



**ASSESSING THE IMPACT OF ICT OPERATIONAL EFFICIENCY ON  
WAREHOUSING DEMAND IN KENYA A CASE OF TILISI LOGISTICS PARK**

**By**

**AMOS KIPRONO YEGON**

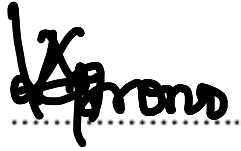
**P54/11734/2018**

**A RESEARCH PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF  
COMPUTING AND INFORMATICS, IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE AWARD OF MASTER DEGREE IN INFORMATION  
TECHNOLOGY MANAGEMENT (ITM), UNIVERSITY OF NAIROBI.**

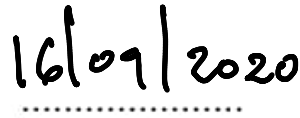
**AUGUST, 2023**

**DECLARATION**

This research project report is my original work and has not been submitted for examination in any other University

  
.....

Signature

  
.....

Date

AMOS KIPRONO YEGON

P54/11734/2018

This research project report has been presented for review with my acceptance as University Supervisor

  
.....

Signature

  
.....

Date

Prof. AGNES N WAUSI

## **DEDICATION**

This project is dedicated to my Dad, Jonah Korir, who taught me that the best kind of knowledge to have, is that which is learned for its own sake. It is also dedicated to my Mother, Emily Korir, who taught me that even the biggest task can be accomplished if it is done one step at a time. I also dedicate this project to my siblings; Charity, Florence, Erick, Lilian and Vincent, for the support they accorded me to make this project a reality. Lastly, I dedicate this work to my Supervisor, Prof Agnes N. Wausi, who fully dedicated her time to accord me the needed help and guidance throughout the time of my research project.

## TABLE OF CONTENT

	<b>Page</b>
<b>DECLARATION</b> .....	ii
<b>DEDICATION</b> .....	iii
<b>TABLE OF CONTENT</b> .....	iv
<b>ABSTRACT</b> .....	vi
<b>LIST OF TABLES</b> .....	vii
<b>LIST OF FIGURES</b> .....	viii
<b>ACRONYMS AND ABBREVIATIONS</b> .....	ix
<b>CHAPTER ONE: INTRODUCTION</b> .....	1
1.0 Introduction.....	1
1.1 Problem Statement.....	5
1.3 Research Objectives.....	6
1.3.1 General Objective.....	6
1.3.2 Specific Objectives.....	7
1.4 Research Questions.....	8
1.5 Study Hypotheses.....	8
1.6 Justification of the Study.....	8
1.6.1 Logistic Firms.....	9
1.6.2 Government.....	9
1.6.3 Researchers.....	9
1.7 Scope of the study.....	9
1.8 Limitations of the Study.....	10
1.9 Summary.....	10
<b>CHAPTER TWO: LITERATURE REVIEW</b> .....	11
2.0 Introduction.....	11
2.1 ICT Utilization in Warehousing Demand.....	11
2.2 Theoretical Framework.....	13
2.2.1 Resource Based View Theory.....	13
2.2.2 Transaction Cost Economics Theory.....	14
2.2.3 Management Theory.....	16
2.3 Review of Empirical Studies.....	17
2.3.1 Utilization of Warehouse Information Technology.....	17
2.3.2 Loopholes to Efficient Utilization of Warehousing Information Technology.....	20
2.4 Conceptual Framework.....	21
2.5 Summary of Literature Review.....	24
<b>CHAPTER THREE: RESEARCH METHODOLOGY</b> .....	25
3.0 Introduction.....	25
3.1 Research Design.....	25
3.2 Study Target Population.....	25
3.3 Sample Size and Sampling Techniques.....	26

3.3.1 Sample Size Determination .....	26
3.3.2 Sampling Procedure.....	27
3.4 Data Collection Research Instruments .....	27
3.5 Pilot Study.....	28
3.6 Validity and Reliability .....	28
3.6.1 Validity .....	28
3.6.2 Reliability .....	28
3.7 Data Analysis and Presentation.....	29
3.8 Ethical considerations .....	31
<b>CHAPTER FOUR.....</b>	<b>32</b>
<b>DATA ANALYSIS, RESULTS AND DISCUSSION.....</b>	<b>32</b>
4.0 Introduction .....	32
4.1 Descriptive Statistics.....	32
4.1.1 Response Rate.....	32
4.1.2 Reliability Test .....	32
4.1.3 Demographic Analysis .....	33
4.1.4 ICT Resource Factors .....	36
4.1.5 Cargo Transaction Tracking .....	38
4.1.6 ICT Systems Management.....	41
4.1.7 ICT Operational Efficiency on Warehousing Management .....	43
4.2 Inferential Statistics.....	46
4.2.1 Correlation Analysis .....	46
4.2.2 Regression Coefficients .....	47
4.3 Discussion of the Results .....	48
4.3.1 ICT Resource Factors .....	48
4.3.2 Cargo Transaction Tracking .....	49
4.3.3 ICT Systems Management.....	49
4.3.4 ICT Operational Efficiency on Warehousing Management .....	50
<b>CHAPTER FIVE .....</b>	<b>51</b>
<b>SUMMARY, CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>51</b>
5.1 Introduction .....	51
5.2 Summary of the Findings .....	51
5.3 Conclusion.....	52
5.4 Further Research Study Areas.....	53
<b>REFERENCES.....</b>	<b>54</b>
<b>APPENDIX I: TIME FRAME.....</b>	<b>60</b>
<b>APPENDIX II: BUDGET.....</b>	<b>61</b>
<b>APPENDIX III: LETTER OF INTRODUCTION .....</b>	<b>62</b>
<b>APPENDIX IV: QUESTIONNAIRES FOR STAFFS &amp; BUSINESS PERSONS .....</b>	<b>63</b>

