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TOPIC

AN INVESTIGATION ON THE IMPACT OF E- LOGISTICS ON MATERIAL AVAILABILITY: A CASE STUDY OF PARIRENYATWA HOSPITAL

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DEDICATIONS

I dedicate this research firstly to God almighty for giving me the wisdom and guidance in doing this project. I am also grateful to my father, mother and family members for their continued unwavering support.

ABSTRACT

The aim of the study was to investigate the impacts of e logistics on material availability using Parirenyatwa Hospital as a case study. Material availability at point of use can be a problem for many companies, i.e. parts are not always available at the assembly line exactly when needed. This can have a lot of consequences for the companies, like delays, rework, extra resources needed, increased work in process etc., which can all lead to extra costs. Yamane (Israel,1997) formula was used to determine sample size of 29 respondents and they are Parirenyatwa Hospital employees. A descriptive research design was used in this research. The researcher used both quantitative and qualitative data analysis techniques. Questionnaire was used as a research instrument. Data was presented in form of tables, graphs and pie charts. The study shows that there is a positive relationship between e logistics and material availability. Apart from that, the study shows that e logistics functions or services being adopted by Parirenyatwa Hospital influences the material availability in the sense that they enhance productivity, reduce lead time profitability, quality services provision and operating cost reduction. However, Parirenyatwa is facing challenges in the adoption e logistics and these include, high costs levels, technical issues, data capture required, increased master maintenance, and complexity. The researcher concluded that though Parirenyatwa Hospital seem to be succeeding and being productive in its e logistics initiatives on material availability, it needs to carry other strategies of maintaining material availability like Economic Order Quantity level, using FIFO, and also material planning.

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CHAPTER 1

1.0 Introduction

This study seeks to analyse the impact of e-logistics on material availability in health sector in Zimbabwe. Material availability plays a signiant role in the running of day to day business by enhancing effectiveness and efficiency of the business organisation. Thus maintaining material availability is necessary in every business because without material the operating cycles of the firm cannot continue (Kanagajuru,2007). Material availability is the percentage of the total inventory of a system operationally capable (or ready for tasking) of performing a signed mission at a given time based on material conditions. Also material availability enables staff to have correct items, at the correct time, in the correct quantity and create a clean and safe environment for effective service delivery, thereby increasing the patient experience and is also cost effective (Alonso E, Field F ,2007).

Parirenyatwa Hospital is one of the large hospital in Zimbabwe whose service delivery is being interrupted due to lack of material availability. Patients ends up having complications due to lack of medicines and drugs and also lack of equipment for operational cases. This study therefore looks at the impacts of material availability at Parirenyatwa Hospital and is an introduction to measures that ensures the smooth flow of materials so as to ensure favourable service delivery.

1.1 Background of the study

Lack of material availability tends to be the major problem in the health sector here in Zimbabwe because only few medicines and equipment's for operations materials are locally available in Zimbabwe, so it relies of imported materials. Parirenyatwa Hospital has a capacity of about 1800 patients beds and a staff compliment of 2000.It was established in 1890.

The lack of medicines in health facilities fosters the use of over the counter medicine or products from unqualified sources, exposing the consumers to the risks of using counterfeit or substandard products (Jia etal.,2016) Additionally a large proportion of medicine is paid out of pocket, potentially exposing households to financial hardships. Studies has shown that lack of material availability has been a great problem in the health sector for the past years before the introduction of e logistics. Where e logistics involves the management of physical flow of goods in an online platform.

The emergency of covid 19 pandemic through away the traditional supply chain management and increased the adoption of e logistics at Parirenyatwa Hospital due to covid movement restrictions. Parirenyatwa procurement department was forced to adopt e logistics to keep in control of material availability. The evidence shows that material availability before the introduction of e logistics ranges from 7.7% to 67% (WHO, 2000) This was because the only solution was to use E.O.Q, where they will order goods when they reach a certain level however due to more accidents that mislead their inventory system. However, the introduction of e logistics, bring in a lot of hopes in the management of material availability in the sense that the flow of good does not take time to reach the final destination due to online management. Statics shows that there has been an increase in the material availability and it ranges from 17.9% to 87.1% (WHO.,2014). this therefore show a great improvement brought by the introduction of e logistics at Parirenyatwa Hospital.

The availability of quality medicines in the provision of health care service is an integral part of universal health coverage, shapes health service delivery as well as household healthcare utilisation. Material availability can best be measured by stock out rates, where average stock out rate is about 8% (Shan et al.,2016). The availability of service delivery positively affects patient trust in the health care providers (Parirenyatwa Hospital) (Musoke et al,2014).

1.2 Problem Statement

Lack of medicines (drugs) and equipment for operations is a major crisis in the health sector, here in Zimbabwe. Most organizations have adopted e-logistics to facilitate the delivery of various inputs that they need for their daily obligations so as to manage material availabity. The adoption of e-logistics by small, medium and large corporate organizations is skyrocketing at both national and international levels. The objective of this research is to evaluate the impacts of e-logistics on material availability in the health sector. The study uses a sample of Parirenyatwa hospital in Harare to determine the impacts of e-logistics on material availability in the health industry.

1.3 Research Objectives

- ✓ To identify the factors that led to the global existence of e-logistics
- ✓ To evaluate the impacts of e-logistics on material availability in the health sector in Zimbabwe
- ✓ To recommend appropriate measures to improve the adoption of e-logistics in the health sector

1.4 Research Questions

- ✓ What are the causes of lack of material availability?

- ✓ What are the effects of material availability in the health industry?
- ✓ Which challenges are being faced in the adoption of e-logistics in the health sector?

1.5 Necessities

1.5.1. To Suppliers of materials and equipment to the health sector

The research shall be of paramount importance to suppliers of medical drugs, equipment and necessary materials in the health sector. Logistics therefore plays a major role in the transportation and delivery of goods and services from their suppliers to consumers within the recommended and possible lead time. Suppliers of medical materials need to know the market consistence and challenges faced by their counter stakeholders in e-logistics trade facilitation for their strategic decision making.

1.5.2. To Learners

After completing this study, it is the researcher's wish students will be able to comprehend the various factors that influence material availability, effects of material availability, challenges faced and measures to address challenges incurred in maintaining material availability through e-logistics business perspective as well as understanding the concept of e-logistics in trade facilitation.

1.5.3. To retailers and consumers of medical resources in the health sector

Retailers and consumers of health equipment, medication, goods and services rely on logistics for delivery of their resources. The researcher hopes that, it is necessary for stakeholders in the health sector to have an appreciation on the importance of e-logistics in the health sector and how it facilitates and sustains the survival of the health industry in Zimbabwe.

1.5.4. To Bindura University

Further literature is also brought the Bindura University on the impacts of e-logistics on material availability in the health sector to help in the diversification and shared knowledge on the worthiness of e-logistics in the health sector for the benefit of the world at large.

1.6 Delimitations of the study

The research managed to come up with its objectives using the limited resources possessed by the researcher. The importance of e-logistics on material availability in the health sector were also outlined to benefit all stakeholders in the health sector. The research was carried out at Parirenyatwa hospital on behalf of all other health organizations in Zimbabwe. This helped the researcher to come up with observations which assumed to be similar to all health entities hence reducing the researcher's work by using a selected sample to represent the entire hospitals in Zimbabwe. Furthermore, the research managed to identify the effects, challenges and recommendations to promote the adoption of e-logistics in the health sector.

1.7 Limitations of the study

In carrying out the study, researcher faced the challenge of ignorance by other people in conducting the research. The research had to find better ways of getting the required information from respondents by explaining in detail the objectives of the research.

The research also faced ye challenge of lack of resources or financial constraints to finance for travelling expenses, printing services. To address this challenge, the researcher had to solicit some funds from the family and friends as well as withdrawing from personal savings to finance for the project.

The research was also time consuming since it was conducted during the semester

period where the research was supposed to be reading and working on assignments. To make the study successful, the researcher devoted some of the time from weekends as well as working overtime in order to achieve the objectives of the study.

1.8 Assumptions of the research

- ✓ The health sector can effectively adopt e-logistics in its operations
- ✓ The data obtained from survey respondents would be a reliable representation of the vast majority of health organizations in Zimbabwe.
- ✓ E-logistics plays a paramount role in service delivery in the health sector in Zimbabwe.
- ✓ The research's intended participants cooperated willing in the provision of necessary data.

1.10 Structure of the project

The research structure is arranged in the following five chapters:

1.10.1 Chapter 1: Introduction

This chapter introduces the background of the research, problem statement, research objectives, research questions, and the significance of the study, assumptions of the research, delimitations, and limitations of the study, as well as summarizing the chapter.

1.10.2 Chapter 11: Literature review; Theoretical framework and Empirical evidence review

The second chapter reviews secondary information suggested by other scholars on the impacts of e-logistics in in the availability on material availability of material in the health sector. It considers other literature that is relevant to the objectives of the

research that is the theoretical framework and empirical evidence review. The chapter ended with a summary of secondary evidence on adoption of e-logistics.

1.10.3 Chapter 111: Research Methodology

This chapter's primary issues and focus point are to introduce the research models that the researcher used to come up with the observations of the research conducted on the impacts of e-logistics on material availability in the health sector. Further to that, the chapter also focuses on the study methodology, the data presentation and analysis techniques, and the summary of the study.

1.10.4 Chapter IV: Data Presentation, Analysis and Evaluation

This chapter focuses on methods of data presentation graphically, tabular and using pie charts as well as standard deviations.

1.10.5 Chapter v: Summary, Conclusions and Recommendations

This chapter summarizes the findings of the investigation impacts of e-logistics on material availability in the health sector. The chapter goes on to give commendations and conclusions as well as the discussion of the overall results of the study.

1.11 Chapter summary

This division summarises the background of the study, the problem statement, the objectives of the research, the research questions, the research assumptions, the delimitations as well as the limitations of the study. It goes on to give definitions of key terms such as e-logistics, its impacts on the availability or provision of health services. The subtopic also devoted its attention to literature review that provides information on the same subject.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter reviews the existing literature that is related to the area of study. The major reason is to well establish the knowledge gap between what has been researched and what the research is focusing on. The chapter will focus on what other authorities say about the impacts of e logistics on material availability. It aims at exploring comprehensively theoretical and empirical findings relating to books and other compiled literature by professionals and writers in the area of material availability. The research extensively and intensively used a lot of text books, academic journals, educational websites

2.1 Definition of E-logistics

E-Logistics is a term used in e-commerce. It can be defined as an essential component of e-commerce, comprising the entire logistics chain that can be composed of: Reception and conditioning of products; Stocking; Picking (moving of products for the preparation of the request) and intervention of the carriers taking delivery;

These steps should be inserted into order tracking tools, allowing better control of the different operations, and giving customers real-time information of the stage in which the product is purchased (Mangiaracina, Marchet, Perotti, & Tumino, 2015)

There must be perfect synchronization with suppliers in the supply process cycles required to replenish the stocks of products sold by the e-commerce site. This logistic synchrony can be obtained more easily in the measurement from the computerization of these processes, generating speed in the exchange of information and resulting in the reduction of terms and costs of acquisition of the products, as well as in the

reduction of the cost of the inventories. In practice, whenever the stock level of a given product reaches the minimum quantity. A purchase order is systematically triggered and sent to the supplier via the internet or EDI, initiating the stock replenishment process. This cycle ends only when the supplier delivers the product to the customer and there is an update of the inventory control and e-commerce systems (Mangiaracina, Marchet, Perotti, & Tumino, 2015).

2.2 Material availability

Availability is a way to measure the probability that a service is available to be used at any moment (Todd, et al., 2004). Material availability is therefore a measure of the probability that the material is available for use at any given instant. According to Lee and Billington (1993) the material availability at point of use depends on e.g. the supplier service performance for these materials. To characterize the availability level three measures are needed: fill rate (fraction on requirements met without delay), mean delay, and variance of delay when shortages occur. These measures together indicate the extent of material shortage delays that can occur at the company (Lee & Billington, 1993).

