# Assessing measures to improve a defence manufacturing site


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Mini-dissertation accepted in partial fulfilment of the requirements for the degree Master of Business Administration at the North-West University

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Graduation: June 2023

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**ACKNOWLEDGEMENTS**

The research study that was conducted is based on the assessment of the measures taken to improve a defence-manufacturing site. The study addressed issues associated with financial loss, ammunition stock control, corruption and theft. The study is considered resourceful for enhancing defence business performance, and the safety and security of the community. Although the study was limited to the site located in Potchefstroom, North West Province. The findings of the research can be relevant and significant to other manufacturers of defence explosive products.

Firstly, I would like to thank God for the positive mind and attitudes that I have applied to the research problem that exists within the defence-manufacturing site**.** It takes courage to view ammunition as a way of life in terms of safety and security. Secondly, I would like to voice my appreciation of my Mother (Annah Mongwe) who has always believed in me. The support I received from friends and family throughout my MBA journey deserves recognition beyond measure. I am grateful to have Duduzile Mkhonto as my future wife, she really has been sympathetic; taking into consideration the amount of time and pressure that one experiences while completing an MBA. I appreciate my wonderful and lovely fourteen-year-old daughter, Tintswalo who is passionate about the academic and career development. I also appreciate my five-year-old daughter, Nhlamulo, who has always kept me smiling during my academic setbacks. Indeed, she has been a constant source of joy and a lifetime motivator. I thank God that my achievement has been complimented by the birth of Ntwanano, my son who will learn all good things from me as his father. To all my brothers and two younger sisters, I really appreciate the support you have demonstrated towards me. I feel appreciated for the academic contribution I have shared with you.

I am grateful for Mr Wouter Jacobs (General Manager) who has granted me the opportunity to conduct this research study within the relevant defence-manufacturing site and to be part of the team for the Berlin, Germany International Business tour. I have unlimited respect to my respondents who have made this study possible. Lastly, I sincerely express my gratitude to Prof Nelda Mouton. Prof has changed my worldview about research. Your passion, kindness, and respect towards others will always be unforgettable. A transformational leader creates opportunities for other leaders.

**ABSTRACT**

Inventory management issues cause business organisations to lose sales and increase their operational costs. Organisations that do not have adequate inventory will be unable to meet their customers' needs and will most likely lose business to their competitors. A defence-manufacturing site involves the production of ammunition products, of which explosives are used as inputs in the transformation process. The operation has become too complex for the business to keep proper records of and control inventory movements.

In this study, the researcher addresses concerns associated with the inconsistent tracking of inventory movement that allows unlawful acts, such as theft and corruption. It aimed to answer whether there are measures taken to improve a defence-manufacturing site.

The study follows a quantitative approach, and, to achieve the aim of the study, the researcher designed a questionnaire that addressed the issues related to the objectives. The questionnaire consisted of four sections based on biography, interpersonal relations, process systems, and general management. Factor analysis was applied to the gathered data to reduce the study variables into constructs. Furthermore, the questionnaire complied with the validity and reliability tests.

The outcomes of this research study present a moderate to strong positive correlation between the study constructs involving biography, interpersonal relation, and process systems (knowledge, waste removal, and confidence). The research instrument was found to be valid and reliable.

In the concluding chapter, the researcher provides recommendations that serve the interest of the defence-manufacturing site and other stakeholders working with explosives. It is recommended that the organisation focus on the training and development of the employees to improve leadership practices and knowledge of process systems involving confidence and waste removal. For future research, this study recommends that researchers explore how change can be managed during the implementation process of measures taken to improve a defence-manufacturing site.

## DEFINITION OF KEY TERMS

The key terms of this study are inventory, inventory management, record management system, explosive ammunition, and managerial leadership. The definitions of these conceptualised key terms are discussed below.

### Inventory

Singh and Verma (2018:2) consider inventory as one of the important assets of the business; it is defined as the quantifiable raw materials, work-in-process products, and finished goods that are ready or will be ready for sale. There are three types of inventory models, which are classified as raw materials, serviceable, and returned goods (Yeo, 2021:1).

### Inventory management

Goel (2021:4) defines inventory management as a discipline that focuses on identifying and tracking physical and system assets. Inventory management lacks visibility when information in the system does not match what is accessible in the physical inventory (Muhr, 2020:7). In addition to this, inventory management is essential for planning production activities that include plant and machine maintenance, as well as other operational requirements like safety and theft prevention (Riza & Purba, 2018:2).

### Record management systems

Widiyanto and Wulandari (2020:2) define record management as processed data that has been documented and preserved in a way that is useful for making future decisions. There are two types of record management systems that are based on manual automated entry techniques: manual record management systems and automated inventory management systems.

### Manual record management system

Foya (2021:39) describes the process of manual counting as a time-consuming activity that poses a great risk of creating multiple errors. These kinds of errors are associated with the human element and they occur because of mismatch and miscount during the physical stock count (Mahzan & Lee, 2021:1).

**Automated inventory management system**

Automation is essential for effective inventory and managerial resource management. These systems help to increase operational efficiency by replacing manual labour with automation and lowering costs. These programs keep track of inventory records, allowing for a more accurate flow of goods, information, and money, as well as better customer service (Saleem, 2020:1). Although automation is classified as an effective management system, Alhayek (2021:2) argues that ERP implementations are time-consuming and resource-intensive, and many of them fail due to a “misfit” between the adopting firm’s business needs and the ERP’s functionality.

**Material visibility**

According to Flapper (2019:1), visibility inside the inventory (the network) is a key business challenge, with the possibility to improve business execution through higher efficiency in processes. This inventory visibility is difficult to accomplish, as it requires sharing delicate information, which requires a significant degree of access control, trust, and security. Furthermore, Muhr (2020:7) emphasises that when information in IT systems does not exactly match what is accessible in the physical inventory, it indicates that inventory management is lacking visibility.

**Explosive ammunition**

Dobržinskienė and Dobržinskij (2021:3) define explosive ammunition as a mixture of chemical compounds that rapidly undergo chemically reactions when exposed to appropriate external conditions. High-temperature and high-pressure gases are released throughout the reaction, and as they expand, they perform mechanical work. A supportive view, based on the definition of explosive ammunition, is described as

chemical substances or mixtures capable of bursting under the influence of external forces, producing heat and gases (Damyanova *et al*., 2020:1).

**Managerial leadership**

Ciulla (2020:72) defines leadership as an influential individual who is capable of getting other people to do something desirable, and states that organisational leadership must introduce motivational measures to ensure that employees are happy and remain committed to the organisation to work towards a common goal (Akuffo & Kivipõld, 2021:2). Leadership is concerned about influencing the practice of general management competencies that involve planning, organising, leading and controlling operational activities (Zindiye *et al*., 2017:23). This is significant for managing planning inaccuracies, resource utilisation, task allocation, and performance management, which could lead to loss within the organisation (Saleem, 2021:1).

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# CHAPTER ONE

## 1.1 INTRODUCTION

Inventory management issues cause business organisations to lose sales and increase their operational costs. Organisations that do not have adequate inventory will be unable to meet customers' requirements and will most likely lose business to the competitors. As a requirement from the Security and Exchange Commission, businesses must keep track of their inventory. To ensure compliance with the effective flow of inventory, it is critical to implement policies and document management procedures. This is important, as every investor wants to be associated with a profit-orientated business organisation and profitability is a relative measure that can be seen when other alternative options are available (Uwah & Udoayang, 2020). Inventory management controls all stock within business organisations and improves cash flow; it satisfies customers' needs, and it further protects and offers security to the community when dealing with dangerous goods.

Although other researchers have addressed the importance of effective inventory management, Bansal (2021:1) stated that traditional inventory management strategies are insufficient to help manufacturers optimise inventory. Even advanced inventory management software and technologies have been shown to be inadequate for producing meaningful results and savings on inventory expenditures.

One of the characteristics of good inventory management is having an accurate and consistent inventory record system. According to Dey (2021:12); an inventory system allows organisations to avoid or minimise inventory-related losses. However, a wide range of industries face significant inventory record inaccuracies and struggle to develop improvement measures. When there is a large difference between physical and virtual inventory, inaccuracies in the record system become significant.

Furthermore, Shirzada (2021) states that an inventory is the organisation's most valuable asset, and inaccuracies in the record system have an impact on financial performance, customer satisfaction, and business sustainability. Yunusa (2021) also

supports this view by stating that inventory is the largest current asset in both manufacturing and service organisations.

