Impact of Information Technology on Inventory Management with Mediation Role of Technological Infrastructure: A Case of Healthcare Sector

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THESIS ACCEPTANCE CERTIFICATE

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DEDICATION

To my wife and parents, for their unwavering support and encouragement throughout this journey. And to all the mentors especially Dr Shujaat Ali and educators who inspired my curiosity and guided my path—this work is as much yours as it is mine.

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ABSTRACT

This thesis explores the impact of Information Technology (IT) on inventory management systems in Pakistan's healthcare sector, with a focus on Lean Inventory Systems (LIS) and Strategic Supplier Partnerships (SSP). The research provides strong evidence of IT's positive influence in optimizing inventory processes, improving supplier collaboration, and enhancing overall healthcare operational efficiency. Through regression analysis and case studies, the study demonstrates how IT infrastructure and technological innovation (TI), including tools like RFID, barcode scanning, and predictive analytics, streamline inventory control, minimize waste, and ensure timely restocking of essential medical supplies.

The findings reveal that IT plays a crucial role as an enabler of Lean initiatives by facilitating real-time information exchange, process integration, and predictive analytics. IT also enhances supplier communication and collaboration, reducing lead times and improving supply chain responsiveness. The study highlights the combined effect of IT infrastructure and emerging technologies such as Artificial Intelligence (AI) and machine learning, which further enhance inventory accuracy and operational efficiency in healthcare facilities.

By examining public and private healthcare sectors in Pakistan, the research underscores the importance of IT in minimizing stockouts, reducing wastage, and supporting continuous care, especially during supply chain disruptions. It also identifies the need for sustained investment in IT infrastructure to maintain and improve healthcare delivery systems.

The thesis contributes to both theoretical and practical understanding, enriching the literature on IT's role in inventory management and its implications for healthcare organizations. It emphasizes the significance of adopting emerging technologies to strengthen inventory management practices and foster sustainable healthcare operations. Finally, the study suggests future research directions, such as expanding the sample size, exploring advanced technologies, and employing longitudinal studies to establish causal relationships between IT and inventory management improvements.

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LIST OF ABBREVIATIONS

FEFO: first expiry, first out

EOQ: Economic Order Quantity

VIM: Vendor-Managed Inventory

JIT: Just-In-Time

TOE: Technology-Organization-Environment

ITR: Inventory Turnover Ratio

IT: Information Technology

LIS: Lean Inventory System

SSP: Strategic Supplier Partnership

TIFR: Technology Infrastructure

IMP: Inventory Management Practices

CHAPTER 1: INTRODUCTION

In Pakistan, the healthcare landscape is marked by a delicate balance between limited resources and a rising demand for quality patient care. With a growing population and a high disease burden, healthcare facilities face significant challenges in managing their resources effectively. Efficient inventory management emerges as a critical factor that directly impacts patient outcomes, operational efficiency, and financial sustainability (Khan et. al., 2023).

To address these challenges, leveraging technology becomes imperative. By adopting technological solutions, healthcare facilities in Pakistan can streamline their inventory processes and ensure the availability of essential medical supplies and medications when needed. Automation and real-time tracking provided by inventory management software enable healthcare providers to monitor stock levels accurately and optimize ordering processes to prevent shortages or overstocking (Muhammad, Eiman, Fazal, Ibrahim & Gondal, 2023).

Besides this technology allows for the collection and analysis of data related to usage patterns, patient demographics, and seasonal variations in healthcare demand. Predictive analytics tools enable healthcare facilities to forecast future inventory needs more accurately, facilitating proactive planning and resource allocation (Saha & Ray, 2019). Remote monitoring capabilities and centralized control systems provided by technology enable healthcare administrators to oversee inventory management processes across multiple facilities from a single location. This ensures consistency and efficiency in inventory control, particularly in a country where healthcare facilities are often distributed across vast geographical areas.

Integration with supply chain partners through electronic data interchange (EDI) systems facilitates automated ordering and replenishment processes, reducing administrative burdens and minimizing delays in supply chain logistics. This seamless integration enhances the overall efficiency of inventory management and contributes to cost optimization and financial sustainability (Buschiazzo, Mula & Campuzano-Bolarin, 2020).

Accurate inventory management facilitated by technology also enhances patient safety and quality assurance by ensuring the availability of essential medical supplies and medications, thus reducing the risk of medication errors and treatment delays. Technology plays a crucial role in addressing the challenges faced by the healthcare sector in Pakistan (Balkhi, Alshahrani & Khan, 2022). By embracing technological solutions for efficient inventory management, healthcare facilities can enhance patient outcomes, improve operational efficiency, and ensure financial sustainability amidst resource constraints and increasing demand for quality healthcare services (Saha & Ray, 2019).

1.1 Background

The management of stock is an important aspect for any organization and particularly running a hospital requires efficient stock management. Stock-outs therefore act as a major hindrance to the provision of health services to patients in that the services can be abruptly held back. For most organisations stock is the biggest single item of investment on assets. Consumers also develop dependence on high stock levels, employees do same too and hence result to higher levels of stock holding (Chopra and Meindl, 2007). In this context, ‘‘stock’’ and ‘‘inventory’’ are the same thing. As Coyle et al. (2003) post, inventory includes raw materials and components, partially finished goods, finished products, and materials required to make a company's product or provide a service. It can also relate to the quantity and/or dollar value of the goods a company possesses.

The main objective of inventory holding is to mitigate the probabilities of stockouts together with their related difficulties. The level depends on the requirements of the branches, the time needed to receive deliveries, available cash, storage costs, and the need to store data. Keeping in view the amount of money available, space for storage and handling, the rates at which different materials are consumed, lead time and safety stocks, the quantities to be held as stock in each case can be fixed and marked on the stock cards. Some or most of these items should be issued if supported by a Material Requisition form.

According to Gudum (2002), unpredictability and irregularity in the nature and time of its flow may result to unfavourable planning, higher expenses, scarcety of stocks and delays. Thus, it is critical to apply certain strategies aimed at the proper control of inventory; in other words, being able to confront uncertainties and specific dynamics on the operational level. To this end, measures need to be employed at both tactical and strategic levels in organisations in order to ensure consistency with the firm's supply chain strategy in an effort to attain superiority.

Researchers have paid much attention to the studies in relation to inventory and supply chain management for enhancing organizational performance, but few empirical works have focused on the relationship between inventory control and healthcare delivery, especially in developing countries. Thus, because of aspects like cost, selection of the supplier, demand and supply fluctuations, this area needs a focused study. These factors are generally found to be positively related with some of the large scale supply chain problems faced by an organization with regards to stock management of inventories and the frequency of deliveries (Aissaoui et al. , 2007).

Inventory decisions in most developing countries' public sector are usually the responsibility of departments and stores management. This decentralization leads to factors that include high costs of inventory, problems with suppliers' choice, late deliveries, stocks that become obsolete, and complete stock-outs. For instance, the Financial Administration Act of 2003 that is referred to as Act 654 offers regulations on the purchase, receipt, storing, maintaining, release and disposal of inventories for the MoF. Government stores obtained to be purchased from the Registered Value Added Tax suppliers and if there some special conditions a person requires an exemption/some waivers, those are to be given by the Minister of Finance or under any enactment with proper reasons.

However, short-term and war purchases are prevalent in many public institutions, and in most cases, the provisions of public procurement laws are disregarded because the proper purchasing procedures were not followed. This indicates the need to invest in better inventory management and compliance with procurement rules to increase the effectiveness of the health systems in the developing nations.

1.1. Problem Statement

In the healthcare sector, the challenge of optimizing inventory management practices while aligning with various functions and characteristics to reduce costs persists. Despite the advantages offered by technology in inventory management, healthcare managers face the imperative of minimizing inventory costs while maintaining patient safety levels, reducing complexity, and preventing drug theft or diversion. Moreover, with increasingly limited financial resources, healthcare facilities seek operational improvements through rationalization strategies to maintain necessary care services and reduce costs. Thus, there is a pressing need for research to develop efficient inventory management techniques that can achieve high levels of quality and productivity, reduce waste and costs, and enhance professional competencies and satisfaction within the healthcare industry's competitive environment.

1.2. Research Objectives

- To determine the impact of Information Technology on Inventory Management systems in healthcare management systems.
- To investigate whether technology infrastructure mediates the effectiveness of inventory management systems in healthcare management systems.
- To investigate the effect of information technology on technology infrastructure in healthcare management systems.
- To compare the perspectives of the public and private sectors in evaluating the impact of information technology (IT) on inventory management systems.

1.3. Research Questions

- What is the impact of Information Technology on Inventory Management systems in healthcare management systems?
- What role does Technology Infrastructure play in mediating the effectiveness of Inventory Management systems within healthcare management systems?
- What is impact of Information Technology on Technology Infrastructure in healthcare management systems?

- How public and private sectors differ while gauging the impact of Information Technology on Inventory Management systems?

1.4. Significance

The study on the effect of technology on inventory management in the healthcare sector holds significant importance due to several key factors. It study addresses the critical issue of patient safety and timely care. Effective inventory management ensures that healthcare facilities have access to essential supplies and medications when needed, directly impacting patient outcomes. By investigating how technology can enhance inventory practices, the study aims to mitigate risks associated with stockouts and improve patient safety during critical situations such as surgeries.

The study contributes to cost control and financial efficiency within healthcare institutions. Inefficient inventory management leads to wastage and financial strain, affecting the overall financial health of hospitals. By examining technology-driven solutions for accurate demand forecasting and optimal stock levels, the study aims to identify strategies to minimize excess inventory and prevent shortages, ultimately achieving cost savings and financial sustainability.

The study also focuses on resource optimization throughout the healthcare supply chain. By leveraging technology, healthcare facilities can track inventory movement, monitor expiration dates, and prevent stock obsolescence, ensuring that resources are utilized optimally at every stage. This aspect of the study highlights the importance of integrating technology to enhance resource management and improve overall efficiency within the healthcare sector.

In the end, the study aims to enhance workflow efficiency by streamlining manual inventory processes through automation and real-time tracking. By reducing administrative burden and freeing up staff to focus on patient care, technology-driven inventory management systems improve workflow efficiency, ultimately leading to better resource allocation and enhanced patient care delivery.

1.5. Scope of the Study

This research study targets the inventory management systems within public and private hospitals within the scenario of Pakistan. It cover all medicine and other non-pharmacy supplies that are in the health facilities. Questionnaires were administered to hospital management and staff with special focus on the officers involved in purchasing and storing of hospital stocks. Thus, targeting such distinguished workers, the study expects to obtain a thorough understanding of inventory practices and, consequently, their influence on the delivery of healthcare in these organizations.

1.6. Limitations of the study

Lack of time to carry out intensive research, coupled with scanty financial and material support formed some of the major hurdles which hindered this research in depth. If the study had been carried out over a longer period of time and if there were sufficient resources available, the investigation could have shown more findings; especially if there were more healthcare facilities surveyed across numerous regions of the country. In this case, the research would have undertaken a wider analysis of how inventory impacts service delivery across the various contexts. More resources and a longer timeframe allocating for the research would have made it possible to delve deeper into other differentiations and factors involved in inventory management programs and the consequent impact on the health-care quality and access.

1.7. Thesis Structure

The first chapter of this research provides an overview of the topic, covering the background, objectives, rationale, aims, and the research problem it seeks to address. It also highlights the industry's context and the significance of the research.

The second chapter involves an in-depth review of relevant literature. This includes the theoretical framework, previous studies on the topic, and the importance of this research to the organization.

The third chapter outlines the research methods, focusing on the research paradigm, environment, and study design. It also provides justification for the chosen approach and discusses the study's limitations.

The fourth chapter presents a detailed analysis of the findings, including interpretations and arguments.

The fifth and final chapter summarizes the research, discussing the theoretical and practical contributions, the study's limitations, and suggestions for future research.

The final section includes references, appendices, and questionnaires.

2 CHAPTER 2: LITERATURE REVIEW

A vital component of materials management in businesses, inventory management affects an organization's bottom line and operational effectiveness. Using a variety of sources, this literature study investigates definitions, viewpoints, and the significance of inventory management.

2.1 Definitions and Concepts

Stock, another name for inventory, is the term used to describe the supplies or equipment that businesses keep on hand until they need them. Inventory is the major focus of materials management, with a focus on its importance in preserving operational continuity, according to Semahegn (2017). Further defining inventory as any item or resource stock utilized in an organization, Adam Jr. and Ebert (2005) emphasize the significance of policies and procedures in tracking and restocking stock levels.

Although the terms "stock" and "inventory" are frequently used synonymously, there is a small difference between the two. Any resource that is inactive yet nevertheless has economic value is considered inventory (Springer India, 2014). On the other hand, stock usually refers to the merchandise that is stored at a particular site, like a warehouse. In order to maintain effective supply chain operations, inventory management entails defining the size and positioning of these commodities (Springer India, 2014).

2.2 Inventory Management

Sales and profits as well as customer requirements and generation of reasonable money are all achievable with proper inventory management. Inventory decisions are becoming increasingly popular in the current world setting (Ballon, 2000) more so with the emergence of what is referred to as industry 4. 0 and their new solutions to supply chains and production networks. Inventory management can enhance its financial position through the reduction of operational costs, an increase in customer satisfaction and overall service delivery (Li et al., 2006; Gabisa & Ram, 2021; Cetinkaya & Lee, 2000). A multi-level inventory management system in the context of the pharmaceutical industry ensures that; medications are available at different facilities (Sbai et. al., 2020). Secrecy, anonymity, a tracking system, transparency, and demand and supply management, all of them have shown how the application of blockchain technology has revolutionized the supply chain. Patients can also be affected in that this policy influences the purchasing of the medicinal supplies in that there are shortages and poor management of the supplies that affects the quality of care and its costs. Therefore, there is a need to manage the pharmaceutical product inventory in an effective manner to meet the needs of the patients (Denton, 2013; Mathur et al., 2018).