The material shortages can be the caused by suppliers being unreliable, for example there might be uncertainties in either their replenishment time or quantity (Graves, 1987). Therefore, Supply Chain Managers need to assess their risk to material availability and prepare for possible future problems by keeping track of existence of materials as well as the information exchange in order to ensure accuracy. To make the information exchange more efficient a good and accurate information system is helpful and it will also make the planning easier (Alonso, et al., 2007). According to Lee & Billington (1993) this risk of material availability problems can be due to different sources of uncertainties along the supply chain, that include demand (volume and mix),

process (yield, machine downtimes, transportation reliabilities), and supply (part quality, delivery reliability). To protect the chain from these uncertainties inventories are often used. These inventories and associated costs need to be controlled by the Supply Chain Managers in order to maximize customer service performance since inventories stored at different points of the supply chain have different impact on the cost and service performance of the chain (Lee & Billington, 1993). For example, finished goods inventories have higher value than raw material inventories, inventories of raw materials have more flexibility than finished products because they can be turned into different alternative finished products, and finished goods inventories have more responsiveness since finished goods can be shipped to customers without delay, whereas some lead time is needed to transform raw materials into finished goods before shipments can be made. It is hard to tell how much of an inventory should be in a supply chain since different supply chains may differ in the network structure, product structure, transportation times, and degree of uncertainty. Therefore, six weeks of supply may be just right for one supply chain, while two weeks of supply is too high for another (Lee & Billington, 1993).

According to Alonso, et al. (2007) companies or organisations tend to keep stock as well as using multiple suppliers to increase the flexibility, which helps them to secure material availability. This is however an opposite of what JIT requires, i.e. few suppliers and low inventory levels. Holding excess inventory also leads to a low return on investment (ROI) since inventories are the tangible assets of a company (Chen, 2007).

Cohen & Lee (1988) came up with a model for linking decisions and performance throughout the supply chain i.e. through material control, production and distribution. By this they wanted to show the impact different material and management strategies have on performance. They viewed each part of the supply chain separately and therefore introduced different sub-models: material control sub-model, production sub-model, stockpile inventory sub-model, and distribution sub-model. They also show how

these models are connected and say that the performance of a company is dependent on the overall model. Since the material control is of most interest for this report the material control sub-model will be looked on in more details than the others.

Cohen & Lee (1988) state that in the material control sub-model, safety stocks of materials are necessary to prevent material shortage, which can lead to production delays. This is because of uncertainties in production and distribution. Even though the demand for finished goods and bill of material for each product are known the material requirements cannot be predicted 100% correctly in time. To simulate this, they used the model for material control that results in service/availability levels for all raw materials used in the production by determining order policies for all the materials. Cohen & Lee (1988) emphasize how important these service/availability levels are because they affect the production lead times, i.e. material shortage can lead to delays in production. According to the authors material shortages can be backordered or the company can get the material from external supplier with shorter lead-times, but in both cases there is a risk of delayed production.

Delayed production affects the service level of finished goods and according to Cohen & Lee (1988) an increase in the service level can decrease distribution cost because the lead-time for replenishing the distribution network becomes smaller. They found that in order to improve the customer service, the inventory in the distribution network needs to be increased or the finished goods availability at the plant needs to be improved. This means that if a company wants to improve customer service but keep the same service level of finished goods, an increase in inventory in the distribution network is needed. On the other hand, if the service level of finished goods is improved the need for an increased inventory in the distribution network is reduced. Therefore, the trade-offs between investments in manufacturing versus distribution must be evaluated (Cohen & Lee, 1988).

By their model, Cohen & Lee (1988) have shown how important improvements in material availability are on customer service, especially in a lean environment where inventories should be kept at minimum.

As shown above material availability is really important in production companies since, obviously, if no material is available there will not be any production. In order to ensure high material availability at point of use companies need to use appropriate planning methods as well as material supply system, depending on the type of the materials. It is also important to take correct actions when material is missing in order to prevent the same problem to happen again. These prerequisites for high material availability as well as preventive activities can be seen in Figure 1 and will be discussed in more details in the following chapters.

2.3 Material planning

To ensure that all parts are available when needed companies need to have good material planning. According to Jonsson & Mattson (2009) production companies get materials, components and semi-finished items from external suppliers and use them as start-up materials for value-adding processes to make end products, which are then shipped to distribution warehouses or directly to customers. These flows, into, within and out of the company, need to be controlled on an operative level. Wilson (1992) further explains the importance to plan the assembly process well since a good assembly process can reduce assembly time, raise quality and reliability, allow greater flexibility, and reduce capital costs. According to Jonsson & Mattson (2009) these activities are carried out within the framework of the overall master production scheduling and are called order planning. Order planning can thus be seen as an execution of plans at the strategic and tactical level of the company. They say that the main task of order planning is to define, for every product, the quantity needed and the point in time when it is needed to satisfy existing requirements. This needs to be done as

efficiently as possible with respect to tied-up capital, delivery service and utilization of resources. Current requirements of materials and capacity need to be considered in relation to supplies of materials and capacity. When only looking at the material perspective of the order planning, it is called material planning (Jonsson & Mattson, 2009).

Das & Bhambri (1994) talk about the material planning as a procurement process i.e. the process of ordering and receiving materials. They say that by redesigning this process, buffers of material between buyers and vendors that were traditionally used to protect themselves for each other's uncertainties can be avoided in order to reduce cost. They further say that improving the supplier relationship and installing quality checks at the supplier's end can also reduce these buffers.

According to Das & Bhambri (1994) the following three decisions must be made in the procurement process:

1. When to release the order (or deliver)?
2. What quantity to order?
3. Which vendor to choose?

Jonsson & Mattson (2009) agree with these decisions, but they do not say anything about the choice of vendor. According to them material planning is all about balancing demand for materials with supply of materials as cost-effectively as possible by answering the following four questions:

1. Which items need to be ordered?
2. How much large quantity needs to be ordered?

3. When do we need to get the items delivered?

4. When do we need to place an order with the supplier or start internal production?

The first question is answered by material planning methods that are in use today. This is done by making proposals for planning new production orders or purchase orders to ensure materials supplies. Existing material planning methods also provide a basis for decisions regarding the other three questions (Jonsson & Mattson, 2009).

According to Jonsson & Mattson (2009) it is important to take decision about the three later questions as early as possible, especially when delivery lead times and throughput times in the company's own workshop are long. Sometimes, however, rescheduling is needed because of changes in demand and different forms of disruptions in material flows that are almost inevitable. If the supply is smaller than the demand, new production orders or purchasing orders need to be planned (Jonsson & Mattson, 2009). If, on the other hand, the supply is larger than the demand already planned orders need to be postponed or the demand influenced by e.g. sales campaigns. This needs to be done because otherwise large stocks will evolve if the supply is larger than the demand or a shortage situation if the supply is smaller than the demand. If, in the long run, there are imbalance between supply and demand the surplus stock needs to be sold at a discount prices or the company loses sales and customers (Jonsson & Mattson, 2009).

The supply of material consists of stock balance according to stock accounts and of information about purchase and production orders planned to be delivered, while the demand consist of forecasts, exploded requirements, customer allocation and allocation for production orders (Jonsson & Mattson, 2009). These types of demand differ in certainty and reliability, where forecasts are the least certain and reliable and allocation the most certain since the later are based on customers' decision or internal planning. Because of this, customer allocations are used for products in stock in near future, while

forecasts are used further in the future (Jonsson & Mattson, 2009).

The balance between supply and demand has both a quantity dimension and a time dimension, which means that the supplies must not only be in a right quantity but also be available at the points in time when the demand arises. According to Jonsson & Mattson (2009) the time aspect is a much larger challenge than balancing the quantities; if a delivery is too late a shortage situation may occur with production disruptions and poor delivery service to customers, but if it is too early an unnecessary capital is tied up in the form of stock. It is therefore very important to plan the material to deliver as close in time to the demand as possible (Jonsson & Mattson, 2009). Synchronization is also a challenge because items are most often interdependent and therefore need to be planned in a holistic way (Jonsson & Mattson, 2009). This is the case for assembly where several incorporate items are required simultaneously and for a customer order with several order lines. When requirements change or some disruptions in material flow on the supply side occur, synchronization is restored if possible through rescheduling. It is, however, not always possible in practice. The stock that arises as a result of incomplete synchronization is called control stock (Jonsson & Mattson, 2009). This incomplete synchronization can be a result of functional drawbacks in material planning methods used, difficulties in completely predicting changes in demand and not making changes quickly enough as disruptions occur, or it can be deliberately created. There are many reasons for why to deliberately create incomplete synchronization, e.g. to co-ordinate deliveries of different items from the same supplier (Jonsson & Mattson, 2009). Then the delivery times for different items are chosen to coincide, even though the demand times do not coincide. The general rule is to let the item that needs to be delivered earliest define the delivery time.

When planning the material based on the demand, it is important to understand the division of demand into independent and dependent types (Jonsson & Mattson, 2009). Independent demand is when the demand for a product has no relation to the demand

for other products, e.g. products stocked for delivery to customers (Jonsson & Mattson, 2009). On the other hand, dependent demand is when the demand for a product relies on the demand for another product, e.g. items that are a part of start-up materials. The dependent demand can therefore be calculated from the demand for the parent item instead of being forecasted (Jonsson & Mattson, 2009).

Material planning can be either of a pull or push type (Jonsson & Mattson, 2009). If materials movement only takes place on the initiative of the consuming unit in a form of an order it is of a pull type. On the other hand, if the consuming unit does not initiate a materials movement, but it is initiated by the supplying unit itself or by a central planning unit in the form of plans, the material planning is of a push type. Most material planning methods can be used for both a pull and a push type of planning, i.e. orders can be made either by orders from the consuming unit (pull) or to produce to stock (push) (Jonsson & Mattson, 2009).

2.4.1 Material planning methods

Different material planning methods are used in order to gain the balance between supply and demand and as synchronized material flow as possible. Das & Bhambri (1994) divide the material planning methods into three categories; demand based methods, reorder methods, and JIT/Kanban methods. With demand based method each material is ordered solely in a required quantity (when there is a demand for it), thus no order lot size is used. One of the demand based methods that is used to identify the requirements is Material Requirement Planning (MRP). In reorder methods material is ordered when the stock goes below a predefined level. The order quantity in reorder methods is predetermined, usually by using Economic Order Quantity (EOQ) methods. With JIT/Kanban methods the supplier is linked to the demand centre for each material by a fixed number of Kanban cards, and orders are released when the quantity on the Kanban card is depleted. Different material planning methods differ in characteristics and are suitable in different planning environments, but they all answer the time questions, i.e.

when to order and when delivery will take place. One goal with all of these methods is, according to Das & Bhambri (1994), to ensure that production is not disrupted, and that the associated inventory costs are minimized.

2.4.2Re-order point systems

According to Jonsson & Mattson (2009) Re-order point system is a system that compares the stock on hand with a reference volume (re-order point). When the stock on hand is lower than the reference volume an order is made, but otherwise not. The order quantity and the re-order point are a constant and are equal to the expected consumption during lead-time for replenishment plus a safety stock to protect against unpredictable variations in demand. According to Jonsson & Mattson (2009) Kanban systems are an example of one variant of the re-order point system. To be able to apply this method information about consumption, stock volume and the re-order point is necessary.

According to Jonsson & Mattson (2009) two types of re-order point systems exist depending on when the comparison between the re-order point and the stock on hand takes place: continuous review system and periodic review system. The continuous review system makes the comparison after every stock transaction, while the periodic review system makes the comparison at given interval, e.g. weekly or daily. There are pros and cons with both methods, some of them can be seen in Table 1

Table 2.1: Continuous review systems vs. periodic review systems

Continuous review system		Periodic review system	
Pros	**Cons**	**Pros**	**Cons**

Orders initiated directly when stock falls below the re-order point	New orders need to be planned per item	Planning can be carried out for a large number of items together, making administration more efficient	A larger safety stock is required because half the review interval becomes part of the uncertain time
Quick and flexible in initiating new material flows in supply chains	Work takes place more frequently and sporadically		
Planning is based on time of consumption rather than time of review			

2.4.3 Periodic ordering systems

Opposite to the re-order point system with a constant order quantity and varying ordering intervals, the periodic ordering systems has a constant ordering intervals with the order quantity varying (Jonsson & Mattson, 2009). The quantity depends on an order-up-to level, which is predefined. This is very beneficial when a number of items are ordered from the same supplier since the total ordering costs and transportation costs can then be reduced (Jonsson & Mattson, 2009). With reduced ordering cost and

transportation cost orders can be made more frequently, which in turn decreases tied-up capital and increases flexibility. According to Jonsson & Mattson (2009) the order-up-to level is equal to the expected usage during the lead-time and the replenishment time plus a safety stock. The difference between the order-up-to level and stock on hand is then the order quantity. The replenishment frequency is fixed and is chosen so that the order quantity on average is as close to economic order quantity as possible. In order to use the periodic ordering system, information about stock on hand and demand from usage statistics, forecasts or requirement calculations is needed as well as the length of the re-ordering interval (Jonsson & Mattson, 2009).

