

**AN ANALYSIS OF THE INVENTORY MANAGEMENT SYSTEM AND
CONTROLS AT GLENCORE: A CASE OF RUSTENBURG SMELTER**

BY

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DECLARATION

I, Thapelo Mogorosi, hereby declare that this research report is my own original work and that all sources have been accurately reported and acknowledged, and that this document has not previously in its entirety or in part been submitted to any university in order to obtain an academic qualification.

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T Mogorosi

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Date

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ABSTRACT

This study analyses the inventory management system and controls at Glencore Rustenburg Smelter. The aim of this research is to share practices or/and understanding of employees with regard to inventory management discipline. Though there are many elements of Supply Chain Management, the focus of the study was limited to only inventory management and controls at Glencore operations (Rustenburg mainly, with some attention paid to Boshhoek and Wonderkop smelters).

The findings of this research provide an insight into employees' understanding and competence as well as policies and procedures. The results depict that the employees of Glencore Rustenburg Smelter seem to be clear about what they do in inventory management and are well conversant with the control systems. The findings of the study revealed that the employees at Glencore Rustenburg Smelter trust their superiors and believe in their style of leadership, and it is also supported by the fact that they are allowed to work independently.

The study also revealed that the personnel employed in the supply chain understand their role within the inventory management and supply chain discipline. The employees are compliant with the policies of inventory and supply chain management and their practices of the inventory management and control system are effective. Furthermore, it was evident that the inventory management and control systems are effective and help Glencore Rustenburg Smelter keep track of their inventory.

Key words: Inventory management system, Supply chain, Control system

LIST OF ACRONYMS

MRP	Material Requirement Planning
MRO	Maintenance, Repair and Operating
SCM	Supply Chain Management
SC	Supply Chain
GR	Goods Receipt
GI	Goods Issue
JIT	Just in Time
ERP	Enterprise Resource Planning
WIP	Work in Process

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CHAPTER ONE

OVERVIEW OF THE STUDY

1.1 Introduction

Inventory management is the direction and control of activities with the main purpose being to get the right inventory in the right place at the right time, in the right quantity, in the right form and the right cost (<http://www.inventoryops.com>). Damelin Education Group (2000) defined the warehouse as “the firm’s physical link with its suppliers. It is here whereby all materials delivered to the firm are physically received, checked, stored and ultimately issued to the ‘user’ departments such as production, engineering” and sales etc.

Handfield, Monczka, Giunipero and Patterson (2011) argued that inventory represents the largest single investments in assets for most manufacturers, wholesalers, and retailers. The five primary categories of inventory are raw materials and semi-finished item inventory, work in process (WIP) inventory, finished goods inventory, maintenance, repair and operating (MRO) supplies inventory and pipeline/in transit inventory. For the purpose of this dissertation will focus on finished goods inventory

Handfield *et al.* (2011) further defined finished goods inventory as including completed items or products that are available for shipments or future customer orders. A higher than anticipated level of finished goods may mean that a decrease in customer demand is occurring, a lower than anticipated finished goods inventory level may indicate that customer demand is increasing. Rustenburg Smelter Warehouse plays a very crucial part in ensuring that materials and spares are always available for production and breakdown - 24hrs a day. It is the physical link between the suppliers and operations (production, services and engineering functions). The warehouse ensures that they procure from the supplier goods of the correct quality and quantity, ensuring that delivery lead times are adhered to. Rustenburg Smelter Warehouse is where materials delivered to Glencore are physically checked, received, stored and ready to be issued to the departments that require usage through reservations (the method used to draw materials from the

warehouse). Inventory for purposes of this procedure consists of materials and spares, which support the maintenance production and manufacturing process, but do not form part of the final product or raw materials (Consumable Store Inventory Count and Adjustment Policy and Procedure, 2014).

Inventory management and production work hand in hand interdependently to achieve one goal, which is production. Production is dependent on readily available inventory; failure to do that will result in stoppages and further production loss. The aim of Rustenburg Warehouse is to minimise stock-holding, which will reduce the inventory cost (Consumable Store Inventory Count and Adjustment Policy and Procedure, 2014). However, this needs a quick turnaround strategy in order to be able to identify vendors that can/will supply stock at the identified period. Proper calculations should be done on the correct materials, the reason being that not every stock can be based on this, some of the materials have a long delivery lead time while some are classified as insurance stock.

1.2 Background to the research problem

According to Mpanywa (2005) the aim of inventory management is to hold inventories at the lowest possible cost, given the objective to ensure uninterrupted supplies for on-going operations. When making decisions on inventory, management has to embrace the different cost components, such as the costs of supplying inventory, inventory-holding costs and costs resulting from insufficient inventories.

Mpanywa (2005) also argued that inventory control is the activity which organises the availability of items to the customers. Inventory control synchronises the procurement, manufacturing and distribution functions to meet the marketing needs. This function comprises the amount of current sales items, new products, consumables; spare parts, obsolescent items and all other supplies. Inventory allows a company to upkeep the customer service, logistic or manufacturing undertakings in events where procurement or manufacturing of the items is not able to meet the demand. Lack of fulfilment of this requirement could arise because of the rapidity of procurement or manufacturing is too lengthened, or because quantities cannot be provided without inventory.

Mpanywa (2005) argued that a virtuous inventory control system compromises the following benefits:

- The appropriate link amongst sales and stock can be well maintained more easily. Without inventory control procedures in place, the store or department can become over-stocked or under-stocked.
- Stock control systems permit buyers to identify best-sellers early enough in the season so that re-orders can be placed to increase total sales for the store or department.

One of the drawbacks of holding excessive inventory is the effect this has on a firm's working capital. Working capital represents the funds committed to operating a business, including the purchase and holding of inventory. Excessive inventory consumes or ties up funds that a company could use more productively elsewhere. Ordering and carrying physical inventory involves a number of costs (Handfield *et al.*, 2011).

1.2.1 Inventory decisions

According to Ganeshan and Harrison (2002) inventory decisions refer to means by which inventories are managed. Inventories exist at every level of supply chain management either as raw materials, semi-finished or finished goods. It is also pointed out that holding inventory can cost between 20% and 40% of the inventory's value, inventories efficient management is important in supply chain operations. This is considered to be strategic in the sense that top management set their goals after taking it into consideration. However, most researchers have approached the management of the inventory from the operational perspective; this includes deployment strategies (pull *versus* push) control policies, the determination of the optimal levels of order quantities and re-order points and setting safe stocks levels at each stocking location. These stages are of fundamental importance as they are primary determinants of customer services stages.

While Handfield *et al.* (2011) are of the opinion that executive managers have not usually been concerned about the set of key performance indicators as the typical supply chain manager; however, in recent years senior executives have begun to appreciate the importance of effective inventory management. Handfield *et al.* (2011) have argued that many companies in historically

high-margin industries (such as energy, utilities and pharmaceuticals) pay little attention to inventory, as it was mentioned that the savings associated with inventory reduction outweighed the potential risk of a lost sale.

1.2.2 Common pitfalls related to inventory management

1.2.2.1 No supply chain metrics

Billington and Lee (1992) are of the view that even though the overall performance of supply chain is dependent on the joint performance on the sites; normally teams are managed by various teams of management and each management team with its own objective and mission. In most cases one might find that the objectives may have a little influence with the overall performance of supply chain, worse to that the objectives may conflict. The effect is that various sites may contain operational goals that, if met, end result in inefficiencies for the entire chain. It is emphasised that supply chain metrics should be based on customer satisfaction.

1.2.2.2 Inadequate definition of customer service

A supply chain should be measured through its responsiveness to customers. There are various definitions of responsive customer services. The majority of the firms measure the percentage of items requests delivered before the customer required dates. Variations are there, like weighing fill rates. Hence these might not satisfy the customers. Overall order fill rate is considered to be the relevant measure of performance, even though measuring might not assist the company in identifying the areas which slows down the completion of the order (Billington & Lee, 1992).

Handfield *et al.* (2011) argued that service and replacement parts can be a major source of inventory waste or customer dissatisfaction if incorrect inventory levels are maintained. Accurate parts forecasts and material control systems are critical for maintaining proper inventory levels for service and replacement parts.

1.2.2.3 Inefficient information systems

Billington and Lee (1992) have argued that normally the databases at various sites that describe the environment of the system, backlog status and the future production plans are not linked.

This rarely happens on one site. More pertinently, retrieving of the information can be a costly manual process. Information retrieval and transmission delays lead to impossible quote accuracy and delivery dates to customers. These delays stop or discourage shorter production planning cycles, leading to “gross forecast errors and inventory and backorder accumulation”.

1.2.2.4 Ignoring the impact of uncertainties

Billington and Lee further argued that “there are many sources of uncertainties in supply chain; supplier lead time and delivery performance, quality of incoming materials, manufacturing process time, transit times and demand”. In order to reduce the effect of the mentioned uncertainties, managers of the supply chain should first of all have an understanding of their resources and the degree of their effect. As a result of this, firms might “overstock some items and under stock some items, wrong resources for performance improvements” (Billington & Lee, 1992).

Handfield *et al.* (2011) stated that supply chains are sensitive to changes in markets, including changes in the availability of material supply as well as price changes. When purchasers anticipate material shortage or price increase, they often increase quantities as a hedge against these uncertainties. Increasing inventory levels in response to a legitimate threat of a shortage can be a good reason, at least in the short run, for holding additional materials. One of the primary objectives of purchasing and supply chain management is to support continued and uninterrupted operations. Inaccurate or uncertain demand forecasts are a common source of uncertainty affecting inventory levels, particularly for companies that produce products in anticipation of future orders.

1.2.2.5 Simplistic inventory stocking policies

Billington and Lee (1992) stated that the first step to address simplistic inventory stocking policies is through understanding and tracking of uncertainties. The second step is to utilise information to drive inventory stocking policies. This is considered a challenging process, as the uncertainties are changing regularly. The other issue is of the suppliers, as some suppliers are more reliable in delivering on time and quality while others are not. Some items’ demands are

predictable as the product matures while the demand of other items is less predictable. The policies on inventory stocking need be reviewed regularly in order to adjust and reflect such changes.

1.2.2.6 Poor co-ordination

Billington and Lee (1992) mentioned that if the customer orders entail many items that are supplied by various divisions and if the customer wants to receive all items at the same time, the firm will utilise a merging centre. The products will be sent to the customer as soon as they all arrive. As a matter of fact, tight coordination amongst the supplying divisions is crucial. It is also important to provide the division with a target date. Unfortunately, setting a target date might take a longer time than expected, and as a result of that the target dates that have been set might not consider the current backlogs in the supplying division. Therefore target dates are usually ignored. Excessive delays are as the result of a lack of coordination, and ultimately lead to poor customer service.

1.2.2.7 Organisational barriers

Often entities of a supply chain belong to various sections within an organization with each section having its own performance measures and evaluation responsibilities. Organisational barriers that may employ coordinated stock control entail differences in objectives and performance metrics, including disagreements on inventory ownership and willingness to utilise resources to assist someone. Most of the big firms have decentralised organisational structures, and this decentralisation usually creates barriers to more integrated inventory controls (Billington & Lee, 1992).

1.3 Problem statement

At Glencore Rustenburg Smelter, it is clear that supply chain's Inventory Management as well as supporting departments has a lack of understanding of storage or warehousing. Warehouse employees do not understand their roles in terms of the stores layout and inventory discipline.

The discipline functions as chains, and therefore failure from the chain hampers the effectiveness of the warehouse. Therefore the problem pertains to whether the following factors influence the general functioning of the Rustenburg Smelter:

- Poor housekeeping,
- Increase in inventory discrepancies (resulting in losses),
- Difficulty in identifying stock during cycle counts (binning),
- Items not being properly marked,
- Packing and stacking (channels, moils, etc.),
- Difficulty in counting materials that are stacked,
- Difficulty in dealing with obsolete stock,
- Warehouse space cramped as a result of poor housekeeping,
- Increased up and down adjustments of stock,
- Improper receiving system resulting in delivery notes missing or filed without being captured on the system, which causes an upward adjustment during the count, and an
- Incorrect or cross issuing of stock.