The active control of the inventory management software enables one to manage on one hand sales, on the other purchases and payments. In this method, Coyle et al. (2003) claim that inventory is a core element of many company operations. They stress that inventory has two functions for businesses: it was found to be useful with regards to order fulfilment, which is equivalent to customer service and is involved with the sale costs.

Since inventory involves a huge cost, almost all businesses rely on proper management of inventory to enhance their operations. According to the literature, inventory management is the most crucial concern to all sectors of a business (Mentzer et al., 2007). This must be done properly and efficiently by the businesses themselves through proper management of their stocks.

Regarding the management of inventory, there are two concerning issues. The first of these encompasses the issues related to the quality of client service, meaning that products must be available at a certain place and at a certain time, in adequate quantities. The second problem area is the cost of acquiring and holding inventory (Stevenson, 2009).

2.3 Importance of Inventory Management

Organizations need to manage their inventories well if they want to improve customer happiness and performance. Guido Van Heck (2009) emphasizes that to avoid material shortages that can cause production to be disrupted, inventory management at many locations within an organization or supply chain is essential. By avoiding the hazards of overstocking or understocking, companies may maintain the proper balance of supply when inventory is managed properly.

According to Wangar L. (2015), a substantial amount of an organization's assets is made up of the materials it owns. As a result, businesses make significant investments in inventory, and to effectively manage these assets, they need to put in place strong material management systems. In addition to ensuring operational continuity, efficient inventory management maximizes resource use, which benefits the organization's overall financial health.

2.4 Inventory Turnover Ratio (ITR)

One of the most important performance metrics in materials management is the Inventory Turnover Ratio (ITR). As a gauge of the efficacy and efficiency of inventory management techniques, it counts the frequency with which inventory is sold and replaced over time (Semahegn, 2017).

2.5 Impact on Supply Chain and Financial Health

An organization's financial stability and the health of its supply chain depend heavily on effective inventory management. The Management Study Guide (2017) states that satisfying organizational requirements and guaranteeing efficient operations depend on maintaining optimal inventory levels. Having too much or too little inventory can have a negative impact on how well the business operates and how well services are provided.

2.6 Types of Inventory

Six primary categories of inventories are distinguished by Narkotey (2012), each of which has a distinct function in the supply chain:

1. **Cycle Stock:** Produced during the replenishment process, this kind of inventory is necessary to supply demand in predictable circumstances. It is assumed that businesses have precise lead times for both replenishment and demand.
2. **Pipeline Inventory:** This inventory is in transit as it moves from one place to another. Even though it isn't ready for sale or transportation until it gets to its destination, it is still regarded as cycle stock.
3. **Safety or buffer stock** is inventory that is kept in excess of cycle stock to account for lead times or demand fluctuations. It ensures that demand may be satisfied even in the event of unforeseen changes by covering short-range variances in both.
4. **Speculative Stock**: This stock is held in anticipation of price increases, among other reasons besides meeting present demand. Businesses buy speculative stock because they anticipate price increases in the future.

5. **Seasonal Stock:** Stored before a season starts to guarantee steady labor and production runs, seasonal stock is a subset of speculative stock. It is a consequence of the growing season in agriculture, which restricts supply all year long.
6. **Dead (Obsolete) Stock:** These are goods that have been out of demand for a predetermined amount of time. Products in this stock have aged, degraded, or become unusable as a result of technology breakthroughs.

2.7 Inventory Management Practices in Hospitals

Hospitals need to manage their inventory effectively in order to improve supply chain performance, cut costs, and improve business operations. Effective inventory management techniques in hospitals include the following, per Maureen (2016):

- **Enhanced Supply Chain Performance:** The supply chain performs better as a whole when effective inventory management solutions are put in place. By making ensuring the right supplies are on hand when needed, hospitals can prevent delays in patient treatment.
- **Cost Reduction:** Hospitals can cut costs dramatically by managing inventory levels. This involves limiting stockouts, which can result in more expensive emergency purchases, and excess stock, which takes up space and funds.
- E**mployee Knowledge and Training**: It's critical to give staff members sufficient instruction and understanding of inventory management procedures. Operations can run more smoothly when staff members are well-informed and make wiser decisions about stock management, ordering procedures, and inventory levels.

2.7.1 Timing; the Most Crucial Aspect

The most important factor in health care delivery is time. Merely a few seconds of delay can be fatal. Thus, one of the main duties of an inventory manager is to make sure that the widest range of healthcare supplies are delivered on schedule. The anticipated patient count is uncertain. Twelve suppliers are becoming more and more unreliable. Thus, the difficulty is increased (Maureen, 2016).

2.7.2 Patient safety; the priority

In the delivery of healthcare, patient safety is of utmost importance. Inventory managers bear major responsibility for guaranteeing the availability and caliber of medical supplies. This review of the literature looks at how inventory management affects patient safety, how to control the quality of products that are kept in storage, and what planning and control systems are required for effective inventory management.

Ensuring patient well-being is the main purpose of healthcare delivery, and inventory managers are essential to reaching this goal. Maureen (2016) asserts that the primary duty of inventory managers is to acquire superior products for clinical application, giving precedence to safety and clinical efficacy issues over economic considerations. In order to avoid using out-of-date and perhaps dangerous products, they also need to make sure that the materials given are within their expiration dates.

2.7.3 Maintaining the Quality of Products in Storage

Several indicators and preventative steps are described by Barraclough (2013) to preserve product quality during storage. Among these are defenses against theft, vermin, fire, and destruction. Certain steps are necessary for effective inventory management, such as packing heavy or fragile things in compact stacks, avoiding crushing bulk-stored products, and taping off sharp edges. Dust and filth must be regularly removed from shelves and items by sweeping, mopping, and wiping them down. Additionally, regularly disposing of waste helps keep pests away. Furthermore, it is essential to keep the storage area's environment consistent to preserve the quality of the product (Vriesendorp, 2010).

2.7.4 Inventory planning and control

Planning and controlling inventories are essential components of inventory management. According to Baye (2017), inventory frequently constitutes the second-largest expense for firms, thus owners must pay special attention to it. Forecasting is the process of figuring out how much inventory is needed to satisfy customer demand. The techniques managers employ to count and keep track of inventory goods are collectively referred to as inventory control. This ensures that ordering and stocking are done as economically as possible while maintaining continuous production and sales.

2.7.5 Scientific Inventory Control Systems

Muhayimana (2015) discusses the two primary questions in inventory control: when to place an order (order level) and how much to order (order quantity). These decisions are guided by inventory models that help strike a balance between the loss due to the non-availability of items and the cost of carrying inventory. Scientific inventory control aims to maintain the optimal level of stock required by the company at minimal cost, ensuring that inventory-related expenses are minimized without disrupting the supply chain.

2.7.6 Set Up, Maintenance, and Organizing of Pharmacy Store

The smooth operation of healthcare institutions depends on the efficient management of pharmacy stores. This literature review, which draws on knowledge from a variety of sources, looks at the different facets of opening, running, and maintaining pharmacy businesses.

2.7.7 Positions and Accountabilities

All employees at healthcare facilities, including physicians, nurses, medical assistants, and storekeepers, must work together to manage pharmacy stores effectively. To ensure that supplies are used properly and are always available, Barraclough and Andy (2013) stress how crucial it is for every employee to understand their specific role in supply management. This is especially important in smaller facilities with fewer employees.

2.7.8 Storage Requirements and Conditions

Drugs and associated supplies are costly and easily spoil if improperly stored. (2013) Barraclough and Andy stress the importance of having a clean, safe storage area. This should be a locked space that is well-organized to accommodate all materials. Furthermore, the store needs to have a safe place for drugs and pricey products like antiretroviral (ARV) medications.

2.7.9 Environmental Aspects to Take into Account

The quality of medications that are kept in storage can be greatly impacted by environmental elements like humidity, light, and temperature. According to Michael N. (2012), all medications can be impacted by high temperatures, especially heat, with liquids, ointments, and suppositories being particularly susceptible. When exposed to light, medications that are light-sensitive, such injectables, can swiftly deteriorate. Humidity can cause moisture to be absorbed by pills and capsules, which might cause them to deteriorate.

2.7.10 Organizing Inventory

Effective organization of pharmacy stores involves grouping similar items together. "Similar" can refer to the route of administration (e.g., external, internal, injectable) and the form of preparation (e.g., dry or liquid medicines). Organizing items alphabetically within these groups can enhance store organization and streamline stock management (Michael, 2012).

2.7.11 Expiry Date Management

Managing pharmaceutical stocks by expiry date is critical to ensuring their efficacy and safety. The first expiry, first out (FEFO) method involves issuing products with the earliest expiry date first, regardless of their receipt order. This approach helps prevent the expiration of valuable pharmaceuticals (Barraclough & Andy, 2013). The expiry date, provided by the manufacturer, is crucial for both dispensers and patients, as using medicines past this date may compromise their quality and effectiveness.

2.7.12 Importance of Proper Storage Conditions

Medicines and health commodities require stringent storage conditions to maintain their shelf-life, safety, and efficacy. Kassie (2014) emphasizes that pharmaceuticals have a defined shelf-life, necessitating precise storage conditions to preserve their usability and potency. The Ministry of Health of Uganda (2012) highlights that the shelf-life, indicated by the manufacture and expiry dates on the label, ensures that products remain safe and effective when stored under recommended conditions.

The USAID | DELIVER PROJECT (2011) further elaborates that the physio-chemical properties of drugs can be significantly influenced by storage conditions, which underscores the necessity of maintaining stable environments to ensure the physical, chemical, and microbiological stability of products. Improper storage can lead to deterioration, spoilage, and the development of hazardous degradation products, which can pose serious health risks to patients.

2.7.13 Guidelines for Good Storage Practices

Medical supply integrity and prevention of obsolescence depend on efficient storage techniques. Guidelines for good storage techniques are provided by the Ethiopian Food, Medicine and Healthcare Administration and Control Authority (EFMHACA, 2015), which emphasizes the need to keep materials and pharmaceutical goods in a way that minimizes contamination and deterioration. The "first expired, first out" (FEFO) concept is supported by the standards in order to make sure that products are used within their safe shelf life.

2.7.14 Role of Qualified and Skilled Staff

Qualified staff are essential for effective inventory management in health facilities. Isabel and Nabais (2009) note that effective pharmaceutical management relies heavily on the competencies and skills of the personnel handling the medicines. Training staff in good storage practices, inventory management, and stock control is critical for maintaining the integrity of pharmaceutical products.

Ali (2011) asserts that medicines management is a technical and professional activity requiring suitably qualified and adequately trained personnel. Proper training and development of staff ensure that inventory management tasks are performed efficiently, thereby supporting the organization's goals and objectives.

2.8 Challenges and Solutions in Inventory Management

Despite its importance, inventory management in health facilities often faces challenges, such as inadequate infrastructure and lack of investment in technology.

Nijoroge (2015) points out that without proper infrastructure to maintain inventory levels, health facilities may incur high holding costs, stockout costs, and lead time costs.

The implementation of technology in inventory management can address many of these challenges. According to Hundessa, Mohammed, and Bheema (2017), computerized inventory management systems offer significant advantages over paper-based systems. They provide up-to-date information, streamline inventory processes, and reduce the time required for inventory counts. The World Health Organization also advocates for computer-based inventory systems, highlighting their integration with maintenance management systems to combine inventory, repair, and maintenance histories.

2.9 Quality maintenance issue at the Hospital

Maintaining high standards of quality in hospital facilities is a complex and critical task due to the intricate engineering services and the essential need for reliable operation. This literature review examines the various challenges and strategies associated with maintaining hospital buildings, drawing insights from multiple sources.

Hospitals are among the most challenging public sector buildings to maintain due to their complex indoor environments and numerous end users. Amankwah (2017) highlights the difficulties posed by the intricate engineering services in hospitals, which necessitate highly reliable, efficient, and cost-effective maintenance practices to prevent frequent breakdowns that could lead to catastrophic consequences.

While it is impossible to create maintenance-free buildings, the need for maintenance can be reduced through good design and proper workmanship. Enshassi (2015) emphasizes the importance of maintainability in building design, noting that well-designed and well-constructed facilities can lead to significant cost savings and better overall functioning. Proper management of the maintenance process, including assessing performance and implementing effective maintenance strategies, is crucial for minimizing maintenance work.

Because hospital buildings have elaborate designs and their electrical and mechanical systems are vital, maintenance management of these facilities is very demanding. According to Enshassi (2015), maintenance management is one of the most difficult facets of facilities management because of the complex nature of hospital facilities and financial limitations. Hospitals have to run as efficiently as possible all the time, and any maintenance mistake might be disastrous.

According to Amankwah (2017), hospitals must change their conventional maintenance procedures in order to perform better. This shift entails tackling the difficulties related to building upkeep, repair, and cleaning in addition to efficient financial management. The importance of maintenance jobs and the cash available should be taken into consideration when prioritizing them.

Gulliford (2017) notes that maintenance, once viewed as a "necessary evil," is now recognized for its strategic importance in healthcare environments. A well-planned maintenance strategy is essential for improving energy efficiency and ensuring the comfort, health, and safety of occupants. Strategic maintenance not only enhances the operational efficiency of hospital facilities but also contributes to the overall well-being of patients and staff.

2.10 Benefits of Inventory Management in Healthcare

In the healthcare industry, efficient inventory management is essential for maintaining equipment and supplies availability, limiting the spread of disease, and keeping expenses under control. This paper looks at the advantages of inventory management in the medical field, the different approaches used, and how they affect productivity.

Preventing losses associated with medical equipment and supplies is a major advantage of inventory management in the healthcare industry. Healthcare equipment, including laptops, ultrasonography machines, and surgical instruments, is costly and easily pilfered for personal use, claims Semahegn (2017). Healthcare institutions can reduce the risk of theft and unauthorized use and save replacement costs by putting strong inventory management systems in place.

