controls to protect workers in the manufacturing industry from chemical exposure and machine-related incidents, respectively.

5.3 BARRIERS TO EFFECTIVE IMPLEMENTATION OF STRATEGIES TO REDUCE ACCIDENT OCCURRENCES AT PRODAIRY PRIVATE LIMITED

The study's findings underscore that "Lack of employee awareness and engagement" poses the most significant barrier to achieving a positive safety culture. This result is consistent with previous research emphasising the vital part of employee engagement and involvement in fostering a robust safety culture. McMahon et al. (2020) discovered that employee participation and communication are key drivers of successful safety programs within the dairy industry. Similarly, Kines et al. (2019) investigated occupational safety and health among dairy farmers and concluded that training and engagement are essential components for promoting safer work practices.

Inadequate resources and budget for safety measures were identified as a significant barrier to effective safety management in PROdairy. This finding is consistent with research conducted in other industries, which has shown that a lack of resources hinders successful safety management. For instance, research conducted by Bakri et al. (2019) on safety management in the construction industry found that limited resources and lack of funding were significant obstacles to promoting safer work practices.

In addition, resistance to change and non-compliance with safety protocols were also identified as significant barriers to implementing effective safety strategies. These findings are in agreement with previous research that indicates that employees' resistance to change and non-compliance with safety protocols hinder successful safety management. A research study conducted by Zheng et al. (2020), examined the implementation of safety programs within the manufacturing industry. The study revealed that employee resistance to change emerged as a significant obstacle to the successful implementation of effective safety practices.

Inadequate communication and coordination among teams can hinder the successful implementation of safety strategies. This observation aligns with previous research underscoring the significance of effective communication and coordination in fostering a positive safety culture. A study by Hasle et al. (2019) on safety management in healthcare revealed that robust communication and coordination are crucial in promoting safer work practices. By maintaining consistent communication and engagement with all stakeholders,

organizations can significantly decrease the risk of accidents and enhance overall safety outcomes.

Finally, a lack of management support and dedication to safety initiatives was recognised as a significant barrier to implementing effective safety strategies at PROdairy. This finding is consistent with previous research that emphasises the importance of management support and commitment to promoting a positive safety culture. A study carried out by AI-Tmeemy et al. (2020) emphasised the significance of robust leadership and management support in ensuring workplace health and safety in the oil and gas industry.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The study revealed that first aid cases were the most occurring common type of accidents, indicating a significant number of minor accidents in the workplace. The most significant causal factor were unsafe acts by employees. Other major contributors include overexertion, lack of worker awareness, absence of proper operational procedures, and inadequate use of personal protective equipment (PPE). In addition, lack of employee awareness and engagement, inadequate resources and budget for safety measures, resistance to change and

non-compliance with safety protocols, inadequate communication and coordination among teams and lack of management support and dedication to safety initiatives were also identified as significant barriers to implementing effective safety strategies.

6.2 RECOMMENDATIONS

Recommendations for the Employer:

- Implement targeted training programs to address unsafe acts and promote safe work practices among employees.
- Conduct ergonomic assessments and implement appropriate engineering controls to reduce the risk of overexertion injuries.
- Develop and enforce clear operational procedures, and ensure effective communication and training on these procedures for all workers.
- Provide adequate and suitable PPE, and enforce its consistent use through regular inspections and monitoring.
- Foster a strong safety culture in the organisation, encouraging open communication, employee engagement, and shared responsibility for occupational safety.

Recommendations for the Employee:

- Actively participate in safety training programs and take personal responsibility for following safe work practices.
- Communicate any concerns or observations related to unsafe conditions, equipment, or procedures to the management.
- Consistently use the appropriate PPE provided by the employer and maintain it in good condition.
- Adopt a proactive approach to identifying and addressing potential hazards in the workplace.
- Promote a positive safety culture by encouraging colleagues to prioritise occupational safety and engage in safe behaviours.

REFERENCES

Achouch, M., Dimitrova, M., Ziane, K., Sattarpanah Karganroudi, S., Dhouib, R., Ibrahim, H., & Adda, M. (2022). On predictive maintenance in industry 4.0: Overview, models, and challenges. *Applied Sciences, 12*(16), 8081.