## **ABSTRACT**

Warehouse Information Technology is concerned with the handling and commissioning of products. It is part of intra-logistics and is closely related to materials handling and packaging technology. Warehouse Information Technology is known to be an integral part of supply chain management. Primary objective of this study was to assess impact of Information Communication Technology on operational efficiency of Tilisi Logistics Park's warehouses demand. The study was informed by following research objectives; to establish how stakeholders at Tilisi Logistics Park utilize ICT for efficient inventory management in on-demand warehouses and to determine shortcomings in the efficient use of ICT techniques for inventory management in on-demand warehouses at Tilisi Logistics Park. Specifically, the study was guided by three theories: Resource-based theory, Transaction cost-economic theory, and Management theory. The research will only use quantitative methods. Descriptive research design was used to provide accurate and efficient representation of the variables under study. The sample was taken from the manager, the workers of the Tilisi Logistic Park and the businessmen. Stratified random sampling was used to determine the sample size of 171 respondents. Purposive sampling technique was used to collect primary data using questionnaires and interview schedule. Researcher performed Pearson's correlation and regression test to establish the relationship between variables under analysis. Data was analyzed using the Statistical Package for Social Sciences (SPSS) software, 25version. Descriptive and inferential statistics was used for quantitative analysis. Frequencies and percentages were used to provide descriptive statistics. Findings were presented in tables and figures and were applicable to the Ministry of Trade and Industrialization. The study revealed that variables studied were statistically and positively correlated to ICT operational efficiency on warehousing demand such as Tilisi Logistic Park. In addition, the study found out that the CT utilization influence operational efficiency on warehousing demand in Kenya. Hence, this study recommends that every warehouse and logistics firm should aim to ensure that management systems effectively automate their processes. Through this the way warehouses are handled can be greatly enhanced. This study therefore suggests the need to carry out researches on how stakeholders are utilizing ICT for efficient inventory management in on-demand warehousing and to determine loopholes to efficient utilization of ICT techniques for inventory management in on-demand warehousing.

## LIST OF TABLES

Table 3.1: Study Sample Population.....	27
Table 4.2: Response Rate.....	32
Table 4.3: Reliability and Validity Results.....	33
Table 4.4: Age of Respondents.....	34
Table 4.5: Gender of the Respondents.....	34
Table 4.6: Level Education.....	35
Table 4.7: Departments where Respondents Work.....	36
Table 4.8: ICT Resource Factors.....	36
Table 4.9: Cargo Transaction Tracking.....	38
Table 4.10: ICT Systems Management.....	41
Table 4. 11: ICT Operational Efficiency on Warehousing Management.....	43
Table 4.12: Correlation Analysis.....	46
Table 4.13: Regression Coefficients.....	47

## LIST OF FIGURES

Figure 1: Resource Based Theory Model .....	14
Figure 2: Transaction Cost Theory Model.....	15
Figure 3: Management Theory Model .....	17
Figure 4: Conceptual Framework .....	22



## ACRONYMS AND ABBREVIATIONS

<b>EOQM:</b>	Economic Order Quantity Model
<b>GPS:</b>	Global Positioning Systems
<b>ICT:</b>	Information Communication Technology
<b>IT:</b>	Information Technology
<b>RFID:</b>	Radio Frequency Identification
<b>SCIT:</b>	supply chain information technology
<b>SCM:</b>	Supply Chain Management
<b>SPSS:</b>	Statistical Package for Social Sciences
<b>TPL:</b>	Third Party Logistics
<b>WMS:</b>	Warehousing Management Systems

## **CHAPTER ONE: INTRODUCTION**

### **1.0 Introduction**

This chapter outlines research background, problem statement, research objectives, research concerns

### **1.1 Background of the Study**

There have been various technological advances around the globe in the current business world and the increase in demand for the use of information technology to improve efficiencies in different areas. In India, Jabbar et al., (2018) conducted a study on ICT 's contribution to effective warehouse management. Zhou, et al., (2017) claims that warehousing logistics involves not only operations related to the physical transportation of the goods, but also maintains relationships with vendors and customers. Warehousing management is, therefore, a mechanism by which consumer needs are met by supply chain alignment and collaboration (Christopher, 2016). The study's main objective was to evaluate the different technologies used in the management of warehousing, including information technology, communication technology and automatic recognition. The research concluded that Technology is a tool for improving productivity and performance in warehousing by increasing the overall efficiency and effectiveness of the logistics system. Besides being less laborious, numerous technical advances have made the job simpler and faster.

According to Baruffaldi, et al., (2019) in the contemporary business environment, warehouse management as viewed by the industry today is not merely managing within the boundaries of a warehouse; it is far broader and reaches beyond the physical limits. Inventory control, inventory planning, cost management; warehouse management is all related to IT software & communication technologies to be used (Lee, 2018). Berhanu, (2017) notes that container

storage, loading and unloading are also protected by today's warehouse management, which is also part of Supply Chain Management (SCM) and needs good management.

Richards, (2017) further indicates that warehousing continues to play a significant role in modern supply chains. With the proper application of ICT warehouses, they are constantly forced to improve their warehousing operations and are able to attain a competitive market through them. ICT also helps to achieve the high-performance warehousing goals by eliminating any waste from the warehouse, streamlining its operations and improving efficiency in all aspects of warehousing.

Technological innovation has been described as one of the business world's biggest influencers today (Richards, 2017). While many claim that information technology helps primarily large enterprises with a substantial financial strength, there is evidence that even small warehouses can benefit from IT developments. This can be done by partially automating their operations through the new internet-based services (Vicén Sampériz, 2018). Organizations are making every effort to cut costs and enhancing efficiency. Only by making correct design decisions about strategic characteristics of warehouse facilities can warehouse maintenance cost savings be achieved (Baruffaldi, Accorsi and Manzini, 2019).

Warehousing continues to play a major role in the modern supply chains in Morocco (Razik, Radi and Okar, 2017). Companies are constantly being pushed to boost their warehousing operations in today's dynamic business climate (Richards, 2017). To achieve high performance warehousing targets, a way of removing any waste from the warehouse needs to be found (Abushaikha, Salhieh and Towers, 2018). The study explored new approaches to improve the efficiency of warehousing roles based on the Maturity model that could better define, clarify, evaluate and optimize this essential feature in warehouse. Consequently, by demonstrating its

ability to assess the maturity of warehousing operations, Razik, (2017) validated the model developed by a case study in a Moroccan firm.

Warehouse management systems have also been available since the earliest computer systems, and basic storage location functionality has been required (Lee, et al., 2018). Today, WMS systems could be stand-alone or part of a business process management program, and can include advanced technologies such as radio frequency identification and speech recognition. The basic concept of the warehouse system, nevertheless, remained the same, which is to provide information to facilitate effective control of material movement inside warehouse (Reis, Stender and Maruyama, 2017). A WMS is always complex to implement. Project planning is critical for any implementation of WMS to succeed. There is the additional difficulty of implementing the program when the warehouse still operates (Schwarzkopf, 2018).

New supply chain technology can help increase agility in the supply chain, improve service, reduce cycle time, achieve greater productivity and deliver product to customers on time if properly implemented (Christopher, 2016). Critical integration of new methods with current technology and processes is also to be ensured. Integrating emerging technology into existing processes would significantly help to improve customer loyalty, cut costs and streamline supply chains (Attaran, 2017).