1.4 Objective of the study

The primary objective of the study is to analyse the inventory management systems and controls at Glencore: A case of Rustenburg smelter. The secondary objectives of this study are:

- To find out what the level of understanding of inventory management at the Glencore Rustenburg Smelter Warehouse is,
- To establish the extent to which personnel employed in the supply chain understand their role within the discipline,
- To examine the extent of compliance with the policies of inventory and supply chain management, and
- To evaluate the effectiveness of the inventory management and control systems.

1.5 Research problem/ questions

The following research questions will lead to a possible solution for the problem statement:

- What is the level of understanding of inventory management at Glencore Rustenburg smelter warehouse?
- How well conversant are the personnel in the supply chain with their roles within the discipline?
- Are the employees compliant with the policies of inventory and supply chain management?
- Are the inventory management and control system effective?

1.6 Research methodology

1.6.1 Research design

Research methodology is perceived as an “operational framework within which the facts are placed so that their meaning may be seen more clearly” (Leedy, 1985). Different methodologies can be employed depending on the type of research that one undertakes. Research design refers to the structure of the enquiry: it is a logical matter rather than a logistical one. These include the qualitative and quantitative methods. In this study the researcher uses a quantitative method to attempt to answer the research question.

In describing research design, Leedy (1985) stated: It is planning. It is the visualization of the data and the problems associated with the employment of those data in the entire project. Research design is the common sense and the clear thinking necessary for the management of the entire research endeavour- the complete strategy of attack upon the central research problem. Before examining types of research designs it is important to be clear about the role and purpose of research design. We need to understand what research design is and what it is not. We need to know where design fits into the whole research process from framing a question to finally analysing and reporting data. Social researchers ask two fundamental types of research questions: 1. what is going on (descriptive research)? 2. Why is it going on (explanatory research)?

(<http://www.nyu.edu/classes/bkg/methods/005847ch1.pdf>)

Bryman (2004) argued that qualitative case study research is the approach usually associated with the social constructivist paradigm which emphasises the socially constructed nature of reality. Qualitative research is about recording, analysing and attempting to uncover the deeper meaning and significance of human behaviour and experience, including contradictory beliefs, behaviours and emotions. Researchers are interested in gaining a rich and complex understanding of people's experience and not in obtaining information which can be generalised to other larger groups.

Quantitative research is generally associated with the positivist/post-positivist paradigm. It usually involves collecting and converting data into numerical form so that statistical calculations can be made and conclusions drawn (Bryman, 2004).

16.2 Sampling

Sampling is often used to ensure ease in managing the study. The findings from the sample may be generalized to the whole population in some instances (Thomas & Nelson, 2001). It should thus be done strategically and logically. A sample is a subset of all members of a target population (Wagner, 2007). Researchers learn about the characteristics of the population using a subset thereof. It is not always easy to gather data from every possible member in a population, but where the size of the population permits it is advisable to include as many members as possible. Sampling is generally preferred to a census for the following reasons: cost; timeliness; destructive testing; and accuracy (Wagner, 2007).

Population is the total of individuals or objects being analysed or evaluated (Johann, 2004). It is a collection of items of interest in research. The population for this study comprised all employees of Rustenburg Smelter in the inventory section and supply chain management department. The stores unit is made up of 20 employees.

Sample can also refer to a finite part of a statistical population whose properties are studied to gain information about the whole that is a set of population respondents selected from the larger

population for the purpose of a survey or experiment. It is a number of individual cases selected from larger population. In reality we actually select the sample cases from what is known as the sampling frame (Soave, 2000).

According to Gay (1996), sampling is a process of selecting a number of individuals from a study population in such a way that those selected are representatives of the larger group from which they are selected. This study utilises Simple Random Sampling to choose participants. All the employees at all levels of the Rustenburg Smelter in the inventory section and supply chain management were given a fair chance of inclusion in the study.

The criteria for inclusion in this study are:

- All employees of the Rustenburg Smelter inventory section and supply chain management, all categories were included to gauge their understanding and perception of the subject matter.
- There are only twenty employees in the unit and they are too few to be sampled from, and therefore were all included in the sample.

1.6.3 Data collection

According to Fowler (2009), a questionnaire is an instrument and a technique of collecting data by means of written questions that the subjects answer in writing, with little (if any) help from the researcher. According to Wegner (2012), “the design of a questionnaire is critical to ensure that the correct research questions are addressed and that accurate and appropriate data for statistical analysis is collected”. In collecting primary data, the researcher has a choice of using different research instruments. As a result, from the several key data collection instruments the researcher selected one which is more relevant to the study for the purpose of data collecting and that was a structured questionnaire. The study uses the survey method of research using questionnaires. The questionnaire is a highly structured data collection technique whereby each respondent is asked the same set of questions.

A questionnaire is a self-report instrument in which the respondent responds to printed questions on a document. The respondents find a well-designed questionnaire easy to fill out while the researcher finds it easy to administer and score (Brink, 1996). The questionnaire comprised closed-ended and open-ended questions. It puts the interviewer in control of the flow of information and reduces the likelihood of misunderstanding questions. Broadly speaking, it consists of a set of questions presented to participants for his or her feedback. Advantages of questionnaires include, among others, that it is used to collect large amounts of information at a low cost per respondent, respondents are able to give more honest answers than when interviewed and respondents' answer questions in a fixed order, and the researcher can adapt the questionnaire based on earlier answers.

The researcher also noted the following pointers: ambiguous questions must be avoided; leading questions generate biased responses and must be avoided wherever possible, and especially with self-administered questionnaires, fixed-alternative questions are recommended. Open-ended questions are difficult to analyse but give deeper meaning to some of the responses given in a closed/fixed question. Both closed-ended (forced/choice) and open-ended questions were therefore be used.

1.6.4 Data analysis

Pre-coded questionnaires make data collection, capturing and analysis easy and efficient. The data analysis follows an explanatory data analysis (EDA) technique and the emphasis is on visual representation and graphic techniques for data analysis. Emory and Cooper stressed the fact that "when numerical summaries are used exclusively and accepted without visual inspection, selection of confirmatory models may be precipitous, based on flawed assumption, and may consequently produce erroneous conclusions". For these reasons, preliminary analysis will start with visual inspection and not with numerical summaries (Emory & Cooper, 1991).

The following statistics methods were used: Descriptive statistics (frequency, graphical presentation and tables); and Correlation and Chi-square test for independence of association. Cronbach's alpha test was also computed to test the reliability and consistency of the data. The raw data were processed through Statistical Packaging for Social Science (SPSS).

1.6.5 Ethical considerations

Bless, Higson-Smith and Kagee (2006) stated that research ethics helps to prevent research abuses and assists investigators in understanding their responsibilities. In this study the participants were informed and ensured that the research was for academic reasons only and was therefore confidential.

The researcher relayed all the necessary information pertaining to the research including the nature, purpose and usefulness, procedures, confidentiality (no names were required when filling the study tool) and the protection of anonymity as well as the voluntary nature of participation to the participants was guaranteed.

This study's population consisted of vulnerable subjects and therefore the researcher adhered to the following ethical principles throughout the process:

- **Confidentiality:** Participants were informed that confidentiality would be maintained.
- **Privacy:** The researcher also informed participants that information collected would be kept safely and secured at the Graduate School and would be discarded after five years and would be used for completion of Post-Graduate study purposes only.
- **Consent:** The researcher obtained an informed consent from individuals when completing the data-collection tool.
- **Equity and Justice:** Participants were informed that treatment and inclusion of participants in the research and research results would be distributed equally and with fairness.

1.7 Definition of key concepts and abbreviations

“MRP” means Material Requirement Planning

“MRO” means Maintenance, Repair and Operating

“SCM” means Supply Chain Management

“SC” means Supply Chain

“GR” means Goods Receipt

“GI” means Goods Issue

“JIT” means Just in Time

“ERP” means Enterprise Resource Planning

“WIP” means Work in Process

1.8 Overviews of the chapters

Chapter 1 serves as introductory outline to the study in terms of its objectives. It commences with the background of the inventory management system and control, problem statement, research questions and the research objectives. A summary of the researcher’s interests and factors that motivated this research study is outlined. A brief overview of the research design was given, including the unit of analysis, data-collection and analysis methods and ethical considerations.

Chapter 2 focuses on the literature review covering the practical implementation of the inventory management systems and control at other institutes. This chapter looks at the academic discourse drawing lessons from the raging debate. It is done with the aim of learning from other scholars, sharing their ideas and ultimately adopting new strategies in order to improve the work environment and enhance effective implementation.

Chapter 3 provides a description of the research methodology. A detailed discussion of the research process and the theory of the statistical tests used in analysing the data is also provided in this chapter.

Chapter 4 presents the research results. The research results were summarised and analysed.

Chapter 5 outlines the research findings and integrates information gathered from this study in terms of the study objectives. The research findings are aligned to the research questions in order to identify measures to be used to improve the inventory management and control at Glencore

Rustenburg Smelter. Strategies are then formulated as part of recommendations as to how to respond to the main question of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter seeks to look into the analysis of the inventory management systems and controls at Glencore: A case of Rustenburg Smelter. It focuses on the literature review covering the practical implementation of the inventory management systems and control at other institutes. The chapter examines theoretical and empirical work done by other researchers. Stenger (1994) indicated that inventories exist throughout the supply chain in various forms for various reasons. At any manufacturing industry like Glencore Rustenburg Smelter, inventory may exist as raw material, work in progress, or finished goods. Inventory exist at the distribution warehouse, in-transit, or “in the pipeline” (Stenger, 1994).

Inventory control involves the procurement, care and disposition of materials. Managers of every company are concerned with three kinds of inventory, namely raw materials, in-process or semi-processed goods and finished goods. Effective control of these kinds of inventory can improve production control, protect against obsolescence, deterioration and/or theft in stock. Inventory control helps in balancing the stock as to value, colour, style and price line in proportion to demand or sales trends. Effective inventory management plays a vital role in improving the operation of supply chain for manufactured goods (Simchi-Levi, Kaminsky, & Simchi-Levi, 2004). Inventory management is the integrated functioning of an organization dealing with supply of materials and associated activities in order to maximise coordination and optimum expenditure on materials. Tom, Akhilesh and Sijo (2013) explained inventory control as the most important function of inventory management and that it forms part of the nerve centre in any inventory management organisation.

The inventory management system encompasses a monitoring arrangement at a manufacturing site and a control that interacts with the monitoring arrangement. The control also interacts with inventory price sources, shipping information sources, manufacturing schedules of vendor, and an inventory tracking device, such as, but not limited to, a global positioning system (GPS). The

inventory management system also relies on appropriately developed inventory policy models to determine when the most appropriate time is to order inventory for the benefit of another inventory management system (Salvo, Mackenzie, Bennett, Relyea & Thomas, 2002). Billington and Lee (1992) indicated that several opportunities exist in supply chain inventories management. The authors are making coordinated decisions between the different echelons, incorporating sources of uncertainty, and designing proper supply chain performance measures.

2.2 Theoretical framework

2.2.1 Concepts of inventory management and control

It is a principal necessity for any organisation to have a proper inventory control system. Miller (2010) explained inventory system as a set of policies that controls and monitor inventory level and determines what level should be maintained, how many orders should be made and when stock should be replenished. Miller (2010) furthermore explained inventory control as the supervision of the storage, supply and accessibility of items to ensure an adequate supply without oversupply. Coleman (2000) and Jay and Barry (2006) defined inventory management as a science-based art of ensuring that just enough inventory stock is held by an organization to meet its demand. Systems in inventory management are developed with the aim of reducing costs associated with the entire process on inventory management and are however described as complex systems to develop (Jones & Riley, 1985). Emmett (2005) defined inventory management as an approach to manage the flow of production in a supply chain, to achieve the required service level at an acceptable cost.