Adamopoulos, I. P., Bardavouras, A. N., & Syrou, N. F. (2023). Occupational safety, policy, and management in public health organizations and services. *Eur J Environ Public Health, 7*(1).

Akdeniz, Y. E. (2023). Investigation of examples of occupational accidents in terms of occupational health and safety1. *Academic Studies in Social, Human and Administrative Sciences*, 1.

Al-Tmeemy, S. M. S., Kari, F. W., & Chong, W. K. (2020). Safety management and occupational health factors in the oil and gas industry: A literature review. *Journal of Loss Prevention in the Process Industries, 74*, 104708.

Bakri, A. M., AlBabtain, A. S., Alkhuraishah, A. A., & Kandil, A. A. (2019). Factors affecting safety management in the construction industry. *Engineering, Construction and Architectural Management*, *26*(4), 665–685.

Baye, B. F., Baye, M. F., Teym, A., & Derseh, B. T. (2022). Utilization of personal protective equipment and its associated factors among large scale factory workers in Debre Berhan Town, Ethiopia. *Environmental Health Insights*, *16*, 11786302221102324.

Brboric, D., Hadzistevic, M., & Petrovic, D. (2020). Causes and predictors of occupational injuries in the metal industry in Bosnia and Herzegovina. *Safety and Health at Work*, *11*(4), 449–455.

Busch, C. (2021). *Preventing Industrial Accidents: Reappraising HW Heinrich--More than Triangles and Dominoes*. Routledge.

Ceylan, H., & Kaplan, A. (2024). Fatal Occupational Accidents in Turkey from a City and Country Perpective. *Kent Akademisi*, *17*(1), 231–254.

Chikwanka, T. Z., & Chiluba, B. C. (2020). Occupational health and safety for workers who are disabled in Africa. *Indonesian Journal of Disability Studies*, *7*(1), 110–115.

Choi, S. D., Guo, L., Kim, J., & Xiong, S. (2019). Comparison of fatal occupational injuries in construction industry in the United States, South Korea, and China. *International Journal of Industrial Ergonomics*, *71*, 64–74.

Claxton, G., Hosie, P., & Sharma, P. (2022). Toward an effective occupational health and safety culture: A multiple stakeholder perspective. *Journal of Safety Research*, *82*, 57–67.

Cullen, O., & Walsh, C. A. (2020). A narrative review of ethical issues in participatory research with young people. *Young*, *28*(4), 363–386.

Cunningham, T. R., Guerin, R. J., Ferguson, J., & Cavallari, J. (2022). Work-related fatigue: A hazard for workers experiencing disproportionate occupational risks. *American Journal of Industrial Medicine*, *65*(11), 913–925.

Driscoll, M., Dalton, D., Jenkins, P., Tinc, P., Murphy, D., Douphrate, D. I., Lundqvist, P., Pate, M., Lindahl, C., Meyerhoff, A., & others. (2022). A scoping review of safety and health interventions in the high-risk dairy industry: Gaps in evidence point to future directions in research. *Journal of Agromedicine*, *27*(1), 51–63.

Duarte, J., Marques, A. T., & Santos Baptista, J. (2021). Occupational accidents related to heavy machinery: a systematic review. *Safety*, *7*(1), 21.

Dyreborg, J., Lipscomb, H. J., Nielsen, K., Törner, M., Rasmussen, K., Frydendall, K. B., Bay, H., Gensby, U., Bengtsen, E., Guldenmund, F., & others. (2022). Safety interventions for the prevention of accidents at work: A systematic review. *Campbell Systematic Reviews*, *18*(2), e1234.

Fasinu, J. O. (2023). *Improving the Health and Safety of Manufacturing Workers by Detecting and Addressing Personal Protective Equipment (PPE) Violations in Real-*

Time with the Use of Automated PPE Detection Technology.

Fuentes-Bargues, J. L., Sánchez-Lite, A., González-Gaya, C., & Artacho-Ram\'\irez, M. A. (2023). Descriptive analysis and a proposal for a predictive model of fatal occupational accidents in Spain. *Heliyon*, *9*(11).