Dissemination of IT has significantly affected the third party logistics industry's competitive scenario in recent years, helping to shift Third Party Logistics' supply chain position significantly (Johnson et al., 2020). The position of logistics service companies is more important than in the past in that they have the task of integrating and optimizing physical and information flows at different supply chain rates (Durst and Evangelista, 2018). Few empirical study focused on performance evaluation of TPLs, in particular structuring 3PIs for value-added services

evaluation (Zybell and Wallenburg 2017). As information technology evolved, several organizations embraced its implementation to improve operational efficiency in their business processes. Logistics companies, in particular, have not been left behind in their company processes while applying IT (Tu, 2018).

On-demand warehousing is essential in: Freight forwarding: in the age of tariffs, flexible freight forwarding is very important (Archetti and Peirano 2019). It combines a technological platform, expertise and infrastructure for better business management and proper planning; Inventory management and planning: on-demand warehousing make it possible for brands and retailers to manage inventory through the creation of a supply chain and creation of more accurate demand forecasts; On-demand warehousing helps in optimization in the movement of goods both inside and outside the warehouse through visibility and controlling of inventory; On-demand warehousing entails after-sales services connecting companies to transport systems and an automated marketplace (Khan *et al.*, 2017).

The demand for warehouse space in Kenya is set to increase as the number of companies setting base in Kenya keeps growing exponentially (Mutai and Moronge 2017). Funds meant for the construction of warehouses is increasing every year as more investors opt to invest their money in the construction of storage houses. According to an Attitude Survey by Knight Frank, a property management company, more resources will be put into logistics and warehousing and the sector will soon end up as the opted for investment option, therefore overtaking high-street retail shops and shopping centers (Christopher, 2016). On-demand warehousing is a major goal of the online retailers for them to be successful and set them apart from their competitors (Fawcett *et al.*, 2018).

Previously, warehouses were popular with the importers and manufacturers (Orenstein, 2019). With the flexibility of ICT, on-demand warehousing is increasingly becoming popular in Kenya. Flexibility is important as it gives brands and retailers unprecedented which create an open logistics network for the optimization of movement of goods (Lakerbaya, 2017). On-demand warehousing is a technology-based solution enabling brands and retailers a platform to create faster and more efficient digital supply chains offering competitive advantages (Kong *et al.*, 2017).

The integration of ICT in the warehouse and logistics sector, in particular, inventory management unleashes enormous potential to unlock the effectiveness of inventory management in the warehousing sector by improving the exchange of information, increasing predictability, eliminating duplication of supply chains, placing orders and better monitoring of demand for some products (Kumar and Muthuvelayutham, 2018). According to Hazwani and Fitri (2018) ICT is among the most important enabler of effective supply chains and logistics. Apiyo and Kiarie (2018) Added the ICT increases the productivity of the supply chain, decreases processing times, achieves higher efficiency and delivers goods to its consumers on time.

### **1.1 Problem Statement**

In order to operate more efficiently, it is important that warehouses recognize the importance of ICT for effective inventory management. Lack of ICT inventory oversight in the warehouse triggers the build-up of inefficiencies within the warehouse, which disrupts operations and thereby increases the costs which in return increase vulnerability and affordability. This can also reduce adaptability, livelihood diversification and investments. Without sufficient insight into warehouses location and layout, pickers may take much longer time in finding the things they

need. This can also lead to poor security in the warehouse which often leads to robbery and pilferage. Bad warehouse management systems also result in a ripple effect on working capital.

Lack of use of ICT by firms is always caused by Resource factors, of; stakeholders, ICT costs, assets and capital and factors that affect ICT utilization are fraudulent transactions and risk coverage limits. Failure to adopt ICT in managing Tilisi Logistics Park translates to high management cost. This occurs in terms of human capital as well as the facilities and equipment required. It also promotes inefficiency which has a direct effect on the overall performance of the clearance of goods thus jeopardizes the achievement of required level of customer service.

Strategic use of ICT software is influenced by different IT systems namely; Warehouse Management Systems, Vendor Management Inventory and Distribution Resource Planning. These allow warehouses to: track stock effectively, quickly recognize out-of-date stocks, reduce clerical errors that can lead to over-stocking or under-stocking with ripple effects on keeping costs and poor delivery of customer service, respectively. The aim of this research is to assess the impact of ICT Operational Efficiency on Warehousing Demand (Tilisi Logistics Park in Kenya, in this case).

### **1.3 Research Objectives**

#### **1.3.1 General Objective**

The general objective of the study was to assess the impact of ICT operational efficiency on warehousing demand.

### **1.3.2 Specific Objectives**

The specific objectives of this study are:

- i. To establish how stakeholders are utilizing ICT for efficient inventory management in on-demand warehousing
- ii. To determine loopholes to efficient utilization of ICT techniques for inventory management in on-demand warehousing.



## **1.4 Research Questions**

The research had the following questions to guide:

- i. How are resource factors influencing utilization of ICT for efficient inventory management after the introduction of on-demand warehousing?
- ii. What outsourced ICT services are used for tracking the movement of goods in on-demand warehousing?
- iii. How are existing ICT loopholes influencing the operational efficiency of on-demand warehousing in logistics?
- iv. How are the existing ICT loopholes in on-demand warehousing limiting efficient operations?

## **1.5 Study Hypotheses**

**H<sub>0</sub>:** ICT systems have no significant impact on ICT operational efficiency on warehousing demand at Tilisi Logistic Park.

**H<sub>A</sub>:** ICT systems have significant impact on ICT operational efficiency on warehousing demand at Tilisi Logistic Park.

## **1.6 Justification of the Study**

This research was tailored to Tilisi Logistics Park (TLP) since it offers investors land parcels for light industrial and logistics developments in a clean and organized environment. TLP is supported by facilities such as matatu lay byes, a petrol station, localized shops and canteens to further benefit the staff and operators at TLP. The study is therefore of great importance to the logistic firms the government and to researchers.

### **1.6.1 Logistic Firms**

Findings from this study would provide Tilisi Logistic Park as well as other logistic firms with more information on how they can effectively use information technology to increase their performance, hence, achieve a competitive advantage in the industry.

### **1.6.2 Government**

Government would be able to use information from this study to come up with new strategies that they can use to increase access and use of information technology in the country, hence, promoting warehousing management and performance.

### **1.6.3 Researchers**

Findings and recommendation could be used by researchers to conduct further studies on impact of operational efficiency on warehousing demand. Through this there can be an increase in knowledge concerning information technology and performance of warehousing and supply chain logistics.