2.4.4Run-out time planning

According to Jonsson & Mattson (2009) the requirements can also be expressed in period of time instead of quantity, which is the case in the run-out time planning method. This method calculates how long the stock on hand plus scheduled receipts is expected to last, by dividing it by expected demand per time unit. Same information about expected demand is required as for the re-order point method based on usage statistics, forecasts or aggregated gross requirements through explosions of the master production schedule. A safety lead-time is used to protect against uncertainty in variations in demand during the replenishment lead-time (Jonsson & Mattson, 2009). The safety lead-time multiplied by demand per time unit equals the safety stock used in the re-order point system. The principle in the run-out time planning method is to order if the run-out time is less than the safety lead time plus the replenishment lead-time (Jonsson & Mattson, 2009).

As with the re-order point method, run-out time planning can be transaction oriented or periodic. When it is transaction oriented then the comparison is made when stock transaction takes place, while when it is periodic the comparison is made on a fixed time interval. The pros and cons with those two alternatives are the same as for the re-order

point method and can be seen in Table 1.

2.5 Material requirements planning (MRP)

According to Brennan, et al. (1994) the material requirements planning method is a set of procedures that transform the demand of a certain product into a schedule of components, subcomponents, and raw materials in order to produce the product. Jacobs, et al. (2011) describe this even easier by saying that the main objective of MRP is to provide “the right part at the right time” so that schedules for completed products are met. As Jonsson & Mattson (2009) state, this is done by calculating when requirements for each material arise, i.e. when the calculated stock becomes negative and estimating deliveries for that time. It means that no order is scheduled for delivery until there is a net requirement. The time to release an order is calculated as the delivery time minus lead-time for the order. If a conflict arises between manufacturing jobs, the order release function decides which jobs are released to the shop-floor and which need to wait for more material to arrive (Chen, 2007).

According to Jonsson & Mattson (2009) MRP is primarily designed for items with dependent demand and it uses the bills of materials (BOM) to find out which components need to be replenished and when. According to Jacobs, et al. (2011) MRP also requires information about the inventory status. The master production schedule (MPS) is the basis for MRP, it states when and in what quantities the end products are going to be delivered. The BOM file in the Enterprise resource planning (ERP) system then breaks the requirements down to when and in what quantities each component is needed. According to Jacobs, et al. (2011) this is a key element in MRP, i.e. the gross to net explosion. Only the product itself, with independent demand, needs to be forecasted. The requirements for all components, with dependent demand, are calculated using BOM. They also state that this can remove uncertainty from the requirement calculations. This gross to net explosion, however, only tells us what is needed, but not

when it is needed. Each item's lead time is also important in order to know when the orders need to be placed in order to get the deliveries on time. Jacobs, et al. (2011) emphasize how important it is to use back scheduling instead of forward scheduling so that unnecessary WIP inventory will not be formed. According to Jonsson & Mattson (2009) this is one of the major strengths with MRP, i.e. its capability to synchronize the flow of materials at times when manufacturing orders for higher level items are planned to start. Jacobs, et al. (2011) agree on that saying that, the combination of back scheduling and gross to net explosion is the heart of MRP.

Guide & Srivastava (2000) state that even though, in theory, the use of MRP should avoid buffers, in reality, uncertainties exist in production systems, e.g. in forecasts and delivery times, and buffers are used to protect against these uncertainties. These buffers can be either in the form of safety stock or safety lead time. Safety stock is, according to Jacobs, et al. (2011: 197), "*a buffer of stock above and beyond that needed to satisfy the gross requirements"* and when used in MRP, the safety stock is subtracted from the stock on hand before the MRP calculations start. Safety lead time is, according to Jacobs, et al. (2011: 197) "a procedure whereby shop orders or purchase orders are released and scheduled to arrive one or more periods before necessary to satisfy the gross requirements" and when used in MRP, the safety lead time is subtracted from the net requirements and set as a delivery time for the planned order. A safety stock is used when there are uncertainties in quantities (scrap, spare part demand, or other unplanned usage) but a safety lead time is used when there are uncertainties in timing, like e.g. the delivery time from the supplier.

As mentioned above, the information needed for material requirements planning is gained from the master production schedule, BOM, stock on hand, lot sizing methods and lead times (Jonsson & Mattson, 2009). The parameters that also need to be defined are the length of time periods used, the length of the planning horizon, the planning frequency, different types of orders, handling of rescheduling and planning time fences.

Like with the other methods, MRP can be grouped per day, week or any other time period, or it can be run for each stock transaction (Jonsson & Mattson, 2009). Shorter planning periods are preferred when making detailed plan for the short term, while longer time periods can be accepted closer to the planning horizon when information is to a large extent based on forecasts. The lead time along the critical path, i.e. the longest accumulated time for manufacturing and purchasing of all items included in the end product, defines the planning horizon; it must be at least as long as this critical path (Jonsson & Mattson, 2009). If the planning horizon is shorter than the critical path, the planning for some items at the lowest product structure will not be sufficient, i.e. it will not be planned sufficiently early which can have the consequences that problems arise in fulfilling the master production schedule. The frequency of material requirements planning differs between companies but it is most common to run the planning daily, while some companies run it weekly or at every transaction. Planned orders then cover the time from the present to the planning horizon (Jonsson & Mattson, 2009).

According to Jacobs, et al. (2011) the MRP processing can be in the form of either regeneration, where all part number records are completely reconstructed each time the records are processed, or the net change approach, where only those items that are affected by the new or changed information are reprocessed. Regeneration can generate very large processing demands on the system, while with the net change approach the computer time can be reduced enough to make daily or even real-time processing. With an increased computer cost the regeneration can be done more frequently with fewer unpleasant surprises.

According to Jonsson & Mattson (2009), planning time fences are used in MRP in order to minimize the cost associated with rescheduling since the consequences of rescheduling are more serious in near future than further away in time. Rescheduling may not only affect the product in focus, but also other products since items can be used in more than one products. The first planning time fence is the release time fence, which is equal to

the throughput time of an order in the workshop (Jonsson & Mattson, 2009). Orders placed until the release time fence are frozen and rescheduling is not allowed. The planning time fence refers to the throughput time in the workshop plus the time from an order placement until delivery of materials. This period is half-frozen since rescheduling might cause problems because purchasing has already been made and capacity must be allocated in the workshop (Jonsson & Mattson, 2009). However, manufacturing orders have not been released so the consequences of rescheduling are not as serious as in the frozen period. The period after the planning time fence is a floating period which means that automatic rescheduling by the ERP system are allowed (Jonsson & Mattson, 2009).

2.5.1 Constraint-based material requirements planning

In order to not only consider the demand but also the supply, e.g. late deliveries from suppliers due to lack of capacity, constraint-based material requirements planning is used. According to Jonsson & Mattson (2009) the constraint-based material requirements planning can be looked at as a second generation of the MRP method and it uses the theory of constraints (TOC) as a basis. It means that all manufacturing orders are planned within available capacity. The traditional MRP only synchronizes the flow of materials with the demand and assumes infinite capacity, while constraint-based material requirements planning method synchronizes the material flow with both the demand side and the supply side (Jonsson & Mattson, 2009). By this capacity can be freed up for other higher priority manufacturing orders and tied-up capital can be reduced by avoiding too early deliveries.

Constraint-based material requirement planning needs information, according to Jonsson & Mattson (2009), from the master production schedules, BOM, stock on hand, lot sizing methods and lead times as well as routing information and work centre information like available capacity. They also state that when using constraint-based

material requirements planning, some kind of advanced planning and scheduling (APS) system, either parallel or integrated with an ERP system, is necessary. It is important to plan all workstations in front of the bottleneck station[1] according to the bottleneck's capacity because otherwise a lot of work-in-process will be stocked in front of the bottleneck since the bottleneck´s capacity limits the material flow. To do this a backward scheduling must be used from the requirements times in a bottleneck work stations, i.e. the last operation before the bottleneck is planned first according to when the items are needed at the bottleneck station to avoid shortages, then the preceding operation is planned and so on (Jonsson & Mattson, 2009). By doing this no operation starts until it is needed. Forward scheduling must then be used for work station after the bottleneck, i.e. first station after the bottleneck is planned first and as soon as possible, and then the following station is planned and so on. This is important since the bottlenecks limit the output from the system (Jonsson & Mattson, 2009).

2.5.2: Comparison of material planning methods

The methods mentioned above all have the same mission; to plan the material requirements. However, they are different in characteristics and it differs which method is best suited depending on the environment. According to Das & Bhambri (1994) in most cases a combination of material planning methods is used since materials vary greatly in size, cost, usage volume, etc. A buyer needs to decide which method to use and whether to use the same method for all materials or separately select a method for each material (Das & Bhambri, 1994). The overall objective of the procurement process is, according to Das & Bhambri (1994), to minimize the buyer's cost.

2.5.3: Material supply system

In a production company there is a need for a material supply system (MSS), which is used to deliver the components that are needed for the production to the destination where they are needed (Finnsgård, et al., 2011a). Finnsgård, et al. (2011b) also confirm this as well as extending the purpose of a MSS by saying that it has to both support the assembly system by supplying it with the components needed as well as maintaining and improving its efficiency. Supplying parts to the assembler is, according to Baudin (2002), the most important thing in order to secure the productivity of the assembly operation. Finnsgård (2009) describes this by saying that the MSS and the assembly system are connected at the workstation (the point of use) where materials are supplied by the MSS and are then assembled by the assemblers. Johansson & Johansson (2006) extend the definition of MSS as the system that supplies materials all the way from the suppliers to the buyers through the production company. They designed a model for MSS that is in four levels: supply chain, plant, sub-unit and utility, and which looks into six different areas: materials feeding, storage, transportation, handling, packaging, and manufacturing planning and control. Even though the authors are describing the MSS on an overall level they do believe that it is also relevant for in plant material supply. Table 4 combines all the design areas and levels as well as the design issues that were found in the research by Johansson & Johansson (2006).

The supply chain level has the material flows between companies in focus. The plant level has then the material flows within the company as a focus; storage location, internal transportation, capacity etc. The sub-unit level focuses the material flows to and from the subunits, which can be a single work station or a group of work stations. Finally, the utility level has its focus on the detailed design issues like the type of equipment and packaging.

Material feeding design area is about choosing the method that fits the company best to feed the material to an assembly station or the company (Johansson & Johansson, 2006). Examples of that are kitting, batching, sequential, and continuous supply. Storage is about where and how the materials are to be stored, this involves all inventory (raw material, work in process etc.). Transportation is both handling the internal transportation as well as external (Johansson & Johansson, 2006). Handling is how and where the company chooses to handle the material, like how to package materials. Packaging, on the other hand, is about the packaging itself (Johansson & Johansson, 2006). Manufacturing and control is then about choosing the right method of manufacturing planning and control, if the company chooses push or pull systems, in what volume the products are produced, how often they are produced etc. (Johansson & Johansson, 2006).

According to Finnsgård (2009), planning and control is the most important in MSS processes and assembly processes. This means that it is important to have a good planning and control to be able to secure a correct flow between the MSS and the assembly processes. This is especially true when the production includes complex products with many different variants (Finnsgård, 2009).

Materials supply system is not only about delivering the material to the assembly station but also to do it in the condition that is the best fit for the assembly (Hanson, 2009). It should also be transported in a safe way so it will not be damaged, which makes the packaging and handling very important in order to be able to protect the parts to the fullest. This is not done in the same way for every part since not all parts have the same characteristics, which means that companies may have many different procedures to deliver and package the parts within the factory (Hanson, 2009).

The material supply system is then connected to the assembly system by material exposure (Finnsgård, 2009). The reason for this is that when material is exposed at the assembly station all work needed to be done by the material supply system is over and therefore the component has left the system and is then ready to be used by the assembly system (Finnsgård, 2009).

2.6.: Causes of shortage of materials

Six causes of shortage of materials were identified. They are summarised in the following subsections.