Gebresilassie, B., Gebremedhin, S., & Gebreyesus, G. (2020). Assessing factors that affect occupational safety in manufacturing industries. *Journal of Engineering, Design and Technology*.

Ghahramani, A., & Amirbahmani, A. (2022). A qualitative investigation to discover causes of occupational injuries and preventive countermeasures in manufacturing companies. *Heliyon*, *8*(9).

Górny, A. (2024). Guidelines and Needs for the Implementation of the ISO 45001 Requirements for Shaping of Safety in Industry 4.0. *International Scientific-Technical Conference MANUFACTURING*, 107–123.

Hasan, M. M., Rahman, M. M., & Tarafder, M. S. (2019). Occupational safety and health management in the manufacturing industry in Bangladesh: A systematic review and research agenda. *International Journal of Occupational Safety and Ergonomics*, *25*(1), 149–162.

Hasle, P., Jensen, P. L., & Bramming, P. (2019). Participatory design of safe and healthy workplaces: A review of the literature. *Scandinavian Journal of Work, Environment & Health*, *45*(1), 1–16.

Karimi, A., Mahaki, B., Ebrahimi, M. H., Bastami, M. T., Babaei Pouya, A., Kasraei, F., & Barkhordari, A. (2020). Survey the effect of simultaneous implementation of ergonomic interventions and management decisions on reduction of musculoskeletal disorders and improvement of work postures in the milking worker of dairy plant. *Iran Occupational Health*, *17*(1), 529–543.

Khahro, S. H., Ali, T. H., Memon, N. A., & Memon, Z. A. (2020). Occupational accidents. *Current Science*, *118*(2), 243–248.

Kineber, A. F., Antwi-Afari, M. F., Elghaish, F., Zamil, A. M. A., Alhusban, M., & Qaralleh, T. J. O. (2023). Benefits of implementing occupational health and safety management systems for the sustainable construction industry: a systematic literature review. *Sustainability*, *15*(17), 12697.

Kines, P., Villumsen, M., Jørgensen, M. B., & Christensen, K. B. (2019). Safety and health in agriculture: The need for a holistic approach. *Annals of Work Exposures and Health*, *63*(3), 243–247.

Kodithuwakku Arachchige, S. N. K., Chander, H., Knight, A. C., Burch V, R. F., & Carruth, D. W. (2021). Occupational falls: Interventions for fall detection, prevention and safety promotion. *Theoretical Issues in Ergonomics Science*, *22*(5), 603–618.

Koppelaar, E., Knibbe, J., Molenbroek, J. F., & Douglass, L. (2019). Safety climate and occupational accidents in the food industry. *International Journal of Occupational Safety and Ergonomics*, *25*(1), 40–49.

Koppelaar, E., Knibbe, J. J., Miedema, H. M., & Burdorf, A. (2019). A systematic review of interventions addressing musculoskeletal-related occupational health and safety for meat industry workers. *Occupational and Environmental Medicine*, *76*(6), 438–445.

Kyriakaki, E. D. O., Symvoulakis, E. K., Chlouverakis, G., & Detorakis, E. T. (2021). Causes, occupational risk and socio-economic determinants of eye injuries: a literature review. *Medicine and Pharmacy Reports*, *94*(2), 131.

Landi, L., Logozzo, S., & Valigi, M. C. (2023). Sustainable Design of Machine Guards. *International Workshop IFToMM for Sustainable Development Goals*, 451–458.

Lyon, B. K., Popov, G., & Roberts, A. (2018). Causal Factors Analysis: Uncovering \& Correcting Management System Deficiencies. *Professional Safety*, *63*(10), 49–59.

Maldonado, O. B. (2020). *Adequacy of machine guarding at Company XYZ*. University of Wisconsin-Stout.

McMahon, B. J., Monaghan, P., & McDonald, C. (2020). Reconceptualising workplace safety culture: Farmers' perspectives on implementing safety change. *Journal of Rural Studies*, *87*, 299–309.