## **1.7 Scope of the study**

The study focused on ICT impact on operational efficiency on the demand for processing of Tilisi Logistics Park in Kenya. The target population was staffs and business people at Tilisi Logistics Park. It ensured an awareness of the effect of ICT operational performance on Tilisi Logistics Park. Analysis was performed for this thesis by providing standardized questionnaires and interviews. The study was expanded to cover the specific digital platforms that Tilisi Logistic Park had adopted.

## **1.8 Limitations of the Study**

This research faced limitations on the lack of willingness of some study participants to share crucial details. Some officers dealing with the safe custody of Tilisi Logistics Park files containing audit reports were reluctant to provide the necessary details. This reluctance contributed to delayed completion of the data collection process.

The process of data collection was not smooth because it was conducted at a time when there was lockdown and reaching out to potential study participants was a tussle to the researcher. The study also experienced limitations on the time spent to conduct an analysis since more time was spent on distribution of questionnaires.

## **1.9 Summary**

The chapter discusses the context of the project, the statement of the problem and the objectives of this research, the significance of the study and the scope of the study, and the definition of terms. Chapter two discusses the literature analysis that guides the study in greater detail. Chapter three deals with the methods employed in the study.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.0 Introduction**

This chapter sets out the literature review of the research. It starts with a general review of theories that support ICT platforms and techniques for inventory management in on-demand warehousing for operational efficiency. It gives a clear view on what ICT is influencing the logistics sector in Kenya. It also outlines research gap, conceptual framework, and finally it provides a literature review summary.

### **2.1 ICT Utilization in Warehousing Demand**

Nunes, et al., (2020) posits that a high market requirement in the realization of trade flows impose a need for more efficient and more effective management of all links of supply chains. According to Sosunova, et al., (2018), the overall connection of logistics subsystems and the exchange of timely and correct information is one of the basic prerequisite conditions for the development of logistics processes. Thereby, the development of information-communication technologies – ICT, gains a significant notation when it comes to the managing of logistics subsystems. In a study done by Ali, and Haseeb, (2019), ICT is a key aspect of operational cost decrease and increase in overall production and delivery of goods. The study presented how the technologies work, how they affect the overall supply chains and what their main benefits are.

The implementation of consignment monitoring technologies now allows companies much greater access to higher amounts of information than they used to be (Urbinati, et al . , 2020). Not only are companies able to use this data for their own advantage with state-of-the-art monitoring systems, but it is becoming increasingly common to allow their own consumers to

access such information. Wiedmann and Lenzen (2018) notes that many supply chains are growing with expanded foreign trade and now include more than one or two organizations. Communication networks open up with monitoring information accessible to all those concerned, and data can flow seamlessly between parties (Janssen, et al., 2017). This means less time is spent following information because it's all there, entered into the tracking system, allowing for more preparation to be carried out in advance and more precise.

ICT facilitates an immediate feed of information to its customer from a third party logistics supplier, and then guides it to the manufacturer or final user (Reinartz 2019). Ventura, et al., (2019) states that data-sharing is made simpler with real-time data since the user already has access to it when searching for relevant information. Customer service levels have improved, as it is easier to respond to customer inquiries effectively. With this level of access, it enables complete transparency between the logistics provider and third party customers, driving up the quality levels and consequently customer satisfaction (Govindan, et al., 2016).

Bar code scanning and RFID is about optimizing day-to-day operations and activities to allow a company to provide a superior quality of service to their customers. When such a system is in place, it will do the collection and analytical tasks and alter the skill set needed to handle stock and the amount of work required to do so. Using a more data-driven approach, operations can be completely streamlined due to the ability to plan forward and shorten lead times, as selection becomes simpler. The operations in principle remain much the same but the procedures become much more time-sensitive and allow the warehouse to have short life cycles of the product. Haddud, et al., (2017) Indicates the ICT is entirely implementable in the supply chain.

According to ElKhouly, and Elkomy, (2019) ICT helps in creating a system where supply chain software converses with software from the suppliers. Haddud, et al., (2017) also argues that ICT provides a framework where all the data are viewed at one place and can be cross-referenced. It also provides ease of comparing the performance and optimizing stock levels, forecasting demand and market growth with scalable figures. Warehouse management systems including transport planning, CRM systems, and external databases are now completely integrable ElKhouly, and Elkomy, (2019).