### 1.2 PROBLEM STATEMENT

There are some concerns regarding inventory mismanagement that allow for unlawful acts, such as theft, particularly when working with deadly munitions. Inventory mismanagement opens up opportunities for fraud and theft (Anisere-Hameed & Bodunde, 2021). Furthermore, Shirzada (2021:2) highlights that corruption and theft are two concerns associated with inventories. The business organisation continuously experiences an unaccounted stock variation and these losses are directly related to direct material costs. There is a problem with inconsistent tracking of inventory movement from the warehouse to the manufacturing environment and the magazine storage facility. Therefore, the problem that will be investigated is to assess the inventory system measure to improve a defence-manufacturing site.

### 1.3 INVENTORY THEORECTICAL BASELINE

The inventory theoretical baseline allows the researcher to draw conclusions and mapping out constructs that are applicable to the study (Antic *et al*., 2022). The baseline for the study is based material visibility, record management, warehouse material flow, process auditing and managerial leadership that seeks to address challenges related to theft, fraud and corruption. The advantage of inventory baseline is to establish a point of reference of which future measurements can be calculated to make informed decisions based on knowledge, system and procedures related to inventory (Talks *et al*., 2022).

## 1.4 RESEARCH QUESTIONS

A research study question seeks to address an issue or problem about the specific subject matter (Ferrer, 2022). A study question is important, as it guides the researcher on how to strategise and formulate a scope of a detailed enquiry about the research problem (Causadias *et al*., 2021).

### 1.4.1 Primary question

What inventory measures were taken to improve a defence manufacturing site?

### 1.4.2 Secondary question

a) What issues are associated with inventory management?
b) What methods and techniques are applied to improve the inventory management system?
c) How do employee characteristics affect inventory management within the organisation?
d) How does management leadership impact inventory control?

## 1.5 RESEARCH OBJECTIVES

Research objectives describe the researcher's intention to accomplish a goal related to a specific subject matter (Yuan *et al.*, 2022). The importance of research objectives is to set a detailed scope on how to answer the research questions (Mashhady *et al*., 2022).

### 1.5.1 Primary objectives

The main aim of the study is to assess inventory measures taken to improve a defence-manufacturing site.

### 1.5.2 Secondary objective

a) Investigate fraud, theft and corruption issues associated with inventory management;
b) Investigate methods and techniques applied for improving the inventory management system;
c) Establish how employee characteristics affect inventory management within the organisation; and
d) Examine the impact of management leadership on inventory control.

## 1.6 SCOPE OF THE STUDY

This research follows the theme of operations management, with an emphasis on the improvement of inventory management. The study will be undertaken in the ammunition industry located in the North West Province, with 250 employees acting as respondents, which is aligned with the sampling requirements of quantitative research.

The employees who participated in this study are operators, team leaders, supervisors, superintendents, work order administrators, and plant managers. The relevant departments include the warehouse and production environment.

## 1.7 RESEARCH METHODOLOGY AND DESIGN

Research methodology refers to a strategic selection of a research approach followed by a design and paradigm that are aligned with the study objectives to answer the research question (Singh, 2022). This study will follow a quantitative research approach, which aims to focus on quantifying the collection and analysis of data. This approach is grounded in a deductive research paradigm, where the emphasis is placed on the testing of theory shaped by positivist philosophies (Gupta & Gupta, 2022).

This study used a questionnaire as a research instrument; a link to the questionnaire was distributed (through emails and WhatsApp) to the potential participants

## 1.8 SIGNIFICANCE OF THIS STUDY

The study addresses issues associated with general business management, leadership, and technology. It highlights the relationship between interpersonal skills, process knowledge, system, waste control, and confidence level that exist amongst employees within the business. This is significant, as it aims to enable the management team to make informed decisions about improving a defence manufacturing site.

## 1.9 DELIMITATIONS AND ASSUMPTION

The study has some limitations that are associated with location. There are four defence manufacturing sites in South Africa. This research study is limited to the one located in Potchefstroom, North West Province.

## 1.10 THEORETICAL FRAMEWORK

A theoretical framework is used to define a specific researcher's viewpoint that guides their analysis and interpretation of the gathered data (Fancourt *et al*., 2021). The importance of a theoretical framework involves understanding certain concepts and the applicable variables in accordance with the provided study definitions (Jurakulovna & Bahodirovich, 2021). There are two types of research theories that apply: the inductive and the deductive approach. An inductive approach aims at developing a theory, while a deductive approach aims at testing existing theories (Naumovska & Zajac, 2022).

For this study, the researcher followed a deductive approach and the approach involves establishment of the correlation between the variables that involves interpersonal relations, process (knowledge, waste removal and confidence) and general management.

## 1.11 ETHICAL CONSIDERATIONS

The standards and code of conduct for researchers are governed by research ethics. To protect the dignity, rights, and welfare of research participants, it is critical to follow ethical guidelines as set out by the NWU ethics committee. The researcher was guided by the four major principles of research integrity, including honesty in all aspects of research, accountability in the conduction of research, fairness and professionalism in working with others, and good stewardship of research on behalf of others.

The research proposal was submitted to the Economic and Management Science Research Ethics Committee (EMS – REC) for ethics application, where it was approved. The North-West Senate Committee granted the researcher permission to commence the study, as the research proposal was found to be in accordance with the standards as set out by the Economic and Management Science Research Ethics

Committee (EMS – REC) in the *Academic Rules for Master's and Doctoral Students at North-West University*. Furthermore, the Scientific Committee concluded that the proposed research methodology posed a low ethical risk. The ethics number was allocated as (Ethics number: NWU-00626-22-A4).

### 1.12 OUTLINE OF CHAPTERS

This study comprises five chapters. The breakdown of this proposition is summarised through the following chapter layout, with a brief discussion of each chapter's content.

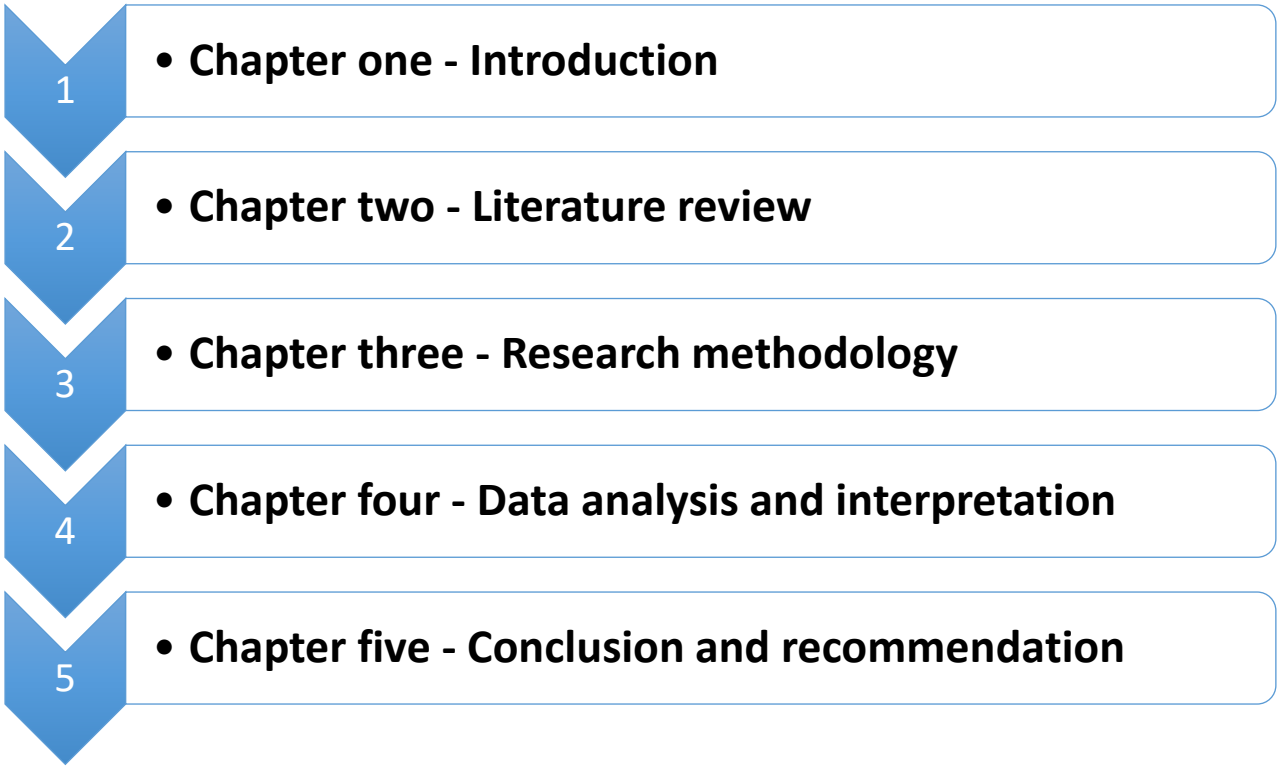


**Figure 1 – Chapter layout**

#### Chapter 1: Introduction

Chapter 1 presents the research topic, background to the research problem, definition of key terms, research questions, objectives, theoretical framework, and the overall outlined details of the study.