Inventory management also plays a vital role in controlling the spread of diseases. Studies have shown that effective inventory control can prevent the spread of infections, such as the case where functional inventory control helped prevent mad cow disease in a healthcare facility in England. Proper tracking of surgical instruments ensures that infected instruments are not reused on other patients, highlighting the importance of inventory control in disease prevention (Semahegn, 2017).

Accurate stock level tracking is made possible for healthcare administrators and staff by efficient inventory control systems. This guarantees that all required tools and supplies are on hand when needed, which is essential for providing top-notch medical care. It becomes difficult to detect running out of supplies without adequate inventory control, which could result in service disruptions and lower-than-expected care quality. Furthermore, inventory control is necessary to keep an eye on perishable goods like pharmaceuticals and make sure they are used before going bad (Jessop & Morrison, 2015).Effective inventory management requires careful planning and close oversight. Healthcare facilities can think about employing professionals to create and put into place inventory control systems, making sure that organizational chiefs continue to oversee the process. This method, however time-consuming, ensures attention to detail, supports cost-saving measures, and maintains effective healthcare services (Semahegn, 2017).

2.11 Inventory Management Techniques

2.11.1 Vendor-Managed Inventory (VMI)

Vendor-Managed Inventory (VMI) involves collaboration between vendors and customers, where vendors manage inventory levels on behalf of the customer. This technique can significantly enhance supply chain efficiency by allowing vendors to plan, monitor, and control inventory, thereby reducing the customer's burden and improving demand accuracy (Nsikan & Uduak, 2015).

2.11.2 Just-In-Time (JIT)

Just-In-Time (JIT) inventory management aims to minimize inventory holding costs by replenishing stock only when needed. This technique is particularly useful for expensive inventory items with low demand, as it avoids excess inventory and associated costs. JIT ensures timely availability of inventory without the risk of stockouts, enhancing customer satisfaction and operational efficiency (Kinyua, 2014).

Just-In-Time (JIT) System is a method of stock control that tries to reduce really stock levels by fashioning supplies and demand to get the desired item on hand at the time it is needed, as pointed out by Coyle et al in the year 2003. Ideally, goods should be delivered at exactly the time when they are required without any delay or earlier than the indicated time.

Just-In-Time System is another inventory management technique that entails having a material at the right place in the right quantity and at the right time for making the right product, as described by Lysons and Gillingham (2003). Different ofms are mostly used in repetitive manufacturing and lean production processes. Inventory, based on JIT System, should only be available when a firm needs it not before after.

To Stock and Lambert (2001), the Just-In-Time System is a program, whose aim is to strip out nonvalue adding activities out of any operation with the objectives of manufacturing quality products, achieving high usage of time for production, low inventory holding and long-term relationship with channel members. In the same breath they continue to argue that anything that is doing more than what is expected of you in your docket is considered by the JIT System as being wasteful. Thus, JIT's general strategic goal focuses on the elimination of safety stock, which is a component of inventory.

Our theory relates to our investigation because it identifies supervisors' working hours as an essential aspect that directly impacts the productivity of the production system; this, in turn, has negative consequences, including excessive inventory and costs in the entire supply chain.

2.11.3 ABC Analysis

The three-group method analyzes objects according to their significance, which may be their relative value or control. As described by Coyle and co-authors, a company aims to place products with the biggest impact or utility in the 'A' category, while products whose impact or utility are comparatively less than the products in category A are placed in category 'B' and 'C'.

The 'B' and 'C' elements may sometimes be perceived to be of far little importance relative to the 'A' items in the ABC studies, thus leading to the management focusing nearly all their efforts on the 'A' items. might result in maintaining very high inventory stocks for the "A" products while completely overlooking the fact that "B" and "C" items are also available. The error in this case is in assuming that each item within the categories 'A', 'B' and 'C' has some level of importance and requires measures to guarantee its availability at a reasonable cost level.

This categorization is intended to ensure buying personnel, amid fiscal and actual resources constraints, they spend their efforts in areas with optimum potential for cost cutting. An approach that deals with each item in the same manner is less effective than techniques that employ selective control (Lysons and Gillingham, 2003).

This theory is relevant to the study since it abides by the fact that all categories are important but should be treated differently, and every inventory should be classified according to how detrimental or valuable it is.

2.11.4 Economic Order Quantity

Plasecki (2001) describes economic order quantity as the accounting measure of the point where the cost of inventory coupled with the expenses incurred in ordering the stock are least. Lysons and Gillingham (2003) explain that EOQ refers to the ordering size for a product that is most cost effective for a business.

The Economic Order Quantity (EOQ) model helps determine the optimal order size to minimize total costs associated with inventory, including ordering and holding costs. This technique ensures cost-effective procurement and inventory levels (Mursyid, 2013).

According to Lysons & Gillingham, (2003) pointed out that in order to calculate EOQ then there is need of building a model of reality mathematically. Every piece of mathematics is an abstraction of real life processes and all models assume something.

Nevertheless, if these presumptions are true or very true, then the model has to remain the same. Instead of elaborating on an assumption, if it is altered or dropped, a new model needs to be developed.

If there is a high CoV and S2 and if both lead time and demand is reasonably constant, then EOQ has been proven to be effective models of inventory management. This is a notion that is relevant to the research because it suggests that determining how much stock or inventory a firm should hold might help reduce costs.

2.11.5 Hospital Service Delivery

Hospitals are healthcare institutions that provide treatment to the sick and injured with specialized staff and equipment. They are complex service organizations, often characterized as people-based service industries (Azizan & Mohamed, 2013). The right to excellent health care is fundamental, and governments are tasked with ensuring healthcare services are available, accessible, acceptable, and of high quality (Pakdili & Harwood, 2005). As such, the healthcare sector is crucial in developing and maintaining a healthy population, which is vital for achieving national goals.

Healthcare services encompass medical and related health professions' efforts to prevent, treat, and manage illness and maintain mental, social, and physical well-being (Irfan & Farooq, 2012). Given their intangible nature, healthcare services are challenging to assess and measure compared to physical products. Patient satisfaction, a key quality dimension and success indicator, depends significantly on the alignment between patients' expectations and their actual experiences with healthcare providers (Pakdili & Harwood, 2005).

Inventory management is integral to hospital operations, aiming to reduce healthcare costs without compromising service quality. Effective inventory management involves planning and controlling inventories to maintain an adequate stock of products while minimizing procurement and carrying costs (Rachmania, 2013). This is especially critical for pharmaceutical products, where mismanagement can lead to increased costs and supply-demand imbalances (Ali, 2011).

Hospitals must ensure that materials of the right quality are available in the right quantities at the right time and place to meet patient care needs (Goren, 2017). Inventory mismanagement, such as the unavailability of common medicines, can severely impact hospital operations, especially in third-world countries where such issues are often linked to poor materials management.

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Effective inventory management faces several challenges, including inadequate use of technology for recording, lack of sufficient storage space, poor warehouse management, and weak inventory control techniques (Wodajo, 2018). Other challenges include a lack of proper training for inventory management and supply chain personnel, insufficient support from top management, and inadequate availability of health commodities.

Manual inventory management systems, still prevalent in many organizations, can lead to inefficiencies and errors. Proper documentation, skillful store clerks, and effective storage procedures are crucial for maintaining optimal inventory levels and ensuring timely and accurate service delivery (Kaudunde, 2013; Bhandari, 2017).

2.11.6 Technological and Procedural Improvements

The adoption of computerized inventory control systems has significantly improved procurement performance and inventory management efficiency. Such systems facilitate easy storage and retrieval of materials, improve sales effectiveness, reduce operational costs, and ensure uninterrupted service delivery (Benjamin & Onchoke, 2016). Inventory audits and internal security practices further enhance procurement performance by identifying inconsistencies and reducing inventory losses.

Optimization of inventory policies is essential for reducing costs and improving service delivery. This involves analyzing system parameters, examining what-if scenarios, and developing plans for implementing changes in storage areas. Optimization efforts should focus on specific products or locations to ensure targeted and effective improvements (Pai, 2018).

2.11.7 Impact on Finance and Organization

Healthcare businesses' operational effectiveness and financial stability are directly impacted by inventory management. Sufficient cash can limit an organization's capacity to meet material requirements, therefore adequate funding is essential for efficient inventory control (Ng'ang'a, 2013). Financial limitations may force workforce reductions and service reductions, which will lower the standard of patient care and overall service delivery.

2.12 Need for Inventory management in Hospitals

Hospitals are complex organizations that provide a wide range of goods and services to medicine practitioners, patients and employees, particularly food and accommodations, cleaning, pharmacy, laboratory, surgeries and administrative services among others. A system of supply management should be created capable of delivering the necessary materials when they are needed since every department has different material and supply needs. The costs of healthcare are increasing, which is why enhancing inventory systems cannot be accomplished at the cost of treatment quality.

For the following reasons, running a efficient stock management is critical to any care center. The fact that the company spends a vast sum on inventory is one of the most critical ones. Thus, while it is possible to see that different healthcare providers have stocks of rather dissimilar size and worth, ordinary medical supplies and their processing take 25 to 30 percent of a normal budget of a hospital. Around eight to nine percent of the total healthcare expenditure of a given country is used to buy medical supplies. Burns (2002) states that the prices of supplies are broken down into three categories: Medical equipment where DIF ranges from 11 – 24 percent, followed by Medical Surgical supplies ranging from 30 – 50 percent and finally the pharmacy services ranging from 15 – 23 percent. The general requirements for medical equipment clearly indicate that are some of the most sensitive items that require keen consideration when preparing the healthcare budget.

Return on investment (ROI) means an applicant's profit after taxes divided by total standard assets, and it is one of the most popular measures of the success of managers. Cutting down the inventory may substantially elevate the return on investment (ROI) and enhance the organizational pillar because medical supply inventories could comprise a huge portion of an organization's assets. Employers, especially in the healthcare system, require employees who are knowledgeable in the management of the medical supplies stock.

A good system to manage pharmaceuticals is critical in increasing availability of drugs, the usage as well as the cost since there is a high expense on drugs as well as fewer resources available for purchase. Each country has approximately 3000 – 4000 listed drugs where more than 70% of the drugs which are listed are the non-essential drugs as per the WHO report of 2010. A district hospital may have an average of 150 – 200 medicines but a health center may only need 40-50 medicines; an ideal rational medicines list for a nation should include 300-400 drugs. Therefore, within the limitations of the resources at hand, having a shorter list means that it is easier to update this list, acquire it, and share it with the patients.

The expenses for medical supplies and handling services vary between 25–30% of an original hospital's budget. A poll held last year showed that precisely 34% of the operating budget, or over $100 million, is used to run supply operations within the healthcare providers. Also, almost half of health care organization respondents was considered as 'immature' supply chain; surveying major retailers found 'high success' at controlling supply-chain expenses and 'flexibility to address market needs.' That is why it is possible to assume that the introduction of the best supply chain techniques originating from the retail industry to the healthcare sector might lead to considerable levels of increased efficiency.

2.13 Information technology

For the social science specialist, the material development, help in the social context, and shared using of the information for the practical objectives are the components of the "technology. " The last refers to any method or tool to complete the work, advance the capabilities (George & Glassman, 2006). In other words, competences that are made by technology organization lead to significant transformations in organizations. this has also demonstrated how these groups are products that are used in the different ways of passing knowledge in the society (Afshari, Bakar, Luan, Samah, & Fooi, 2008).

Information technology popularly referred to as IT therefore refers to all elements of computer technology The term IT is originated from the initials of information technology which is pronounced as 'I.T.' This entails the internet, networking, hardware, software and the professional who deal with these resources. Today, many organizations have dedicated IT sections that deal with computers, nets, and such things. Computing and automation, network and communications, computation and systems, website construction, technical support and several other related fields constitute the occupation of IT. Current society identifies itself as an information age hence information technology as a significant component of our society (Kumar, 2014).

Technology defined by Apulu and Latham (2011) as any apparatus through which it is possible to acquire, process, store, and transfer information or data. This is true due to advancement in technology whereby it triggers a new age for companies with new discoveries and innovations. This refers to the act where several economies interconnect and integrate to provide a single world economy augmented in the last decade of this century (Ansari, 2013). It is surprising but the idea that information technology affects everyone, and everything is, indeed, accurate as it has substantially altered how people learn, perform activities, and even talk. Over time technology has developed and currently is not a preserve of the developed nations (Bakshi, 2013). Thus, organizations benefit from information technology (IT) because enhances not only internal, but also external effectiveness and the quality of business (Mathaba, Dlodlo, Smith, & Adigun, 2011).

2.14 Information technology and inventory management

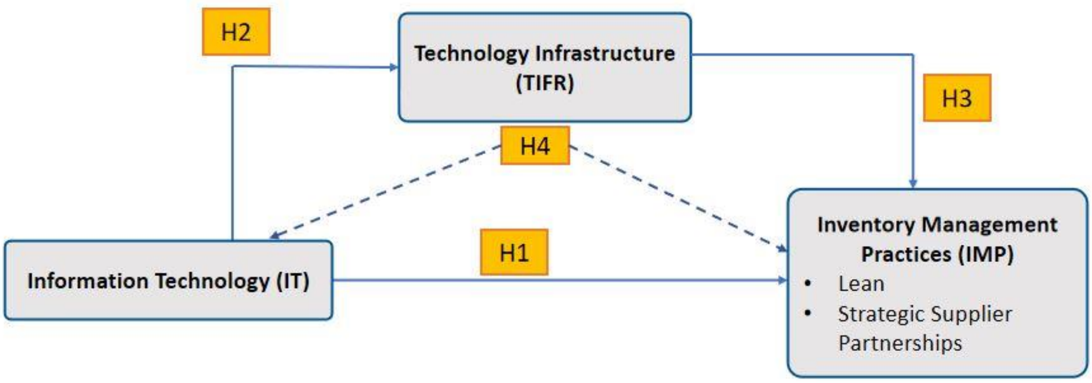
Stakeholder observations, interviews and questionnaires were used as the study methodologies to understand how ICT influences a company's inventory management as proposed by Zengwa and Choga (2016). As found in the study, the implementation of ICT in the management of stocks improved the inventory by increasing the capacity of the transactional system in which stock transactions are affected, the ability to access consolidated database information and the uplifting of departmental productivity and efficiency. Every stock exchange transaction has probes and countermeasures today due to technology. Further, it showed how it enhanced the organization's processes in stock management showing a reduction of labour costs and enhanced quality of inventory. While ICT has assisted a lot in inventory management, the same research proved that some areas still require enhancement as they are counter-productive to the efficiency of the system in general.