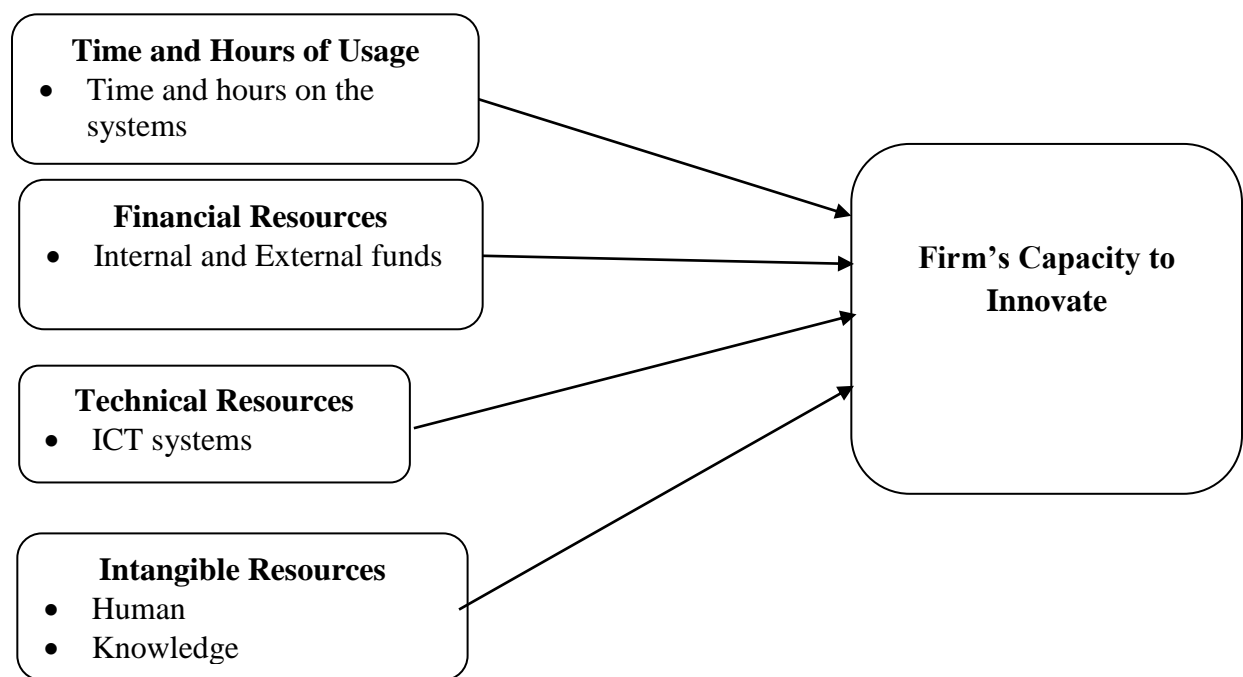
## **2.2 Theoretical Framework**

This research adopts three theories that explain operation efficiency of ICT in on-demand warehousing. These theories comprise of Resource-Based Theory, Transaction Cost Economics Theory and Management Theory. The research follows a multi-theory approach; as selected theories appear to be more consistent with known facts relevant to research variables. In addition, the established research theories summarize and organize a vast amount of information, making the current study more focused on its main variables.

### **2.2.1 Resource Based View Theory**

The Resource-Based View (RBV) theory claims that companies need mostly time as a key resource. However, other resources such as financial, technical and intangible resources are important for every organization and they can be used to gain innovative operational efficiency that can contribute to superior long-term success. Resources that are unique and uncommon can contribute to an operational efficiency. This theory was developed by Mahoney and Pandian in 1992 and it explains the ability to deliver a sustainable firm operation.

It entails managing resources in such a way that competitors cannot mimic their results, which eventually generates a competitive advantage (Brem and Wimschneider, 2016). Business groups in emerging economies take lead when entrepreneurs and companies have sector entry capabilities. However, such capacity can be retained as a precious, rare, and inimitable ability only if an asymmetric circumstance of foreign trade and investment prevail.



**Figure 1: Resource Based Theory Model**

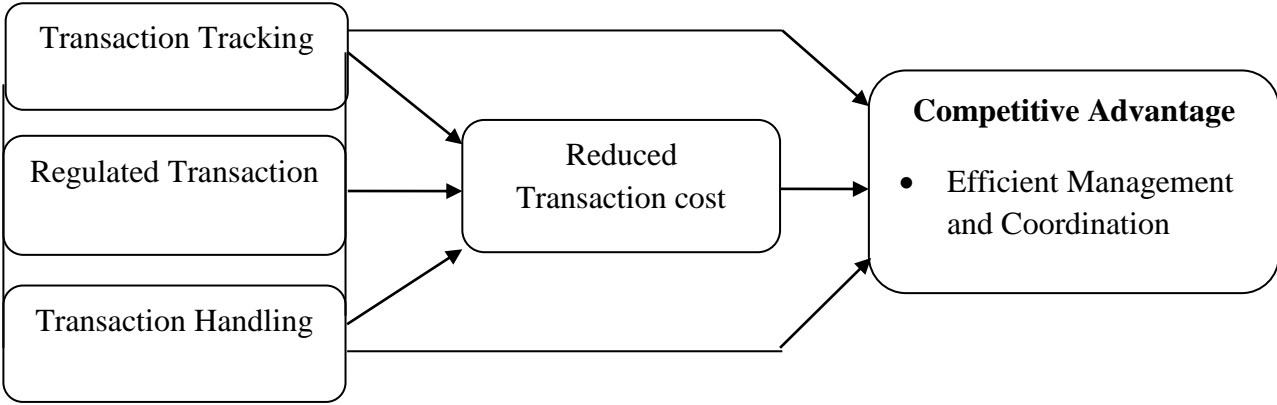
Source: Adapted from Mahoney and Pandian in 1992 and modified by Author 2020

### **2.2.2 Transaction Cost Economics Theory**

The theory of transaction costs refers to the optimal organizational structure that produces economic productivity by reducing the exchange costs. The theory implies that the management costs of recording, monitoring and handling transactions arise from each form of transaction. The Transaction Cost Theory was introduced in 1986 by Williamson. Williamson argues that one that

achieves economic stability is the ideal organizational structure by reducing the exchange costs. The theory suggests that each type of transaction generates coordination costs for monitoring, controlling and managing transactions (Schmidt and Wagner, 2019).

Transaction cost economics theory argues that ICT usage leads to lower transaction costs linked to transaction management and successful communication (Wiesner, 2017). It clearly acknowledges the costs of coordination between the economic institutions in the markets, emphasizing that a firm's main role is to manage transactions effectively. ICT reduces logistics management costs, enhancing transactional productivity by increasing knowledge exchange and collaboration capacities, resulting in increased performance of supply chains. For a firm to improve performance and survive in a competitive environment, it will have to adapt to respond to competitive actions. Information Communication Technology reduces the coordination costs, making it more valuable in the intensely competitive markets.