2.6.1: Origin or availability of materials.

Only very few construction materials are locally available in Brunei, so it relies on imported materials in general. The only available materials locally are: ordinary Portland cement, sand, aggregates, timber, bricks and glass. However, their local supplies cannot wholly meet the demand of the local construction industry. Therefore, these materials, along with other construction materials, are imported to meet the demand, mainly from China, Indonesia and Malaysia. This takes longer time for sourcing, procuring and transporting of the materials. Moreover, land transport is the only delivery method available within Brunei that results in to a long lead time

for materials. With higher demand of materials, for example during the construction of national housing projects, which involve the construction of hundreds or thousands of houses, local suppliers experience shortages of their stock. On the other hand, locally available materials may also encounter shortage in production. For example, one of the Brunei industrial areas had suffered power failure for several days a few years back, resulting in to temporary stoppage of cement production and the factory ran out of stock. During the times of higher demand (i.e. increased number of ongoing projects), Brunei also suffers from shortage of bricks at times and contractors need to import bricks from neighbouring provinces of Malaysia. Moreover, local authority limits timber logging to only 17% by the year 2045, although 75% of Brunei is covered with forest [14]. This may cause shortage in timber supply and Brunei may need to import it from neighbouring countries to cater for current needs.

2.6.2: Poor estimation of materials quantity.

Poor estimation causes either shortage of supply or oversupply. Shortage of supply disrupts construction progress on site, as reordering can cause prolonged delay and additional costs, especially if the material needs to be imported from overseas. Reordering might cause other problems too, such as inconsistency in colour and size tolerance. On the other hand, oversupply incurs additional costs / losses to contractor.

2.6.3: Poor workmanship.

This occurs due to lack of care by the contractor while installing the material (e.g. imported fittings and fixtures, and modular parts), resulting in poor finishing and the product (i.e. material) being non-functional. Similar to Brunei, rework of bad quality performance was found to be one of the most significant factor causing project

delays in India [16]. However, the problems in Brunei come from contractors' installers, by not installing the product in the proper way (i.e. according to the instructions of suppliers), as they want to complete the work faster. Some materials need certain techniques to install, but some contractors ignore these and use their own way to complete the job faster. When problems arise, such as cracking or malfunction, an investigation by the supplier then takes place. The outcomes of the investigation decide whether the supplier should replace the materials or the contractor needs to compensate for the losses. In either case, such problems delay the project activities as the investigation process first needs to be done, followed by negotiations (between the contractor and the supplier), and the ordering of new product results in more waiting time.

2.6.4: Quality of material.

The quality of materials can delay their usage on site if the materials do not meet the standard or contain defects. The defect can be due to improper handling during packaging, shipment or delivery. This was also observed in a study in Iran [17]. Some materials may have minor defects that can be repaired, but some materials may have major defects that cannot be repaired and therefore cannot be used at all, e.g. broken sanitary appliances. This happened with one of the interviewed companies, when they ordered a manufactured door from Malaysia. The procurement/ordering process was made online, where the items were viewed through the manufacturer's website, and appeared to be nice products with good quality. However, when the doors arrived on site, they were found to be of poor quality with holes throughout the door panel, possibly due to insects or termites. The interviewed company made a report to the supplier within three days of receiving the doors, with proof of defect, to arrange for compensation. This consumed more time due to the need to wait for the new doors to arrive. If it is already the time to install the door, then there is no choice other than to wait for the next delivery.

2.6.4: Inconsistent demand.

Inconsistent demand occurs when the sales of a material or product do not depend on the demand of the local market. Paint is one such material. It is hard to know which colour is saleable, because sometimes clients look for a certain colour of paint that is not in stock at that time. If the quantity/volume required by the client is large and the local distributor is also without stock, the material needs to be imported from overseas, usually from Singapore. The manufacturer starts producing the paint once they receive the order, and it normally takes one month to arrive in Brunei. But by the time the ordered colour is available, some different colour that is unavailable is then demanded by the client. Therefore, the paint of unwanted colourist kept in stock. However, once there is demand, the paint will be sold out quickly and a new order then has to be made. This seems to be a unique problem to Brunei, probably due to smaller volume of its construction industry.

2.6.4 Special materials.

An example of such materials is special appliances, fittings and lightings that are used in buildings that have differential needs, e.g. prison, hospital or for diplomatic offices. One of the interviewees is the sole distributor of specialised and sophisticated lighting appliances in Brunei. Therefore, they should ensure the availability of this material to cater the local demand. However, the technology of such appliances change very fast, so they cannot take the risk of keeping a large stock due to the fear that they cannot sell those after a few months. Therefore, they only order the products when demanded by certain projects. Moreover, this special material/ appliance is imported from all over the world, as the factories of these lighting appliances are in places as diverse as Hungary, Holland, China, Thailand and Malaysia. Each factory produces only certain kind of appliances. Therefore, there involves very long lead times. If orders are not placed sufficiently long before by certain projects, delay in supply is likely to occur, which then leads to project delay.

In this regard, Seboru [18] observed that the nature of demand for materials is both project specific and client specific.

2.8 Theoretical Framework

According to Swartz and Orgill (2000), a conceptual framework is a visual or written depiction of how certain traits or qualities that you want to examine should be related to one another. It is "connected to the ideas, actual findings, and significant theories employed in advancing and organizing the understanding advocated by the study." Pushkin (1993), page 23,

2.8.1 Material Forecasting Models

Forecasting model is designed to aid in forecasting particular events. The forecast model is designed around factors that are believed to be important influences on the future use of a material (Abraham, Bovas (1983). The past consumption of a material can be used to determine its future use. Both of these methods produce reliable forecast. A number of forecast models are available in the forecasting functionality.

2.8.2 Constant Model

A constant model assumes that the use of a material is constant. Being constant doesn’t mean that the use of material is the same each month, but rather than that variation in material usage fluctuates a little, and a constant mean value can be calculated (Angrist, Joshua D (2009). This forecast model can apply, for example to electricity consumption in an office. Although summer months raise electricity consumption due to increased air conditioning use, consumption doesn’t vary a great deal from the mean vary over a longer period of time, such as a year.

2.8.3 Trend Model

A trend model is used when an identifiable increase or decrease of material exists over a period of time. The trend may include areas of movement away from the trend.

But the overall movement follows the trend (Armstrong, J. Scott (2001). For example, a downward trend over time may represent the use of printer cartridge of top-selling printers that become obsolete over a short period of time, perhaps only 12 to18 months. As the purchase and use of the printer becomes decreases, the cartridges used in that printer will also decrease.

2.8.4 Seasonal Model

The seasonal model affects many businesses due to the weather, holidays or vacations. A seasonal model is defined as a pattern that repeats for each period of time (Anderson, Eric T (2006). For example, the annual seasonal pattern has a cycle that is 12 periods long, if the periods long, if the periods are months. A seasonal model may be applicable to a company that makes patio furniture, which experiences greater demand from May through September, and this pattern is repeated each year.

2.8.5 Seasonal trend Model

The seasonal trend model is similar to the seasonal model, expect that instead of the same pattern occurring each period, the pattern is moving further away from the, mean value, either positive or negative (Gavan J (2006). For example, California sparkling wine manufacturers can see a positive trend, as sales have continued to rise. A negative seasonal market, but the overall trend continues to be negative as sales slow each year.

Factors affecting materials availability

The design of the material supply system can be greatly affected, according to Hanson (2009), by the physical characteristics of the components. Characteristics like the shape, weight, size and sensitivity to damage need to be considered. This is because these characteristics can control what unit load is chosen to be used for the handling which then has an effect on what equipment is used (Hanson, 2009). This can be a choice between large equipment and a smaller one. For example, smaller

equipment's are more fitted for milk run deliveries while larger units need larger equipment's. Another thing Hanson (2009) mentions that affects the material supply system is how many different product variants the production company has as well as how many variants each product has. If a company has many different products it will include many part variants, this has the effect that the company needs to keep a lot of inventory (because of the wide variety of products) and the material handling will be increased (Hanson, 2009).

2.9 EMPIRICAL LITERATURE REVIEW

Empirical evidence is the way of gaining knowledge by means of direct and indirect experience or study of past research. It is done for the purpose to link and review the study with past research that has been conducted (Merriam, 2014). It can also be done for the purpose of acquiring knowledge and getting in depth knowledge about relating literature.

2.9.1: Ahmad Zeb et.al. (2017) Study

Conducted various field visits in order to collect data regarding a bridge project, and it was gathered from inventory books and physical stock verification. After which the ABC analysis was done using MS excel using following steps (1) collect items details with their unit prices. (2) Find the total value to the item in the project by the product of expected units required and unit price. (3) Arrange the items in descending order of their values. (4) And then classified according to ABC - A (highest value), B (Moderate Value), C (Lowest value). FOR THE DETAILED analysis S curve analysis was done of cement, in which planned cost of the material procurement was compared with actual cost. According to the study, cement and steel is categorized in Class A, Aggregates are in Class B and stones are in Class C.

2.9.2: Madhavi et.al. (2013) Study

Conducted a thorough case study, surveys, and interviews with professionals working in this field. The biggest issue with materials procurement is connected to project schedule delays and a lack of stipulated quality. Following some study, they implemented in the future several inventory control techniques such as Always Better Control (ABC) analysis and the First in First Out (FIFO) Method at various workplaces. They also stated that utilizing the ABC analysis lowered the material cost in total and actual cost by 20%, and First in First Out (FIFO) Method employing at work site controlled the costs of contractor quoting the rate, as well as assisting in appropriate release of the finance and preparation of the budget process.

2.9.3: Gulsen et al. (2012) Study

Had been discovered a multiple parameter ABC (Always Better Control) analysis using fuzzy, c-means (FCM) clustering. It is not cost effective to establish an

inventory management strategy for each individual stock keeping unit (SKU). ABC analysis is one of the most often used methods for classifying stock holding units (SKUs). The conventional method ranks stock
keeping units (SKUs) in descending order of annual dollar consumption, which is the product of unit price and annual demand. The few stock keeping units (SKUs) with the greatest yearly dollar usage are in group A and should be examined the most; the stock keeping units (SKUs) with the lowest annual dollar usage are in group C and should be considered the least; and the other stock keeping units (SKUs) are in group B. We suggested fuzzy, c-means (FCM) clustering to a multi-criteria ABC analysis issue in this work to assist managers in making better decisions under fuzzy conditions. The results suggest that the fuzzy, c-means (FCM) approach is a straightforward and adaptive solution for inventory management.

2.9.4: Vikram Kulkarni et.al. (2017) Study

This research is being conducted to overcome the weaknesses left by poor material management on construction sites. Materials account for more than 70% of project costs and, if not handled appropriately, can have an impact on overall project costs. The study examines nine distinct small, big, and medium-sized construction organizations in Maharashtra. The questionnaire survey approach was used to collect data in this study. The questionnaire survey approach was used to collect data in this study. In the Maharashtra area of India, nine organizations (3 small, 3 mediums, and 3 big) were chosen at random for this study. The data received from the questionnaire survey was carefully organized and evaluated. According to the data acquired, there were a few problems in the material management systems of all three types of construction enterprises that affected material management. According to the results of this poll, only major enterprises employ standard protocols and software for material management, thus they have few issues. Medium and small businesses, on the other hand, lag behind in material management because they do not employ software or are unaware of material management procedures. Material management should receive more attention from top management.

2.10: Research Gap

Therefore, the research gap that was identified was that many researchers that have been identified in the literature focused more on finding the alternative strategies to mitigate material unavailability and less focused on studying the impact on material availability. The study therefore focuses on closing this gap by analysing the impacts of e logistics on material availability.

2.11: Summary

The chapter highlighted with a literature, empirical and theoretical view the impacts of e logistics on material availability in health sector. This chapter outlined some other studies and models done by different scholars in relation to impacts of e logistics on material availability in the health sector. The next chapter will look at the methodology of the research.

CHAPTER THREE

3.0 Introduction

Saunder et al (2007) Define research methodology as the choice of research approach to be adopted for the purpose of collection and analysis of data. Research methodology focused on how the researcher carried out the research there is a quantitative and qualitative research methodology, the former referring to the research that generates or uses numerical data whereas the qualitative research methodology uses qualitative data.