The study by Mongare and Nasidai (2014) sought to establish the impact of Information and communication technology on inventory control systems in transport organizations. These include the following sub-sections; questionnaire as the major data collection instrument as well as data analysis and finding, where descriptive statistics were used. Stock control is beneficial to all the stakeholders in that depending on the stakeholders' type, it can be vital for both the short-term and long-term considerations. The solutions implemented in inventory management systems do not necessarily mean that the organizations will require more staff, specialized workers, and technology. Otherwise, the available technology that is currently integrated with the Local Area Network including personal computers and other gadgets can be utilized. Supply chain management and procurement administration are both big on inventory management, as is clear from the following merchandise. This means that instead of following the adoption of stock control technology merely because other business entities have adopted the technology, firms should focus on their requirements and utilize the best technology that could enhance the achievement of their goals. To reduce or adopt wholly any avoidable costs concerning the implementation of stock control systems from the government, the latter must be concerned with continuing to telecommunication infrastructure.

According to Chitiga and Choga (2016), the research whose function is to undertake a qualitative study of the impact of ICT on SMEs' inventory management utilized questionnaires and interviews for data collection. The research also found out that it is limited to a few tasks only with the computer systems in the management of inventories. SMEs appreciate the role of computers in stock management but due to resource constraints and impact of ICT they are unable to implement proper stock policies and practices properly. The major challenges attributed to the effectiveness of employing ICT in inventory control are the factors such as; lack of computer literacy and erratic power supply. Company staff within SMEs should be taught how to use the modern advanced ICT systems and society should be made conscious of the importance of computers.

Shah and Shin (2007) looked at the connections between inventories, profitability, and information technology. The production, wholesale, and retail sectors have all seen uneven changes in stock levels, according to their study's empirical findings. Furthermore, the findings attest to the lack of a connection between IT spending and financial outcomes across all three industries. Nonetheless, the results show that, in the industrial and retail industries, inventory performance plays a major mediating role, supporting the process model of IT investment at the sector level. The collective outcomes of these research underscore the distinctions among the manufacturing, retail, and wholesale domains and have wider ramifications than those derivable from individual-sector investigations. The results show that increases in inventory performance are the indirect means by which the considerable advantages of IT investment on financial performance are achieved. Examining relationships established at the firm level within a higher level of aggregation helps to understand the consistent boundaries of these connections and aids in theory development.

2.15 Theoretical framework



- ❖ Independent Variable = Information Technology (IT)
- ❖ Dependent Variable = Inventory Management Practices (IMP)
- ❖ Mediator = Technology Infrastructure (TI)

2.16 Proposed Hypothesis Based on Model

H1: Information Technology has a significant positive relationship with Inventory Management Practices

H2: Information Technology and Technology infrastructure have a significant positive relationship

H3: Technology Infrastructure has a significant relationship with Inventory management practices

H4: Technology Infrastructure mediates the relationship between Information technology and Inventory management practices

2.17 Technology-Organization-Environment (TOE) Framework:

The TOE framework, developed by Tornatzky and Fleischer in 1990, provides a comprehensive framework to analyze the adoption and implementation of technological innovations within organizations. The framework considers three key aspects:

1. **Technology Context**: Refers to the internal and external technologies relevant to the firm. In this case, Information Technology represents the technological innovations and tools that can be leveraged to improve various organizational processes, including inventory management.
2. **Organization Context**: Involves the characteristics and resources of the firm, including the firm's size, scope, managerial structure, and other organizational attributes. Technology Infrastructure fits within this context, acting as the foundation that supports and enhances the implementation and utilization of IT.
3. **Environment Context**: Includes the external factors such as industry characteristics, market structure, regulatory environment, and competitors. Although not explicitly mentioned in your model, the environment context can influence how IT and Technology Infrastructure are leveraged for inventory management practices.

2.17.1 Application to the Model:

- **Independent Variable (IT)**: Within the TOE framework, IT represents the technological innovations available to the organization that can be utilized to enhance inventory management practices. This includes software, hardware, and other digital tools that improve efficiency, accuracy, and tracking in inventory management.
- **Mediator (Technology Infrastructure)**: Technology Infrastructure serves as the organizational context within the TOE framework. It provides the necessary support and foundation for the effective use of IT. A robust technology infrastructure ensures that IT systems are effectively integrated, maintained, and utilized, thereby enhancing their impact on inventory management practices.
- **Dependent Variable (Inventory Management Practices)**: This represents the outcome or the result of the effective implementation of IT and Technology Infrastructure. Improved inventory management practices can lead to better stock control, reduced costs, improved customer satisfaction, and overall operational efficiency.

2.17.2 Mechanism:

- **Direct Impact of IT on Inventory Management Practices**: Information Technology directly influences inventory management practices by providing tools and systems that enhance tracking, forecasting, and control of inventory.
- **Mediated Impact through Technology Infrastructure**: Technology Infrastructure mediates this relationship by providing the necessary environment and support for IT systems to function optimally. Without a solid technology infrastructure, the effectiveness of IT in improving inventory management practices could be compromised.

The TOE framework supports the model where Information Technology (IT) is the independent variable, Inventory Management Practices is the dependent variable, and Technology Infrastructure acts as a mediator. IT directly impacts inventory management practices by offering technological solutions, while Technology Infrastructure enhances this impact by ensuring the effective implementation and utilization of these technological tools within the organization.

2.18 Deterministic Inventory Theory

Deterministic Inventory theory was first posited by Buzacott, (1975). Deterministic models of inventory control are used to determine the optimal inventory of a single item when demand is mostly largely obscure. According to Crook and Jones (2010), deterministic inventory theory is one of the fundamental techniques used by firms to develop inventory reserve estimates. Deterministic models of inventory control are used to determine the optimal inventory of a single item when demand is mostly largely obscure. Deterministic inventory model helps to understand the challenges of Irregular large orders and frequent small orders. Large orders increase the amount of inventory available, which is costly, but may benefit from volume discounts. Suppliers ensure that perishable goods are sold within their expiry period to prevent loss (Eckert, 2012). The periodic demand for the items is uncertain. Too much supplies results in wastage while too little leads to shortages. Frequent orders are costly to process, and the resulting small inventory levels may increase the probability of stock outs, leading to loss of customers. This theory is relevant to the study as it provides a link with the independent variable of demand forecasting to the study. This is most applicable to health facilities as it deals with perishable goods and services seeking to mitigate inventory management costs.

2.18.1 Application to the Model

Deterministic inventory theory developed by Ford Harris in 1913 focuses on managing inventory when demand, lead time, and other variables are known and constant. This approach enables businesses to develop optimal inventory policies that minimize costs while meeting demand without uncertainty.

The deterministic inventory theory's emphasis on certainty complements the study's exploration of Information Technology’s role in inventory management, where technological infrastructure ensures the precision needed for such models.

3 CHAPTER 3: METHODOLOGY

3.1 Research Design

Research design, therefore, means the method used in organizing a particular research study to achieve its intended objective of providing answers to research questions. This research utilized the quantitative research methodology, which Burns and Grove (1993) identified as an organized, structured, and systematic process of collecting data that uses non-subjective research methods with the aim of assessing relationships and examining the cause-and-effect relationship between variables. Actually, the research design used was descriptive survey design. Mouton (1996) define a survey as a method or technique of acquiring fresh data with the view to describing a large population that one cannot manage to study directly. Acquire data from a selection of individuals with self-report, where the participants answer a number of questions that an investigator attaches to them (Polit and Hungler 1993). In this study, data was obtained through self administered questionnaires administered and administered personally by the researcher. The reason for selecting descriptive survey design was that this design offers the best picture of a given person, event, place, or group in terms of behavior, attitude, skill, understanding, knowledge etc. This design was selected to meet the study's objectives: in order to find out their knowledge retention and perception towards selected aspects in some specific identified private and public hospitals.

3.2 Research Strategy

This research is deductive because it is based on pre-existing theories. We have so much to read because other factors were studying and testing various hypotheses and starting to emerge from those previous theories. Because the research has already been done, a deductive approach is used in this study.

3.3 Population of the study

According to Burns and Grove (1993), a population means all the parts of a subject matter to include people, things, or events that are eligible for the study. The study population in this research included all the staff and management personnel in the current public and private hospitals in the Federal and Provincial capital cities of Pakistan. Specifically, the target population included staff from various departments: the Finance & Administration Unit, Records & Archives Unit, Stores/Supply Unit and the Pharmacy. Given this, the study was interested in the following departments to ensure it obtained exhaustive information that relates to the managerial and operational aspects of the hospitals.

3.4 Sampling

Sampling constitutes a very significant aspect of any investigation and entails some key factors. The aim of most investigations is to obtain data about a population, the data can be collected through everybody in a population through a census or through a subset of the population through a sample.

In the current study purposive and convenience sampling were used as the methods of selecting the samples. The target population was composed of the hospital's staff and departmental personnel who were involved in the procurement and supply of stock. This technique helps in making sure the sample contains a population that is directly related with the study. In its turn, convenience sampling was applied in order to obtain a sufficient number of respondents within the different units of the hospital; the participants were selected according to whether or not they were available and interested in completing the questionnaire.

The target sample of the study was 260 employees. This number was considered sufficient to obtain a representative sample of the hospital's staff and management. Questionnaires were distributed to 260 people to determine the views of the staff and management concerning inventory management. This paper adopted a convenient and random sampling technique because the participants were selected randomly without compromising on their willingness to participate in the study.

Thus, the sample size assumed for this study was 260 individuals. Thus, based on the information given by Pallant (2007), it can be stated that if the number of participants is thirty or more, statistical analysis can be provided even if the collected responses were non-normally distributed. This adequacy enables one to come up with valid and reliable conclusions out of the data that is collected.

3.5 Data Sources

The alternative type of data that was mostly used in the study was primary data which means data collected directly by the researcher to meet certain research purposes. In this case, structured questionnaires and casual interviews were used to put across questions and collect the primary data. Consequently, the following techniques were selected in a way to cover as much as essential data as possible:

Written questionnaires were used to give participants more time to give their responses. This method can be efficient for interviewing many respondents simultaneously for the reason of standardization of answers obtained. Other informal interviews were also administered to augment the responses to the questionnaire since the response was quantitative and such interviews helped to get qualitative responses together with explanations to some of the issues raised. Using these techniques, the study sought to achieve rich and appropriate data straight from the target population in order to meet the requirements of the research study.

3.6 Tool for Data collection

Specifically, the study used both primary and structured questionnaires developed for quantitative data collection techniques. These structured questionnaires were again divided into four broad sections to ensure that all the research objectives where captured comprehensively.

The first part was to obtain the demographic data of the organization and that of the respondents in an effort to establish background information about the study. The second section focused on the first objective: defining and categorizing technological solutions used in healthcare inventory management systems, characterized by certain features and performance capabilities. The third section addressed the second objective: examining the factors, difficulties that exist in healthcare facilities when it comes to the integration of technology-based inventory management system. The last section focusing on the purpose of the study proposed to determine the effects of using technology company inventory on patient safety, treatment success, and cost-effectiveness. All the dimensions were adopted from the previous studies of (Oballah et al., 2015 and Anichebe and Agu, 2013) but the researcher designed it to suit the objectives of the study to solicit answers that would meet the objectives.

The respondents of this study comprised of senior officers or officers at a comparable grade, from several public hospitals were targeted due to their experience and authority in inventory management as well its potential influence on the performance of public hospitals. They were good candidates in offering insights concerning the goals of the study.

The semi structured questionnaires were administered using a convenience sampling technique where the researcher and the respondent fixed the time for the distribution of the questionnaires. This approach made the process of data collection to be more flexible by allowing the participants to make their own time for responding to the questionnaires thus improving the response rate and quality of the data that was given.

3.7 Data Analysis

Sullivan (2001) noted that data analysis is one of the most difficult and at the same time most intriguing phases of the study. It is the method of making inferential sense out of data gathered in a study and comes in many varieties. Quantitative data analysis is a systematic approach of drawing together and sorting out data into parcel and then analyzing as well as summarizing into useable data.

When collecting the data, a process of data reduction was followed in order to choose, sort, modify, narrow, and abstract the data for the later analysis. The collected data was then preprocessed to a suitable format we could use for manipulation and analysis. When collecting the responses from the questionnaires, the data that was collected was edited for completion, comparability and reliability.