**Figure 2: Transaction Cost Theory Model**

Source: Adapted from Hang 1998

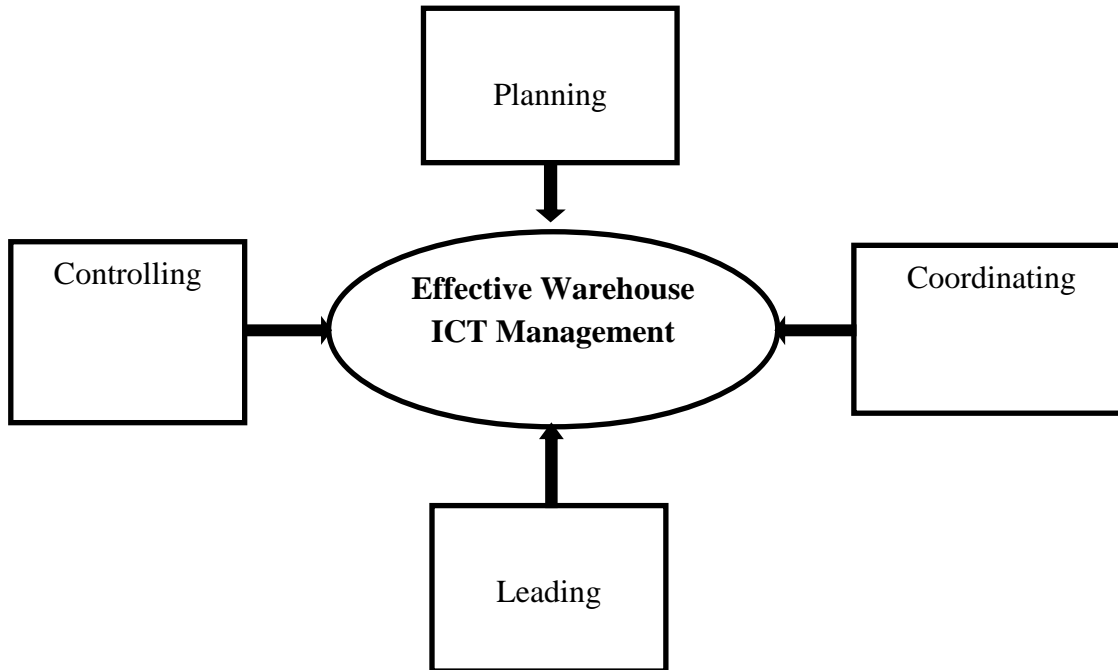


### **2.2.3 Management Theory**

Management theories are the set of general rules which guide managers to manage an organization. It was first formulated by Frederick Winslow Taylor in 1909 who was one of the early advocates of the theory of management. Frederick Winslow Taylor said that the management theories are an explanation for motivating employees to respond effectively to company objectives and implement good means

Theory of general management emphasizes that managers are essential to business. Management theory was coined from the behavioral theory which indicates that management is the rule of game within the organization and it involves planning, organizing, directing and controlling organizational activities. In addition, it considers other management processes such as motivating, coordinating, staffing and communication. In doing so, it reduces the complexity of risks and transaction costs associated with any single move.

For this analysis this theory is adopted because it allows the logistics firms to make a decision. It will encourage logistics managers to use a model that is a reflection of the situation in real life. This study will explore four management elements that are frequently repeated in the Organization and highly integrated (planning, co-ordination, leadership, and control).



**Figure 3: Management Theory Model**

Source: Adapted from Frederick Winslow Taylor 1909 and modified by Author 2020

## 2.3 Review of Empirical Studies

### 2.3.1 Utilization of Warehouse Information Technology

Globally, Warehouse Information Technology is perceived to be an integral part of supply chain management. Bahr, Mavrogenis and Sweeney (2019) published a report on the application of information and communication technology to warehouse operations in the United Kingdom. According to Duan and Xu, 2016, Warehouse Information Technology is generally referred to as Company System or the Warehouse Management System. He noted that the Warehouse Management System is designed to support all distribution activities and to provide efficiency and information in real time during service. Interlink Technologies started offering WMS solutions in 1986 and became a pioneer in the global supply chain industry (Angelos, 2017).

Dima, et al. (2018) argues that the sustainability of potential economies depends on the production and implementation of technology. Guneskaran, *et al.*, (2017) examined the effect of information technology on the logistics companies ' competitive advantage in China. The findings showed that ICT has a large impact on the enterprise's competitive advantage. David and Muthini (2019) have also conducted research on supply chain management activities and efficiency across public research institutions in Kenya. Information technology has been shown to have a clear statistically relevant relationship to results.

Altayeb, et al., (2017) argue that RFID technology is a non-contact and automatic identification technology that uses radio signals to identify, track, sort and detect a range of objects, including people, vehicles, products and assets, without the need for direct contact. Nayak, (2019) studied the effect of radiofrequency identification (RFID) technologies on the supply chain of hospitals. Findings showed that the use of RFID has contributed to cost savings and improved quality of service. RFID technology can minimize costs.

Ayers and Odegaard (2017) claim that, At Wal-Mart and Procter, RFID innovations helped reduce inventory by 70 percent and boost service rates from 96 percent to 99 percent. The effect of RFID technology on the efficiency and competitiveness of retail supply chains was studied by Ayers and Odegaard (2017). It has been identified that RFID influences the productivity and profitability of the product. McMurtrey, (2018) investigated whether RFID increased the financial efficiency of firms. Findings showed that RFID has an impact on the financial results of

the company. Ko, Azambuja, and Lee (2016) claimed that the Radio Frequency Identification System (RFIDS) can be used to reduce costs, exchange information and increase performance.

Luvaha and Ayienga (2016) investigated the application of RFID technology to improve the quality of customer service in a Kenyan supermarket. The results showed that the use of RFID technology has allowed the business to enhance the level of customer service by reducing the time customers spend in the stores. Ali and Haseeb (2019) investigated the impact of RFID (Radio Frequency Identification) technology on supply chain efficiency. The results showed that RFID use reduces project time costs and increases organizational performance and production. Biswal, Jenamani, and Kumar (2018) note that RFID technologies can increase supply chain process efficiency, reliability, and speed; reduce storage and handling costs.

Maata and Ombui, (2018), also conducted ICT and supply chain efficiency research among logistics firms in Nairobi, Kenya. It has been discovered that (RFID) and Global Positioning Systems (GPS) have had a major effect on the supply chain efficiency of logistics companies, among other ICT applications. Magutu, et al., (2016) conducted research on the Supply Chain Approaches, Technology and Performance of Large-Scale Manufacturing Companies in Kenya. It was discovered that its use of origin allowed the company to restructure the entire production set up to achieve higher rates of service and lower inventories and lower costs of the supply chain, thereby growing income.

### **2.3.2 Loopholes to Efficient Utilization of Warehousing Information Technology**

Karim and Salin (2018) performed an inventory management study in Malaysia. The study found that warehousing The management of inventories is a crucial element in managing and reducing total costs and increasing the standard and quality of services provided by any company. Lau, Nakandala and Shum (2016) argued that this is an area that plays a major role in any firm's overall production costs and supply chain. The inventory is a buffer against the uncertainty of supply and demand (Muller, 2019). Inventory is a double-edged sword because lack of inventories can lead to a loss of productivity, whereas excess inventories can lead to a loss of profitability (Wiengarten et al., 2017). Management of inventories has a strong and substantial impact on the financial efficiency and profitability of the business (Zimon, 2019). Efficient inventory management also gives enterprise competitive advantages over rivals.

Koster, Johnson, and Roy (2017) conducted a report to assess the operational efficiency of information technology management in Canada. He noted that competitive pressure is forcing businesses to concentrate on Supply Chain Information Technology (SCIT) to meet consumer demands. Glenn Murphy, Chairman and CEO of GAP Inc., recently reported that GAP is leveraging information technology to expand its industry-leading Omni-channel capability (Nakasumi, 2017). The level of integration and collaboration required for the implementation of Omni-channel delivery is focused on an efficient SCIT. SCIT is a key factor facilitating cross-border cooperation and integration (Liu, *et al.*, 2016). For example, SCIT enables firms to exchange knowledge easily and efficiently with their chain partners, which is a significant feature of on-demand warehousing and modern supply chains (Manners-Bell and Lyon, 2019).