3.1 Research Design

A research design, according to Creswell (2013), is a sort of inquiry that uses qualitative, quantitative, and mixed methods techniques and gives precise instructions for research study operations. Johnson & Onwuegbuzie (2004) alluded that, research design refers to the conditions set up for data collection and analysis, and it is further expanded to include the arrangements made for data collection and analysis in a way that tries to balance relevance to the research purpose with economy of procedure in order to produce the best results. Consequently, a research design is a plan for employing empirical data to respond to a certain research subject. The researcher used the descriptive research design for purposes of this study.

3.2 Descriptive Research Design

Descriptive research seeks to systematically and appropriately describe a population, circumstance, or phenomena, Shona McCombes (2022). According to McCombes, “descriptive research design can answer what, where, when and how questions, but not why questions”. This was argued by Grimes and Schulz (2002) who said that, “a good descriptive study must respond to the following pertinent questions: who, what, why, when, where, and the sixth question, so what?” Important reporting elements that are clear, detailed, and measurable are provided by descriptive research designs. The study design uses both qualitative and quantitative data to derive results following data analysis. In order to gather information on the subject at hand, the study design employs observational surveys methodology. This information is then utilized to inform suggestions for particular tactics. According to Kothari (2004), descriptive research designs emphasize on the use of probability sampling designs (random sampling), and in addition, statistical designs call for the use of pre-planned designed for analysis and well-structured instruments for data collection.

3.2.1 Justification of descriptive research design

The study used a descriptive research design, which aims to highlight the existing state of the environment caused by e logistics adoption by painting a picture of the real changes that have taken place. The employment of SAP system as a communication and accounting tool have brought about many unsustainable injuries in the service delivery of the health sector organizations. The research approach can provide different strategies, making it useful for the study of the best ways to adopt the e logistics because the outcomes will benefit both health institutions as a whole rather than just the Parirenyatwa Hospital as single. According to Lodico et al. (2006), it was outlined that descriptive research designs use sample sizes of a large population. Therefore, this has had a greater influence on the researcher's decision to adopt this research design as she is working with a large population in the health sector (Parirenyatwa Hospital) and generalizing findings proves to be both cost-effective and helpful in increasing the availability of materials. Because of the flexibility offered by the research instruments which are questionnaires, and observations, the researcher's method has the capacity to generate vast amounts of data.

3.3 Target Population

A target population is only the group of people you have chosen to investigate or conduct research on, Greenland (2005). Lavrakas (2008) further reinforced the generalization of sample findings to the total population under investigation by stating that the target population is the entire collection of units for which the survey data are to be used to draw conclusions. As a result, the term "target population" refers to a group of people within a larger population that the researcher is interested in studying. The findings from the sample thus represent the entire population because the subjects chosen for the study are thought to share some common characteristics. A Total Population of 40 people has been used

in the research which will be drawn from company employees thus the managing director, managers, marketing executive managers, production manager, warehouse manager, operational workers thus procurement officers, and others.

Table 3.1 Target population

Respondents	**Total**
Parirenyatwa PMU employees	40
Total	**40**

3.4 Sample size

According to Burmeister and Aitken (2012), a research sample is the bare minimum of participants necessary for conducting a qualitative study and responding to a survey. In addition, Boyd (2014) alluded that the sample size is a portion of study samples drawn from the target community, and these people are thought to be typical of the entire population. For the purposes of this research the researcher focused his efforts on management and sectional heads as these individuals have vast experience with the organizational processes and procedures as well as industrial knowledge due to their exposure in previous experiences during the implementation of the e logistics on material availability in their operations.

For the researcher to determine the sample size for this study, the following formula

from Yamane (Israel, 1997) was used;

$$n = \frac{N}{1+N(e)^2}$$

n = sample size

N = research population

e = is the acceptable margin error

Hence, the workings to determine the sample size for the research is as follows;

$$n = \frac{40}{1+40(0.10)^2}$$

$$n = 29.29$$

Therefore, the research sample size is equal to 29 as calculated from the formula.

Of the 40, total number of employee's at Parirenyatwa Hospital the researcher had to work with department heads, management and team leaders and a limited number of employees who were selected based on their qualifications and availability. The researcher selected 29 respondents from the company.

3.5 Sampling

In statistical analysis, sampling is a procedure in which a specific number of observations are taken from a larger population, Oppong (2013). According to Wilson (2010), sampling is a procedure employed in statistical analysis in which a specific number of observations are taken from a large population. Much focus has been placed on choosing study subjects with the intention of providing pertinent data for

the researcher's investigation of the issue at hand.

3.5.1 Sampling Techniques

Convenience sampling, stratified sampling, and judgemental sampling were all used in this study.

Convenience Sampling

Convenience sampling involves choosing individuals who are frequently and easily accessible. When compared to other sample procedures, convenience sampling is typically favoured by many researchers since it is affordable and simple (Ackoff, 1953). Many research difficulties can be solved with the aid of convenience sampling.

Justification of convenience sampling

The researcher used the convenience sampling approach because it suited the organizational working conditions that were the subject of the analysis. Based on their availability and willingness to engage, eight accountants from local government and four accountants from physical planning were chosen to take part in the study. Not only did this save time, but because the individuals gave their time voluntarily to fill out the surveys, biases on the data they provided were decreased.

Stratified Sampling

In stratified sampling, a random sample is drawn from each subgroup after the population has been divided into strata (or subgroups). A subgroup is a natural collection of things. Subgroups may be created depending on factors like company size, gender, or occupation. In situations when there is a lot of variance within a population, stratified sampling is frequently used. Its goal is to guarantee that each stratum is fairly represented (Ackoff, 1953).

The researcher stratified workers at the Parirenyatwa Hospital, Procurement Department by classifying their areas of employment. The questionnaire was distributed to the employees in order for them to respond to the researcher's questions based on their availability and willingness to engage in the research exercise.

Justification of stratified sampling

This technique was used because it increases the likelihood that the stratum or population will be represented, resulting in accurate data that can be extrapolated to other strata.

Judgmental sampling

Choosing specific locations, people, or events on purpose in order to provide important data that cannot be learned from other options is known as judging or purposeful sampling (Maxwell, 1996). When a researcher feels that certain cases or volunteers should be included in the sample, they will include them. In general, judgmental sampling is a non-probability sampling technique that can be used to choose research subjects based on the researcher's expertise and knowledge of the subjects needed to provide information; as a result, it is based on the researcher's capacity to identify research subjects that are pertinent.

Justification of judgemental sampling

The researcher used this sample strategy based on the argument of the participants' competence and job experience in the workplace. The researcher chose participants who had a longer history of service to the organization and were thought to be more knowledgeable about facts relevant to the research study.

3.6 Sources of data

Data, according to Abawi (2013), is information that a researcher has collected during a research project but has not yet analysed in order to change into relevant information. There are two types of data sources: primary data and secondary data. Depending on the research objective and the context, data may be either qualitative or quantitative.

3.6.1 Primary data

According to Douglas (2015), "primary data" refers to information that was acquired directly by the researcher. When necessary information is not discovered in published sources that is secondary data, primary data is collected, asserts Currie (2005). The three most popular approaches for gathering primary data are surveys, interviews, and observational studies. Due to the fact that it is information that has been collected from research participants using a variety of data collecting procedures, qualitative data is largely considered to be primary data.

The information is described as qualitative since it is a result of the respondent's individual beliefs, values, and attitudes on the topic of the interview. Qualitative data is information that is offered by a research subject being interviewed (Gill et. al, 2010). The validity and reliability of qualitative data are stated to be high and low, respectively. The researcher used surveys and in-person interviews to gather primary data from the target population.

3.6.2 Secondary data

Secondary data is information that has been gathered in the past for various purposes. It can be found in the organization in various formats, including written, printed, electronic, and public or unpublished confidential papers. Secondary data, according to Currie (2005), is data that have already been gathered for purposes

other than one at hand and can be easily and less expensively located. The attributes of secondary data have been linked to lower researcher involvement, data gathering for other issues, a quick and simple collection process, and ultimately, relatively inexpensive collection costs.

Quantitative data has been examined and analysed using psychometric procedures or when the findings of a large-scale survey have been analysed, according to Currie's classification of secondary data in 2005. Quantitative data, in comparison to qualitative data, tend to have high dependability but poor validity.

The researcher had to obtain secondary data from the company's website and corporate records, and the process required the researcher to sign a paper promising not to disclose that specific data to anybody else for any reason other than those directly linked to the study.

3.7 Research Instrument

3.7.1 Questionnaire

According to Krueger's definition of 2000, a questionnaire is a tool used mostly in normative surveys for data collecting. This is a systematically created form or document with questions that are intended to elicit replies from participants in the research or respondents in order to gather data or information. There are two categories of questionnaires: structured questionnaires and unstructured questionnaires. A structured questionnaire has questions that are predetermined and created in advance, but an unstructured questionnaire acts as a guide, particularly during interviews, and allows the researcher to seek for clarification on other responses given.

The researcher chose to employ a structured questionnaire with closed-ended questions for the study's objectives. The closed-ended questions take the form of

Likert scales, which have predetermined answers that participants are expected to select from the provided options. With the exception of a few open-ended questions, the researcher primarily used closed-ended questions that offer no opportunity for interaction with the respondents. The department's internal divisions were surveyed using the questionnaire to collect information.

Justification of Questionnaire to research study

For the purposes of this study, a questionnaire was utilized because it has long been recognized as the best method for gathering qualitative information from the research population. The questionnaire gives respondents the opportunity to assess the disputed areas without the researcher or interviewer's or interviewee's input. According to Travers (2001), surveys give respondents the option of anonymity, which enables respondents to respond honestly to inquiries that are too delicate in nature.

3.8 Reliability of Data

According to Joppe (2002) and Williams (2007), data reliability implies that if the same study methodology is consistently employed in the same setting, the same results can be obtained. According to Howard (2008), reliability is the degree to which a questionnaire will yield the same result if administered once more or using the test-retest concept. This definition is in agreement with the one given above. Validity examines the closest approximation to a proposition's truth or untruth. If the information is dependable for that particular research study, the researcher can ensure dependability as determined by Smith et al. (2008) by posing the measure will generate the same result that were created by past investigations.

The researcher employed uniform questions for management and every employee who took part in the research study to ensure the validity of the research

instruments. In order to guarantee a high response rate and accuracy, the research made sure that all the information required for the study was clearly described. Rudd (2005) states that the dependability rate ranges from 60% to 80%. To guarantee clarity, the researcher conducted a pre-test with participants who were not a part of the research sample, asking them to respond to questions from the research instrument and looking for discrepancies with the instrument.

3.9 Validity

According to Joppe (2002), the validity of a study is determined by looking at how accurate the results are as well as whether the expected results are actually produced by the research. According to Howard (2008), questionnaire validity gauges how accurately a questionnaire captures reality. According to Byram et al. (2013), validity is the degree to which a test is purported to test what it is supposed to test, and it can be divided into two categories: external validity and internal validity. The ability of a study tool to measure what it is intended to measure is known as internal validity, whereas external validity focuses on generalizability. Since the personnel that were employed in the study were from the same organization, the average validity was given.

The researcher conducted a pilot test of the questionnaires to evaluate responses in order to increase validity. To ensure that the validity of the research has been considered from all angles, the researcher employed a large percentage of closed-ended questions as opposed to open-ended ones. Additionally, Johnson and Christensen (2014) defined close-ended questions as those that require responders to select from a list of pre-suggested solutions. In order to eliminate unrelated responses, closed-ended questions were used.

3.10 Ethical considerations

Ethics are "a moral philosophy or system of morality practiced by a person or group of people". Certain set of ethical principles guide the scientific activity of research. "Research ethics is vital in our everyday research endeavours and mandates that researchers should uphold the dignity of their subjects and accurately disseminate the information that is gathered" (Fouka & Mantzorou, 2011). Scientific integrity, informed consent, anonymity and secrecy are the primary ethical issues in research. The next subsections go into great detail about these issues.

3.10.1 Informed Consent

According to the definition of informed consent by Burns & Grove (1993), this is "the prospective subject's voluntary assent to engage in a study, which is achieved following consolidation of essential information regarding the study". A management-level and individual-level request for participation in the study was made from the organization. The study's goal and the procedures for handling the data the subjects provided were explained to them.