Inventory is one of the largest and most tangible investments of any manufacturing organization. The aim of inventory management is to hold inventory at the lowest possible cost and objectively ensures uninterrupted supplies for-day-to day operations. When making inventory decisions, management has to compromise between the various cost components, such as the cost of supplying inventory, storage cost of inventory and cost resulting from sufficient inventories (Peterson & Silver, 1998; Zipkin, 2000). According to Miller (2010), inventory control is the activity which organizes the availability of items to the customers. It coordinates the acquiring, manufacturing and distribution functions to meet the marketing needs. Rosenblatt (1977)

indicated that: “The cost of maintaining inventory is included in the final price paid by the customer. Good in inventory represent a cost to their owner; the manufacturer has the expense of materials and labour. The wholesaler also has funds tied up”.

Lyson (2006) stated that inventory serves as an insurance policy against the unexpected breakthrough, delays, strikes and other disturbance that could disrupt ongoing activities. Abuhilal *et al.* (2006) indicated that inventory is one of the key cost contributors in any supply chain. The statement by Abuhilal *et al.* (2006) is supported by Ganeshan and Harrison (1995) who stated that inventory cost can be between 20%-40% of revenue. Heizer *et al.* (2004) indicated that inventory is one of the most expensive assets of many companies and can represent about 50% of total invested capital. Chase (2010) stated that the purpose of inventory is to maintain independence of operations, to satisfy demand, to allow flexibility in production scheduling, to provide a safeguard for variability in supplier lead-times and to take advantage of economic order sizes. Kennedy *et al.* (2002) and Chase (2010) stated that the basic purpose of inventory management is to answer the following four questions: Firstly, when should an order be placed? Secondly, how many units should be ordered when an order is placed? Thirdly, what is the objective of the inventory policy? Lastly, is the objective to reduce costs or to increase availability or service levels?

Mather (1984) indicated that inventory is a valuable asset to many people and businesses, “it’s like money in the bank” is a common expression. Mather (1984) further indicated that inventory management has an enormous influence in the economy. It has a whiplash effect through the logistics chain, amplifying small real demand changes into enormous boom-and-bust cycles affecting raw material producers (Mather, 1984). Inventory is defined by Ghosh and Kumar (2003) as a stock of goods that is maintained by a business in anticipation of some future demand. This definition was also supported by Brag (2005) who stated that inventory management has an impact on all business functions, particularly operations, marketing, accounting, and finance.

Stock and Lambert (2001), categorized inventories into six main types, namely:

1. **Cycle stock:** is the inventory that results from the replenishment process and is required in order to meet demand under conditions of certainty. That is when the firm can predict demand and replenishment times (lead times) perfectly.
2. **In-transit inventory (pipeline):** is the inventory that is *en-routed* from one location to another. It may be considered part of cycle stock even though it is not available for sale and or shipment until after it arrives at the destination.
3. **Safety or buffer stock:** is the stock held in excess of cycle stock because of uncertainty in demand or lead time. The notion is that a portion of average inventory should be devoted to cover short-range variations in demand and lead time.
4. **Speculative stock:** is inventory held for reasons other than satisfying current demand. That is inventories purchased as a result of speculations of price hikes.
5. **Seasonal stock:** is a form of speculative stock that involves the accumulative volume of inventory before a season begins in order to maintain a stable labour force and stable production runs or in the case of agriculture products, inventory accumulated as a result of a growing season that limits availability throughout the year.
6. **Dead (obsolete) stock:** is the set of items for which no demand has been registered for some specified period of time. They are out of date, deteriorated or no longer useful as a result of, for example, advancements in technology.

According to Hillier and Lieberman (2001), organisations should follow the following steps in order to have an effective inventory management system: Firstly, the need to develop a mathematical model which describes the behaviour of inventory; secondly, the need to design and adopt an optimal inventory policy with respect to the firm's mathematical model; thirdly, the need to develop a computerized information processing system that will provide information on the current inventory levels; and lastly, the need to use the current inventory levels information to apply the optimal inventory policy to replenish existing inventory levels.

Ghosh and Kumar (2003) indicated that the scope of inventory management also “concerns the fine lines between replenishment lead times, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management,

replenishment, returns and defective goods and demand forecasting”. Balancing the preceding competing requirements leads to optimal levels of inventory (Ghosh & Kumar, 2003). Therefore, the basic goal of the manufacturers is to maintain a level of inventory that will provide optimum stock at lowest cost.

Narain and Subramanian (2008) indicated that a good inventory management system provides information to effectively manage the flow of materials, effectively utilise people and equipment, coordinate internal activity and communicate with customers. They further indicated that inventory management does not make decisions or manage operations, but provides information to managers to enable them to make more accurate and timely decisions to manage their operations. Ellram (1996) stated that inventory management is an important function that helps to insure the success of manufacturing and distribution companies. The effectiveness of inventory management systems is directly measurable by how successful a company is in providing high levels of customer service, low inventory investment, maximum throughput and low costs. Inventory management entails holding an appropriate amount of inventory. Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. On the other hand, too little inventory often disrupts business operations, and increases the likelihood of poor customer service (Dimitrios, 2008).

Inventory management cycle involves the following areas: planning, ordering and scheduling of the materials used in the manufacturing process. Inventory management exercises management over three types of inventories that is raw materials, work in progress and finished goods. Purchasing is primarily concerned with management over the raw materials inventory, which includes; raw materials or semi-processed materials, fabricated parts and MRO items (Maintenance, Repair and Operations) (Garry, 1997). However, Lau and Snell (2006) argued that inventory management is primarily about specifying the size and placement of stocked goods.

Ogbo (2011) postulated that the main objective of inventory management and control is to inform managers how much goods should be replenished, when they should be ordered, how frequently orders should be placed and what the appropriate safety stock is, for minimizing stock-outs. Therefore, the overall goal on inventory is to have what is needed, and to minimise

the number of times one is out of stock. Morris (1995) indicated that inventory management in its broadest perspective is to keep the most economical amount of one kind of asset in order to facilitate an increase in the total value of all assets of the organisation's human and material resources.

Lysons and Gillingham (2003) stated three main aims of inventory management as:

- To provide both internal and external customers with the required service levels in terms of quantity and order rate fill.
- To ascertain present and future requirements for all types of inventory to avoid both overstocking and bottlenecks in production, and
- To keep costs to a minimum by variety reduction, economical lot sizes and analysis of costs incurred in obtaining and carrying inventories.

Granville and Emmett (2007) stated that a flawed or unrealistic business plan leads to failure in forecasting how well a firm may do in the future. This has an impact on inventory management because if a company forecasts more growth than they actually experience, it can lead to an overstock of inventory. The opposite is true if forecasters do not predict enough growth and are left with not enough inventories. Failure to identify shortages ahead of time leads to a lack of enough products in stock to meet customer demands which spoil customer relations. The staff in charge of inventory management should look over their inventory on a regular basis to make sure enough products are in stock (Granville & Emmett, 2007).

Plossl (1985) stated the following five inventory types defined by function:

- Fluctuation inventories: These are inventories carried because the quantity and timing of sales and production cannot be predicted accurately. Fluctuation inventories may be provided in the production plan so that production levels do not have to change in order to meet random variations in demand,
- Anticipation inventories: These are inventories built up in advance of a peak selling season, a marketing promotion programme or a plant shutdown period,

- **Lot-size inventories:** It is frequently impossible or impractical to manufacture or purchase items at the same rate at which they will be sold. The items, therefore, are obtained in larger quantities than are needed at the moment; the resulting inventory is the lot-size inventory,
- **Transportation inventories:** These exist because materials must be moved from one place to another, and
- **Hedge inventories:** Companies using large quantities of basic minerals or commodities that are characterised by fluctuating prices can realise significant savings by purchasing large quantities, called hedge inventories, when prices are low. Also, buying extra quantities at an existing lower price will reduce material costs of items scheduled for a price rise later.

Meng (2006) indicated that all businesses, including Rustenburg smelter, keep a supply of inventory for the following reasons:

- **To maintain independence of operations:** A supply of materials at a work centre allows that centre flexibility in operation,
- **To meet variation in product demand:** If the demand for the product is known precisely, it may be possible to produce the product to exactly meet the demand. However, demand is usually not completely known, and a safety or buffer stock must be maintained to absorb variation,
- **To allow flexibility in production scheduling:** A stock of inventory relieves the pressure on the production system to disseminate goods. This causes longer lead times, which permit production planning for smoother flow and lower-cost operation through larger lot-size production,
- **To provide a safeguard for variation in raw material delivery time:** When material is ordered from a vendor, delays can occur for a variety of reasons: a normal variation in shipping time, a shortage of material at the vendor's plant causing backlogs, an unexpected strike at the vendor's plant or at one of the shipping companies, a lost order, or a shipment of incorrect or defective material, and

- **To take advantage of economic purchase order size:** There are costs to place an order: labour, phone calls, typing, postage, and so on. Therefore, the larger each order is, the fewer the orders that need be written.

Meng (2006) also stated that inventory costs are important for three major reasons. Firstly, inventory costs represent a significant component of total logistics costs in many companies. Secondly, the inventory levels that a firm maintains at points in its logistics system will affect the level of service the firm can provide to its customers. Thirdly, cost trade-off decisions in logistics frequently depend upon and ultimately affect inventory carrying costs.

2.2.2 Inventory management system used by the firms

Firms should maintain adequate levels of stock in order to enable smooth business operations in order to achieve the objectives of minimizing stock-related costs. A number of practices have therefore been advanced to handle these costs. Kalyango (2005) stated the following practices that minimize stock related costs:

1. **Inventory planning and scheduling:** This is how units of stock are acquired by an organization in a given period to enable smooth business operations. A good stock plan set in advance will enable planners to set procurement/purchase dates and quantities that are consistent with the plan to avoid disruptions due to inventory shortages (Dilworth 1992), and
2. **Inventory recording:** Accurate and up-to-date stores records are keys to effective stores/warehouse management. The basic procedures include counting and recording promptly after receipt or production and whenever there is a store transaction, issue of stores should be properly authorized and show details such as code number, quantity of the transaction and the voucher reference (Muller, 2003). Brooks *et al.* (2007) indicated that inventory recording is undertaken by organizations to reduce the errors of stock management and to ensure accurate and reliable stock records. It involves spot checks/surprise checks, stock taking, which is the physical counting and measuring of quantity of each item in stock and recording the results.

Kamukama (2013) stated the following documents used in inventory management:

- **Purchase requisition note:** Document raised by either the storekeeper or user department to the purchasing officer requesting for inventory /materials need for use.
 - **Goods received note:** Document prepared on receipt of stock to the stores.
 - **Stock record card/bin cards:** used for recording materials received and used in the store. Bin card has three columns which include the receipt column, issue column and Balance column.
 - **Materials return note:** These permit the unused materials to be returned to the store from the production department and other user departments.
 - **Shortages note:** This is a document issued by the stores department to inform him/her that materials required are in short supply or not available in the store.
 - **Scrap note:** This is a document used for recording scrap generated and it allows such scrap to be handed over to the stores department in exchange for good materials. Inventory recording is undertaken by organizations to reduce the errors of stock management and to ensure accurate and reliable stock records. It involves spot checks/ surprise checks, stock-taking, which is the physical counting and measuring of quantity of each item in stock and recording the results (Brooks *et al.*, 2007).
3. **Inventory valuation:** It is also a stock control technique, which refers to the establishment of the value of stock and therefore its implication on the profits. Lucey (1994) identified the following methods of stock valuation; First in First out (FIFO), Last in First out (LIFO) and the average price method.
- **First in First out (FIFO)** is a method whereby prices of goods are determined by depending on the oldest stock until all the units are finished and then the second oldest is used to determine the prices and the trend continues. According to Kamukama (2013), the FIFO method follows the principle that materials received first are issued first. After the first lot or batch of materials purchased has been exhausted, the next lot is taken up for supply. The inventory is priced at the earliest costs. This means that the unused raw materials (closing stock) are constituted by the goods which were not recently purchased.

4. **Physical inventory counts:** The inventory value should be provided to UIS Accounting Office within one week after the fiscal year end. Adjustments to correct discrepancies must be adequately documented by management (Piasecki, 2003).
5. **Inventory control:** Inventory control is the activity which organizes the availability of items to the customers of the organization. It coordinates the purchasing, manufacturing and distribution functions to meet the marketing needs. This role includes the supply of current sales items, new products, consumables, spare parts, obsolescent items and all others supplies (Wild, 2002).