Riza, and Purba (2018) sought to determine the effectiveness of the Quantity Model of the Economic Order. That's the volume of inventory that lowers total inventory stock costs and the purchasing costs. This is one of the to be produced classic production models. It can be applied extensively, as discussed by Khalilpourazari and Pasandideh (2019) in their in-depth analysis. The model only works if the demand for a service or product is constant throughout the year and any new orders are fulfilled in full until the inventory is nil. For each order placed there is a fixed charge, regardless of the number of units ordered.

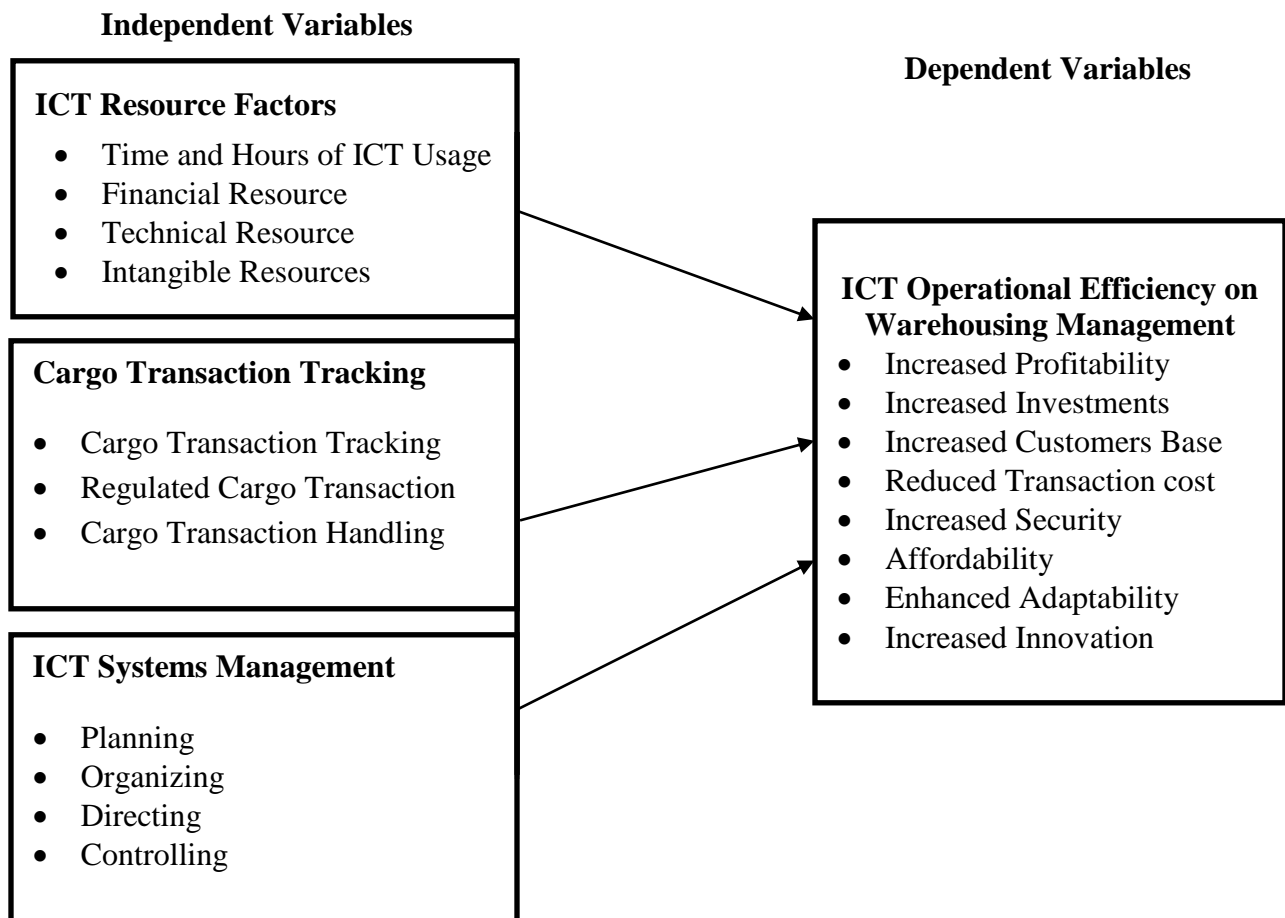
The cost of holding or storing each unit kept in storage is often expressed as a percentage of the purchase cost of the item, according to Alfares and Ghaithan (2016). The parameters required for the solution are total year demand, manufacturing costs for each item, fixed shipping costs and storage costs for each item each year. Cont and Kukanov (2017) the number of times the order is issued that the total cost would also have an effect; however, that sum could be estimated from other parameters.

According to Shaikh (2017), the model assumes constant purchasing costs and demand, the lead time is fixed, and the item's purchase price is constant. Additionally, there is still no discount available, the refilling is completed immediately and the whole shipment is delivered at once. The general aim of this model is to determine the best units to buy for the lowest costs associated with production, storage and distribution costs. The EOQ is basically a trade-off between the production costs and the cost of maintaining the commodity.

## **2.4 Conceptual Framework**

This section presents a conceptual framework that addressing the research objectives. In sets the stage for presenting the research questions that drives the investigation based on the problem statement. It also presents the context and the issues being investigated in this study. In addition,

this conceptual framework maps out the actions that must be undertaken in the study to fill the knowledge gaps. That is, answering questions that other researchers have not fully explained yet. Finally, it presents the dependent and independent variables to be used in the analysis. These variables have been identified based on the synthesis of literature.



**Figure 4: Conceptual Framework**

**Source: Researcher**

The study identified 3 factors that will be investigated in relation to the impact of ICT operational efficiency on Warehousing Demand in Kenya.

**ICT Resource Factors:** These are key factors of production or inputs used to promote use of ICT. They include Time and Hours of ICT Usage, Financial Resource and Technical Resource and Intangible Resources which depicts how operational efficiency has been enhanced in the warehouse.

**Cargo Transaction Tracking:** Cargo transaction tracking involves checking Moving consignment traffic, status and location with capture of logistics domain business transaction outcomes. These include; Cargo Transaction Tracking, Regulated Cargo Transaction and Cargo Transaction Handling shows real time tracking of cargo in the warehouse.

**ICT Systems Management:** ICT systems management involves the control of hardware and software changes into operating systems. It involves processes that guide activities such as motivating, coordinating, staffing and communication within the warehouse to smoothen or ease the operations.