3.10.2 Anonymity and Confidentiality

Anonymity and confidentiality was observed during data gathering. "Subjects are considered anonymous when even the researcher is unable to link them to their specific responses" (Burns & Grove, 1993). In order to safeguard them, respondents were requested not to write their names down on the scripts. During questionnaires, anonymity was also maintained; comments were not recorded in relation to specific people. Data was securely stored to maintain confidentiality, and names of individuals and organizations were not revealed when reporting findings.

3.10.3 Scientific honesty

Scientific honesty is necessary for the results and conclusions of a study to accurately reflect the topics being investigated. As knowledge and truth-seeking are the main objectives of research, ethical standards discourage the fabrication or falsification of data (Sclafani, 2018). Dishonesty, in the words of Brink (1996), "involves the retention or manipulation of data, as well as the manipulation of design and methodology." The results acquired are valid because the researcher did not in any way tamper with the findings.

3.11 Data presentation and analysis

Data analysis is typically thought of as a method via which researchers look for significance. It is well known that researchers use their intellectual ability to try to interpret and make sense of quantitative data or raw data gathered from research samples (Hatch, 2002). The Centre for Teaching, Research, and Learning described analysis as the method by which researchers organize and question data to find patterns, themes, and links as well as to come up with explanations, present critiques, and construct theories. The process, according to the researcher, entails synthesis, assessment, interpretation, categorisation, speculating, contrasting, and pattern-finding.

Thematic analysis is a technique for locating, examining, and summarising patterns in data (Braun & Clarke 2006, p.79). The practise of "encoding qualitative information" is how Boyatzis (2008) defines thematic analysis. Then, themes are used to organise the data that has been coded. One might focus from the broad to identifying themes and patterns in the data using thematic analysis. Thematic analysis was used in this study to examine the data. After the questionnaires were completed, the researcher went through all the transcripts and classified some of the responses using pre-established codes while also creating new codes as they

went through the responses. Each set of questionnaire responses from the same departmental section was analysed separately. After analysis, the codes were compiled into themes. During the analysis stage, the researcher used a computer in storing, retrieving and for the further process of the data analysis using Microsoft office suit applications such as Microsoft Word and Excel.

3.12 Chapter summary

This chapter provided information on the technique the researcher employed to collect data. The techniques and resources that were employed were also justified. The information gathered using the methods mentioned above will serve as the foundation for the next chapter. There are quantitative and qualitative components to the data.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter presents data analysis and discussion of research findings. The researcher analysed and summarized both primary and secondary data using tables, graphs and pie charts.

4.1 DATA PRESENTATION

4.1.1 Demographic Response Rate

Table 4.1 Overall response rate

Data collection technique	No. of people participated or responded	Out of	Response rate
Questionnaire	27	29	93%
Totals	27	29	93%

Primary source

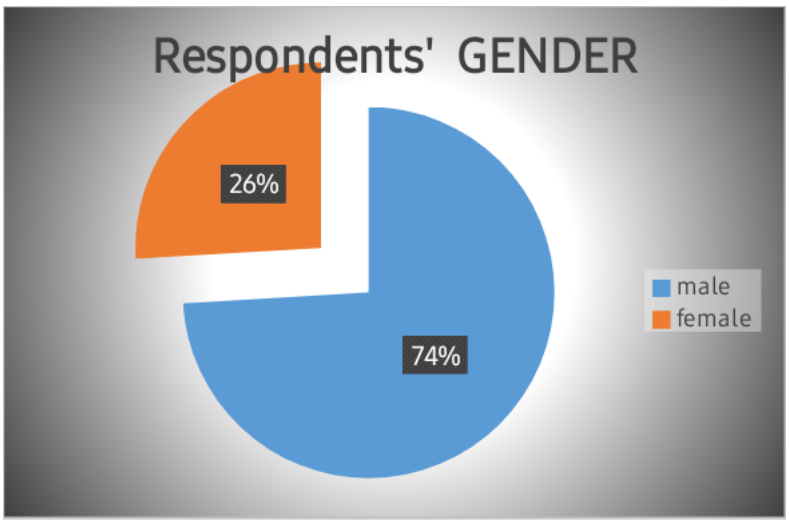
A total of 30 questionnaires were administered to the employees of Parirenyatwa Hospital. The employees were both managerial staff and non-managerial staff. Out of the 29 questionnaires administered, 27 responded to these questionnaires and 2 failed to respond. The questionnaire response rate was (93%).

The results above in table **4.1** reflect an overall response rate of (93%) which is high enough to validate the research results. Magenta and Magenta (2003), supports the response rate achieved on this study saying "a response of above 50% is adequate enough to represent a phenomenon under investigation". The response rate above also justifies the use of the findings as a basis for making recommendations to the research topic of establishing the impact of supply chain disruption on organisational performance.

4.1.2: Gender Distribution

Out of the 27 respondents from hospital staff the qualitative results revealed that were twenty males and seven were females' respondents. Therefore, majority of the respondents were male as shown by the diagram below.

Figure 1: Respondents gender



Primary source

There is an overwhelming majority of 74% of the respondents being male in gender and 26% being women in the sector. This appears not to be representative of the gender structure in the Zimbabwe population where the male to female ratio stands

to be 43% men is to 57% women. Thus study findings seem to be supportive with the formal economic structure where it stands at 74% for males and 26% for females the formal employment economic sector according to the findings has less women and this could be attributed to the nature of the environment and sector which is Hospital and Female dominated.

4.1.3 Age of the respondents

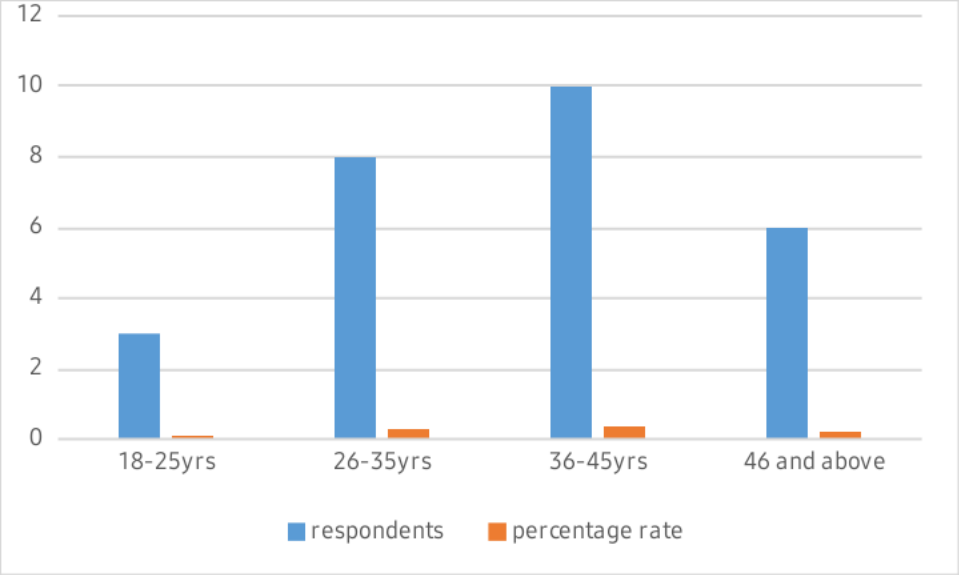
*The age of the respondents is presented in **table 4.2** and **Figure 2***

Table 4.2: Age of respondents

Age range	**Number of Respondents**	**Percentages rate**
18-25yrs	3	11%
26-35yrs	8	30%
36-45 yrs.	10	37%
46yrs and above	6	22%
Total	27	100%

Primary source

Figure 2: Age of respondents



There is a higher percentage of 37% in the age group ranging from 36 years to 45 years and these are directly or indirectly related to the Parirenyatwa Hospital. The second is 30% in the group ranging 26 years to 35years. Only 22% is the minority which is above 46 years and above. These findings show that fewer individuals, 11% are in their youth in most of the Ministry departments.

These findings are realistic in the sense that the Zimbabwe Government owned and run sector offers quality job security to all its employees

4.1.4 Positon held by respondents.

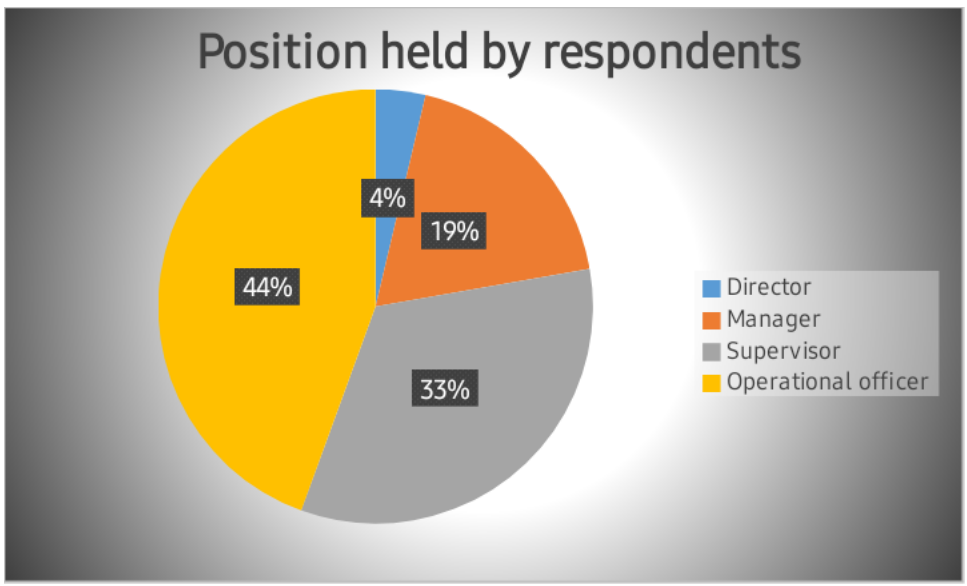
Participants were also asked to briefly describe their roles within the departments to which they are affiliated. Such information provides the researcher with a variety of responses that enable the researcher develop concise answers to the topic. The number of respondents and their organizational hierarchy are shown in the table below.

Table 4.3 – Position level of the respondents

Position	Respondents	Total Percentage
Director	1	4 %
Manager	5	19 %
Supervisor	9	33 %
Operational Desk Officer	12	44 %

Operational Desk Officers make up the greatest percentage of participants with 44% that is 12 responded that they are operational desk officers of the total respondents, followed by 33% of supervisors who are part of sectional heads and team leaders when it comes to procurers in different sections of the procurement department. 19% represents part of management in the procurement department and 4%, one director who is the Head of the procurement department who also took part in the research as shown on the chart below.

Figure 3: Position held by respondents



Primary source

The researcher centered more efforts on operational desk officers as these are the employees who are responsible for procuring material since they are involved in the day-to-day hands on operations of the organisation.

4.1.5 Level of education

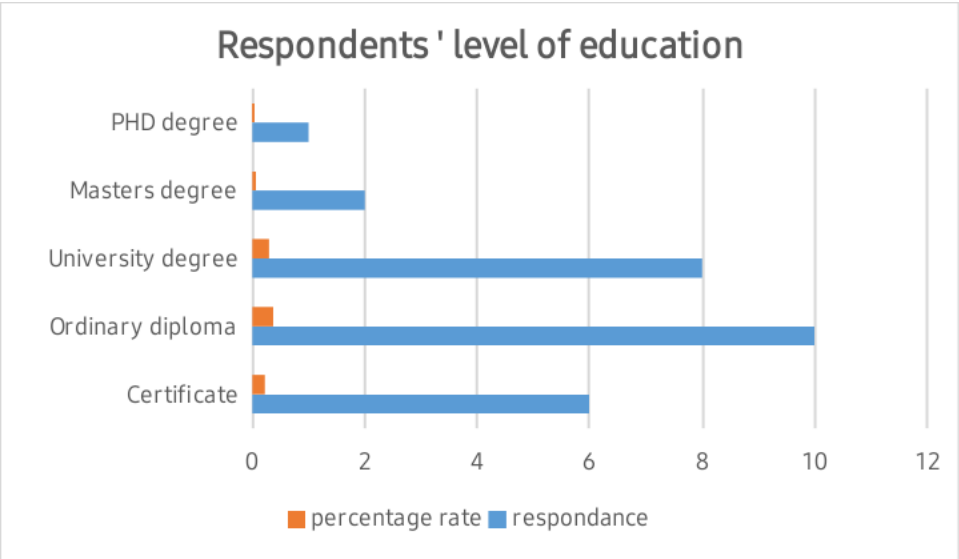
Table 4.4: Level of education

Level of education of hospital staff	Frequency	Percentage rate
Certificate	6	22%
Diploma	10	37%
Degree level	8	30%
Masters level	2	7%
PHD Degree	1	4%

Primary source

Table 4.2 above shows that, 10 of Parirenyatwa Hospital staff had diplomas, 6 had certificates and 8 had degrees,2 have Master's Degree and lastly 1 had PHD Degrees. Hence highly qualified personnel are likely to provide expertise knowledge about the research problem under study as shown below.