Lysons and Gillingham (2003) stated that inventory/stock control refers to the techniques used to ensure that stocks of raw materials, work in progress (WIP) and finished goods are kept at levels which provide maximum service levels at minimum costs. An effective inventory control system should minimize time and carrying costs, maintain sufficient stock for smooth production, sales operation and on sufficient customer service, and control investment in inventories or keep an optimum level (Pandey, 2002). Different business concerns may apply different inventory practices to meet specific requirements and circumstances to help in containing the costs associated with inventory.

6. **ABC analysis:** It is also regarded as a material control tool. It is considered as the best approach and based on the principle of selective control. The maxim is “put your effort where the results are maximized” (Kamukama, 2013). Bloomberg, Lemay and Hanna (2002) note that the ABC analysis categorizes products based on importance. Importance may come from cash flows, lead time, stock outs, sales volume, or profitability. Once the ranking factors is chosen, break points are chosen for classes A, B, C and so on.

The 80/20 concept is particularly useful in distribution planning when the products are grouped or classified by their sales activity. The top 20 percent might be called A items, the next 30 percent B items, and the remainder C items. Each category of items could be distributed differently. For example, A items might receive wide geographic distribution through many warehouses with high levels of stock availability , whereas C items might be distributed from a single, central stocking point(e.g. a plant) with lower total stocking

level than for the A items. B items would have an intermediate distribution strategy where few regional warehouses are used (Ballou, 2004).

7. **XYZ analysis:** The classification is based on the stock value of items. Items having a very high stock value are classified as 'X', and items with least stock value are classified as 'Z'. The method of arriving at the classification is the same as ABC classification described above. The value of each item is expressed as a percentage of the total. One can determine which items make up the first 70% of the inventory stock value, the next 20% and the balance 10%. The groups are called X, Y and Z respectively and the items within the group are called the X, Y or Z item (Narain & Subramanian, 2008)

2.2.3 Inventory decisions

Decision-making is central to supply chain management. Managers of every organisation are faced with decisions regarding levels of stock and inventory requirements on a daily basis. Inventory management decisions, like most other decisions in business, are ultimately evaluated according to their financial bearing. Hence, it is significant to understand the different costs relating to inventory management. According to Chase (2010), inventory costs can be split into the following categories: holding cost, set-up cost, ordering cost and shortage cost.

According to Do Rego and de Mesquita (2011), it is useful to sub-divide the inventory control problem according to the lifecycles of materials into four categories. The first is the decision to stock an item or not, the second is placing an initial order, the third is inventory control during the continuous operating period and the fourth is final orders and obsolescence. Do Rego and de Mesquita (2011) further stated that the first question of whether to stock an item or not is an important initial consideration for managing inventory. It is seldom the case of not keeping any stock but it is essential to critically evaluate whether it is worth bearing the cost of stocking even one item versus ordering upon demand.

2.2.4 Inventory policy

Farasyn *et al.* (2011) indicated that inventory policy is an operating framework or a standard operating procedure (SOP) in implementing an inventory model and a company should introduce policies to reduce lead time, regulate usage and thus minimize safety status. It is very important for the policy to highlight areas of need and concern with regards to the safety status. Inventory control policies are commonly used to assist in inventory management. They are used to answer two main questions: “When to place an order and how much to order. Different philosophies and models can be used to manage inventory. The choice of inventory model is dependent on factors such as demand pattern, lead time, uncertainty and variability in the inventory management process and availability of information” (du Toit, 2014). Billington and Lee (1992) stated the first step to address simplistic inventory stocking policies is through understanding and tracking of uncertainties. The policies on inventory stocking must be reviewed regularly in order to adjust and reflect changes in uncertainties.

Vrat (2014) highlighted that in practice, three inventory policies are normally employed. These are described as follows:

1. Economic Order Quantity (EOQ)-Reorder Point (ROP) Policy

Under this policy, the inventory status is continuously monitored. Whenever the inventory level falls to a predetermined level called a re-order point (ROP), a replenishment order of fixed quantity called economic order quantity (EOQ) is placed. Thus EOQ (Q) and ROP (R) are the two decisional variables involved in solving the problem of how much to buy and when to buy.

2. Periodic Review Inventory Policy

The stock status is periodically reviewed under this policy after a fixed time interval (T). When the review period is reached, the order is placed which is determined by the following relationship:

$$Q = (S - X)$$

Where Q = *order quantity*, S = maximum stock level (or order up to level) and X = stock on hand at the time of review.

3. Optional Replenishment Policy.

This is a variant of periodic review inventory policy in which there are two levels of inventory identified as S (the maximum level) and s (the minimum level). The stock levels are periodically examined at fixed time interval T . However, if the stock levels are more than the minimum level (s) at the time of review, the replenishment decision is deferred to the next review cycle, and no order is placed because the current stock is deemed to be adequate for the time being until the next review cycle. If, at the time of review, the stock level (X) is less than or equal to (s), then the order quantity Q is determined so that it raises the stock level to S . This policy is also called as minimum-maximum stock level policy or (s, S) policy. This is also called an optional replenishment policy because there is an option of skipping the replenishment decision to the next review period if the current inventory on hand is more than the minimum level prescribed (Vrat, 2014).

The inventory policy of Glencore states that:

1. Consumable stores inventory shall be recorded at the lower of cost or net realisable value.
2. Consumable stores inventory adjustments shall be processed on the same day.
3. Reason codes shall be provided in Enterprise Resource Planning system that enables the integration of data and business processes for all consumable stores inventory adjustments.
4. Consumable stores adjustment values shall be written off to a provision account.

The inventory policy of Glencore also indicated that inventory items should be counted on a daily and weekly basis and recorded on the daily inventory count list and weekly inventory count list respectively (Consumable stores inventory count and adjustment policy and procedure, 2014).

2.2.5 Relationships between inventory management and performance of the business

The lean production principle was pioneered by Womack *et al.* (2003). This principle was linked with reduced inventories. The argument is that as inventory is reduced there will be profit improvement due to interest savings as well as a reduction in storage fees, handling and waste. These savings have been estimated by literature to be in the range of 20 -30 percent (Brigham & Gapenski, 1996). King and Lenox (2001) concluded that lean production is complementary to improvements in the performance of the procurement function and it often lowers the marginal cost of pollution reduction thus enhancing competitiveness.

Kakuru (2000) indicated that inventory management is the integrated function of purchasing activities so as to achieve minimum coordination and optimum expenditure. For a business to perform well, it has to apply proper inventory management system and control techniques. In this case the business must consider inventory as a key factor that will determine its profitability and in order to maximize profitability, inventories must be acquired ahead of sales as levels of inventory largely depend on sales or demand of the products.

Agus and Noor (2006) examined the relationship between the inventory management and financial performance of the business and they found that inventory management practice has a significant relationship with profitability and return on sales. Lwiki *et al.* (2013) indicated that inventory management is a “crucial part of a firm because mismanagement of inventory threatens a firm’s viability such as too much inventory consumes physical space, creates financial burden, and increases the possibility of damage, spoilage and loss”. Eroglu and Hofer (2011) examined the relationship between inventory management and financial performance of a firm. Their results revealed that there is a significant positive relationship between the two variables. Sahari, Tinggi and Kadri (2012) empirically examined the relationship between inventory management, firm performance and capital intensity on a sample of 82 construction firms in Malaysia and they their study revealed that there is a positive correlation between inventory management and financial performance, and that also there is a positive relationship between inventory management and capital intensity.

The business manager should aim at maintaining an optimum level of inventory in the right quantity, quality and at the right time thus maximizing benefits and minimizing losses in funds tied up when over investment in inventories is done (Kabera, 1996).

2.2.6 Challenges faced in managing inventory

Pandey (2002) indicated that inventory management can be affected by general economic factors, company factors, uncertainty risks and ambitions. The level of economic conditions affects inventory management in that things like inflation, high taxes affect management decisions on spending since they affect the anticipated profits by increasing costs of production and also affecting the budgeted expenses that increases.

Inventory management challenges can interfere with a company's profits and customer service. These challenges can cost a business more money and can lead to an excess of inventory overstock that is difficult to move. Most of these problems are usually due to poor inventory processes and out-of-date systems (Gourdin, 2001).

Stock and Lambert (2001) mention a number of challenges in inventory management which include: unqualified employees in charge of inventory, using a measure of performance for their business that is too narrow, a flawed or unrealistic business plan for a business for the future and not identifying shortages ahead of time. If the company employs unqualified people in charge of inventory without adequate training, experience or who neglect the job this will lead to inventory problems that will result in poor organizational performance. The above may also influence the use of a measure of performance for business that is too narrow. This is a situation where the performance measure is not wide enough and do not encompass all the aspects of the organization. Many areas get overlooked and can lead to either inventory shortages or inventory stockpiling.

Lacey (2005) postulated that excessive levels of stock are undesirable because they increase the risks of inventory becoming obsolete, stock loss through damage and theft, increased storage costs like rent, insurance and unnecessary tie up of the firm's funds. In general the stock flow process ought to be followed to avoid inventory becoming obsolete. He further stated that a firm

would be foregoing profits when it continues maintaining excessive levels of inventory, which implies that the probability position of the firm is being threatened in the long run since funds are not being invested in other profitable ventures.

2.3 Conclusion

The focus of this chapter has been on the analysis of the inventory management systems and controls at Glencore: A case of Rustenburg Smelter. This chapter reviewed the literature review covering the practical implementation of the inventory management systems and control at other institutes. The chapter also examined theoretical and empirical work done by other researchers such as Stenger (1994), Salvo, Mackenzie, Bennett, Relyea and Thomas (2002), Billington and Lee (1992), Miller (2010), Coleman (2000) and Jay and Barry (2006), and many others. The next chapter focuses on the research design and methodology used in the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the research design that has been used in the study to conduct the research. Research methods, research design, research methodology, data collection, measuring instruments, motivation for the use of self-administered questionnaires, sample design, data analysis, procedures and quality assurance are also discussed. In describing the research design, Leedy (1985:92) states: “It is planning”. It is the visualization of the data and the problems associated with the employment of those data in the entire project. Research design is the common sense and the clear thinking necessary for the management of the entire research endeavour - the complete strategy of attack upon the central research problem

3.2 Research methods

Research is the systematic process of collecting and analysing information to increase our understanding of the phenomenon under study. It is the function of the researcher to contribute to the understanding of the phenomenon and to communicate that understanding to others. This chapter explains what research is and what it is not.

(http://wps.prenhall.com/chet_leedy_practical_8/0,9599,1569572-,00.html).

Research has been defined by several authors in different ways, but there appears to be agreement that research is a process of enquiry and investigation, it is systematic and methodical and research increases knowledge (Hussey & Hussey, 1997). Leedy (1993) defined research as “A studious inquiry or examination, especially a critical and exhaustive investigation or experimentation having its aim, the discovery of new ideas and facts and their correct interpretation, the revision of accepted conclusions, theories, or laws in the light of newly discovered facts or the practical application of such conclusions, theories or laws”. People often use a systematic approach when they collect and interpret information to solve the small

problems of daily living (Leedy, 1993). Research is, by its nature, cyclical or more exactly, helical. The research process follows a cycle and begins simply (Leedy 1993).

Data collection involves a range of activities, from the individual in a library extracting information from volumes of national and international statistics to a team of thousands carrying out national census. This research focuses on primary data, “primary data which is captured at the point where it is generated”. Such data is captured for the first time and with a specific purpose in mind (Wagner, 2013). Therefore, the designing of a plan for primary data collection calls for a number of decisions on research approaches, a sampling plan and research instruments to be used because it focuses on people’s knowledge, attitudes, preferences or buying behaviour. The problem at hand also has a bearing on which data-collection technique to use in the gathering of the data.

The researcher used a structured survey making use of a list of questions. Survey research is one of the most widely-used methods for primary data collection. According to Wagner (2013), the major advantage of the primary data is that it offers greater control over data accuracy and it is directly relevant to the problem at hand. Depending on the survey design, it provides information more quickly and at a lower cost than other data-collection methods. A sample must be representative of all the members of the target population if it is to produce valid and precise statistical inferences of the population parameters based on the sample evidence (Wagner, 2013). According to (Wagner, 2013) there are four probability sampling methods of randomly selecting observation to include in the survey namely: simple random sampling; systematic random sampling; stratified random sampling and cluster random sampling. The researcher chose to use simple random sampling for its relevance in this study. Each observation in the entire population of the Glencore has an equal chance of being selected.