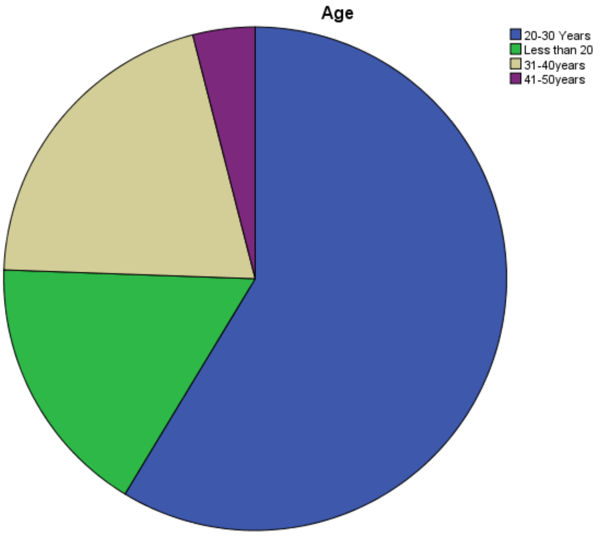
Data analysis was done using Microsoft Excel statistical software as well as Statistical Package for Social Sciences (SPSS). Frequency and descriptive tables were used to analyze the results collected in the current study. Qualitative accounts were done in order to assign meaning to the numbers and to expound their significance. Consequently, recommendations that can be deduced from the research results are enumerated considering these analyses.

4 CHAPTER 4: RESULTS

Table 1: Descriptive statistics

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20	38	16.9	16.9	75.6
	20-30 Years	132	58.7	58.7	58.7
	31-40years	46	20.4	20.4	96.0
	41-50years	9	4.0	4.0	100.0
	Total	225	100.0	100.0	

Figure 1: Pie chart showing Age



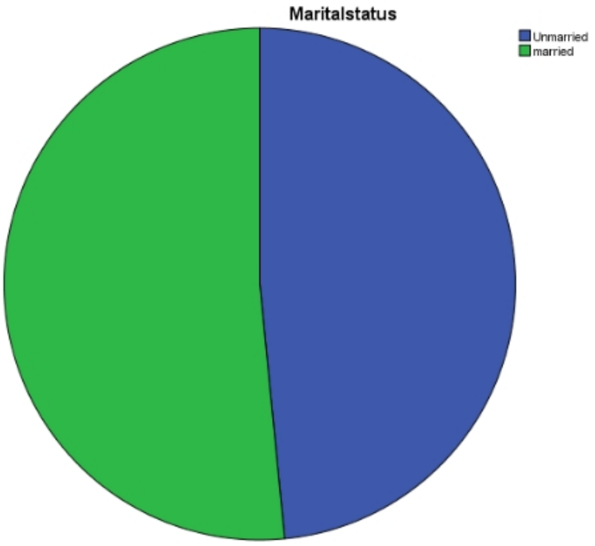
The table presents the distribution of respondents' ages across different categories, detailing the frequency, percent, valid percent, and cumulative percent. The majority of respondents, 58.7% (132 individuals), are between 20-30 years old. This is the largest age group among the sample. The second-largest group, comprising 20.4% (46 respondents), falls within the 31-40 years age range. Those younger than 20 years make up 16.9% (38 respondents) of the sample, while the smallest group, 4.0% (9 respondents), is aged between 41-50 years.

The valid percent values mirror the overall percent values since there are no missing data. The cumulative percent column shows the increasing totals as each age category is added. It starts with 58.7% for the 20-30 years group, which is the cumulative percent up to that category. Adding the 31-40 years group brings the cumulative percent to 96.0%, and finally, including the 41-50 years group completes the total at 100%.

Table 2: Marital Status of the respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unmarried	109	48.4	48.4	48.4
	married	116	51.6	51.6	100.0
	Total	225	100.0	100.0	

Figure 2: Pie chart showing Marital status of the respondents

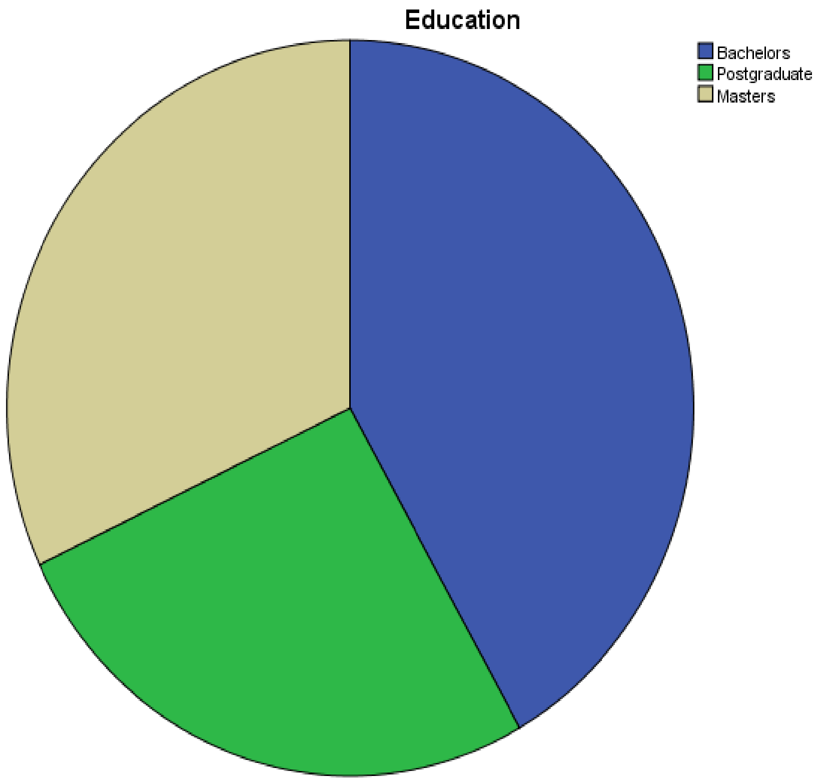


The marital status distribution of the respondents indicates a relatively balanced sample. Out of the 225 respondents, 109 are unmarried, which accounts for 48.4% of the total sample. This nearly half proportion of unmarried individuals is closely matched by the 116 respondents who are married, making up 51.6% of the sample. The cumulative percentage for married respondents reaches 100%, indicating that the entire sample is split almost evenly between unmarried and married individuals. This balanced distribution suggests that the sample includes a nearly equal representation of both marital statuses, with a slight majority being married.

Table 3: Education level of the respondents

Education					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelors	94	41.8	41.8	41.8
	Postgraduate	59	26.2	26.2	68.0
	Masters	72	32.0	32.0	100.0
	Total	225	100.0	100.0	

Figure 3: Education level of the respondents



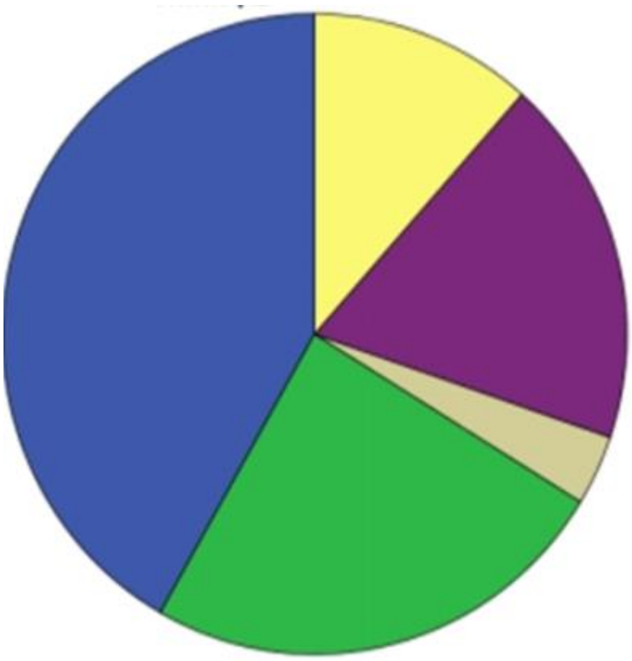
The largest group of respondents, 41.8% (94 individuals), hold a Bachelor's degree. The next largest category, representing 32.0% (72 respondents), have obtained a Master's degree. Those with Postgraduate qualifications account for 26.2% (59 respondents). There are no missing values in the data, meaning the valid percent column mirrors the overall percent for each category.

The cumulative percent column reveals that 41.8% of respondents have a bachelor's degree, and this increases to 68.0% when including those with Postgraduate qualifications. Finally, with the addition of respondents with a master's degree, the cumulative percent reaches 100%.

Table 4: Experience of the respondents

Experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-3years	94	41.8	41.8	41.8
	4-6years	55	24.4	24.4	66.2
	7-9years	8	3.6	3.6	69.8
	10+years	42	18.7	18.7	88.4
	Less than 1 year	26	11.6	11.6	100.0
	Total	225	100.0	100.0	

Figure 4: Experience of the respondents



The provided table illustrates the distribution of respondents' work experience across various categories, measured by frequency, percent, valid percent, and cumulative percent. The majority of respondents, representing 41.8% (94 individuals), have 1-3 years of work experience. This is followed by 24.4% (55 respondents) who have 4-6 years of experience. Those with over 10 years of experience constitute 18.7% (42 respondents), while 11.6% (26 respondents) have less than 1 year of experience. The smallest group, comprising 3.6% (8 respondents), falls within the 7-9 years of experience category. The valid percent mirrors the overall percent since there are no missing data. The cumulative percent column reveals that 41.8% of respondents have up to 3 years of experience, 66.2% have up to 6 years, 69.8% up to 9 years, 88.4% have 10 or more years, and the cumulative total reaches 100% when including those with less than 1 year of experience. Overall, the data reflect a diverse range of work experiences among the respondents, with a notable concentration in the 1-3 years category.

4.1 Normality

Because the normality of data is a need for several tests like correlation and regression, it is crucial to assess its normality. The researcher utilized histograms to make sure the data were normal.

We used shapiro wilk test of normality for small sample sizes (less than 2000). If the p-value is less than 0.05, it indicates that the data significantly deviates from a normal distribution (i.e., it is not normally distributed). If the p-value is greater than 0.05, it suggests that the data is normally distributed. So in the given table all the P values are greater than 0.05 hence it is normally distributed.

Table 5: Shapiro wilk

	Shapiro-Wilk		
	Statistic	df	Sig.
IT	.977	225	.07
LEAN PRACTICES	.968	225	.09
STRATEGIC SUPPLIER	.974	225	.08

PARTNERSHIP			
IT INFRASTRUCTURE	.957	225	.07
INVENTORYMANAGEMENT	.972	225	.06

4.2 Correlation Matrix

Table 6: Correlation Matrix

Correlations

		Lean1	Lean2	Lean3	Lean4	Lean5	SSP1	SSP2	SSP3	SSP4	SSP5	SSP6	SSP7	IT1	IT2	IT3	IT4	IT5
Lean 1	Pearson Correlation																	
	Sig. (1-tailed)	1																
	N	225																
Lean 2	Pearson Correlation	.198**	1															
	Sig. (1-tailed)	.001																
	N	225	225															
Lean 3	Pearson Correlation	.582**	.129*	1														
	Sig. (1-tailed)	.000	.027															
	N	225	225	225														
Lean4	Pearson Correlation	.232**	-.016	.433**	1													
	Sig. (1-tailed)	.000	.404	.000														
	N	225	225	225	225													
Lean5	Pearson Correlation	.114*	.049	.375**	.569**	1												
	Sig. (1-tailed)	.044	.233	.000	.000													
	N	225	225	225	225	225												

***. Correlation is significant at the 0.01 level (1-tailed).*

**. Correlation is significant at the 0.05 level (1-tailed).*

		Lean1	L2	L3	L4	L5	SSP1	SSP2	SSP3	SSP4	SSP5	SSP6	SSP7	IT1	IT2	IT3	IT4	IT5
SSP1	Pearson Correlation	.284**	.162**	.378**	.274**	.518**	1											
	Sig. (1-tailed)	.000	.007	.000	.000	.000												
	N	225	225	225	225	225	225											
SSP2	Pearson Correlation	.414**	.181**	.516**	.539**	.432**	.364**	1										
	Sig. (1-tailed)	.001	.000	.003	.000	.000	.000											
	N	225	225	225	225	225	225	225										
SSP3	Pearson Correlation	.175**	.318**	.321**	.324**	.358**	.169**	.362**	1									
	Sig. (1-tailed)	.004	.000	.000	.000	.000	.006	.000										
	N	225	225	225	225	225	225	225	225									
SSP4	Pearson Correlation	.442**	.163**	.449**	.183**	.122*	.198**	.381**	.228**	1								
	Sig. (1-tailed)	.000	.007	.000	.003	.034	.001	.000	.000									
	N	225	225	225	225	225	225	225	225	225								
SSP5	Pearson Correlation	.510**	.320**	.518**	.455**	.334**	.320**	.622**	.366**	.555**	1							
	Sig. (1-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000								
	N	225	225	225	225	225	225	225	225	225	225							
SSP6	Pearson Correlation	.231**	.105	.345**	.415**	.347**	.021	.319**	.395**	.256**	.493**	1						
	Sig. (1-tailed)	.000	.058	.000	.000	.000	.375	.000	.000	.000	.000							
	N	225	225	225	225	225	225	225	225	225	225	225						
SSP7	Pearson Correlation	.008	.035	.224**	.174**	.245**	.177**	.123*	.228**	.362**	.180**	.508**	1					
	Sig. (1-tailed)	.452	.301	.000	.005	.000	.004	.033	.000	.000	.003	.000						
	N	225	225	225	225	225	225	225	225	225	225	225	225					

		Lean1	L2	L3	L4	L5	SSP1	SSP2	SSP3	SSP4	SSP5	SSP6	SSP7	IT1	IT2	IT3	IT4	IT5
IT1	Pearson Correlation	.348**	.212**	.564**	.453**	.410**	.330**	.454**	.416**	.308**	.423**	.152*	.082	1				
	Sig. (1-tailed)	.000	.001	.000	.000	.000	.000	.000	.000	.000	.000	.011	.110					
	N	225	225	225	225	225	225	225	225	225	225	225	225	225				
IT2	Pearson Correlation	.557**	.127*	.632**	.451**	.451**	.330**	.349**	.382**	.455**	.438**	.302**	.144*	.589**	1			
	Sig. (1-tailed)	.000	.029	.000	.000	.000	.000	.000	.000	.000	.000	.000	.016	.000				
	N	225	225	225	225	225	225	225	225	225	225	225	225	225	225			
IT3	Pearson Correlation	.341**	.097	.368**	.024	.015	.289**	.361**	.309**	.148*	.314**	.068	-.001	.219**	.152*	1		
	Sig. (1-tailed)	.000	.073	.000	.360	.411	.000	.000	.000	.013	.000	.156	.494	.000	.011			
	N	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225		
IT4	Pearson Correlation	.341**	.097	.368**	.024	.015	.289**	.361**	.309**	.148*	.314**	.068	-.001	.219**	.152*	1.000**	1	
	Sig. (1-tailed)	.000	.073	.000	.360	.411	.000	.000	.000	.013	.000	.156	.494	.000	.011	.000		
	N	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	
IT5	Pearson Correlation	.557**	.127*	.632**	.451**	.451**	.330**	.349**	.382**	.455**	.438**	.302**	.144*	.589**	1.000**	.152*	.152*	1
	Sig. (1-tailed)	.000	.029	.000	.000	.000	.000	.000	.000	.000	.000	.000	.016	.000	.000	.011	.011	
	N	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225

***. Correlation is significant at the 0.01 level (1-tailed).*

**. Correlation is significant at the 0.05 level (1-tailed).*

4.2.1 Correlation between Lean Inventory Management Practices and Information Technology.

IT1:

LEAN1: 0.348** (p = 0.000)

LEAN2: 0.212** (p = 0.001)

LEAN3: 0.564** (p = 0.000)

LEAN4: 0.453** (p = 0.000)

LEAN5: 0.410** (p = 0.000)

IT1 has a positive and significant correlation with all LEAN variables, with the strongest correlation being with **LEAN3** (0.564). This suggests that improvements in **IT1** are strongly associated with enhancements in **LEAN3**.