Figure 4: Respondents level of education



Primary source

4.1.6- Years of service with the organisation

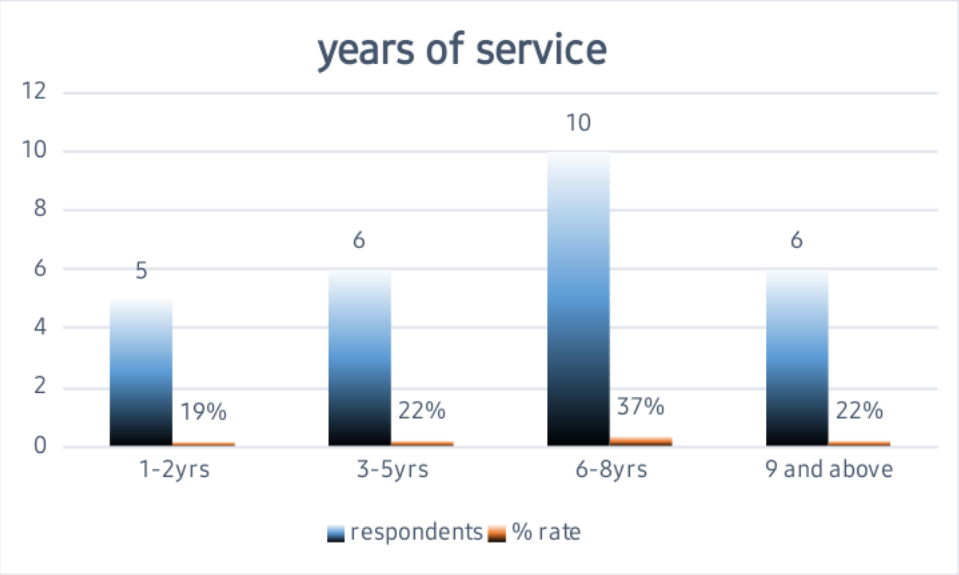
Years of services of despondence is illustrated by the table 4.5 and figure 5 below

Table 4.5: Respondents' duration at the Hospital

Year range	**Number of Respondents**	**Percentages rate**
1 - 2yrs	5	19%

2-5yrs	6	22%
6-8 yrs.	10	37%
9yrs and above	6	22%
Total	**27**	**100%**

Figure 5: Respondents year of service



Primary source

According to the research's findings, 37% percent of the sample's participants had job experience in the organization that falls between 6 and 8 years. Following are six

participants who reported that they had worked for the organization for between 3 and 5 years and that a similar number had worked there for 9years and above that's 22% . A total of 19 percent of the participants had worked for the company for only one to three years. The period of employment is crucial in evaluating a respondent's level of understanding of organizational norms and regulations. According to Storkey (2011), a person who is familiar with the organization's systems and who is knowledgeable about all the protocols established for managing activities in the company can quickly identify and evaluate a particular research subject. In the context of the study, employees who have been working with Parirenyatwa Hospital since the adoption of e logistics on material availability will aid in providing first-grade data.

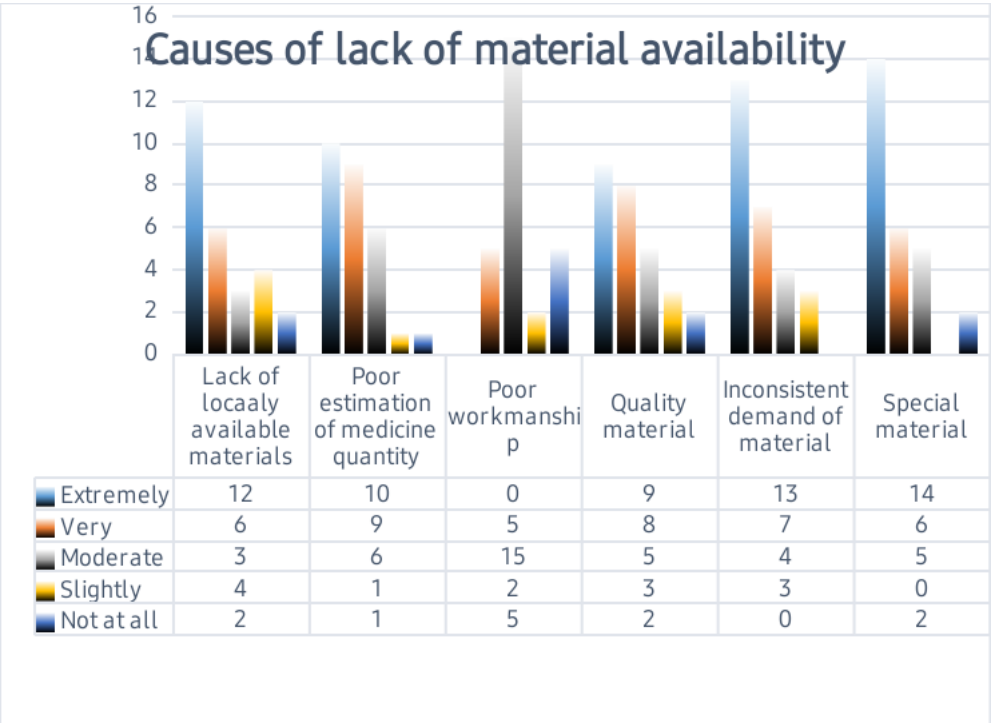
SECTION B:

Focuses on the investigation results of the effectiveness of e logistics on material availability at Parirenyatwa Hospital.

4.2.1 Causes of lack of material availability at Parirenyatwa Hospital

Participants were asked to rate the causes of lack of material availability at Parirenyatwa Hospital. Figure 6 summarizing the results is shown below.

Figure 6: Causes of lack of material availability



Primary source

The results from the study were as follows; lac k of locally available materials (12 extremely, 6 very, 3 moderate, 4 slightly, and 2 not at all)Poor estimation of medicine quantity (10 extremely, 9 very,6 moderate , 1 slightly and 1 not at all), Poor workmanship (0 extremely, 5 very, 15 moderate, only 2 slightly, and 5 not at all) Quality material (9 extremely , 8 very,5 moderate, 3 slightly, and 2 not at all), Inconsistent demand of material (13 extremely,7 very, 4 moderate, 3 slightly and 0 not at all) Lastly special materials (14 extremely.6 very,5 moderate,0 slightly and 2 not at all causes lack of material availability.

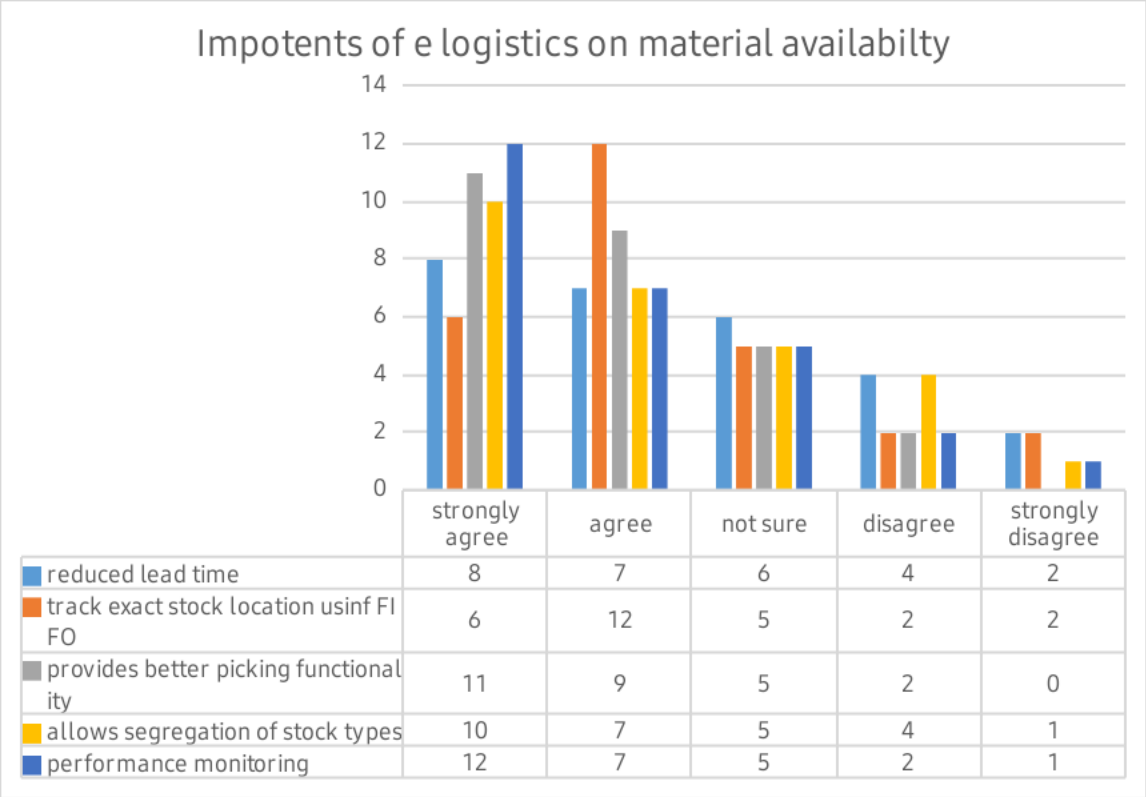
Most respondents thought that the above causes have a direct effect and impact on the availability of material. Michael Koploy (2013) articulates that lack of locally available material, poor estimation of medicine quantity, poor workmanship, quality material, inconsistent demand of material, special material has a strong impact on the availability of material. Thus the findings adumbrated above are realistic and they hold true in practical.

SECTION C

4.2.2: An evaluation of the impotence of e logistics on material availability at Parirenyatwa Hospital.

The research findings in respect of the above mentioned are illustrated in Figure 7 below.

Figure 7: Important of e logistics on material availability



Primary source

Findings of the important of e logistics on the material availability of Parirenyatwa Hospital were as follows; reduced lead time 8 strongly agree,7 agree, 6 not sure ,4 disagree, 2 strongly disagreed Track exact stock location using FIFO 6 strongly agree, 12 agree,5 not sure 2 disagree and 2 strongly disagree), Provides better picking functionality (11 strongly agree,9 agree, 5 were not sure, 2 disagree, and 0 strongly disagree), Allows segregation of stock types,10 strongly agree, 7 agree,5 were not sure, 4 disagree, and 1 strongly disagree), Performance monitoring (12 strongly agree, 7 agree, 5 were not sure .2 disagree, 1 strongly disagree.