3.3 The research design

Before examining types of research designs it is important to be clear about the role and purpose of a research design. We need to understand what research design is and what it is not. We need to know where design fits into the whole research process from framing a question to finally analysing and reporting data. Social researchers ask two fundamental types of research

questions: 1. What is going on (descriptive research)? 2. Why is it going on (explanatory research)? (<http://www.nyu.edu/classes/bkg/methods/005847ch1.pdf>)

The research design refers to the overall strategy that one chooses to integrate the different components of the study in a coherent and logical way, thereby, ensuring that the researcher will effectively address the research problem. It constitutes the blueprint for the collection, measurement and analysis of the data. The design therefore guides the researcher in choosing the right method of data collection. The function of research design is to ensure that the evidence obtained enables the researcher to effectively address the research problem as unambiguously as possible (<http://libguides.usc.edu/content>).

Research methodology is perceived to be an “operational framework within which the facts are placed so that their meaning may be seen more clearly” (Leedy 1985: 88). Different methodologies can be employed depending on the type of research that one undertakes. These include the qualitative and quantitative methods. In this study the researcher only uses the quantitative methods.

3.3.1 Research methodology

Hussey and Hussey (1997) maintain that it is not uncommon in business research to use a mixture of methodologies especially in methods of collecting and analysing data. This means that both qualitative and quantitative data collection and analysis methods were used in this study, even if the study is mainly quantitative in nature.

3.3.1.1 Qualitative approach

Creswell (2012) defined qualitative research as a method of inquiry that involves getting information (data) by questioning the participants. Babooa (2008) indicated that a qualitative research approach involves an in-depth understanding of participants’ behaviour and the reasons that govern participants’ behaviour. Unlike a quantitative research approach, qualitative research relies on reasons behind certain behaviours and experiences of the participants.

3.3.1.2 Quantitative approach

Maree (2012) defined quantitative research as an organised way of collecting data in numbers from a certain group extracted from a population and analysing that data in order to get the findings that will represent the population that is being studied. A quantitative approach involves the use of structured questions where the response options have been predetermined and a large number of respondents are involved. Quantitative research considers numbers, symbols, measurements and statistics in outlining key variables for the collection, analysis and interpretation of data. However, measurements applied must be objective, quantitative and statistically valid (Babooa, 2008). In this study, the responses received from the participants through questionnaires provided quantitative data.

3.3.1.3 Mixed approach

Mixed-methods may be defined as “research in which the investigator collects and analyses data, integrates the findings and draws inferences using both qualitative and quantitative approaches/methods in a single study” (Tashakkori & Creswell, 2007). Tashakkori and Creswell (2007) further stated that a mixed-methods study is one that includes a qualitative and quantitative dimension, but difficulties often arise when the researcher attempts to articulate how the two elements relate to one another.

3.3.2 Data collection

In collecting primary data, the researcher has a choice of using different research instruments. As a result, from the several key data-collection instruments the researcher selected one which is more relevant to the study for the purpose of data collecting and that was a structured questionnaire.

3.3.3 Measuring instruments

The study used the survey method of research using questionnaires. The questionnaire is a highly structured data-collection technique whereby each respondent was asked the same set of questions.

3.3.3.1 Questionnaires

A questionnaire is a self-report instrument in which the respondent responds to printed questions on a document. The respondents find a well-designed questionnaire easy to fill out while the researcher finds it easy to administer and score (Brink, 1996: 154). The questionnaire comprised closed-ended questions only. It puts the interviewer in control of the flow of information and reduced the likelihood of misunderstanding questions. Broadly speaking, it consisted of a set of questions presented to participants for his or her feedback. Advantages of questionnaires include, among others, that it is used to collect large amounts of information at a low cost per respondent. Respondents are able to give more honest answers than when interviewed and respondents' answer questions in a fixed order, and the researcher can adapt the questionnaire based on earlier answers.

The researcher also noted the following pointers: ambiguous questions had to be avoided; leading questions generate biased responses and had to be avoided; wherever possible, especially with self-administered questionnaires, fixed-alternative questions were recommended. Open-ended questions are difficult to analyse. Closed-ended (forced/choice) questions were therefore used.

The advantages of questionnaires: practical; a large amount of information was collected from a large number of people in a short period of time and in a relatively cost-effective way. This was carried out by the researcher or by any number of people with limited effect to its validity and reliability. The results of the questionnaires were quickly and easily quantified by the researcher through the use of a software package. The results could also be analysed more 'scientifically' and objectively than other forms of research; when data has been quantified, it can be used to compare and contrast other research and may be used to measure change. Positivists believe that quantitative data can be used to create new theories and / or test existing hypotheses

(http://libweb.surrey.ac.uk/library/skills/IntroductiontoResearchandManagingInformationLeicester/page_51.htm).

The disadvantages of questionnaires are argued to be inadequate to understand some forms of information - i.e. changes of emotions, behaviour, feelings etc. Phenomenologists state that quantitative research is simply an artificial creation by the researcher, as it is asking only a limited amount of information without explanation and thus lacks validity; there is no way to tell how truthful a respondent is being; there is no way of telling how much thought a respondent has put in; the respondent may be forgetful or not thinking within the full context of the situation. People may read differently into each question and therefore reply based on their own interpretation of the question - i.e. what is 'good' to someone may be 'poor' to someone else, therefore there is a level of subjectivity that is not acknowledged; there is a level of researcher imposition, meaning that when developing the questionnaire, the researcher is making their own decisions and assumptions as to what is and is not important, therefore they may be missing something that is of importance.

(http://libweb.surrey.ac.uk/library/skills/IntroductiontoResearchandManagingInformationLeicester/page_51.htm).

3.3.4 Sample design

A sample is a subset of all members of a target population (Wagner, 2013). It is not always easy to gather data from every possible member in a population, but where the size of the population permits it is advisable to include as many members as possible. Sampling is generally preferred to a census for the following reasons: cost; timeliness; destructive testing; and accuracy (Wagner, 2013).

There are approximately 20 employees employed in the Glencore and the entire population was used as a sample.

3.3.5 Data-analysis procedure

Pre-coded questionnaires make data collection, capturing and analysis easy and efficient. The data analysis follows an explanatory data analysis (EDA) technique and the emphasis is on visual representation and graphical techniques for data analysis. Emory and Cooper stressed the fact

that “when numerical summaries are used exclusively and accepted without visual inspection, selection of confirmatory models may be precipitous, based on flawed assumption, and may consequently produce erroneous conclusions”. For these reasons, preliminary analysis started with visual inspection and not with numerical summaries.

3.3.6 Validity and reliability

Both qualitative and quantitative researchers agreed that research findings need to be reliable and valid. In addition, Krishnaswamy, Sivakumar and Mathirajan (2009) further distinguished between these two concepts in the following manner: Validity is concerned with confirming the truth-value or believability of the findings that will be established by the researcher, which means the extent to which the data provides insight while reliability focuses on identifying and documenting recurrent accurate and consistent features or themes (Krishnaswamy, Sivakumar and Mathirajan, 2009). Validity refers to the degree that an instrument measures what it is supposed to be measuring whilst reliability looks for the degree of consistency with which an instrument measures an attribute, hence, the Cronbach’s alpha was used in this study.

Cronbach’s alpha is a test for a model or survey’s internal consistency, called a ‘scale reliability coefficient’ sometimes. Cronbach’s alpha assesses the reliability of a rating summarizing a group of test or survey answers which measure some underlying factors (e.g., some attribute of the test-taker). A score is computed from each test item and the overall rating, called a ‘scale’ is defined by the sum of these scores over all the test items. The cut-off point is 0.7, meaning an alpha value less than 0.7 is not acceptable. When using Likert-type scales it is imperative to calculate and report the Cronbach’s alpha coefficient for internal consistency and reliability for any scales or subscales one may be using (Parson, 2006). The reliability analysis are presented in the table below:

Data	Cronbach’s Alpha	Items	Comments
Clients’ data	0.874	40	Excellent and consistent

3.4 Ethical consideration

The researcher relayed all the necessary information pertaining to the research including the nature, purpose and usefulness, procedures, confidentiality (no names were required when filling the study tool) and the protection of anonymity as well as the voluntary nature of participation to the participants was guaranteed.

This study's population consisted of vulnerable subjects and therefore the researcher adhered to the following ethical principles throughout the process:

- Confidentiality: Participants were informed that confidentiality would be maintained.
- Privacy: The researcher also informed participants that information collected would be kept safely and secured at the Graduate School and would be discarded after five years and would only be used for completion of Post Graduate study purposes only.
- Consent: The researcher obtained an informed consent from individuals when completing the data-collection tool.
- Equity and Justice: Participants were informed that treatment and inclusion of participants in the research and research results would be distributed equally and with fairness.

3.5 Conclusion

In this chapter, a research plan was developed for data collection starting with the questionnaire for assessing the relevance and avoiding wrong questions to be asked. Secondly, a sampling plan was formulated from a defined population as a representative of a large population. The research population was identified and the sample size determined. In the primary data, the researcher used questionnaires to collect data and ultimately, analysed the data. In chapter 4, the data was analysed using relevant statistical techniques and the results of the study are discussed.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

4.1 Introduction

The chapter presents data obtained through a questionnaire administered to employees of Glencore Rustenburg Smelter. The data from the questionnaire is presented and analysed in the order of the research objectives presented earlier in chapter one. The questionnaire was divided into the following two sections namely; Section A: Demographics and Section B: General Questions.

Part A: Demographics

4.2 Response rate

The total number of questionnaires distributed to respondents was twenty (20). All the questionnaires were administered at Glencore Rustenburg Smelter, Rustenburg and Wonderkop Smelters. Seventeen out of the total of 20 questionnaires distributed were completed and returned which constitutes an 85% response rate.

4.3 Personal information analysis

This section depicts the personal data of the respondents.

Figure 4.1 Age group

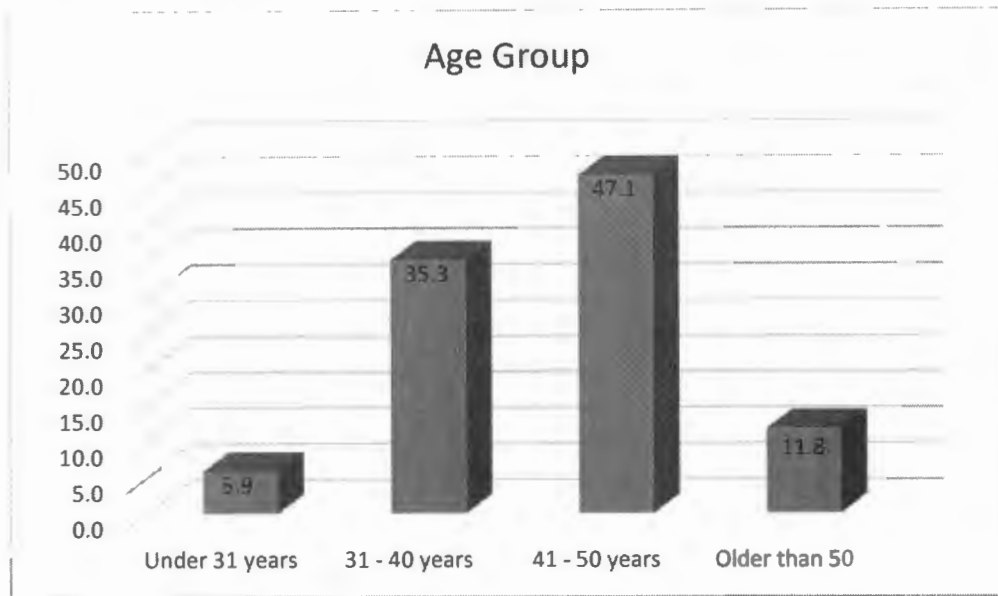


Figure 4.1 depicts the age groups of the respondents in which the majority (47.1%) of the respondents were between the ages of 41-50 category, followed by the 31-40 with 35.3% and the least (5.9%) were in the under 31 category.