**Chapter 2: Literature review**

Chapter 2 defines and discuss theories related to a defence manufacturing site by focusing on the research variables that are relevant to accomplishing the study objectives.

**Chapter 3: Research methodology**

Chapter 3 focuses on data collection for the study; it includes the research design, approach, and data collection techniques that are applicable for responding to the research questions. The research population and sampling size for the study is also specified. A tool for data analysis was applied for identifying variables from the respondents.

**Chapter 4: Results and discussion**

Chapter 4 presents the outcomes of the data analysis based on the responses collected from the respondents concerning the specified study variables. The results are presented in charts and tables.

**Chapter 5: Conclusion and recommendations**

Chapter 5 offers a conclusion that is based on key similarities and differences between the theories in the literature review and the actual findings presented in Chapter 4. Furthermore, this chapter discusses their implications for the current as well as future research studies. The recommendations were formulated based on the outcome of the study.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 INTRODUCTION

A defence manufacturing site involves the production of ammunition products, during which explosives are used as inputs in the transformation process. The operation has become too complex for the business to keep proper records and to control the inventory movements of the ammunition products. Record management is an essential component of the process of information gathering and documentation concerning the physical inventory within a business (Adusei & Senyah, 2022).

To improve business performance within a defence manufacturing site, it is necessary for management to comprise leaders who introduce efficient systems of record management that are associated with processes and systems that lead to sustainable inventory management control (Saffady, 2021).

This chapter investigates the measures taken to improve a defence manufacturing site by focusing on previous research conducted by other researchers regarding record management systems, inventory control, general management, and leadership within the business.

## 2.2 DEFENCE MANUFACTURING SITE

The defence-manufacturing site is the industrial base sector in the global economic environment that specialises in product development, manufacturing, and the delivery of ammunition products to meet military requirements (Matthews & Koh, 2021). The defence industry is of importance because it offers protection against security threats. Adversarial foreign governments pose dangers to national security, which may include direct actions of war and violence.; however, they can also be more subtle and difficult to notice (Antczak *et al*., 2021).

There are over 100,000 businesses in the defence sector, which work under contract for the Department of Defence to supply the government with the relevant goods and services (Mahoney, 2021).

In 2021, the worldwide defence market was projected to increase at a compound annual growth rate (CAGR) of 6.8%; from $452.69 billion in 2021 to $483.47 billion in 2022 (Palavenis, 2021).

## 2.3 CONCEPTS OF INVENTORY MANAGEMENT

The concepts and principles of inventory management are indispensable, especially where cost is involved and where it is associated with performance and sustainability within the organisation (Cesarelli et al., 2021). Achieving proper and correct inventory management is motivated by more than just costs; environmental and societal factors are also taken into account (Escobar Nieves, 2022:17). Inventory visibility, record management systems, security, and managerial leadership have the biggest impacts on inventory management (Kaewchur, 2021).

### a) Inventory visibility

Real-time material visibility in has always been a key concern in many organisations (Agrawal *et al*., 2022). Information is important for decision-making (Srinivasarao, 2021:11); in most cases, business organisations struggling with material traceability, fraud, and security enhancement (Pal *et al*., 2021). Supply chain visibility enhances the organisation's ability to organise and process the information, which is dependent on the organisation's internal resources and capabilities. The effectiveness of chain visibility is dependent on the quality of the exchanged information (Alzoubi, 2021). The key element in inventory visibility is sustainability; if the business organisation lacks sustainability, it will not minimise the risks associated with waste and environmental footprint (the social and ethical performance of the supply chain). Human resources, lean manufacturing, and technology underpin material visibility (Apeji & Sunmola, 2022).

### b) Human resource

Human resources are the most important and instrumental element of any business, as they comprise knowledge and skills (Chelladurai & Kim, 2022). The increase in the importance of people within the organisation is directly proportional to the implemented strategic human resource management (Boxall & Purcell, 2022:4). Business objectives are achieved through the capabilities of the people who execute the planned activities; however; it is argued that how realistic the expected outcomes are depends on the level of employee wellbeing, their state of emotional intelligence, their job satisfaction, performance management strategies, organisational commitment, and motivation (Mahapatro, 2022). This enables the organisation to develop accurate policies for recruitment, selection, appointments, training, skill transfer, as well as skills and development programs. The operational issues associated with material visibility require competence for task execution; however, this is completely determined by the attitudes of the employees (Saputra & Mahaputra, 2022).

### c) Lean manufacturing

Lean manufacturing refers to the principles of waste elimination within a process operation (Sadiq *et al*., 2021); it has been designed to enhance the industry's efficiencies through internationally recognised tools and techniques (Ulewicz *et al*., 2022:1). The principles of lean manufacturing are predominantly concerned with process facilitation, continuous improvement, and identifying non-value-adding activities that lead to human error (Naciri *et al*., 2022). Furthermore, lean manufacturing seeks to maximise the utilisation of resources, including capital, land, operational facilities, human resources, location, and distribution (Singh *et al*., 2021). One of the non-value-adding activities involves unutilised talent, inventory mismanagement with poor material visibility, overproducing, ineffective record management techniques, and a mismatch between physical and system stock (Aravindh *et al*., 2022:1).

Although findings indicate that lean manufacturing is a good method for improving business performance and mitigation of inventory risk through innovation, Martínez-Cerón et al. (2022) argue that the application of the concepts is dependent on timeous

and accurate access to information that is used for decision-making. Furthermore, the implementation of lean manufacturing is limited by the flexibility of the organisations to embrace a cultural shift, the resistance of employees to change, and the lack of management support (Maware & Parsley, 2022:1).

### d) Technology

Technology can be defined as a creative way of doing activities; it is used to adapt to the continuously changing environmental conditions by creating modern transformations (Salam *et al*., 2022:1). It is necessary to discover and support world-class technologies that can secure continuous competitiveness in major industries (Han Yeon *et al*., 2022:1). Technology has an impact on society, as it demonstrates how social realities vary from era to era (Bibri, 2022). The implementation of ERP system technology is effective for improving operational performance, which includes material visibility within every stage of the supply chain process (Santoso *et al*., 2022); however, it is argued that this modern system with high efficiency does not function in isolation because dependents on a human skill transfer and extensive knowledge management (Grigorescu & Ion, 2022:1).

Furthermore, Sternad Zabukovšek *et al*. (2022) emphasise that organisations should consider technological acceptance because the end users of the ERP system have varying viewpoints. Some end users of the ERP system are unfamiliar with the use and application of this technology and, as a result, it is widely argued and feared that this technology cannot be easily adapted (Afiana *et al*., 2022). The development of modern technology is induced by diversified social needs (Chen & You, 2022) and the organisation must consider two factors: user satisfaction and engagement to sustainability, which benefit from the efficiencies of modern ERP systems (Mohanty *et al*., 2022:1).

## 2.4 RECORD MANAGEMENT SYSTEMS

Record-keeping systems are essential for the maintenance and traceability of valuable information, which could be utilised in the future as a reference for historic trends that play a significant role in decision-making. The record management system keeps track

of and records of inventory movements; it is necessary for changes to be captured on a daily basis (Lian & Aman, 2021). The elements of record keeping include generation, organisation, distribution, utilisation, retrieval, and even destruction; however, the accuracy of the record keeping depends on the type of system that is utilised in the business. Therefore, both public and private business enterprises share the common problem of inventory management due to inadequate record management system that affect the overall performance of the organisation (Mbugi & Lutego, 2022). Information overload creates problems for business organisations and it directly affects the type of record management system employed in the selection between a computerised and manual record-keeping system.