Migueles, C. P., & Zanini, M. T. F. (2024). The effects of national culture on safety: Insights from a multi-case study. *Safety Science*, *173*, 106447.

Mohammed, A. S., Al-Wadei, A. T., & Al-Hashim, Y. H. (2020). Occupational safety and health in the construction industry in Saudi Arabia. *Journal of Engineering, Design and Technology*, *18*(5), 1466–1490.

Mohammed, K. A., Hamouda, A. M., & Alqahtani, A. M. (2020). Occupational safety and health (OSH) in the construction industry in Saudi Arabia: A systematic review and agenda for future research. *International Journal of Environmental Research and Public Health*, *17*(8), 2733.

Muzamwese, T. C. (2023). Effects of sustainable business networks on the environmentally sound Management of Chemicals in Zimbabwe. *Circular Economy and Sustainability*, 1–21.

Niwas, R., Thakare, O., & Gudadhe, N. (2023). Working Environmental Impact of Personal Protective Equipment in Modern Industrial Sector. In *Emerging Technology and Management Trends in Environment and Sustainability* (pp. 198–208). Routledge.

Nyambura, D., & others. (2021). *Organizational factors influencing occupational safety and health practices: a comparative study of new Kenya Cooperative Creameries and Daima Dairy*. University of Nairobi.

Odebiyi, D. O., & Okafor, U. A. C. (2023). Musculoskeletal disorders, workplace ergonomics and injury prevention. In *Ergonomics-new insights*. IntechOpen.

Ozbakir, O. (2023). Hazard and risk assessment in a dairy products factory using the Fine Kinney Risk Method: recommendations for mitigation. *International Journal of Agriculture Environment and Food Sciences*, *7*(3), 563–572.

Pant, K. J., Cotter, P. D., Wilkinson, M. G., & Sheehan, J. J. (2023). Towards sustainable Cleaning-in-Place (CIP) in dairy processing: exploring enzyme-based approaches to cleaning in the Cheese industry. *Comprehensive Reviews in Food Science and Food Safety*, *22*(5), 3602–3619.

Pereira, J. F., Dal Forno, A. J., Kipper, L. M., Granato, M. A., Aragão, F. V., & de Aguiar, C. R. L. (2024). Diagnosis About Work Accidents in Textile Industry: Insights to Implement Occupational Health and Safety Systems. *International Journal of*

Professional Business Review: Int. J. Prof. Bus. Rev., *9*(1), 31.

Prasad, W., Wani, A. D., Khamrui, K., Hussain, S. A., & Khetra, Y. (2022). Green solvents, potential alternatives for petroleum based products in food processing industries. *Cleaner Chemical Engineering*, *3*, 100052.

Rahman, M., Emon, M. E. H., Antor, M. H., Haque, S. A., & Talapatra, S. (2024). Identification and prioritization of barriers to Industry 4.0 adoption in the context of food and beverage industries of Bangladesh. *Benchmarking: An International Journal*.

Saleh, A., & Bista, K. (2017). Examining factors impacting online survey response rates in educational research: Perceptions of graduate students. *Online Submission*, *13*(2), 63–74.

Sanhokwe, H., & Takawira, S. (2023). Evaluating the decent work scale measurement model in Zimbabwe. *Journal of Career Development*, *50*(3), 727–742.

Sarker, P. (2022). *Use of inventory control theory and multi-objective optimization to model work-rest scheduling*. Iowa State University.

Senthanar, S., MacEachen, E., & Lippel, K. (2020). Return to work and ripple effects on family of precariously employed injured workers. *Journal of Occupational Rehabilitation*, *30*(1), 72–83.

Shabani, T., Jerie, S., & Shabani, T. (2023). Overview of quality health safety and environmental management systems implementation in Zimbabwe. *Safety in Extreme Environments*, 1–13.

Small, D., Small, R. M., & Green, A. (2023). Improving safety by developing trust with a just culture. *Nursing Management*, *30*(6).

Syron, L. N., Lucas, D. L., Bovbjerg, V. E., & Kincl, L. D. (2019). Injury and illness among onshore workers in Alaska's seafood processing industry: Analysis of workers' compensation claims, 2014-2015. *American Journal of Industrial Medicine*, *62*(3), 253–264.