Figure 4.2 Race

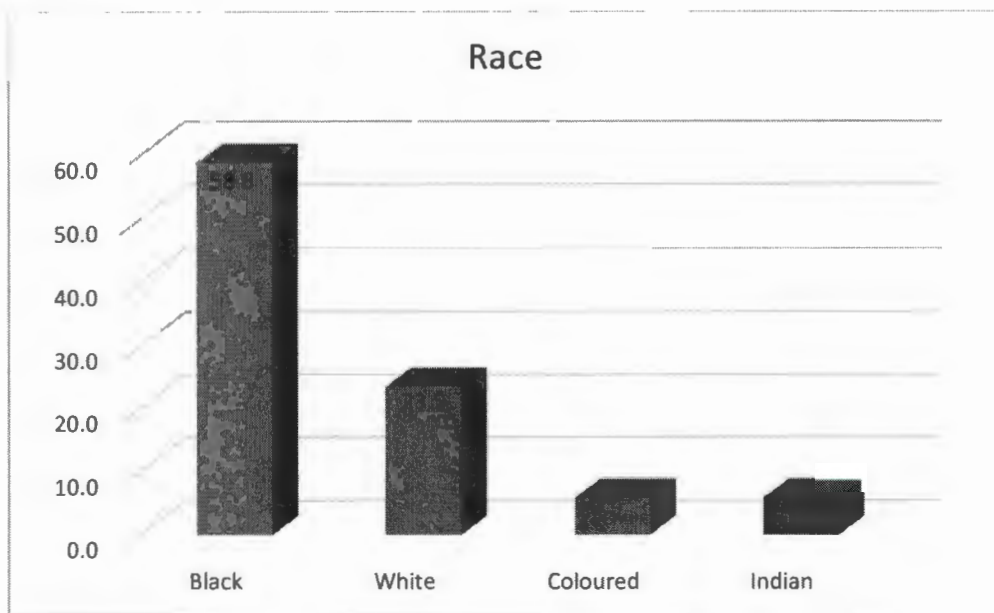


Figure 4.2 depicts that 58.8% of the respondents are black, followed by 23.5% white and the coloured and Indians sharing a 5.9% each.

Figure 4.3 Present educational qualification

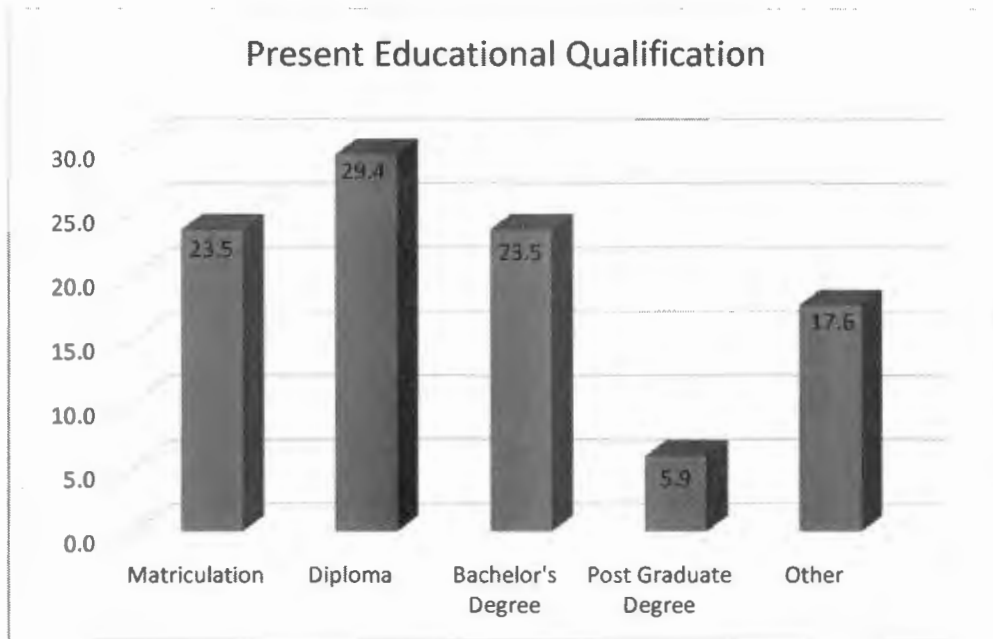


Figure above shows that 29.4% of the respondents indicated that they held a diploma, followed by 23.5% with bachelor's degree and matriculation, with the least (5.9%) holding a post-graduate qualification.

Figure 4.4 Gender

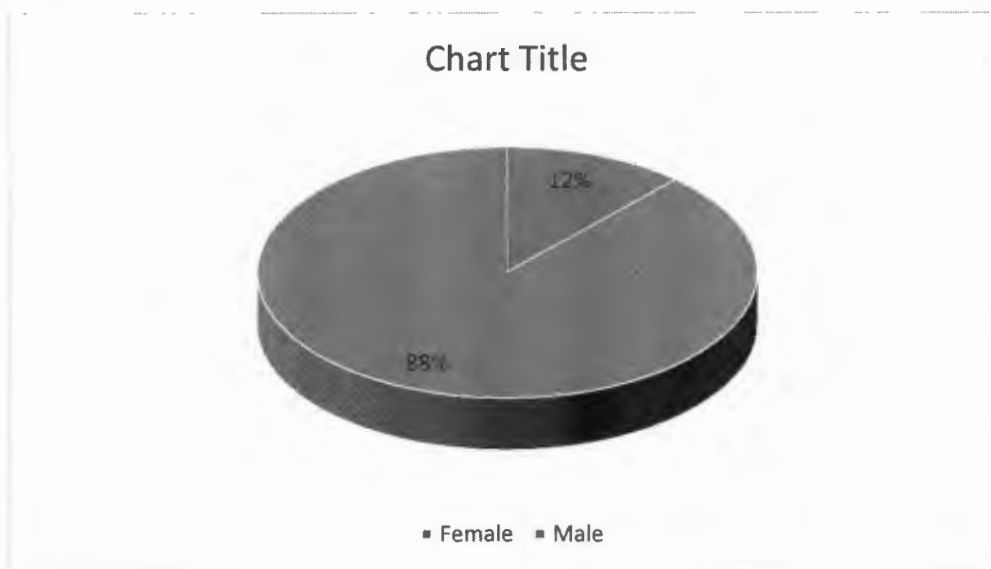
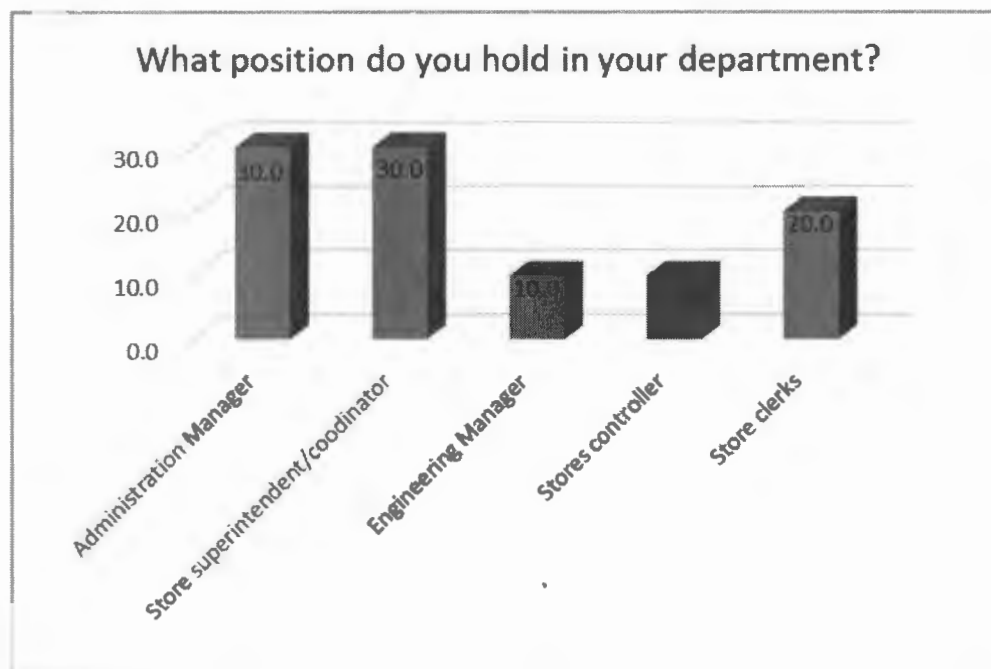


Figure above shows that the majority of the respondents were males with 88%. The minority was females with 12%.

Figure 4.5 What position do you hold in your department?



The above figure shows that 60% of the total respondents were in administration as managers and store superintendent/coordinators with an equal share, followed by store clerks (20%), with Engineering and stores controllers sharing 10% each.

Figure 4.6 Business unit

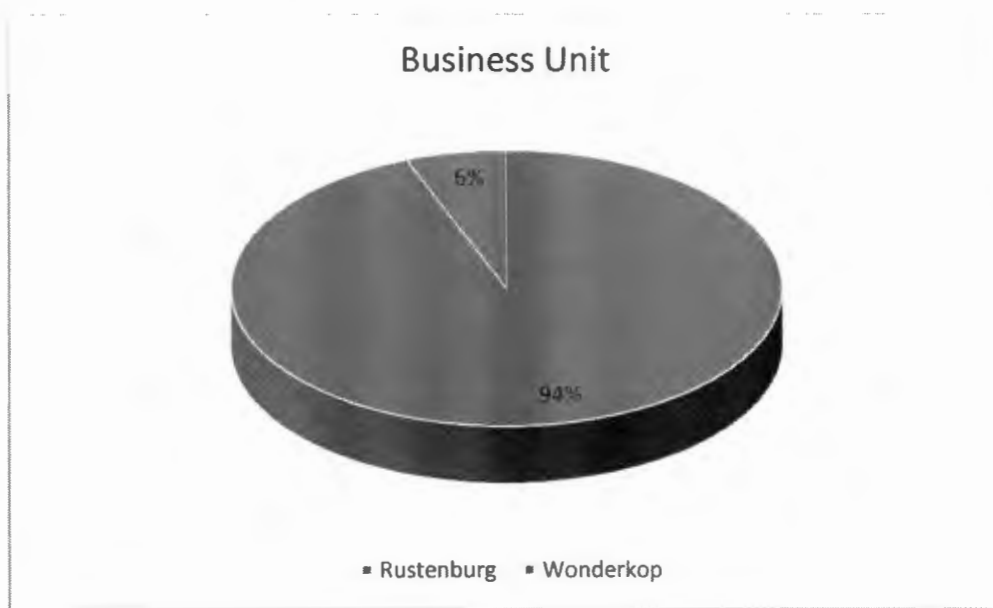


Figure 4.6 depicts that the Rustenburg business unit (94%) was more represented in the survey as compared to the Wonderkop business unit (6%).

Section B

Table 4.1: Understanding of inventory management at the Glencore Warehouse

STATEMENTS	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE	TOTAL
	1	2	3	4	5	
I know the core business of inventory management.	5(29.4%)	10(58.8%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100)
Inventory management is a centralized function	6(35.3%)	8(47.1%)	1(5.9%)	1(5.9%)	1(5.9%)	17(100)
Inventory management is a system used to oversee the flow of products and services in and out of an organization.	7(41.2%)	7(41.2%)	2(11.8%)	0(0.0%)	1(5.9%)	17(100)
I attend inventory training very often?	3(17.6%)	3(17.6%)	1(5.9%)	6(35.3%)	4(23.5%)	17(100)
There are indicators for measuring performance of inventory management	5(29.4%)	10(58.8%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100)
I find it useful to reconcile the monthly inventory expenditure through the monitoring tool	4(23.5%)	8(47.1%)	3(17.6%)	2(11.8%)	0(0.0%)	17(100)
The Admin Manager involves all sectional managers to take full control of their respective budgets	8(47.1%)	9(52.9%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100)
Records are kept to add value, and reconciled to general ledger controls at reasonable intervals (at least annually)	9(52.9%)	6(35.3%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100)
Management monitors and approves the write-offs of obsolete and inactive inventories	10(58.8%)	5(29.4%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100)
All classes of inventory items are physically counted annually	8(47.1%)	7(41.2%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100)

Table 4.1 presents the responses to the questions relating to understanding of inventory management at the Glencore Warehouse. The respondents were requested to respond to ten statements. They were asked to rate each item on a scale of 1 to 5 (1=strongly agree; 2=agree; 3=unsure, 4=disagree and 5= strongly disagree). Accordingly, 88.2% (29.4% & 58.8%) of the respondents indicated that they know the Core Business of Inventory Management, 82.4% (35.3% & 47.1%) of the respondents indicated that inventory management is a Centralized Function. The data shows 82.4% (41.2% & 41.2%) of the respondents indicated that Inventory management is a system used to oversee the flow of products and services in and out of an organization, 58.8% (35.3% & 23.5%) of the respondents indicated that they do not attend inventory training very often, 88.2% (29.4% & 58.8%) of the respondents indicated that there are indicators for measuring performance of the inventory management.