### 2.4.1 Manual record management system

A manual system is a record keeping system where records are maintained by hand, without using a computer system. Manually tracking information creates problems for the organisation, which are related to waste misplacement and fraud. The main issue with a manual recording system is that it is labour intensive; it requires a continuous review of recorded information and consumes a lot of time (Kahl *et al*., 2022).

### 2.4.2 Automated record management system

The introduction of automation technology has simplified and minimised human error in various areas, including the process of manually counting production items and raw material (Cuevas & Casauay, 2022:1). To easily maintain records and security vulnerabilities that result in inaccuracies when collecting information, the automated technological system has been developed (Parkar *et al*., 2022). The application of modern technologies has replaced the need for manual record keeping and storing piles of paperwork (Badge & Mokashi, 2022) and it benefits the organisation by eliminating the backlog of information not was not being updated on time (Nelago *et al*., 2022).

The function of an automated record system is to improve data capturing, verification, and security levels of stored information (Ye *et al*., 2022:1). Although the technology

improves the speed of delivery and accurate information, the organisation must be willing to pay the cost of the improved efficiencies (Pinatih, 2022).

## 2.5 EXPLOSIVE SECURITY MANAGEMENT

Explosive can be defined as materials with a chemical composition that are used to produce ammunition weapons, which include grenades, mortars, projectile, and aircraft bombs that are designed to conquer the enemy on the battlefield (Balagansky, 2022). Chemical reactions enable explosives to produce gases at temperatures, pressures, and speeds that cause catastrophic damage through force and/or through the production of hazardous amounts of heat, light, sound, gas, or smoke.

### 2.5. Importance of classification and division

Explosive are classified according to their ability to rapidly conflagrate or detonate. These classifications have six hazard division categories, which are explosive Division1.1, Division 1.2, Division 1.3, Division 1.4, Division 1.5, and Division 1.6. Understanding explosive division is critical for exposing the safety and security risk associated with theft, fraud and corruption when inventory is not well managed. Because of the potential risk of explosives to cause harm to people and property, the manufacturing site is located significantly away from the community to maximise safety (Thakur *et al*., 2018). Classifying explosives is important for enhancing the protection of human health and the environment; it provides a system for hazard communication. Furthermore, it is important for ensuring supply chain security during transportation (Li *et al*., 2022:1). The classification of explosive division is commonly realised through packaging, which contains information such as the name of the manufacturer, batch number, year, and location of production.

### 2.5.2 Explosive and sensitive material management

It is important to emphasise the control of explosive management within the supply chain process to enhance the security and protection of the environment. According to Popa *et al*. (2021:1), the majority of fatalities in humans are caused by explosive, directly or indirectly. In addition to this, they also cause damage to properties and the

environment (Nguyen, 2021:1). To decrease the probability of incident occurrences, control related to the management of dangerous goods that include explosives is necessary (Lazarević *et al.*, 2021:1). Alzahrani and Seth (2022:1) emphasised that to achieve this, the organisation must be prepared to invest in information technology to enhance protection and security systems. According to Liliya *et al*. (2021:1), when safe distances between explosive storage and production are not well calculated, it will remain a challenge to ensure that people are safe from the harmful effects of explosions. Liu *et al*. (2021) argue that, when safety risk analyses are conducted without considering the interaction of the risk factors, it negatively affects the effectiveness of explosive management that ought to provide security and protection.

### 2.5.3 Legal act and regulations

All explosive-related tasks are governable by several acts and regulations because the relevant employees complete potentially dangerous tasks in the production environment that may cause harmful health effects, incidents, or accidents (Polavarapu & Gummadi, 2021:1). The first duty of an employer is to provide accomplished safety and an appropriate working environment through implementing several acts and regulations (Gaya, 2022:1). The several acts and regulations includes *Occupational Health and Safety Act, 1993 (Act 85 of 1993), Explosives Act, 2003 (Act 15 of 2003), Hazardous Substances Act, 1973 (Act 15 of 1973), National Environmental Management Act, 2008 (Act 62 of 2008), Atmospheric Pollution Prevention Act, 1985 (Act 15 of 1985) and National Road Traffic Act, 1996 (Act 63 of 1996*). According to Odion-Obomhense and Ejikeme (2022:2), acts and regulations are ineffective unless there are a sufficient amount of inspectors and government officials who are available to facilitate the implementation process in a manner that enforces the requirements. Furthermore, McLachlan *et al*. (2022:1) state that the regulations are effective when constructed in a manner that is clear, consistent, and simple to follow.

## 2.6 MANAGERIAL LEADERSHIP

Leadership is a process where leaders exhibit certain behaviours that influence followers. Yet, each follower may view the leader's behaviour differently, owing to

differences in disposition and context. Leadership styles can play an essential role in influencing the experience of employees, including their experience of the demands and resources provided to them by their respective leaders (Avolio *et al*., 2022). Leaders are encouraged to empower their followers by developing them into high-involvement individuals and teams focused on quality, service, cost-effectiveness, and the output quantity of production. Leaders paint a picture of how that vision will affect the company as a whole, as well as each individual (Andersen, 2018).

In managerial leadership, it is a leader's key responsibility to focus on clarifying the required roles and tasks and to provide direction on how to execute them. Organisations and leaders seek to have an environment of engaged employees who spend considerable time and resources to improve the engagement process, which has an enormous influence on employee productivity and organisational performance (Manmeet Kaur & Poh, 2022).

### 2.6.1 Impact of leadership on inventory management.

Leadership is critical on a decision-making process associated with effective management of inventory within a defence-manufacturing site (Pascariati & Ali, 2022). The decision-making process entails planning of the required systems followed by, implementing, monitoring and continuous review of performance during strategic session (Haricharan, 2022). Decision making process may be influenced by understanding the risk factors of inventory mismanagement such as fraud, corruption and theft (Lăzăroiu *et al*., 2020). The golden thread of leadership is to drive efficiency and sustainable systems that provides protection and security assurance when working with inventory of explosive and sensitive materials. Furthermore, the organisation needs to be aware of the weak leadership skills that result from a lack of a strategic perspective, which includes self-awareness, team development, and empowerment (Kwiotkowska *et al*., 2022).

## 2.7 CHAPTER SUMMARY

This chapter reviews literature that is related to the research study objectives. It provides an in-depth understanding and insights into the challenges that exist within a

defence-manufacturing site. The theories of record management systems, general management, leadership, technology and explosives regulations are covered. The next chapter discusses research methodology based on the study approach, research design, data collection, and analysis.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 INTRODUCTION

The previous chapter contains a discussion of the theories related to the study. This chapter provides details on how to collect data from the respondents through research approach, design, and measuring instruments. The researcher elaborates on the methods applied for testing the validity of the questionnaire and the reliability of responses from the respondents. In addition, the method for data analysis will be discussed.

## 3.2 RESEARCH METHODOLOGY

Research methodology refers to the specific set of procedures and techniques that are applied to a targeted population in order to extract valuable information that can be used to add or create new knowledge about a subject matter (Gupta & Gupta, 2022). The study methodology follows the science of conducting research in a systematic approach (Mishra & Alok, 2022). The elements of research methodology are research approach and design, and the type of research methodology must be chosen based on the characteristics that link with the research objectives (Basias & Pollalis, 2018).

### 3.2.1 Research paradigm

Scientific discoveries are guided by research paradigms that are based on assumptions (Park *et al.*, 2020:1). In addition, Khatri (2020:1) mentions that the concept of research paradigm refers to the theoretical or philosophical ground for research. The positivism paradigm is relevant to this research and is founded on the belief that science is the only source of true information.

This study is based on a cross-sectional time frame with questionnaires given to respondents and collected at a specific time. These questionnaires were issued via

email and WhatsApp to those who had access to the relevant technology in order to comply with COVID-19 protocols.

### 3.2.2 Research approach

The research approach for this study was based on a quantitative cross-sectional design, which is defined as the process of data collection and analysis through the application of statistics that specify details of who, what, when, where, how much, how many, and how (Mohajan, 2020:3). This study will focus on numerical analysis of a large population to prove the hypothesis.