Takala, J. (2019). Burden of injury due to occupational exposures. *Handbook of Disability, Work and Health*, 1–22.

Tang, L. C., & Tjin, S. C. (2019). Evaluating the effectiveness of personal protective equipment in reducing construction workers' risk of injury. *Safety Science*, *111*, 16–25.

Tang, S. L., & Tjin, S. C. (2019). Use of personal protective equipment among Chinese construction workers. *International Journal of Occupational Safety and Ergonomics*, *25*(2), 329–335.

Tessema, M., Sema, W., & others. (2022). Utilization of personal protective equipment and associated factors among large-scale factory workers in Debre-Berhan Town, Amhara Region, Ethiopia, 2021. *Journal of Environmental and Public Health*, *2022*.

Verde, M. T., Bonavolontà, F., Liccardo, A., Lamonaca, F., Di Stasio, E., & Raimondi, G. (2023). A smart combination of IoT and blockchain enabling technologies to measure and improve workplace safety in dairy farm. *Acta IMEKO*, *12*(4), 1–7.

Xu, Y., Reniers, G., Yang, M., Yuan, S., & Chen, C. (2023). Uncertainties and their treatment in the quantitative risk assessment of domino effects: Classification and review. *Process*

Safety and Environmental Protection, *172*, 971–985.

Yilmaz, C., & Turan, A. H. (2023). The causes of occupational accidents in human resources: the human factors theory and the accident theory perspective. *International Journal of Occupational Safety and Ergonomics*, *29*(2), 796–805.

Zheng, W., He, X., Wang, K., & Chen, S. (2020). An empirical study on the influencing factors of safety management in manufacturing. *An Integrative Perspective of Process Innovation and Safety Climate. Safety Science*, *129*, 104815.

APPENDICES

APPENDIX I : STATISTICAL FORMULAS

Yamane's Formula

$$n = N \div (1 + N \times e^2)$$

Whereas N is the population size

e represents the margin of error (12%) whilst,

n denotes the sample size.

$$n = \frac{500}{1 + 500\,(0.12^2)} \qquad n \approx 60.96 \qquad n = 61$$

Hence the sample size will be 61 participants.

To make sure the sample size is representative of the population in each department, the following formula will be used,

$$n = \frac{N_s}{N}$$, multiply answer by n_t

Where n = sample size for the stratum (department), N_s = population size of the stratum (department), N = total population size and n_t =desired total sample size

APPENDIX II: RESEARCH QUESTIONNAIRE

My name is **Wisdom Davis Sayimani**. l am studying Safety Health and Environment with the Bindura University of Science Education, researching on a topic titled ***"An analysis of factors contributing to occupational accident occurrences at PROdairy Private Limited"***. Your participation in this research is entirely optional, and I guarantee that any details you provide will be handled with the highest level of privacy and discretion. The study aims to

gather insights that will help in suggesting ways to enhance occupational health and safety measures and decrease the frequency of accidents at PROdairy Private Limited.

Department: …… **Date: ……**

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

INSTRUCTIONS TO PARTICIPANTS

- ***Tick on the appropriate answer and fill in wherever possible.***
- ***Do not put your name on any part of the document.***

1. What is your age ? 18-25years 26-45 46-65 > 65 years

2. Gender : Male Female

3. Marital Status: Single Married

4. What is your education level ? Primary Ordinary Advanced Tertiary

5. Work Experience: 0-5 years 16-10 years

Section B: Types of accidents

6. Have you witnessed or been involved in an accident at PROdairy Private Limited?

Yes No . If yes, please answer the following questions from 6**(a)** to 6**(b)**

(a) Describe the accident briefly: **……**

……..