IT2:

LEAN1: 0.557** (p = 0.000)

LEAN2: 0.127* (p = 0.029)

LEAN3: 0.632** (p = 0.000)

LEAN4: 0.451** (p = 0.000)

LEAN5: 0.451** (p = 0.000)

IT2 shows strong positive correlations with all LEAN variables, especially **LEAN3** (0.632), indicating that **IT2** is a critical factor in enhancing **LEAN3**

IT3:

LEAN1: 0.341** (p = 0.000)

LEAN2: 0.097 (p = 0.073, not significant)

LEAN3: 0.368** (p = 0.000)

LEAN4: 0.024 (p = 0.360, not significant)

LEAN5: 0.015 (p = 0.411, not significant)

IT3 is positively correlated with **LEAN1** (0.341) and **LEAN3** (0.368), indicating some relationship, particularly with **LEAN3**, but not with **LEAN2, LEAN4, and LEAN5**.

IT4:

LEAN1: 0.341** (p = 0.000)

LEAN2: 0.097 (p = 0.073, not significant)

LEAN3: 0.368** (p = 0.000)

LEAN4: 0.024 (p = 0.360, not significant)

LEAN5: 0.015 (p = 0.411, not significant)

Identical to **IT3**, showing strong correlation with **LEAN1** and **LEAN3** but not significant with others.

IT5:

LEAN1: 0.557** (p = 0.000)

LEAN2: 0.127* (p = 0.029)

LEAN3: 0.632** (p = 0.000)

LEAN4: 0.451** (p = 0.000)

LEAN5: 0.451** (p = 0.000)

Identical to **IT2**, showing strong correlation with all **LEAN** variables, particularly with **LEAN3**.

4.2.2 Correlations Between IT and SSP Variables:

IT1:

SSP1: 0.330** (p = 0.000)

SSP2: 0.454** (p = 0.000)

SSP3: 0.416** (p = 0.000)

SSP4: 0.308** (p = 0.000)

SSP5: 0.423** (p = 0.000)

SSP6: 0.152* (p = 0.011)

SSP7: 0.082 (p = 0.110, not significant)

IT1 is significantly correlated with most Strategic Supplier Partnership variables, especially **SSP2 (0.454)**. However, it does not show a significant correlation with SSP7.

IT2:

SSP1: 0.330** (p = 0.000)

SSP2: 0.349** (p = 0.000)

SSP3: 0.382** (p = 0.000)

SSP4: 0.455** (p = 0.000)

SSP5: 0.438** (p = 0.000)

SSP6: 0.302** (p = 0.000)

SSP7: 0.144* (p = 0.016)

IT2 shows significant positive correlations with all Strategic Supplier Partnership variables, with the strongest correlation being with **SSP4 (0.455).**

IT3:

SSP1: 0.289** (p = 0.000)

SSP2: 0.361** (p = 0.000)

SSP3: 0.309** (p = 0.000)

SSP4: 0.148* (p = 0.013)

SSP5: 0.314** (p = 0.000)

SSP6: 0.068 (p = 0.156, not significant)

SSP7: -0.001 (p = 0.494, not significant)

IT3 is significantly correlated with most Strategic Supplier Partnership variables except **SSP6** and **SSP7**, with the strongest correlation being with **SSP2 (0.361).**

IT4:

SSP1: 0.289** (p = 0.000)

SSP2: 0.361** (p = 0.000)

SSP3: 0.309** (p = 0.000)

SSP4: 0.148* (p = 0.013)

SSP5: 0.314** (p = 0.000)

SSP6: 0.068 (p = 0.156, not significant)

SSP7: -0.001 (p = 0.494, not significant)

IT3 shows a strong correlation with most Strategic Supplier Partnership variables, except **SSP6** and **SSP7**.

IT5:

SSP1: 0.330** (p = 0.000)

SSP2: 0.349** (p = 0.000)

SSP3: 0.382** (p = 0.000)

SSP4: 0.455** (p = 0.000)

SSP5: 0.438** (p = 0.000)

SSP6: 0.302** (p = 0.000)

SSP7: 0.144* (p = 0.016)

Identical to **IT2**, showing significant positive correlations with all Strategic Supplier Partnership variables, particularly SSP4 (0.455).

Interpretation

The correlations between Information Technology (IT1 to IT5) and the Inventory Management Practices (LEAN Inventory System and Strategic Supplier Partnership) reveal significant relationships that suggest strong interconnectedness. IT1 demonstrates positive and significant correlations with all LEAN Inventory System dimensions, especially LEAN3, indicating that improvements in IT1 are strongly associated with enhancements in LEAN3. IT2 and IT5 exhibit similar patterns, showing strong positive correlations with all LEAN dimensions, particularly LEAN3. This suggests that IT2 and IT5 are critical factors in enhancing various aspects of LEAN Inventory Management system. IT3 and IT4, while also showing some positive correlations with LEAN Inventory Management system, have weaker relationships and fewer significant correlations compared to IT1, IT2, and IT5.

When examining the correlations between IT and Strategic Supplier Partnership dimension, IT1 again shows significant positive correlations with most Strategic Supplier Partnership dimension, notably SSP2. However, IT1 does not have a significant correlation with SSP7. IT2 and IT5 exhibit strong positive correlations with all SSP dimensions, particularly SSP4, indicating their crucial role in influencing SSP dimension. IT3 and IT4, while correlated with several SSP dimensions, show weaker relationships and lack significant correlations with SSP6 and SSP7.

4.3 Regression Analysis

Table 7: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.796[a]	.630	.621	1.124
a. Predictors: (Constant), TI, ITINFRASTRUCTURE				

The regression analysis reveals a strong positive relationship between the independent variables (TI and ITINFRASTRUCTURE) and the dependent variable (INVENTORY MANAGEMENT), as indicated by the multiple correlation coefficient (R) of 0.796. This high R value suggests a robust linear relationship between the observed and predicted values. The R Square (R^2) value of 0.630 indicates that 63.0% of the variability in INVENTORY MANAGEMENT is explained by the model, demonstrating its substantial explanatory power. Adjusted R Square, at 0.621, confirms that the model remains robust even after accounting for the number of predictors and sample size. The standard error of the estimate is 0.28523, indicating that the model's predictions are fairly accurate. Overall, the model effectively explains a significant portion of the variance in INVENTORY MANAGEMENT and provides reasonably accurate predictions.

Table 8: Anova

Anova					
Model	Sum of Squares	Df	Mean Square	F	Sig.

1	Regression	73.947	2	36.973	454.468	.000[b]
	Residual	18.061	222	.081		
	Total	92.008	224			
a. Dependent Variable: INVENTORYMANAGEMENT						
b. Predictors: (Constant), TI, ITINFRASTRUCTURE						

The regression analysis results indicate that the independent variables (IT and ITINFRASTRUCTURE) significantly explain the variation in the dependent variable (INVENTORY MANAGEMENT). Specifically, the regression sum of squares is 73.947, representing the variation explained by the model. The residual sum of squares is 18.061, representing the unexplained variation or error term. The total sum of squares is 92.008, combining both explained and unexplained variation.

The F-value is 454.468, which is the ratio of the mean square regression to the mean square residual. This high F-value suggests that the regression model fits the data well. The significance level (p-value) is 0.000, indicating that the likelihood of the F-statistic being due to random chance is extremely low. Therefore, the model is statistically significant, and the independent variables together significantly predict INVENTORY MANAGEMENT. This strong statistical significance and high explanatory power demonstrate the model's effectiveness in explaining the variance in INVENTORY MANAGEMENT.

Table 9: Coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.936	.088		10.688	.000

	ITINFRASTRUCTURE	.078	.034	.103	2.300	.022
	IT	.669	.037	.817	18.264	.000
a. Dependent Variable: INVENTORYMANAGEMENT						

The regression analysis highlights the significant predictors of INVENTORY MANAGEMENT. The constant term (0.936) represents the expected value of INVENTORY MANAGEMENT when both ITINFRASTRUCTURE and TI are zero, with a t-value of 10.688 and a p-value of 0.000, indicating statistical significance.

For ITINFRASTRUCTURE, the unstandardized coefficient is 0.078, meaning a one-unit increase in ITINFRASTRUCTURE results in a 0.078 unit increase in INVENTORY MANAGEMENT, holding other variables constant. The standardized coefficient is 0.103, indicating its relative importance in the model. With a t-value of 2.300 and a p-value of 0.022, ITINFRASTRUCTURE is a statistically significant predictor at the 5% level.

TI has an unstandardized coefficient of 0.669, indicating a one-unit increase in TI leads to a 0.669 unit increase in INVENTORY MANAGEMENT, holding other variables constant. The standardized coefficient is 0.817, showing its substantial impact. The t-value is 18.264, and the p-value is 0.000, indicating high statistical significance at the 1% level.

In summary, both ITINFRASTRUCTURE and TI significantly predict INVENTORY MANAGEMENT. However, TI has a much stronger influence, as evidenced by its higher standardized coefficient. Improvements in both variables lead to better INVENTORY MANAGEMENT, with TI having a more substantial impact.

Table 10: Model Summary 2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.747[a]	.558	.556	.56074
a. Predictors: (Constant), IT				

- **R**: The correlation coefficient (0.747) indicates a strong positive relationship between the independent variable (**IT**) and the dependent variable (**ITINFRASTRUCTURE**).
- **R Square**: This value (0.558) means that approximately 55.8% of the variance in **ITINFRASTRUCTURE** is explained by the independent variable **IT**. This indicates a good fit of the model.
- **Adjusted R Square**: This value (0.556) adjusts the R Square value for the number of predictors in the model. Since there's only one predictor, the adjusted R Square is very close to the R Square, indicating that the model's explanatory power is reliable.
- **Std. Error of the Estimate**: The standard error (0.56074) is a measure of the accuracy of predictions. Smaller values indicate more precise predictions by the model.

Table 11: Anova2

Anova						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	88.570	1	88.570	281.685	.000[b]
	Residual	70.118	223	.314		
	Total	158.688	224			
a. Dependent Variable: ITINFRASTRUCTURE						
b. Predictors: (Constant), IT						

- **Sum of Squares (Regression)**: This value (88.570) indicates the variance explained by the regression model.
- **Sum of Squares (Residual)**: This value (70.118) indicates the variance that is not explained by the model (error or residual).
- **F-Statistic**: The F value (281.685) tests whether the regression model provides a better fit to the data than a model with no predictors. A high F value suggests that the model significantly improves the fit.
- **Significance (Sig.)**: The p-value (0.000) indicates that the regression model is statistically significant. Since it is less than 0.05, it means that the independent variable (**IT**) significantly predicts the dependent variable (**ITINFRASTRUCTURE**).

Table 12: Coeffecients2

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.854	.162		5.258	.000
	IT	.804	.048	.747	16.783	.000
a. Dependent Variable: ITINFRASTRUCTURE						

- **Constant (Intercept)**:
  - **B**: The unstandardized coefficient for the intercept is 0.854, which represents the expected value of **ITINFRASTRUCTURE** when **IT** is zero.

- **t and Sig.**: The t-value (5.258) and p-value (0.000) indicate that the intercept is statistically significant.

- **IT (Independent Variable)**:
  - **B**: The unstandardized coefficient (0.804) suggests that for each unit increase in **IT**, **ITINFRASTRUCTURE** increases by 0.804 units.
  - **Beta (Standardized Coefficient)**: The standardized coefficient (0.747) shows the strength of the relationship between **IT** and **ITINFRASTRUCTURE** in standardized terms, confirming a strong positive relationship.
  - **t and Sig.**: The t-value (16.783) and p-value (0.000) indicate that the effect of **IT** on **ITINFRASTRUCTURE** is statistically significant.

Table 13: Model Summary 3

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.799	.798	.28796
a. Predictors: (Constant), TI				

- **R**: The correlation coefficient (0.794) indicates a very strong positive relationship between the independent variable (**TI**) and the dependent variable (**INVENTORYMANAGEMENT**).
- **R Square**: The R Square value (0.799) suggests that 79.9% of the variance in **INVENTORYMANAGEMENT** is explained by the independent variable **TI**. This indicates that the model has a strong explanatory power.
- **Adjusted R Square**: The adjusted R Square (0.798) is slightly lower than the R Square, which is expected when only one predictor is used. It confirms that

the model's explanatory power remains high even when adjusted for the number of predictors.