## 3.3 RESEARCH DESIGN

Research design is a plan modelled by the researcher before data is collected so that the research objectives are achieved validly at the minimum possible cost (Asenahabi, 2019). The research design describes the method that is used to discover the solutions to research questions (Rinjit, 2020). The elements of research design consist of the study population, sampling techniques, data collection, analysis and the conclusion on how findings will be presented (Baran, 2022). The researcher must be creative in designing the methodology, as the nature of research problems differ from one form to the other (Mello, 2021).

### 3.3.1 The population of the study

This study will assess and measure the effectiveness of the methods and techniques applied toward the improvement of inventory management within a defence-manufacturing site. The sample population consists of 250 workers and includes operators, a team leader, work order administrators, supervisors, superintendent, and managers. Employees from other departments, such as finance, product development, laboratory, and human resource was not be invited for participation. The respondents are located on one site within the North-West Province.

Rahi (2017:3) defines population as all individuals or items that a researcher seeks to understand. The unit of analysis will be presented by demographic characteristics (race, gender, age group, sector, and position) and applied descriptive statistics.

### 3.3.2 Sampling method

Sampling means selecting a given number of subjects from a defined population as representative of that population, while the sampling method refers to the technique applied in drawing the sample.

Questionnaire were sent to the respondents and 155 responses were received. The respondents include the operators, team leaders, supervisors, superintendents, work order administrators, and plant managers. There are two known types of sampling methods: probability and non-probability sampling. A probability sample has been chosen in such a way that each element has a known chance of being included, while non-probability samples are those that are selected using non-random methods (Pandey & Pandey, 2021:46).

The researcher will focus on a non-probability sampling method with a purposive sample. This technique requires the purposive collection of information about the individuals within the population. The sample collected may be comprehensive and representative of the population, allowing conclusions and generalisations to be established.

### 3.3.3 Data collection

Data collection is the process of collecting raw data from respondents by using questionnaires, which are classified as research instruments (Rose *et al.*, 2019:2). The raw data to be collected from the respondents are referred to as primary data that is defined as the information gathered by someone else for a different purpose; this is a viable option for researchers with limited time and resources (Johnston, 2017:1).

### 3.3.4 Data analysis

Data analysis is the process of defining, measuring, analysing, and interpreting the collected data to gain knowledge (Baviskar *et al.*, 2021:1). The researcher used the skills and knowledge of a statistician and SPSS to analyse the collected data. The collected data is analysed to understand behavioural relationships between dependent and independent variables so that research questions can be answered.

Factor analysis was used for data analysis. This tool was used for condensing a large number of variables into a smaller number of factors (Taherdoost *et al*., 2022). Prior development of research factors and the measurement of sample adequacy provided the researcher with information that outlines the strength of the sample; furthermore, the sampling adequacy was assessed by examining the Kaiser-Meyer-Olkin (KMO).

## 3.4 VALIDITY AND RELIABILITY

### 3.4.1 Validity

Validity refers to what the instrument or scale measures and how well it performs its function in relation to the study objectives (Cernovsky *et al*., 2021:3). Validity of the measuring instrument is tested based on the content and construct of the study (Andrade, 2018), and this is based on composite reliability and average variance extracted (Chapelle & Lee, 2021).

A questionnaire was used as a measuring instrument for the research study. A Statistician from the North-West University was provided with a questionnaire for content and construct validity testing. The content validity is significant when all aspects of the questionnaire fulfil the study objectives.

In the construct validity, the convergent validity test was used to assess the research factors based on composite reliability and average variance extracted. The construct validity test is significant under the following conditions;

a) Calculated composite reliability > 0.7
b) Calculated average variance extracted > 0.5
c) Composite reliability > average variance extracted

### 3.4.2 Reliability

Reliability in quantitative research refers to the accuracy of an instrument. It measures the degree to which a study tool consistently produces the same outcomes when applied to the same circumstances (Doroftei *et al*., 2021). Reliability is measured by using Cronbach's alpha coefficient, which involves assessing the degree of agreement on a standardised 0 – 1 scale (Wang, 2022). Furthermore, reliability measures the confidence level in the accuracy and usefulness of knowledge (Ganesha & Aithal, 2022). The inter-item correlation and the Cronbach's alpha were calculated using SPSS to assess the reliability of the questionnaire.

Inter-item correlations measure the extent to which scores on one item are related to scores of other items on a questionnaire (Ocen *et al*., 2022).There is a strong inter-item correlation when the calculated values are ≥ 0.5. Cronbach's alpha values range between 0 to 1 and the least acceptable value is at 0.60. However, when dealing with dependability, an alpha value of 0.70 shows a better correlation. Additionally, if the variable in a test is standardised, the alpha value is derived based on its average correlation (Elgimati *et al*., 2021:4).

## 3.5 ETHICAL CONSIDERATIONS

Ethical considerations in business research refer to the grounded principles of collecting data from respondents by demonstrating the qualities of being fair, trustworthy, respectful, honest, and transparent. The code of conduct and moral values are important aspects in this regard (Sakib, 2022); research ethics committees were established to facilitate the acceptability of research projects to protect the dignity of respondents and participants (Tusino & Furfaro, 2022). The elements of ethical considerations include informed consent, risk management, confidentiality, and justice (Young *et al*., 2022). These elements allow the respondents and participants to have the flexibility to decide how they want their data to be shared and utilised (White *et al*., 2022).

### 3.5.1 Informed consent

For the respondent or participant's autonomy to be preserved, informed consent is essential and a fundamental feature of ethical practices (O'Neill *et al*., 2022). For this study, the researcher informed all the respondents about the objectives of the study by addressing the title of the research, the academic background, and the comprehensive details of how to participate in the study. The researcher also informed the respondents about the granted permission to conduct the research study within the organisation, this was done by specifying the details on the designed questionnaire document.

The research study acknowledged COVID-19 protocols prior to distributing the questionnaires to the respondents. The following techniques were applied for collecting data from the respondents:

a) Questionnaires were sent through emails or WhatsApp messages to those who already had email addresses and mobile phones ;
b) Email addresses were created for those who did not have access to work or private emails; and
c) The link containing the questionnaire was sent to the respondents through emails and the WhatsApp application installed on their mobile phones.

### 3.5.2 Ethics risk management

Ethics risk refers to the process of limiting the effectiveness of the consent form that intends to communicate and enable respondents to make an informed decision about sharing data during the process of conducting the research (Beardsley *et al*., 2019). Ethics risk management refers to the psychological safety and protection of the respondents or participants that experienced discomfort as a result of feeling that the information shared during the study could be used against them and disadvantage them in their career growth within the organisation (Webber & Brunger, 2018). The rights of all respondents were protected as the researcher emphasised that the respondents may choose not to be part of the research at any time. The study did not pose any intimidation or any cause of harm to the respondents.

### 3.5.3 Confidentiality

Confidentiality agreements exist between two or more parties involved in the subject matter to commit and prevent unfair disclosure of information (Tang, 2018). This agreement was created many decades ago by qualified lawmakers to pervade dispute resolution (Benham, 2021). Confidentiality is achievable when there is a limit or restriction of access to private information (Otto & Pham, 2022).

The researcher addressed the issue of and assured the respondents that the highest level of confidentiality will be maintained. The anonymity of respondents was achieved during data collection after the submission of responses on the google form. The spreadsheet only displays the responses without the identity or traceability of the respondent. The research was for academic purposes; the outcome of the study may be published and is accessible on official academic sites such as Google Scholar.

## 3.6 CHAPTER SUMMARY

The outline of this chapter has provided details on how data was collected from the respondents through research methodology, design, and the relevant measuring instrument. The validation and reliability test method for the measuring instrument is also discussed Chapter 3. In the next chapter, the researcher focuses on data presentation and a discussion of the analysis.

# CHAPTER FOUR

## RESULTS AND DISCUSSION

### 4.1 INTRODUCTION

This chapter presents the research design and methodology used to collect data. It also describes how the data was analysed to achieve the research objectives for the study. Furthermore, the chapter presents the results through charts and graphs.

Raw data was collected from the respondents using a questionnaire. The questionnaire was distributed to employees within a defence-manufacturing site and 155 responses were received. The structural composition of the questionnaire contained the following:

a) Section A is based on demographic analysis;
b) Section B is based on interpersonal relations;
c) Section C is based on technology; and
d) Section D was based on general management.

### 4.2 DATA ANALYSIS

Factor analysis was applied for data analysis to a large set of variables that are contained in a questionnaire. Research study factors were defined as interpersonal relation, general management, and process systems that involves knowledge, confidence, and waste removal.