The findings presented above are realistic and true in the sense that most of the

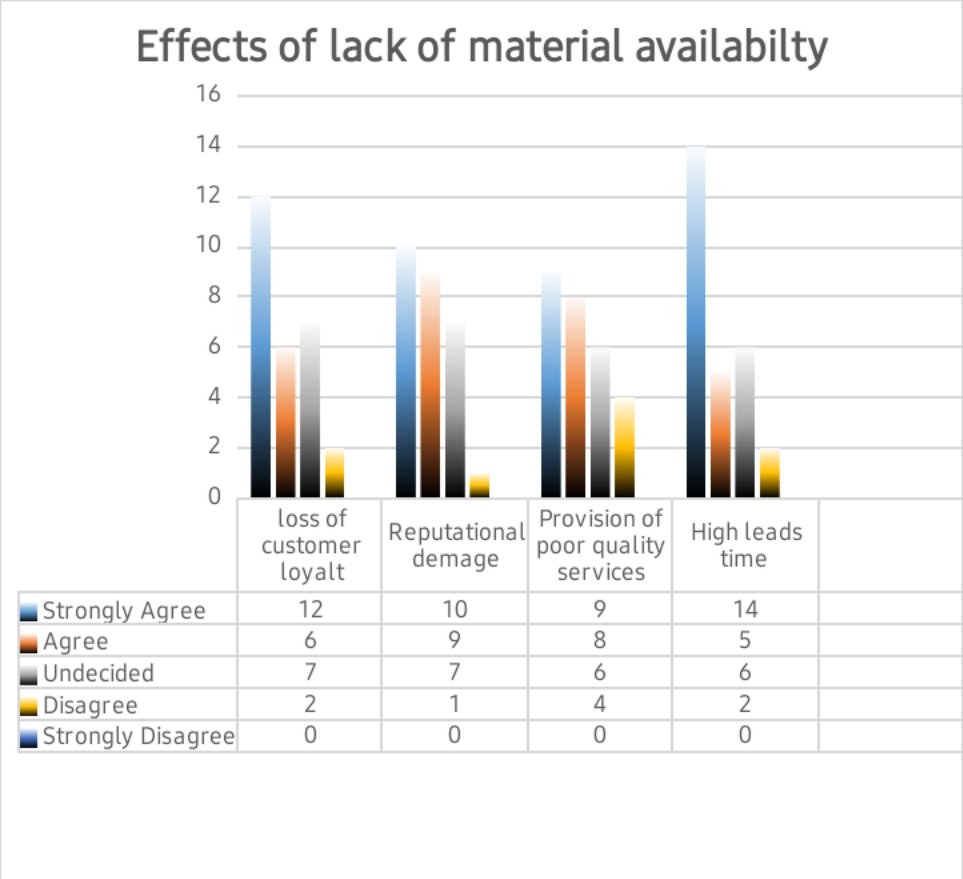
respondents agreed and strongly agreed that all of the importance of e logistics has an effect on material availability of Parirenyatwa Hospital. Hence the respondent's feedback is quite realistic

SECTION D

4.2.3: Effects of lack of material availability on the service delivery at Parirenyatwa Hospital

The research findings in respect of the above are clarified in Figure 8 below.

Figure 8: Effects of material availability on service delivery



Primary source

Results from the respondents pertaining material availability problems faced by the of Parirenyatwa Hospital were as follows; loss of customer loyalty, l2 strongly agree,6 agree, 7 undecided ,2 disagree, 0 strongly disagreed) Reputational damage(10 strongly agree, 9 agree,7 were undecided ,1 disagree and 0 strongly disagree), Provision of poor quality services(9 strongly agree,8 agree, 6 were undecided, 4 disagree, and 0 strongly disagree), High leads time,(14 strongly agree, 5 agree,6 were undecided, 2 disagree, and 0 strongly disagree).

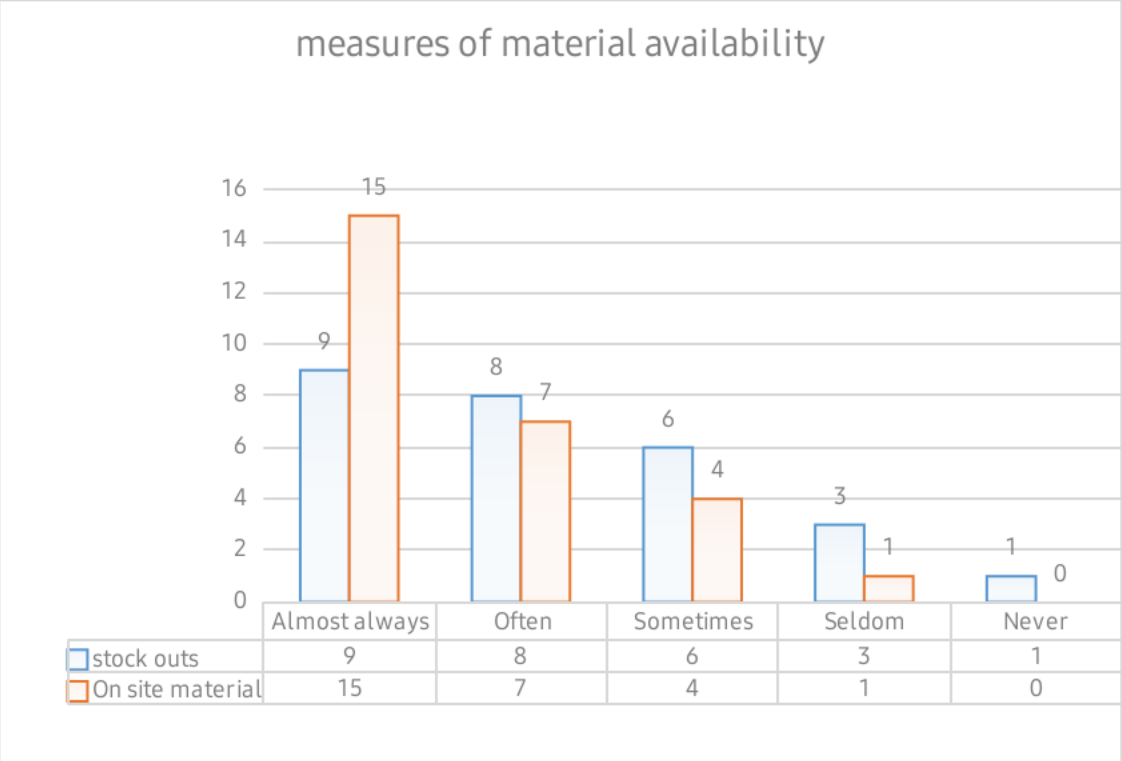
The challenges faced by Parirenyatwa Hospital are true and evident as respondents overwhelmingly agreed and strongly agreed that there were such negative experiences in the organisation.

SECTION E

4.2.4: Measures of material availability at Parirenyatwa Hospital

The research findings in respect of the above are presented in Figure 11 below.

Figure 9: Measures of material availability



Primary source

Results from the respondents pertaining how often material availability being measured using stock outs and on site materials at Parirenyatwa Hospital were as follows; Stockouts, 9 Almost always,8 often, 6 sometimes ,3 Seldom, 1 never) On site material (15 almost always, 7 often,4 sometimes ,1 seldom and 0 never). Therefore, Parirenyatwa Hospital carry the process of measuring material availability almost always using on site material method than out of stock method. This therefore shows that the percentage rate of material unavailability has decreased due to the introduction of e logistics activities in the health sector making e logistics an effective way of maintaining material availability.

4.4 Conclusion

This chapter concentrated on the analysis and presentation of the data that was acquired using a questionnaire. Tables, pie charts, and other graphical representations were used to display the results. Data analysis was delivered in a descriptive manner, and the next chapter will concentrate on a summary of the

research's conclusions.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The main thrust of this chapter was to establish whether the research findings answered the research topic. A summary and highlights of the study are given in this chapter.

5.1 Summary of findings

The study sought to investigate the impacts of logistics on material availability at Parirenyatwa Hospital following objectives; to identify the factors that led to the global existence of e logistics. To evaluate the impacts of e logistics on material availability. To recommend appropriate measures to improve the adoption of e logistics on improving material availability.

The measurement instruments or tools used to collect data were questionnaires as this gave respondents the chance to answer freely. The data collected were analysed using descriptive statistics such as percentages so as to provide accuracy. The results were displayed in tables, pie charts and graphs to make them pictorially clear and easy to understand.

It is the researcher's opinion that while some of the findings may not be completely conclusive, and may raise more questions than they provide answers, they nevertheless are indicative of areas for future study.

There have been a number of issues that needed solutions although the findings varied from year to year depending on the financial situation in the country at a particular moment. The major findings that affected Parirenyatwa Hospital was the costs of adopting e logistics activities in an organisation

In as much as the e logistics strategies were implemented there were a number of

issues that hindered the smooth flow of these operations. The adaptation from the old traditional system was a challenge as most of the personnel had limited capacity to change to new systems as they preferred the old fashioned ways of maintaining material availability. As a government institution the ministry had its beaucratic challenges that delayed the processing of different issues as a single matter involved many people with different position of influence before it is resolved.

The researcher noted that there were a number of challenges the affected the hospital in relation to the storage of hospital materials. This ranged from the technological backwardness of the warehousing structure, lack of proper infrastructure to the warehouses, as most hospital material and medicines needs to be stored in storages with the good required conditions so that it will not become harmful to customers.

5.2 Conclusion

The researcher noted that the level of professionalism in the procurement sector has slightly improved over the years but however due to the issue of brain drain the country has been facing it is difficult to maintain a steady increase in the sector. As noted by the respondent's professional qualification levels. There is need for upgrade in terms of qualifications.

Other material availability methods should be used so as to maximise on the levels of efficiency in relation to the inputs from the government. The ministry can maximise on its capacity to recruit more personnel who would bring in new ideas and methods.

The infrastructure that is already in existence should be properly maintained and renovated as this has been a major setback in the material availability of the ministry. The goods that are held in stock should be provided with sufficient insurance, this would attract customers who would know that the custodians of their products are reliable.

The stock valuation system should be improved and in most cases centralised. There

is need to embrace new technology in the audit methods, as these have high chances of accuracy that would help in the smooth flow of materials.

5.3 Recommendations

The researcher made the following recommendations

i) That the Ministry should actively move toward an e logistic system that provide corporate visibility into warehouse activities;

ii) Have an effective material planning system so as to prevent lack of material availability:

iii) Focusing on material availability to improve service delivery.

5.4 Areas for further study

There is a direct correlation between e logistics and material availability as highlighted in chapter 2. There is much need to study on the impact of e logistics on material availability and how to harness these, so as for organisation to delivery service in a way that makes customers satisfied.

5.5 Conclusion

This chapter presented the summary of the whole project, conclusion on research findings and recommendations. The researcher gave the implication for further research on the issues of warehousing.

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APPENDIX

Dear respondent,

I am You Gambire studying towards an Honours Degree in Purchasing and Supply Management with Bindura University of Science Education (BUSE). I am currently conducting a research entitled “An analysis on the impacts of e logistics on material availability on health sector Zimbabwe. A case of Parirenyatwa Hospital.”

The purpose of this letter, therefore, is to kindly request you to respond to the attached questionnaire. The information you give will be treated confidentially and at no time will your name be referred to directly. The information given will only be used for academic research purpose. For any other clarifications regarding this study, please feel free to contact the researcher on 0771908051 or email at gyou1099@gmail.com

Thank you in advance for your time and cooperation.

Yours Faithful

Gambire Y

Research Project Questionnaire

Instructions: Please put a tick on front of what you consider most appropriate answer

Remember there is no wrong response.

Section A: ***Preliminary information of respondent***

1. **Please indicate your gender**.

Male	Female

2. **Age group**

18-25yrs	26-35yrs	36-45 yrs.	46yrs and above

3. **Employment position held in the organisation.**

Director	Manager	Supervisor	Operational level

4. **What is your highest education level attainment?**

Certificate	
Ordinary Diploma	
University Degree/ Advanced Diploma	
Master's Degree	
PHD Degree	

5. Year of service within the organisation.

1 – 2yrs	3 – 5yrs	6 – 8yrs	9 – 10yrs	Other (specify)

SECTION B:

What would you think is causing lack of material availability at Parirenyatwa Hospital?

1 Strongly Agree 2. Agree 3. Undecided 4. Disagree 5. Strongly Disagree

No	Cause	Rating				
		1	2	3	4	5
1	High leads time					
2	High production cost					
3	Loss of customer loyalty					
4	Reputational damage					
5	Provision of poor quality service					

SECTION C:

What are the effects of lack pf material availability on the service delivery at Parirenyatwa Hospital?

1. Strongly Agree 2. Agree 3. Not sure 4. Disagree 5. Strongly Disagree

No	Feature	Rating				
		1	2	3	4	5
1	Lack of locally available medicines					
2	Poor estimation of medicines quantity					
3	Poor workmanship					
4	Quality of material					
5	Inconsistent demand of material					

SECTION D

To what extent is e logistics of great Important towards material availability?

1. **Strongly Agree** *2.* **Agree** *3.* **Undecided** *4.* **Disagree** *5.* **Strongly Disagree**

No	Important	Rating				
		1	2	3	4	5
1	Reduces lead time					
2	Track exact stock location using FIFO					
3	Provides better picking functionality					
4	Allows segregation of stock types					
5	Performance monitoring					

SECTION E

How often is material availability being measured at Parirenyatwa Hospital?

1.Almost always 2. Often 3. Sometimes 4. Seldom 4. Never

No	Important	Rating				
		1	2	3	4	5
1	Stock outs					

2	On site Materials					