It is evident from the data that 70.6% (23.5% & 47.1%) of the respondents find it useful to reconcile the monthly inventory expenditure through the monitoring tool, 100% (47.1% & 52.9%) of the respondents indicated that the Admin Manager involves all sectional managers to take full control of their respective budgets. The data reveals that 88.2% (52.9% & 35.3%) of the respondents sometimes indicated that records are kept to add value, and reconciled to general ledger controls at reasonable intervals (at least annually), 88.2% (58.8% & 29.4%) of the respondents indicated that management monitors and approves the write-offs of obsolete and inactive inventories, and lastly 88.3% (47.1% & 41.2%) of the respondents indicated that all classes of inventory items are physically counted annually.

Table 4.2: To establish the extent to which personnel employed in the supply chain understand their role within the discipline

STATEMENTS	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE	TOTAL
	1	2	3	4	5	
I am able to break down your operating inventory into the three major categories when reporting levels—safety, replenishment and excess or obsolete stock.	3(17.6%)	7(41.2%)	7(41.2%)	0(0.0%)	0(0.0%)	17(100)
The company is using the most effective method to calculate their safety stock levels.	4(23.5%)	7(41.2%)	5(29.4%)	1(5.9%)	0(0.00%)	17(100)
I do recalculate safety stock levels on a regular basis to ensure that they are up to date.	3(17.6%)	7(41.2%)	2(11.8%)	5(29.4%)	0(0.0%)	17(100)
There are detailed perpetual inventory records periodically reviewed for slow-moving items	4(23.5%)	11(64.7%)	1(5.9%)	1(5.9%)	0(0.0%)	17(100)
Discrepancies between physical counts and perpetual records are investigated and resolved	8(47.1%)	7(41.2%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100)
Root-cause analyses are regularly performed on excess and obsolete stock and the relationship on how they are linked to action plans to curb more excesses from being occurring is drawn.	5(29.4%)	7(41.2%)	4(23.5%)	1(5.9%)	0(0.0%)	17(100)
The role of the inventory unit is to manage and avoid the silent build-up of inventory resulting from increased uncertainty in demand and supply.	6(35.3%)	11(64.7%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100)
The efficient flow of goods and services in supply chain management does not require	0(0.0%)	4(23.6%)	3(17.6%)	5(29.4%)	5(29.4%)	17(100)

any collaboration with both clients and suppliers						
The most effective supply chain strategies are the result of a holistic management approach.	4(23.5%)	9(52.9%)	3(17.6%)	0(0.0%)	1(5.9%)	17(100)
I understand all the three levels of Supply Chain Management	4(23.5%)	6(35.3%)	5(29.4%)	2(11.8%)	0(0.0%)	17(100)

Table 4.2 presents the responses to the questions relating to the extent to which personnel employed in the supply chain understand their role within the discipline. The respondents were requested to respond to ten statements thereof. They were asked to rate each item on a scale of 1 to 5 (1=strongly agree; 2=agree; 3=unsure, 4=disagree and 5= strongly disagree). Accordingly, 58.8% (17.6% & 41.2%) of the respondents pointed out that they were able to break down the operating inventory into the three major categories when reporting levels-safety, replenishment and excess or obsolete stock., 64.7% (23.5% & 41.2%) of the respondents indicated that the company is using the most effective method to calculate their safety stock levels. The data shows that 58.8% (17.6% & 41.2%) of the respondents indicated that they recalculate safety stock levels on a regular basis to ensure that they are up to date, 88.2% (23.5% & 64.7%) of the respondents indicated that there are detailed perpetual inventory records periodically reviewed for slow-moving items, 88.3% (47.1% & 41.2%) of the respondents pointed out that discrepancies between physical counts and perpetual records are investigated and resolved.

It is evident that 70.6% (29.4% & 41.2%) of the respondents indicated that root-cause analyses are regularly performed on excess and obsolete stock and the relationship on how they are linked to action plans to curb more excesses from being occurring are drawn, 100% (35.3% & 64.7%) of the respondents indicated that the role of inventory unit is to manage and avoid the silent build-up of inventory resulting from increased uncertainty in demand and supply. The data reveals that 58.8% (29.4% & 29.4%) of the respondents indicated that the efficient flow of goods and services in supply chain management require any collaboration with both clients and suppliers, 76.4% (23.5% & 52.9%) of the respondents stated that the most effective supply chain

strategies are the result of a holistic management approach, and lastly 58.8% (23.5% & 35.3%) of the respondents indicated that they understand all three levels of Supply Chain Management.

Table 4.3: To examine the extent of compliance with the policies of inventory and supply chain management

STATEMENTS	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE	TOTAL
	1	2	3	4	5	
The Section has inventory policies?	12(70.6%)	5(29.4%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100%)
Policies and procedures are clearly stated and systematically communicated	13(76.5%)	3(17.6%)	0(0.0%)	1(5.9%)	0(0.0%)	17(100%)
The Policies and Procedures support internal control	12(70.6%)	5(29.4%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100%)
There are Standard Operating Procedures (SOPs)for recording and tracking items	7(41.2%)	10(58.8%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100%)
There are SOPs for recording the cost information on items	7(41.2%)	7(41.2%)	3(17.6%)	0(0.0%)	0(0.0%)	17(100%)
The inventory section has service standards of performance	5(29.4%)	9(52.9%)	3(17.6%)	0(0.0%)	0(0.0%)	17(100%)
Supply chain needs to manage risks to optimize their performance.	7(41.2%)	10(58.8%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100%)
Finance unit plays a vital role in ensuring that supply chain risks are sufficiently mitigated.	8(47.1%)	7(41.2%)	2(11.8%)	0(0.0%)	0(0.0%)	17(100%)
An efficient method for managing inventory is to hire a dedicated inventory control specialist and to comply with the policies.	5(29.4%)	5(29.4%)	4(23.5%)	3(17.6%)	0(0.0%)	17(100%)
I have been trained on all the policies, and SOP in the unit.	3(17.6%)	6(35.3%)	2(11.8%)	6(35.3%)	0(0.0%)	17(100%)

Table 4.3 presents the responses to the questions relating to the extent of compliance with the policies of inventory and supply chain management. The respondents were requested to respond to ten statements thereof. They were asked to rate each item on a scale of 1 to 5 (1=strongly agree; 2=agree; 3=unsure, 4=disagree and 5= strongly disagree). Accordingly, 100% (70.6% & 29.4%) of the respondents indicated that section has inventory policies, 94.1% (76.5% & 17.6%) of the respondents pointed out that policies and procedures are clearly stated and systematically communicated, 100% (70.6% & 29.4%) of the respondents indicated that policies and procedures support internal control, 100% (41.2% & 58.8%) of the respondents indicated that there are Standard Operating Procedures (SOPs) for recording and tracking items.

The data shows that 82.4% (41.2% & 41.2%) of the respondents stated that there are SOPs for recording the cost information on items, 82.3% (29.4% & 52.9%) of the respondents indicated that the inventory section has service standards of performance, 100% (41.2% & 58.8%) of the respondents stated that supply chain needs to manage risks to optimize their performance. It is evident from the data that 88.3% (47.1% & 41.2%) of the respondents indicated that the finance unit plays a vital role in ensuring that supply chain risks are sufficiently mitigated, 58.8% (29.4% & 29.4%) of the respondents indicated that an efficient method for managing inventory is to hire a dedicated inventory control specialist and to comply with the policies, and lastly 52.9% (17.6% & 35.3%) of the respondents indicated that they had been trained on all the policies, and SOP in the unit.

Table 4.4: To evaluate the effectiveness of the inventory management and control system

STATEMENTS	STRONGLY AGREE	AGREE	NOT SURE	DISAGREE	STRONGLY DISAGREE	TOTAL
	1	2	3	4	5	
Adequate provision is made for obsolete and inactive items in inventories.	4(23.5%)	6(35.3%)	4(23.5%)	2(11.8%)	1(5.9%)	17(100)
Management monitors and do controls of all obsolete and inactive inventories.	4(23.5%)	7(41.2%)	5(29.4%)	1(5.9%)	0(0.0%)	17(100)
Adequate insurance coverage is provided.	4(23.5%)	7(41.2%)	5(29.4%)	1(5.9%)	0(0.0%)	17(100)
The receiving, issuing, accounting and storing responsibilities are properly segregated.	6(35.3%)	7(41.2%)	2(11.8%)	2(11.8%)	0(0.0%)	17(100)
The company has a tracking system to manage inventory and monitor turnaround times	6(35.3%)	9(52.9%)	1(5.9%)	1(5.9%)	0(0.00%)	17(100)
Inventory tracking system formats range from spreadsheets to computer programmes	5(29.4%)	11(64.7%)	1(5.9%)	0(0.0%)	0(0.0%)	17(100)
An effective way to manage inventory is to determine the inventory demands of the business.	9(52.9%)	8(47.1%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100)
Having high levels of inventory adds to expenses and increases overhead costs	11(64.7%)	5(29.4%)	1(5.9%)	0(0.0%)	0(0.0%)	17(100)
A useful way to manage inventory is to establish lead time reports to understand how long it takes to replenish your inventory.	11(64.7%)	5(29.4%)	1(5.9%)	0(0.0%)	0(0.0%)	17(100)
Inventory management must have effective controls in place.	12(70.6%)	5(29.4%)	0(0.0%)	0(0.0%)	0(0.0%)	17(100)

Table 4.4 presents the responses to the questions relating to the effectiveness of the inventory management and control system. The respondents were requested to respond to ten statements thereof. They were asked to rate each item on a scale of 1 to 5 (1=strongly agree; 2=agree; 3=unsure, 4=disagree and 5= strongly disagree). Accordingly, 58.8% (23.5% & 35.3%) of the respondents indicated that adequate provision is made for obsolete and inactive items in inventories, 64.7% (23.5% & 41.2%) of the respondents indicated that management monitors and do controls of all obsolete and inactive inventories, 64.7% (23.5% & 41.2%) of the respondents indicated that adequate insurance coverage is provided.

The data shows that 76.5% (35.3% & 41.2%) of the respondents indicated that receiving, issuing, accounting and storing responsibilities are properly segregated, 88.2% (35.3% & 52.9%) of the respondents indicated that the company has a tracking system to manage inventory and monitor turnaround times, 94.1% (29.4% & 64.7%) of the respondents pointed out that inventory tracking system formats range from spreadsheets to computer programmes. The data reveals that 100% (52.9% & 47.1%) of the respondents indicated that an effective way to manage inventory is to determine the inventory demands of the business, 94.1% (64.7% & 29.4%) of the respondents indicated that having high levels of inventory adds to expenses and increases overhead costs, 94.1% (64.7% & 29.4%) of the respondents indicated that a useful way to manage inventory is to establish lead time reports to understand how long it takes to replenish your inventory, and lastly 100% (70.6% & 29.4%) of the respondents indicated that inventory management must have effective controls in place.

4.4 Conclusion

Chapter 4 presented empirical data. The data was analysed for ease of presentation and interpretation. However, the raw data had been processed through the SPSS system, and the SPSS (Statistical Packaging for Social Science) output was input into the tables. The next chapter discusses the results and concludes with recommendations.