### 4.3 VALIDITY AND RELIABILITY

#### 4.3.1 Validity

Factor analysis was applied for construct validation, and this was done by focusing on section B to D of the questionnaire, respectively. This was done to reduce the variables into research factors. Furthermore, the Kaiser-Meyer-Olkin (KMO) measure of

sampling adequacy was applied on the questionnaire. The sample becomes adequate when KMO ≥ 60%.

### 4.3.2 Reliability

The researcher submitted an Excel sheet containing the responses to the NWU Statistician and the reliability of the questionnaire was determined using the SPSS statistical tool software. Cronbach alpha was applied as a tool for reliability analysis.

The Cronbach's alpha coefficient formula = $\frac{rk}{[1+(k-1)r]}$ where *k* represents the number of items considered and *r* represents Cronbach's alpha value (Amirrudin *et al*., 2021).

## 4.4 EFFECT SIZES

### 4.4.1 Cohen's effect sizes d

The standardised difference between two means is denoted by Cohen's d, an effect size (Bowring et al., 2021). It may be utilised with the reporting of t-test and ANOVA findings. Cohen's d is a suitable effect size for the comparison of two means. The procedures that were used for d-values concerning variances between means are as follows:

a) Small effect: d = |0.2|;
b) Medium effect (noticeable with the naked eye): d = |0.5|; and
c) Large effect and practically significant: d ≥ |0.8|.

### 4.4.2 Correlation

The definition of Karl Pearson's coefficient of correlation is a linear correlation coefficient with a value range of -1 to +1. High negative correlation is represented by the value -1, and strong positive correlation is represented by the value +1 (Chatterjee, 2021). The degree of correlation coefficient strength is measured as follows as stated by Edelmann *et al*. (2021).

a) r = |0.1| (small effect);
b) r = |0.3| (medium effect, noticeable with the naked eye); and
c) r ≥ |0.5| (large effect and practically significant).

## 4.5 RESULTS

### 4.5.1 Biographical data

Biographical data for the study is based on the age, position, and work experience of the respondents within a defence-manufacturing site.

#### a) Age

The age ranges from 20 to 69 years.

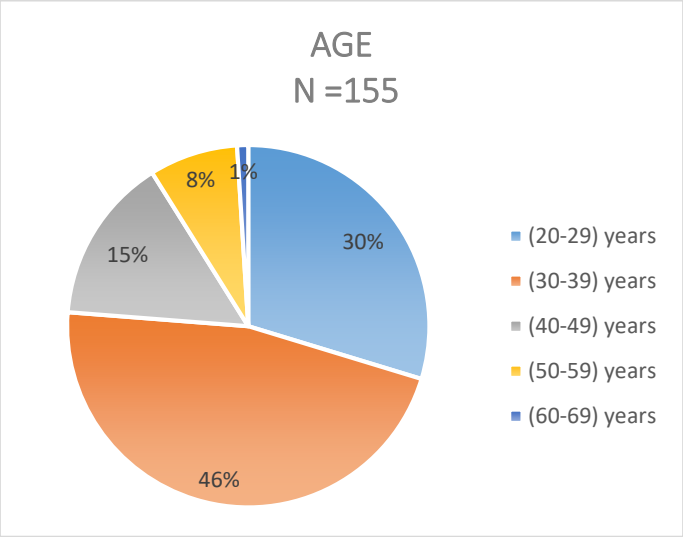


Figure 4.1 – Age group

The age distribution within a defence-manufacturing site is divided into five segments as shown on the pie chart, and 76% of employees are within the age group of 20 to 29 years and 30 to 39 years. Each age group has a unique set of expectations, requirements, and motivations, as well as a distinctive way of working and a varying degree of dedication to their jobs (Gultom *et al*., 2022).

Age distribution is important for this study, as it will show how several age groups interact with one another based on overlapping interest and preferences within a business environment. Furthermore, it is important for measuring how different age groups understands and apply inventory management techniques within a defence-manufacturing site.

**b) Position**

Position is the role given to an employee to perform duties within a business organisation (Fidlerová *et al*., 2022). The role specifies critical skills that are required to achieve the study objectives and to measure how they influence the research factors related to management of inventory.

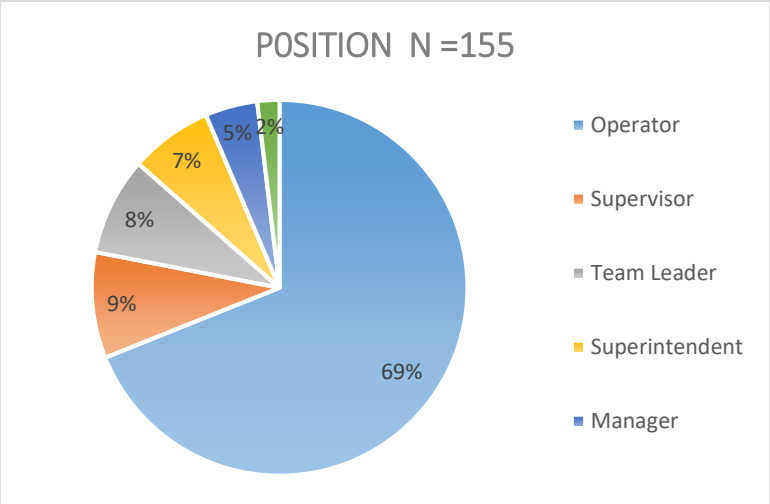


Figure 4.2 - Position

Six positions were identified from the respondents, of which 69% was classified as a direct labour that is physically exposed to processes and systems in operation within a defence-manufacturing site. The remaining 31% were classified as indirect labour that is responsible for administration and management duties. Position is important in this study because it measures the degree to which inventory management skills and techniques are applied by different roles within a defence-manufacturing site

**c) Years of experience**

The years of experience ranged from 0 –to 30 years.

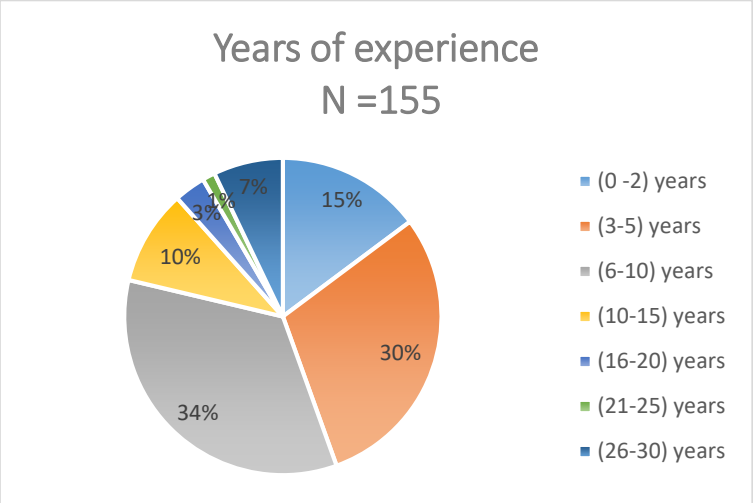


Figure 4.3 - Experience

Experience can be characterised as information acquired over time (Sakdiyakorn *et al*., 2021); 64% percent of the employees have three to 10 years of experience of defence-manufacturing business. This experience is distributed between direct and indirect labour with different roles. Experience is important for this study as it measures the time spent by employees with varying roles on applying the inventory management skills and techniques within a defence-manufacturing site.

### 4.5.2 Statistical results

#### a) Validity

The table presents the outcomes of the applied factor analysis method of reducing variables to develop validated constructs.

Results of factor analysis on section B, C and D are as follows:

| Items | | | | | % Variance | Cumulative |
|---|---|---|---|---|---|---|
| Section | Name | N | MSA | Retained | Explained | Vary between |
| B | Interpersonal relation | | 0.90 | 1 | 65 | 0.58 and 0.76 |
| C | Process - Knowledge | | 0.85 | 3 | 75 | 0.56 and 0.87 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Process - Waste removal | | | | | |
| | Process - Confidence | | | | | |
| D | General management | | 0.86 | 1 | 73 | 0.68 and 0.76 |

Table 4.1 - Validity

Section B contains only one construct and the MSA value of 0.90, which implies that the sample was adequate. The total variance value is 65% that demonstrates a moderate predictive power of the model.