- **Std. Error of the Estimate**: The standard error (0.28796) reflects the average distance that the observed values fall from the regression line. A lower value indicates that the model's predictions are relatively accurate.

Table 14: Anova 3

Anova						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	73.517	1	73.517	886.598	.000[b]
	Residual	18.491	223	.083		
	Total	92.008	224			
a. Dependent Variable: INVENTORYMANAGEMENT						
b. Predictors: (Constant), IT						

- **Sum of Squares (Regression)**: This value (73.517) represents the variance explained by the regression model.
- **Sum of Squares (Residual)**: This value (18.491) indicates the variance that is not explained by the model (error or residual).
- **F-Statistic**: The F value (886.598) tests whether the regression model provides a better fit to the data than a model with no predictors. A very high F value suggests that the model significantly improves the fit.
- **Significance (Sig.)**: The p-value (0.000) is less than 0.05, indicating that the regression model is statistically significant. This means that **TI** is a significant predictor of **INVENTORYMANAGEMENT**.

Table 15: Coefficients 3

Coefficients						
Model	Unstandardized Coefficients			Standardized Coefficients	T	Sig.
	B		Std. Error	Beta		
1	(Constant)	1.003	.083		12.026	.000
	IT	.732	.025	.894	29.776	.000
a. Dependent Variable: INVENTORYMANAGEMENT						

Constant (Intercept):

- **B**: The unstandardized coefficient for the intercept is 1.003, meaning that when **TI** is zero, the expected value of **INVENTORYMANAGEMENT** is 1.003.
- **t and Sig.**: The t-value (12.026) and p-value (0.000) indicate that the intercept is statistically significant.

- **TI (Independent Variable)**:
    - **B**: The unstandardized coefficient (0.732) indicates that for each unit increase in **TI**, **INVENTORYMANAGEMENT** increases by 0.732 units.
    - **Beta (Standardized Coefficient)**: The standardized coefficient (0.894) confirms the very strong positive relationship between **TI** and **INVENTORYMANAGEMENT**.
    - **t and Sig.**: The t-value (29.776) and p-value (0.000) show that the effect of **TI** on **INVENTORYMANAGEMENT** is highly statistically significant.

4.4 Comparison Between Public and Private

For Public Sector

Table 16: Correlation Coefficient for Public sector

Correlation				
		IT	IT Infrastructure	Inventory Management
IT	Pearson Correlation	1	.610**	.722**
	Sig. (2-tailed)		.000	.000
	N	105	105	105
IT Infrastructure	Pearson Correlation	.610**	1	.671**
	Sig. (2-tailed)	.000		.000
	N	105	105	105
Inventory Management	Pearson Correlation	.722**	.671**	1
	Sig. (2-tailed)	.000	.000	
	N	105	105	105
**. Correlation is significant at the 0.01 level (2-tailed).				

IT and IT Infrastructure: The Pearson correlation coefficient is 0.610. This indicates a moderate positive relationship between Information technology and IT Infrastructure. The correlation is significant at the 0.01 level, meaning there's strong evidence that this relationship is not due to chance (p-value = 0.000).

IT and Inventory Management: The Pearson correlation coefficient is 0.722, which indicates a strong positive relationship between Information Technology and Inventory Management. This correlation is also significant at the 0.01 level (p-value = 0.000).

IT Infrastructure and Inventory Management: The Pearson correlation coefficient is 0.671, indicating a positive relationship between IT Infrastructure and Inventory

Management. This correlation is also statistically significant (p-value = 0.000).

There is a strong interrelationship between all three variables, especially between Information Technology (IT) and Inventory Management.

The strong positive correlations suggest that improvements in one variable are likely associated with improvements in the others.

Since all relationships are significant at the 0.01 level, there is a high level of confidence in the strength of these associations.

For private sector

Table 17:Correlation coefficient for Private sector

Correlation				
		IT	IT Infrastructure	Inventory Management
IT	Pearson Correlation	1	.749**	.801**
	Sig. (2-tailed)		.000	.000
	N	120	120	120
IT Infrastructure	Pearson Correlation	.749**	1	.711**
	Sig. (2-tailed)	.000		.000
	N	120	120	120
Inventory Management	Pearson Correlation	.801**	.711**	1
	Sig. (2-tailed)	.000	.000	
	N	120	120	120
**. Correlation is significant at the 0.01 level (2-tailed).				

Pearson Correlation Coefficients:

IT and IT Infrastructure: The Pearson correlation coefficient is **0.749**. This indicates a strong positive relationship between Information Technology (IT) and IT Infrastructure. The relationship is statistically significant at the 0.01 level (p-value = 0.000), meaning there is strong evidence that this association is not due to chance.

IT and Inventory Management: The Pearson correlation coefficient is **0.801**, indicating a very strong positive relationship between Information Technology (IT) and Inventory Management. This relationship is also significant at the 0.01 level (p-value = 0.000).

IT Infrastructure and Inventory Management: The Pearson correlation coefficient is **0.711**, suggesting a strong positive relationship between IT Infrastructure and Inventory Management. This relationship is also statistically significant (p-value = 0.000).

There is a strong positive interrelationship between **Information Technology (IT)**, **IT Infrastructure**, and **Inventory Management**. The highest correlation is between **IT and Inventory Management** (**0.897**), indicating that improvements in IT are closely related to improvements in Inventory Management. All correlations are statistically significant at the 0.01 level, providing strong evidence that these relationships are not due to random variation. In essence, investing in IT and IT infrastructure seems to strongly influence the effectiveness of Inventory Management.

The deviations in correlation between the two sectors representing public and private sectors, could be due to several factors which are as follows:

1. Differences in Technology Adoption:

Public Sector: Often faces budget constraints, bureaucratic processes, and slower decision-making, leading to delayed or uneven adoption of new technologies. This might result in weaker or more inconsistent relationships between IT, IT infrastructure, and inventory management.

Private Sector: Typically adopts technology more quickly to stay competitive, leading to stronger integration between IT systems, infrastructure, and inventory management, as seen in the higher correlations.

2. Efficiency of IT Infrastructure:

Public Sector: May have outdated or fragmented IT infrastructure, which could limit the effectiveness of IT in improving inventory management. This might explain the slightly lower correlations in the public sector data.

Private Sector: More likely to invest in advanced, integrated IT infrastructure, creating stronger synergies between IT and inventory management, resulting in higher correlations.

3. Organizational Flexibility:

Public Sector: Typically operates under more rigid structures and regulations, which may reduce the flexibility and speed of implementing IT solutions that effectively support inventory management.

Private Sector: More agile and responsive, allowing for quicker adjustments in IT and inventory systems, leading to a closer connection between these elements.

4. Focus on Performance Metrics:

Public Sector: The focus is often on meeting regulatory requirements and public accountability rather than operational efficiency, which might weaken the correlation between IT and operational outcomes like inventory management.

Private Sector: Driven by profitability and performance metrics, leading to stronger alignment between IT investments and tangible outcomes like efficient inventory management.

5. Human Resources and Expertise:

Public Sector: May face challenges in recruiting and retaining top IT talent, which could impact the effective use of technology in enhancing inventory management, resulting in lower correlations.

Private Sector: Can attract and retain skilled IT professionals, leading to more effective use of IT infrastructure and stronger performance in inventory management.

6. Goals and Priorities:

Public Sector: Often prioritizes broader public service goals over operational efficiency, leading to less focus on optimizing inventory management through IT infrastructure.

Private Sector: Prioritizes operational efficiency and cost reduction, making IT and inventory management more tightly linked, as reflected in the stronger correlations.

These factors explain why the relationship between IT, IT infrastructure, and inventory management might be stronger in the private sector compared to the public sector.

4.5 Discussion of results

In the context of the research, it is possible to state that the data analysis offers strong evidence for the positive impact of IT on LIS and positive effects of IT on SSP. This research finding supports prior studies that stress the fact that the introduction of IT in the management process brings about a change in inventory management practices and realizes strategic supply chain goals.

Thus, this study establishes that, as an enabler, IT has a significant function in enhancing Lean Inventory Systems. As a result of the facts highlighted in the literature review section of the present paper, it can be noted that studies by Shahin, et al. (2020), Agus and Hajinoor (2012) and Moyano-Fuentes et al. (2012) have indicated that IT is an important enabler of Lean initiatives as it achieves efficient information exchange, integration of processes and real-time information tracking of inventories. I also discovered that this integration affects increases productivity, efficient utilisation of resources and minimization of wastage.

Like in the case of Strategic Supplier Partnerships, several emphases point to the IT division's assertiveness. shows that I&IT improves the cases of communication, collaboration, and synchronization with the suppliers, according to of Fekpe and Fiagbey, (2021), Shah and Shin (2007) and Flynn et al. (2010). This research thus reveals that sound IT support backed by efficient data management improves supplier performance evaluation, shortens lead time, and increases supply chain responsiveness. These enhancements are quite important so as to sustain steady and healthy interaction with suppliers and for a steady supply of medical commodities.

The findings of the regression analysis provides insight into the independent variables that significantly explain the state of inventory management in the healthcare industry, especially the level of IT infrastructure (ITINFRASTRUCTURE) and Technological innovation (TI). As a result, this discussion turns to the subject of explaining how these emerging technologies affect inventory management with references to scholarly papers.

The management of inventory is most advanced through IT hence why IT infrastructure is important in establishing good inventory systems in healthcare facilities. Based on the regression analysis, we discover that ITINFRASTRUCTURE brought the unstandardized coefficient of 0. Actually, table 078 is a statistically significant that determines inventory management. This research finding is supported by literature which shows that elaborative IT systems increase the chances of inventory accuracy, reduce stock out situations, and decreases wastage.

Barbara Saha and Sanjit Ray' study in 2019 shows that IT capabilities like electronic data interchange (EDI) and automatic inventory tracking system strengthen the inventory operations because they facilitate real time data accuracy in operations and improve the decision-making process. These systems promote the coordination and transparency of the supply chain since this area must be closely monitored to prevent overstocking or understocking.

However, by adopting IT infrastructure in the management of inventories, most the healthcare organizations are able to carry out their activities effectively. The authors Uthayakumar and Priyan (2013) while discussing the IT application in inventory control and management mentioned that RFID and bar code scanning systems are effective in minimizing errors and improving the functionality of the firms. This technological integration enables the healthcare providers to be in a position to be able to have records of the stock when it is low so that they can order for restocking and not let the supply run out especially when it comes to the basic necessities in the provision of treating and managing of diseases.

Technological innovation has a significant influence on the inventory; the unstandardized coefficient of 0 is quite high. 669 in the regression analysis In the present study the estimated value for indicating the level of the effects of Internet adoption on the firms' performance was obtained to be 669 in the regression analysis. A number of new phenomena that are within TI include AI, machine learning, and blockchain, among others, form part of TI that leads to the boosting of inventory management in the healthcare setting.

It can be seen that both the variables, namely ITINFRASTRUCTURE and TI have a combined consequence on the management of inventories. Although it is ITINFRASTRUCTURE's responsibility to offer the fundamental systems and tools required for precise inventory and data management, TI unveils enhanced features that enhance these functions. The interaction between these two results in upgrade of stock control and management practices translating to sustainability.

For instance, extending AI with current IT investments could assist in performing everyday inventory ordering and restocking, utilizing predictive analytics. This also enhances the degree of accuracy of the job besides relieving the human assets to work more on tactical tasks. Thus, Tichy et al., (2020) establish that such development of technology helps in the healthcare setting to minimize inventory levels, which besides helps the hospital to minimize wastage of essential medical stocks, these are specifically available when required.

In addition, the global conscious effort in the implementation of new solutions contributes greatly to the supply chain risks. For instance, during the current coronavirus outbreak affecting the supply chain, it becomes essential to promptly address attributes that relate to inventory requirements. According to the literature, where organizations have invested in IT structure and TI, such disasters are managed in a manner that continuity of care is facilitated whilst affecting the patients' outcomes.

The study also supports IT's influence on Lean Inventory Systems and Strategic Supplier Partnerships and stresses on the need to dedicate resources in IT for effective inventory in hospitals. The results of the study are in sync with prior research and give evidence and advancement toward other the various goals in the NHS such as, SDG 3, SDG 9 and SDG 12. It will be imperative to maintain and increase the investment put into IT infrastructure and such technologies to support continuity of such enhancements, not to mention the enhancement of the ever-sensitive health care segment.

5 CHAPTER 5: CONCLUSION AND IMPLICATIONS

5.1 Conclusion

The findings of this research give strong support to the fact that IT has a positive effect on inventory management within the healthcare industry. Through mapping out of variables that define the provision of IT infrastructure and influence technological innovation, the use of LIS, and the development of effective SSPs, the research shows how IT supports inventory management and thus improves organizational operations.

This leads to a finding that while the level of IT infrastructure or support and Technological innovations have been established to be the most reliable predictors of organisations' inventory management capability. Although basics underlying the management of inventory are imparted by the IT infrastructure, technology enhances these basics with better functionalities. The study establishes that there exists a direct link between enhancements in IT leading to enhancements in Lean Inventory systems hence Strategic Supplier Partnerships consequently improving on healthcare delivery systems and its use of resources.

5.2 Theoretical Implications

- Hence, the research provides theoretical significance regarding the impact of IT on inventory management. It enriches and expands upon the existing theories of IT infrastructure and technical advancements' impact on inventories, especially in the healthcare industry.
- Based on the results, it is possible to confirm the theoretical relationship between Lean Inventory Systems and IT. They describe how IT can support the application of Lean and present methodologically sound evidence of

propositions that attribute to IT the role of enabler for improved integration and elimination of wasteful processes.