(b) Location of the accident**……..**

7. What are the usual types of accidents and injuries encountered by workers in your department?

First aid cases Medical Treatment Cases Road Traffic Accidents

Lost time injuries

8. From the following tick where applicable the causal factors that leads to accidents at PROdairy?

Machine failure Human error _ Unsafe acts _

Unsafe condition _ Falling objects Inadequate training

Lack of awareness Overexertion Lack of PPE/C

Foreign objects and abrasions Absence of proper operational procedures

Inadequate fall protection/ Safety harness

Section C: Control measures

9. Are there any specific control measures implemented at PROdairy Private Limited to prevent accidents? Yes No . *If yes, please answer the following question* 9**(a)** to 9**(b)**

(a) What specific control measures are in place?

Installation of machine guards Additional work relief/ Shift Working

Regular plant inspection Consistent issuance of PPE

Use of non-toxic chemicals instead of toxic chemicals

(b) Have there been any improvements in incident prevention since the implementation of these control measures? Yes No

10. Are there any safety training programs or initiatives provided by PROdairy Private Limited to enhance employee awareness and prevent accidents? Yes No . If yes, please answer the following questions from 10**(a)** to 10**(d)**

(a) What is the training being provided? **……**

…….

(b) How often are these training programs conducted?

Daily Weekly Monthly Yearly

(c) Have you personally participated in any safety training programs? Yes No

(d) If yes, did you find the training programs helpful in preventing accidents?

Yes No

Section D: Barriers to effective implementation of accident reduction strategies

11. In your opinion, what are the main barriers or challenges to effectively implementing strategies to reduce accidents at PROdairy Private Limited?

Lack of employee awareness and engagement

Insufficient resources and budget for safety measures

Inadequate communication and coordination among teams

Resistance to change and non-compliance with safety protocols

Lack of management support and commitment to safety initiatives

12. What strategies or approaches do you suggest for overcoming these barriers or challenges?

……..

……..

End of questionnaire……Thank you!!!

APPENDIX III: INTERVIEW GUIDE (HEADS OF DEPARTMENTS)

An analysis of factors contributing to occupational accident occurrences at PROdairy Private Limited

My name is **Wisdom Davis Sayimani**. As a learner at Bindura University of Science Education, I am undertaking a research project focused on the topic mentioned above. You are welcome to answer the following interview questions. Any information you share will be

used exclusively for academic purposes, and I will ensure complete confidentiality of your responses.

Department: …… Date: ……

1. Please provide a brief explanation of your company's profile

…….

…….

2. What are your thoughts or comments on the occupational accidents and injuries that have occurred at your company?

……..……

…….

3. Describe the common types of occupational accidents that occur at your company?

…….

4. In your opinion, what are the main causes of the occupational accidents and injuries that happen at your company?

…….

…….

5. Is there any process or person responsible for reporting occupational accidents and injuries at your company? If so, how is this reporting done?

……..

6. Are there any specific control measures or safety protocols currently in place to prevent accidents at PROdairy Private Limited? Yes No . *If yes, please specify*

…….

…….

7. How are these control measures communicated and enforced among employees?

……

0. How frequently are these control measures reviewed and updated to ensure their effectiveness?

…….

9. What are the main challenges or barriers faced in implementing strategies to reduce accident occurrences at PROdairy Private Limited?

…….

…….

10. Are the employees involved in identifying and addressing these barriers?

Yes No . *If yes,* can you provide examples of any initiatives or actions given by employees to overcome these barriers?

…….

…….

12. How is the effectiveness of strategies and actions to reduce accidents measured and evaluated within the organization?

……..

……..

Thank you very much for your involvement in this research.

APPENDIX IV: RESEARCH PERMISSION LETTER

PRODairy

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Mobile: +263 772 125 417-8 / 836

Bindura University of Science Education
P. Bag 1020
Bindura
Zimbabwe

30 April 2024

Att:TO WHOM IT MAY CONCERN

RE: LETTER OF CONSENT

We PROdairy Private Limited do hereby give our consent to **WISDOM DAVIS SAYIMANI,** student number B201468B to collect data at our company for his academic research project entitled, "An analysis of factors contributing to occupational accident occurance at Prodairy Private Limited."

Feel free to contact us if you require any further information

Looking forward to your favorable response.

Yours Faithfully

Audelly Nhevera
HR Manager

PRODairy
HUMAN RESOURCES DEPARTMENT
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