Three constructs were identified for section C, and the MSA value was found to be 0.846, which indicates that the sample is adequate. The three identified constructs are named process system knowledge, waste removal, and confidence. The total variance value is 75% that implies the model has a strong predictive power.

Construct general management was identified under section D with an MSA value of 0.86. This indicates that there was sample adequacy at section D. The total variance explained was 73% signifying a strong correlation and predictive power of the model.

**b) Reliability**

| Inter Item Correlation | | |
|---|---|---|
| Section | N of Items | Cronbach's Alpha |
| B (Q6- Q13) | 8 | 0,91 |
| C (Q14-Q15) | 2 | 0,65 |
| C 16-20) | 5 | 0,92 |
| C (21-23) | 3 | 0,79 |
| C (22-23) | 2 | 0,81 |
| C (16-21) | 6 | 0,92 |
| D (24-28) | 5 | 0,90 |

Table 4.2 - Reliability

The Cronbach’s alpha test results are all greater than 0.6 and this implies that the questionnaire can reliably produce similar results, should the study be repeated under the same conditions.

The overall inter-item correlation is good, except for section C (Q14 – 15). This could be related to the fact that there were only two items present and that one employee understood the question differently from the other.

### c) Correlation

| Factor | | SECTION A: Personnel characteristics 1. Age group (Years) | 2. Position | 3. Years of experience | B_Interpersonal_relations | C_Process_Systems_Knowledge | C_Process_Systems_Waste_removal | C_Process_Systems_Confidence | D_General_Management |
|---|---|---|---|---|---|---|---|---|---|
| B_Interpersonal_relations | Pearson Correlatio | 0,054 | .215** | 0,067 | 1 | .595** | .638** | .527** | .723** |
| | Sig. (2-tailed) | 0,508 | 0,007 | 0,411 | | 0,000 | 0,000 | 0,000 | 0,000 |
| | N | 155 | 154 | 155 | 155 | 155 | 155 | 155 | 155 |
| C_Process_Systems_Knowledge | Pearson Correlatio | .243** | .430** | .288** | .595** | 1 | .639** | .492** | .676** |
| | Sig. (2-tailed) | 0,002 | 0,000 | 0,000 | 0,000 | | 0,000 | 0,000 | 0,000 |
| | N | 155 | 154 | 155 | 155 | 155 | 155 | 155 | 155 |
| C_Process_Systems_Waste_removal | Pearson Correlatio | 0,143 | .196* | .196* | .638** | .639** | 1 | .403** | .795** |
| | Sig. (2-tailed) | 0,075 | 0,015 | 0,015 | 0,000 | 0,000 | | 0,000 | 0,000 |
| | N | 155 | 154 | 155 | 155 | 155 | 155 | 155 | 155 |
| C_Process_Systems_Confidence | Pearson Correlatio | 0,119 | .178* | .206* | .527** | .492** | .403** | 1 | .507** |
| | Sig. (2-tailed) | 0,140 | 0,028 | 0,010 | 0,000 | 0,000 | 0,000 | | 0,000 |
| | N | 155 | 154 | 155 | 155 | 155 | 155 | 155 | 155 |
| D_General_Management | Pearson Correlatio | 0,091 | .237** | 0,150 | .723** | .676** | .795** | .507** | 1 |
| | Sig. (2-tailed) | 0,263 | 0,003 | 0,063 | 0,000 | 0,000 | 0,000 | 0,000 | |
| | N | 155 | 154 | 155 | 155 | 155 | 155 | 155 | 155 |

Table 4.3 Correlation

There is a strong positive correlation between interpersonal relations, general management, and process systems (knowledge, waste removal and confidence) with $r \geq 0.5$ and significant at two tail level $\leq 0.01$. This implies that an increase in interpersonal relations or general management practices will result in an improved process system in terms of knowledge, waste removal, and confidence. The improvements were positively correlated to employee designation status, although the effect was small with $0.1 < r \leq 0.3$ and significant at two-tailed level $\leq 0.0.1$

Moderate positive correlation was observed between knowledge in process system and employee confidence with $r \leq 0.5$ at two tailed significance level $\leq 0.01$. An improvement in process knowledge moderately improves the employee confidence. These improvements were also positively correlated to the employee age group, position, and years of experience and have a small to medium effect with $0.1 < r \leq 0.5$. These effects were significant at two-tailed level $\leq 0.01$.

In addition to this, a moderate positive correlation was realised between waste removal process system and employee confidence with $r \geq 0.5$ and significant at two tail level $\leq 0.01$. As an employee understands the waste removal process more, it significantly improves the level of confidence. The improvements were correlated to employee designation and years of occupational experience. The effects were small with $r \leq 0.3$ at one tailed significant level $\leq 0.03$.

**d) Effect sizes**

| Construct | N | Mean | Std. Deviation | d - value |
|---|---|---|---|---|
| B_Interpersonal_relations | 155 | 3,39 | 0,88 | 0.76 |
| C_Process_Systems_Knowledge | 155 | 3,31 | 1,04 | 0.69 |
| C_Process_Systems_Waste_removal | 155 | 3,50 | 0,90 | 0.74 |
| C_Process_Systems_Confidence | 155 | 3,86 | 0,84 | 0.76 |
| D_General_Management | 155 | 3,3548 | 1,02 | 0.69 |

Table 4.4 Effect sizes

The calculated d-value for the five constructs indicated a moderate strength relationship that exists amongst the variables. This signifies that no intervention was required as the constructs had a notable effect when applied to employees within the defence-manufacturing site.

## 4.6 CHAPTER SUMMARY

In this chapter, results are presented through tables, charts, and graphs. The implications of the findings are discussed in a logical sense that is meaningful to the reader. The results and discussions presented in this chapter were based on biographical data and the statistical analysis of the collected data of the respondents. The next chapter concludes the study results and includes recommendations.

# CHAPTER FIVE

## CONCLUSION AND DISCUSION

### 5.1 INTRODUCTION

The primary objective of this study is to assess measures taken to improve a defence-manufacturing site. This chapter summarises findings followed by a conclusion and recommendations. The recommendations are included for the benefit of the relevant role players within the defence-manufacturing industry and will be resourceful for future research.

### 5.2 CONCLUSION AND ACHIEVEMENTS OF THE STUDY OBJECTIVES

The objective of this study is to assess measures to improve a defence-manufacturing site. The primary objective is associated with problems that involve inventory mismanagement and seeks to address this issue through secondary objectives, which were:

a) To investigate issues associated with inventory management;
b) To investigate methods and techniques applied for improving the inventory management system;
c) To establish how employee characteristics affect inventory management within the organisation; and
d) To examine the impact of management leadership on inventory control.

The research questions were designed to cover aspects related to the study objective:

a) What issues are associated with inventory management?
b) What methods and techniques are applied to improve the inventory management system?
c) How do employee characteristics affect inventory management within the organisation?
d) How does management leadership impact inventory control?

There was a moderate to strong correlation between the eight identified study constructs. These constructs involved age group, position, years of experience, interpersonal relation, general management, process system knowledge, waste removal, and confidence. The variables of the study constructs have noticeable effects that can improve a defence-manufacturing site.

The issues associated with inventory management include employee process knowledge, waste removal, and management leadership practices that involve a decision-making process for dealing with the issues. Furthermore, this involves a knowledge of standard procedures of waste removal.

The techniques of improving inventory management were found to be dependent on the process system applied within a defence-manufacturing site. This involves knowledge of working with record management systems that can be either manual or automated. The age group and designation status directly affect how employees perceive process systems as it evolves from one generation to the next. The site has 76% of employees that are within the age group of 20 - 29 years and30 - 39) years; thus, it can be concluded that this generation does not have resistance to technological advancement.

## 5.3 RECOMMENDATIONS

The recommendations for this study are exclusively based on the best interest of the company and well-being of the community. The problem statement has exposed that inventory mismanagement results into financial loss, theft, and corruption. The researcher recommends that the business should focus on improving process systems associated with stock movements. This can be achieved if employees increasing their knowledge through training followed by investing in the modernised counting and record-keeping systems.

It is further recommended that they provide leadership training courses to the departmental managers, as it was observed that leadership practices have a positive correlation with interpersonal relations and process systems within the business. Employee characteristics have a significant positive correlation with the study

constructs; therefore, it is recommended that management appoint the right employees for the right responsibilities involving a process system for managing inventory movements.