- The research contributes to the notion of SSP and its theoretical development by demonstrating the role of IT support on the quality and richness of interactions with suppliers. They endorse/promote assertions that associate IT capabilities with improvements in supplier relationships as well as supply chain nimbleness.

5.3 Practical Implications

- It is high time that healthcare organizations focused on adapting superior IT structures especially for managing inventory. Replacements of the current systems that enable facilities for electronic data interchange, real time tracking, and embedded processes are important for improving the levels of precision and organizational efficiency.
- The applicability of the emerging technologies in the field of AI, machine learning and block chain can contribute largely to inventory management. These technologies can be implemented by the care providers to perform routine jobs, enhance decision making and inventory management in healthcare institutions.
- It is vital to note that Lean Inventory System should be incorporated with the healthcare facility's IT. These two areas will be integrated, resulting in the reduction of wastage of resources, improvement of efficient usage as well as resulting in improvements of the overall organization and procedures of the inventory management system.
- Appropriate application of IT leads to development of relationships with suppliers and increase of interaction and performance evaluation. Therefore,

healthcare organizations should use IT to improve partnerships and guarantee the right supply.

5.4 Limitations and Future Directions

5.4.1 Limitations

- This is due to the fact that the study selected one particular type of health industry or a particular area of operation. These results may be limited to other sectors, regions or type of healthcare organizations that were not included in the study. Future studies should extend the concept for a range of healthcare delivery contexts including primary care practice, specialty clinics, or other countries' healthcare systems to increase transferability of the findings.
- One of the main issues with a small sample size is the possibility of less variation and, accordingly, reliability of results when comparing various small, medium, and large organizations or organizations of different types. Thus, the next studies should enroll a greater number of subjects to get a clearer picture of the facilitating role of IT in the task of controlling stocks in different healthcare settings.
- Concerning turnover of technology, creative designs already embedded in the current IT infrastructure base and advanced technological creations have been taken into consideration; however, the continuously changing technology landscape may not be fully captured due to this reason. There could be other issues surrounding the application of the new technologies such as advanced applications of artificial intelligence; hence, new applications of block chain technologies with regard to inventory that were not considered in this research. When reposing the subject in broader and further terms, future research should

consider the effect of contemporary technological innovations as well as the change, potential impact of new innovations on the management of inventories.

- The study is based on survey data and subjective indicators, so it is possible to observe bias and errors. These perceptions indicate that respondents did not have actual outcomes of using the IT and assessment of its influence in managing inventory. For a more accurate analysis of the IT and inventory, it would be necessary to include other forms of data collection like case studies, interviews, or observational research.
- One major methodological issue that arises from this is that the cross-sectional data used in the study doesn't allow causal relations to be drawn. Even though the study establishes the relationship between IT and the practices of inventory management, it does not establish the cause effect relationship. Annual research that shows the evolution of change of events would be useful for depicting how IT influences the dynamics of inventories.

5.4.2 Future Directions

To address these limitations and build upon the findings of this study, future research should explore several avenues:

- Further research works ought to be carried out in a variety of healthcare facilities and in diverse regions to increase the external validity of the data. Subfields of study could include comparing IT effects on inventory in different types of healthcare institutions including hospitals, outpatient clinics, or limited care medicine stations.
- Extending the sample size and an assortment of the sample will give more accurate and generalizable outcomes. Future research should focus on collecting data from more healthcare organizations, not only in terms of their size, types,

or regions and also more questions are providing to know the overall idea about Health IT and inventory management.

- To identify the effect of new technologies, like AI, machine learning, blockchain and others that are already starting to appear on AIS, it is going to be relevant to explore how these technologies change the conditions of inventory management. More research should be conducted to understand how these technologies are implemented into ‘stock’ and supplies management in healthcare facilities and the implications.
- Therefore, in a bid to improve the quality and richness of the data obtained, there is a need to use multiple research methods in future research studies. Due to the limitations of quantitative survey data, including potential subjectivity, the research will incorporate interviews and case studies to supplement observational quantitative surveys of IT’s effects on inventory management.
- Longitudinal studies shall be employed to develop causal relations with the surveyed IT and inventory management practices. In this manner, researchers are able to identify how IT influences changes in inventory and factors that contribute to such outcomes in the long run.

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APPENDIX

Questionnaire

Dear Respondents

We are conducting this research on Inventory management practices to gather valuable insights into this phenomenon. This study is purely for research purposes only and any answer you provide will be anonymous and confidential and no individual will be identified. Please take time to read the following information.

Answering the questionnaire will take approximately 10 – 15 minutes; it is up to you to decide whether or not to take part. You are still free to withdraw at any time and without giving a reason. Your decision to withdraw will not affect your rights/any future treatment you receive.

By taking part in this study, you are implicitly confirming that you have read the information above and you agree to participate.

If you have any questions regarding this study, please do not hesitate to contact me using the contact information below.

Thank you in advance for your participation in this research

Section 1: Characteristics of study participants

Please tick (   ) the appropriate circle which corresponds to your answer.

Demographic profile

a) ○Age

○○○○Less than 20   20 – 30   31 – 40   41-50   51-60

b) ○○**Gender**   Male   Female

c) ○○**Marital Status**   Single   Married

d) ○Education

○○Bachelor   Master   Post Graduate

e) Which unit of the hospital do you work?

○○○○○○OPD   Stores   Record

Pharmacy   Surgical   Laboratory

Other _______________

f) How long have you worked for the hospital?

○○○○○less than 1 yr   1-3 Yr   4-6 Yr

7-9 yr   10 years and above

Please rate the following terms based on intrinsic and extrinsic determinants of sustainable entrepreneurial intentions, below:

1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

Section 2: TECHNOLOGY INFRASTRUCTURE (Islam et al., 2015))

My organization uses technology that allows

1	It monitors its competition and business partners	1	2	3	4	5
2	Employees to collaborate with other people inside the organization	1	2	3	4	5
3	Employees to collaborate with other people outside the organization.	1	2	3	4	5
4	People in multiple locations to learn as a group from multiple sources	1	2	3	4	5
5	It to retrieve and use knowledge about its markets and competition.	1	2	3	4	5
6	To generate new opportunities in conjunction with its partners.	1	2	3	4	5

Section 3: INVENTORY MANAGEMENT PRACTICES (Oballah et al., 2015)

Use the following scale:

1 = strongly disagree 2 = disagree 3 = neutral 4 = agree 5 = strongly agree

Lean Inventory System

1	Operation of Just-In-time (JIT) purchasing system – where no safety stocks are kept	1	2	3	4	5
2	Agreements with supplier for short cycle deliveries (items which doesn’t take long to deliver)	1	2	3	4	5
3	Accurate prediction of supplier delivery dates	1	2	3	4	5
4	Operation of materials Requirements planning system (MRP) – where bills of materials are 100% accurate	1	2	3	4	5
5	Little or no expediting	1	2	3	4	5
Strategic Supplier Partnerships						
6	Involving suppliers early in product design process	1	2	3	4	5
7	Use of suppliers to manage inventory on behalf of the hospital (Vendor managed Inventory)	1	2	3	4	5
8	Use of fewer suppliers as opposed to many suppliers.	1	2	3	4	5
9	Frequent meetings between hospital’s inventory staff and the suppliers	1	2	3	4	5
10	Complete information sharing between the hospital and its suppliers	1	2	3	4	5
11	Proper communication between the hospital and suppliers	1	2	3	4	5
12	Long – term agreements between the hospital and its suppliers	1	2	3	4	5
INFORMATION TECHNOLOGY						

13	The hospital has computerized all inventory management systems	1	2	3	4	5
14	The hospital's computers are linked with those of suppliers in a real time environment	1	2	3	4	5
15	The hospital uses Electronic Data Interchange Technology (EDI)	1	2	3	4	5
16	IT metrics and KPIs are defined	1	2	3	4	5
17	IT is aligned with business goals	1	2	3	4	5

Section 4: CHALLENGES OF INVENTORY MANAGEMENT (Anichebe and Agu, 2013)

Please to what extent do you agree with the following as the challenges of inventory management

1	Delays in delivery of drugs leading to insufficient inventories	1	2	3	4	5
2	Use of outdated storage facilities	never	rarely	sometime s	often	Alway s
3	Use of manual inventory management system/Lack of technology	never	rarely	sometime s	often	Alway s
4	Lack of training	never	rarely	sometime s	often	always
5	Holding too much/too little inventory	never	rarely	sometime s	often	always

6	Bureaucratic process in procurement	never	rarely	sometimes	often	always
7	Loss of drugs through inventory shrinkages	never	rarely	sometimes	often	always
8	Conflict of interest	never	rarely	sometimes	often	always
9	Weak management system	never	rarely	sometimes	often	always
10	Insufficient funds for procurement	never	rarely	sometimes	often	always
11	Purchase of drugs with a near expiration date	never	rarely	sometimes	often	always
12	Overstocking/under stocking	never	rarely	sometimes	often	always

Snapshot of Results

2	2	2	1	2	3	2	3		3	4	2	2	3	2	2
2	2	3	3	4	2	1	2	3	2	1	2	1	3	2	1
3	3	3	5	4	4	2	3	2	3	2	3	3	3	3	2
1	1	3	1	1	1	4	5	5	5	5	5	5	5	5	5
3	3	4	1	1	1	4	4	5	5	4	5	4	5	5	4
2	1	2	4	3	4	4	3	2	2	2	2	2	4	2	2
4	2	3	1			2	4	5	4	3	2	4	1	5	4
4	3	3	5	4	4	2	2	2	2	2	1	2	2	2	1
5	5	5	5	1	5	4	1	1	1	1	1	1	1	1	1
4	4	3	5	4	3	5	3	3	4	4	3	4	3	3	3
2	2	4	3	1	1	4	2	5	4	4	5	5	5	5	4
4	5	2	1	4	3	3	3	3	3	3	3	4	4	5	4
3	4	4	3	2	4	3	2	4	1	3	1	2	2	4	4
3	4	4	5	5	5	4	1	3	3	3	4	3	3	3	4
4	4	3	5	2	1	4	3	2	3	2	2	3	3	3	3
5	5	3	4	4	4	3	2	1	1	1	2	1	1	1	3
3	2	2	4	2	4	4	4	3	4	4	4	3	4	4	4
3	4	4	3	1	1	3	2	3	1	2	1	2	2	2	3
5	5	5	5	2	4	4	2	1	4	4	5	2	4	3	5
4	4	4	5	4	4	2	1	1	2	1	1	1	1	1	1
3	4	4	3	3	3	3	3	4	4	3	3	3	2	3	3

20 – 30	Female	Masters		OPD	1-3 Yrs	3	2	5	4	4	4	1	3	4
20 – 30	Female	Bachelors	Private	Pharmacy	Less than 1	1	1	1	1	1	1	3	4	1
41-50	Female	Post Gradu	Private	OPD	10 Years an	4	4	4	5	4	4	4	4	4
20 – 30	Female	Bachelors	Private	OPD	4-6 Yrs	4	4	4	4	4	4	4	4	4
20 – 30	Female	Bachelors	Public	Laboratory	4-6 Yrs	3	4	4	3	3	2	4	2	3
20 – 30	Female	Bachelors	Private	OPD	Less than 1	3	3	3	2	4	2	2	2	3
31 – 40	Female	Masters	Private	OPD	4-6 Yrs	3	2	3	3	2	3	3	3	3
20 – 30	Female	Post Gradu	Public	Surgical	1-3 Yrs	2	4	4	2	4	3	3	3	3
20 – 30	Female	Post Gradu	Public	OPD	1-3 Yrs	1	2	1	1	1	1	1	1	2
31 – 40	Female	Post Gradu	Public	Surgical	4-6 Yrs	1	1	1	1	1	1	3	3	3
20 – 30	Female	Bachelors	Private	OPD	4-6 Yrs	3	4	3	2	3	2	3	3	2
20 – 30	Female	Post Gradu	Public	Surgical	1-3 Yrs	3	4	4	3	2	4	2	3	4
31 – 40	Female	Post Gradu	Private		1-3 Yrs	3	4	4	4	4	4	3	3	3
20 – 30	Female	Post Gradu	Private	OPD	1-3 Yrs	5	5	5	5	2	5	3	4	4

20 – 30	Female	Masters		OPD	1-3 Yrs	3	2	5	4	4	4	1	3	4
20 – 30	Female	Bachelors	Private	Pharmacy	Less than 1	1	1	1	1	1	1	3	4	1
41-50	Female	Post Gradu	Private	OPD	10 Years an	4	4	4	5	4	4	4	4	4
20 – 30	Female	Bachelors	Private	OPD	4-6 Yrs	4	4	4	4	4	4	4	4	4
20 – 30	Female	Bachelors	Public	Laboratory	4-6 Yrs	3	4	4	3	3	2	4	2	3
20 – 30	Female	Bachelors	Private	OPD	Less than 1	3	3	3	2	4	2	2	2	3
31 – 40	Female	Masters	Private	OPD	4-6 Yrs	3	2	3	3	2	3	3	3	3
20 – 30	Female	Post Gradu	Public	Surgical	1-3 Yrs	2	4	4	2	4	3	3	3	3
20 – 30	Female	Post Gradu	Public	OPD	1-3 Yrs	1	2	1	1	1	1	1	1	2
31 – 40	Female	Post Gradu	Public	Surgical	4-6 Yrs	1	1	1	1	1	1	3	3	3
20 – 30	Female	Bachelors	Private	OPD	4-6 Yrs	3	4	3	2	3	2	3	3	2
20 – 30	Female	Post Gradu	Public	Surgical	1-3 Yrs	3	4	4	3	2	4	2	3	4
31 – 40	Female	Post Gradu	Private		1-3 Yrs	3	4	4	4	4	4	3	3	3
20 – 30	Female	Post Gradu	Private	OPD	1-3 Yrs	5	5	5	5	2	5	3	4	4