CHAPTER FIVE

DISCUSSIONS OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Chapter five presents and discusses findings from the study. This chapter draws together all the various arguments that have run through the mini dissertation. The discussion is based on the results obtained on each of the research questions. Based on the discussions, conclusions and recommendations are made. Finally, areas that need further research are proposed.

5.2 Discussion of results

5.2.1 Research Objective 1: Understanding of inventory management at the Glencore Warehouse

According to the results, the majority of the respondents were in favour of the following statements: that they know the Core Business of Inventory Management; that inventory management is a Centralized Function; that Inventory management is a system used to oversee the flow of products and services in and out of an organization. The majority opposed the statement that they attended training very often. The majority of the respondents aligned themselves with following statements on their understanding of the inventory management system: that there are indicators for measuring performance of the inventory management; that it is useful to reconcile the monthly inventory expenditure through the monitoring tool; the entire (100%) group of respondents agree that the Admin Manager involves all sectional managers to take full control of their respective budgets. The majority also submitted the following: that records are kept to add value, and reconciled to general ledger controls at reasonable intervals (at least annually); that management monitors and approves the write-offs of obsolete and inactive inventories, and lastly that all classes of inventory items are physically counted annually.

The data paints a picture that at the Glencore Rustenburg Smelter the level of understanding of inventory management at the Glencore warehouse is generally good. The only weakness emanating from the data is lack of regular training of staff on new inventory management systems and controls.

5.2.2 Research Objective 2: To establish the extent to which personnel employed in the supply chain understand their role within the discipline

In line with this, the majority of respondents are in favour of and supportive to all the statements except for the statement that the efficient flow of goods and services in supply chain management does not require any collaboration with both clients and suppliers. They responded with the disagree highlighting that the efficient flow of goods and service in supply chain management do rely on collaboration between clients and the suppliers.

The data also shows that the employees of the Glencore Rustenburg Smelter understand their roles and responsibilities within the inventory management discipline and supply chain in general. The only weakness emerging from the data is lack of regular training of staff on new inventory management systems and controls.

5.2.3 Research Objective 3: To examine the extent of compliance with the policies of inventory and supply chain management

Thus, the majority of the respondents were in favour of all the statements as listed in the tool: that section has inventory policies; that policies and procedures are clearly stated and systematically communicated; that policies and procedures support internal control; that there are Standard Operating Procedures (SOPs) for recording and tracking items; that there are SOPs for recording the cost information on items; that the inventory section has service standards of performance; that supply chain needs to manage risks to optimize their performance; that finance unit plays a vital role in ensuring that supply chain risks are sufficiently mitigated; that an efficient method for managing inventory is to hire a dedicated inventory control specialist and to comply with the policies, and lastly that they have been trained on all the policies, and SOP in the unit.

The data concurs with the fact that the employees at Glencore Rustenburg Smelter submitted that they comply with the policies of inventory and supply chain management. All the aspects of inventory and supply chain are available and the SOPs which guide the processes are also available.

5.2.4 Research Objective 4: To evaluate the effectiveness of the inventory management and control system

Clearly then, the majority of the respondents were in favour of all the statements as listed in the tool: that adequate provision is made for obsolete and inactive items in inventories; that management monitors and does controls of all obsolete and inactive inventories; that adequate insurance coverage is provided; that the receiving, issuing, accounting and storing responsibilities are properly segregated; that the company has a tracking system to manage inventory and monitor turnaround times; that inventory tracking system formats range from spreadsheets to computer programs; that an effective way to manage inventory is to determine the inventory demands of the business; that having high levels of inventory adds to expenses and increases overhead costs; that a useful way to manage inventory is to establish lead time reports to understand how long it takes to replenish your inventory, and lastly that inventory management must have effective controls in place.

The majority of respondents are of the opinion that their inventory management systems are effective. The data clearly illustrates that showing a positive response to all the statements relating to the effectiveness of the inventory management control systems.

5.3 Drawing the relationship between variables.

5.3.1 Age group

Age group		
	χ^2 (Chi-square)	p-value
I find it useful to reconcile the monthly inventory expenditure through the monitoring tool	8.972	0.030

The data revealed a statistically significant difference in age groups of employees and the one question asked to employees. The age group of an employee affects the manner in which an employee responded to the above statement at a significance level of 0.05 or 5%.

5.3.2 Race

Race		
	χ^2 (Chi-square)	p-value
Inventory management is a Centralized Function	35.733	0.000
I understand all the three levels of Supply Chain Management	20.213	0.017
I have been trained on all the policies, and SOP in the unit.	24.533	0.004
The company has a tracking system to manage inventory and monitor turnaround times	21.333	0.011

The data shown a statistically significant difference in race and the four questions asked to employees. The race of an employee affects the manner in which an employee responded to the above questions at a significance level of 0.05 or 5%.

5.4 Conclusion

In conclusion, the data clearly illustrates that the respondents seem to be clear about what they do in the inventory management and are well conversant with the control systems. The impression that that the employees at Glencore Rustenburg Smelter trust their superiors and believe in their style of leadership also supports the fact that they are allowed to work independently. The personnel employed in the supply chain understand their role within the inventory management and supply chain discipline as illustrated by the data. The data also showed that the effectiveness of the inventory management and control system is high and helps Glencore Rustenburg Smelter keep track of their inventory. The data highlights clearly that the employees are compliant with the policies of inventory and supply chain management and their practices of the inventory management and control system are effective. The study showed no statistically significant difference with most of the variables in the tool except for age versus the

statement that “I find it useful to reconcile the monthly inventory expenditure through the monitoring tool”. Age only became a factor on this statement above. There was a statistically significant difference between race and the following four statements: “Inventory management is a Centralized Function”; “I understand all the 3 Levels of Supply Chain Management”; “I have been trained on all the policies, and SOP in the unit; The Company has a tracking system to manage inventory and monitor turnaround times”.

5.5 Recommendations

The following recommendations, based upon the results of the study, are:

- 5.1.1 Some practices are dependent on some of the demographic factors such as age and a further investigation into gathering whether people who have been in practice for a long while have a different approach to some of their operations in inventory management and control system. Age played a role in the useful in reconciling the monthly inventory expenditure through the monitoring tool.
- 5.1.2 A follow-up study to test the actual system in seeing its effectiveness in action. It emerged clearly from the data that a significant majority of the respondents were trained usefully to reconcile the monthly inventory expenditure through the monitoring tool; the staff understand Levels of Supply Chain Management and the company has a tracking system to manage inventory and monitor turnaround times. The expected outcome will be that the company should not experience stock-outs and obsolete stock with the kind of training and expertise in the company.
- 5.1.3 More studies are needed to investigate the impact of training of staff on new inventory management systems and controls.

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APPENDIX

QUESTIONNAIRE

My name is Thapelo Mogorosi, (student number: 16474929) I am a student at the North West University, currently studying towards a Master of Business Administration. I am carrying out a study on the analysis of the inventory management system and controls at Glencore: a case of Rustenburg Smelter.

I kindly request you to read the following executive summary in order to gain an insight of what my study is based on, and respond to the questions below. Your co-operation in this exercise is greatly appreciated. You are kindly requested to fill it to air your views on the level of understanding and what could be done to improve the inventory management systems and controls at Rustenburg Smelter. Although participation in this study is voluntary, you are encouraged to participate accordingly. You are rest assured that the findings of this study will be reported in summary form and that no individual responses will be identified.

The study is made of four objectives:

- To find out the level of understanding of inventory management at Rustenburg smelter Warehouse
- To establish the extent to which personnel employed in the supply chain understand their role within the discipline
- To examine the extent of compliance with the policies of inventory and supply chain management
- To evaluate the effectiveness of the inventory management and control system

Please do not include your names. Your response will be held in strict confidence and will be used for this study only. *Place an "X" in the box that indicates your response.*

TOPIC: Analysis of the inventory management systems and controls at Glencore: A case of Rustenburg Smelter.

SECTION A

BIOGRAPHICAL DATA

Complete the following by only using **X** to mark in the relevant block.

1. Age	2. Race	3. Gender
Under the age of 31 yrs	Black	Female
Between 31 and 40	White	Male
Between 41 and 50	Coloured	
Between 51 and older	Indians	
	Other	

4. Present educational qualification	5. What position do you hold in your department?	6. Which business unit?
Matriculation	Administration Manager	Rustenburg
Diploma	Store supritendent / co-ordinator	Wonderkop
Bachelor of Degree	Engineering Manager	Boshoek
Post- Graduate Degree	Production Manager	
	Stores controller	
	Store clerks	

SECTION B To find out the level of understanding of inventory management at Glencore Warehouse

Use the scale below by crossing X in a number that express your view in each item:

1.	2.	3.	4.	5
Strongly Agree (SA)	Agrees (A)	Unsure/Don't Know (U)	Disagrees (D)	Strongly Disagree (SD)

Statement	SA	A	U	D	SD
1. I know the Core Business of Inventory Management.					
2. Inventory management is a Centralized Function					
3. Inventory management is a system used to oversee the flow of products and services in and out of an organization.					
4. I attend inventory training very often?					
5. There are indicators for measuring performance of the Inventory management					
6. I find it useful to reconcile the monthly inventory expenditure through the monitoring tool					
7. The Admin Manager involves all Sectional managers to take full control of their respective budgets					
8. Records are kept to add value, and reconciled to general ledger controls at reasonable intervals (at least annually)					
9. Management monitors and approves the write-offs of obsolete and inactive inventories					
10. All classes of inventory items are physically counted annually					

SECTION C To establish the extent to which personnel employed in the supply chain understand their role within the discipline

Statement	SA	A	U	D	SD
1. I am able to break down your operating inventory into the three major categories when reporting levels—safety, replenishment and excess or obsolete stock.					
2. The company is using the most effective method to calculate their safety stock levels.					

3. I do recalculate safety stock levels on a regular basis to ensure that they are up to date.					
4. There are detailed perpetual inventory records periodically reviewed for slow-moving items					
5. Discrepancies between physical counts and perpetual records are investigated and resolved					
6. Root-cause analyses are regularly performed on excess and obsolete stock and the relationship on how they are linked to action plans to curb more excesses from being occurring is drawn.					
7. The role of inventory unit is to manage and avoid the silent build-up of inventory resulting from increased uncertainty in demand and supply.					
8. The efficient flow of goods and services in supply chain management does not require any collaboration with both clients and suppliers					
9. The most effective supply chain strategies are the result of a holistic management approach.					
10. I understand all the 3 Levels of Supply Chain Management					

SECTION D To examine the extent of compliance with the policies of inventory and supply chain management

Statement	SA	A	U	D	SD
1. The Section has inventory policies?					
2. Policies and procedures are clearly stated and systematically communicated					
3. The Policies and Procedures support internal control					
4. There are Standard Operating Procedures (SOPs)for recording and tracking items					
5. There are SOPs for recording the cost information on items					
6. The inventory section has service standards of performance					
7. Supply chain needs to manage risks to optimize their performance.					
8. Finance unit plays a vital role in ensuring that supply chain risks are sufficiently mitigated.					
9. An efficient method for managing inventory is to hire a dedicated inventory control specialist and to comply with the policies.					
10. I have been trained on all the policies, and SOP in the unit.					

SECTION E To evaluate the effectiveness of the inventory management and control system

Statement	SA	A	U	D	SD
1. Adequate provision is made for obsolete and inactive items in inventories.					
2. Management monitors and do controls of all obsolete and inactive inventories.					
3. Adequate insurance coverage is provided.					
4. The receiving, issuing, accounting and storing responsibilities are properly segregated.					
5. The company has a tracking system to manage inventory and monitor turnaround times					
6. Inventory tracking system formats range from spreadsheets to computer programs					
7. An effective way to manage inventory is to determine the inventory demands of the business.					
8. Having high levels of inventory adds to expenses and increases overhead costs					
9. A useful way to manage inventory is to establish lead time reports to understand how long it takes to replenish your inventory.					
10. Inventory management must have effective controls in place.					

THANK YOU FOR TAKING PART, MUCH APPRECIATED