## 5.4 LIMITATION OF STUDY

The limitations of this study are associated with location. This means that the outcomes of this study werebased exclusively on one site that is located in Potchefstroom, North West Province. Therefore, the results cannot be generalised, as there are four sites in South Africa operating in the defence manufacturing industry. It is recommended that future studies be focused on other sites at different geographical locations within South Africa. This will enable the outcomes to be more representative.

## 5.5 RECOMMENDATION FOR FUTURE RESEARCH

This study has placed a foundation for the improvement of a defence-manufacturing by focusing on interpersonal relations, employee characteristics, and process systems. For future research, it is recommended to explore how change can be managed during the implementation process of measures taken to improve a defence-manufacturing site.

## 5.6 CHAPTER SUMMARY

This chapter assesses the degree to which the research findings have achieved the objective of answering the research questions that are associated with the defence-manufacturing site. The positive correlation that was found between interpersonal, process system, and leadership style was associated with the inventory and record management issues that exist within the business. The recommendations are suggested based on technological systems and employee training that can be used to improve the standard procedures of managing inventory movements.

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## APPENDIX 1 - QUESTIONNAIRES

## SOLEMN DECLARATION

**Solemn declaration by the student**

I ***Anele Jackie Mongwe*** declares that the presented questionnaires have been drafted for academic purposes based on measures taken to improve inventory management within a defensive manufacturing site. This task is partial completion of the requirements set for the MBA degree at the North-West University.

As a result of this, you are kindly request to be part of the 250 respondents who will be sharing views based on the 28 drafted questionnaires. As an NWU student, I commit to keeping your information and responses confidential.

Signature of student:  Student number: ***36901067***

Signed at ***Krugersdorp*** on this ***23rd*** **day** of ***March 2022***

## Topic: Assessing measures taken to improve a defence manufacturing site.

This questionnaire aims to collect data related to inventory management challenges that are currently affecting a defence manufacturing site and formulate improvement strategies that will be recommended to management for implementation to minimize stock variation and losses. Inventory accounts for about 50 % of the organisational assets with significant cost implications.

The questionnaires will be distributed via emails to the repsondents who already have email addresses however, those who do not have will be assisted with creating their personnel email addresses. The data collection via emails will be resourceful towards compliance to covid-19 protocols. Cross-sectional time frame applies with questionnaires given to respondents and collected at a specific time.

This survey has 4 sections which are broken down as follows;

**Section A: Personnel characteristics**

**Section B: Interpersonal relations**

**Section C: Technology (process & systems).**

**Section D: General management**

## Inclusions and limitations

The respondents must be in manufacturing or warehouse departments with at least 3 years of working experience. The age of the respondents must be between 20 years and 65 years. They are no restrictions based on the degree of designation. The respondents will not be forced to be part of this study and it is estimated that it will take **15 minutes** to read, understand and complete these questionnaires.

## SECTION A: Personnel characteristics

### 1. Age group (Years)

| 20-29 | 30-39 | 40-49 | 50-59 | 60-69 |
|---|---|---|---|---|
| | | | | |

### 2. Position

| Operator | Team Leader | Supervisor | Superintendent | Manager |
|---|---|---|---|---|
| | | | | |

### 3. Years of experience

| 0 - 2 | 3 - 5 | 6 - 10 | 10 - 15 | 16 - 20 | 21 - 25 | 26 - 30 |
|---|---|---|---|---|---|---|
| | | | | | | |

## SECTION B: Interpersonal relation

Please point out your evaluation by drawing a cross in the applicable column to show your perception and attitude.

| | **Strongly Disagree** | **Disagree** | **Agree** | **Strongly agree** |
|---|---|---|---|---|
| **4**. Communication channels within the department is satisfactory. | | | | |
| **5**. There are duplicate instructions from managers within the department. | | | | |
| **6**. Information and instructions given to me are accurate. | | | | |
| | **Strongly Disagree** | **Disagree** | **Agree** | **Strongly agree** |

| | | | | |
|---|---|---|---|---|
| **7.** Performance feedback is provided to me. | | | | |
| **8.** I am aware of the performance management system within the department. | | | | |
| **9.** There is satisfactory skill transfer within the organisation. | | | | |
| **10**. I know what is expected of me in the department. | | | | |
| **11.** I am motivated to carry out my duties. | | | | |
| **12.** I have the necessary support from my seniors. | | | | |
| **13.** There is leadership practice within the department. | | | | |

## SECTION C: Technology (process and systems)

Please point out your evaluation by drawing a cross in the applicable column to show your perception and attitude.

| | **Strongly Disagree** | **Disagree** | **Agree** | **Strongly agree** |
|---|---|---|---|---|
| **14.** I can confidently describe the process flow in my workplace. | | | | |
| **15.** I understand the importance of calibration, general maintenance of weighing scales and instruments. | | | | |
| **16.** I know the general procedure of material movement e.g. receiving and dispatching. | | | | |
| **17.** I know what an ERP system business. | | | | |
| **18.** I know how to use the ERP system. | | | | |
| | **Strongly Disagree** | **Disagree** | **Agree** | **Strongly agree** |

| | | | | |
|---|---|---|---|---|
| **19.** I know what is meant by production order, transfer requirement, and transfer order. | | | | |
| **20.** I know how to use production books, daily production sheets, and movement tickets. | | | | |
| **21.** A manual counting system is effective in operation. | | | | |
| **22**. I keep records of rejects and scrap and report on the works order administrator. | | | | |
| **23.** Raw material and product waste are scrapped procedural on the ERP system. | | | | |

## SECTION D: General management

Please point out your evaluation by drawing a cross in the applicable column to show your perception and attitude.

| | **Strongly Disagree** | **Disagree** | **Agree** | **Strongly agree** |
|---|---|---|---|---|
| **24.** I am satisfied with how the cycle count of raw material and finished goods is planned. | | | | |
| **25.** Stocktaking is done and verified by competent employees. | | | | |
| **26.** Stock take is done in an organised manner. | | | | |
| **27.** I know what a stock adjustment is and how it implicates finance. | | | | |
| **28.** There is control on stock movement. | | | | |

**APPENDIX 2 - PERMISSION LETTER**

RHEINMETALL
DENEL MUNITION

Rheinmetall Denel Munition (RF) Proprietary Limited
PO Box 187 · Somerset West 7129 · South Africa

**Permission Letter to Northwest University (NWU)**

To whom it my concern,

This letter serves as a proof that ***Anele Jackie Mongwe*** with a Northwest University student number: ***36901067*** has been granted a permission to execute his business research within the ***Defence Manufacturing Site (Pty) Ltd*** which is located in Potchefstroom Boskop site.

He has presented his research tittle which seeks to assess measures taken to improve defence manufacturing site. He has indicated that his focus area will be based on cost, security and operations related to inventory management.

We have allowed him to conduct his studies in partial completion of his MBA studies and we also trust that the university will use the information as contained in the report for academic purposes.

**Name and surname:** Riaan Beuken
**Designation:** Plant Manager
**Contact number:** 018 – 299 – 8729
**Email address:** Riaan.Beuken@rheinmetall-denelmunition.com

Signature:  Date: 23 March 2022

**APPENDIX 3**

**CERTIFICATE: PROOFREADING**

KRÜGER LANGUAGE PRACTITIONERS

# Certificate of Proofreading

391 Walter Sisulu Street
Miederpark
Potchefstroom
2531
1 December 2022

**TO WHOM IT MAY CONCERN**

I, Mirrycke Krüger, hereby confirm that Krüger Language Practitioners and colleagues have proofread the mini-dissertation of Mongwe A (student number 36901067), titled:

**Assessing measures taken to improve a defence-manufacturing site**

Submitted in fulfilment of the requirements of the Degree Masters of Business Administration at the North-West University.

**SUPERVISORY PRIMARY PROOFREADER:** Mirrycke Krüger
**AUXILIARY PROOFREADERS:** Simone Russouw, Ann-Lize Bosshoff, and Suzanne-Marie Botha

Yours sincerely

Mirrycke Krüger
SATI member number: 1000377
Qualified Language Practitioner: BPHIL Ethics, Philosophy, and Languages (with distinction/ GoldenKey)
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063 521 4151

Krüger Language Practitioners outsourced sections of the work to trained and qualified language practitioners to meet the deadline (of 24 hours). Mirrycke Krüger revised the work of all the auxiliary proofreaders.