## **2.5 Summary of Literature Review**

In this section the literature relating to every research topic has been reviewed. There has been a theoretical study of the use of ICT in warehousing management underpinning this work. Resource Based Theory, Transaction Cost Economics Theory and Management Theory have been explicitly reviewed. The literatures on the use of warehouse information technology and Loopholes for effective use of warehousing information technology have also been reviewed. In addition, the gaps in the research arising from the literature gaps have been illustrated.

However, the utilization levels of information technology storage, especially in the Tilisi Logistic Park, remain extremely small. The explanations for the low utilization rate differ from person to person. The most popular examples involve established ICT-related loopholes for both internal and external ICT service providers.

This study explores the impact of the use of ICT storage on the management of Tilisi Park Logistics. This is achieved by evaluating both the usage of ICT in Tilisi Park Logistic and Loopholes for the Effective Use of Information Technology Warehousing.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.0 Introduction**

This chapter outlines the various steps that will be taken to complete the study. It sets out the data collection, data validation, and data analysis methods. Therefore, the chapter includes the following subsections: nature of the sample, target population, procedures for data collection and analysis of the results.

### **3.1 Research Design**

Creswell and Creswell (2017) define a research design as a plan, map, or technique used to respond to research questions. The study adopts a descriptive research design which focuses on key areas of interest. Descriptive research design also helps the researcher to clearly identify and describe a research problem's true characteristics without altering the study variables. Kim, et al. (2017) describes a descriptive survey design as a design that seeks to accurately reflect a specific individual, circumstance or community 's characteristics. Researchers register, count, delineate and rank in a succinct review, according to Adams (2017). Descriptive research studies are also defined as studies that have the precise representation of the characteristics of individuals, circumstances or groups and/or the frequency with which certain phenomena occur as their principal objective. This concept has been used in previous studies relating to the adoption of technology in banks.

### **3.2 Study Target Population**

Accordingly, the study population Kern, et al. (2016) is a well-defined or well-defined group of people, groups of things, households, firms, services, elements or under investigation events. The target population is the specific population which is being asked for information (Kern, et al., 2016).

### 3.3 Sample Size and Sampling Techniques

The research followed stratified random sampling in which logistic companies in the Nairobi area were divided into five strata: Northern, Eastern, Central Western and Southern Nairobi. According to Etikan and Bala, (2017) stratified random sampling is suitable if the target population lacks homogeneity as it provides high statistical performance. For about 742 logistics companies in the Nairobi area, (Kenya Business List Directory, 2017) purposeful sampling was used to settle at Tilisi Logistics Park.

#### 3.3.1 Sample Size Determination

It was predicted that the target population for this study would exceed 10,000 hence Fisher's et al. (1998) formulae will be used to derive the sample size needed.

$$n = \frac{Z * p * q}{(d^2)}$$

Where:

**n**= Desired sample size

**Z**= the standard normal interval of confidence deviates from 95 percent (1.96)

**p**= an estimated percentage of the target population with interest characteristics (0.5)

**q**= 1-p

**d**= Degree of accuracy set at 0.05

$$n = \frac{1.96*0.5*0.5*0.05}{(0.05^2)}$$

**n=196**

The study sample size was composed of 1 manager, 5 officials, 40 staffs working at Tilisi Logistic Firm and 150 business people. The study sample population was determined by using systematic sampling.

**Table 3.1: Study Sample Population**

<b>Targeted Respondents</b>	<b>Sample Size</b>
Manager	1
Officials	5
Staffs	40
Business persons	150
Total	196

### **3.3.2 Sampling Procedure**

Sampling is the selection of units to be used in the analysis. The selected units will be representative of the entire sample population. Members were separated into homogeneous clusters using a two-stage cluster sampling. Every division formed a cluster, and then stratified sampling was used to obtain two heterogeneous strata; old members and new members. For the staff at Tilisi Logistic Firm, simple random sampling was adopted to get the desired sample size.

### **3.4 Data Collection Research Instruments**

Primary data were used and gathered by close-ended and open-ended questionnaires and in-depth and scheduled interviews. Primary data were divided into Section A; dealing with Context Data of Respondents, Section B; ICT use for efficient inventory management in on-demand storage and Section C; limitations in the effective use of ICT techniques for inventory management in

on-demand storage. The respondents were staffs working at Tilisi Logistics Park warehouse and businessmen who used the Tilisi Logistics Park warehouse facilities.

### **3.5 Pilot Study**

Piloting involves small-scale training of selected participants. Few participants were in the pilot study to report on different aspects of the test instruments. Sahu and Singh, (2016) notes that it is important to perform experiments using a pilot study. According to Sahu and Singh, (2016), pre-testing analysis methods provides space for error detection prior to actual data collection, and 10% of the sample population was considered appropriate to perform a pilot study.

### **3.6 Validity and Reliability**

#### **3.6.1 Validity**

Arias, et al., (2018) describe validity as the substance of the instrument relating to the study components. In order to know how accurate, the instruments of analysis are, the supervisor and my colleagues must expertly analyze the instruments of review. Their input would help to develop the resources for analysis. Taherdoost, (2016), notes that instruments are validated using content validity methods that measure the level of representation on common content concepts or indicator domains. Validity was built to assess the characteristics or existence of the psychological construct evaluated by the testing instruments.

#### **3.6.2 Reliability**

Reliability is the degree to which the results of a research study can be repeated using the same process (Koo, 2016). Reliability is the accuracy of data collection methods, taking into account

tests from various outcomes (Monahan, 2019). To obtain accurate results, qualitative research approaches, including interviews and comprehensive literature review, will be used to collect information on the use of information technology in warehousing and its contribution to operational performance.

The piloting approach should use 5% of the target population, which will not be included in the report. The input obtained from the pilot study would make it possible to change the test instruments accordingly. At a time, span of two weeks, the instruments will be retested by the same pilot group; however, questions will be shuffled and separate papers will be used. The analysis will use Chronbach alpha with coefficients varying from 0.00 to 1.00 to show the reliability of the questionnaires for all variables.

### **3.7 Data Analysis and Presentation**

Data analysis is the transformation of raw data into useful knowledge for easy comprehension and interpretation. Researcher used descriptive statistics, correlations and regression analysis to present data findings. Standard deviation was used to illustrate the operational efficiency of the ICT systems implemented at Tilisi Logistics Park. The correlation test and linear regression model was used to assess the overall operational efficiency of ICT approaches implemented in the logistics field. The concept of regression is:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \varepsilon$$

Where: Y = Operational efficiency of on-demand warehousing

$\beta_0$  = Constant Term;

$\beta_1, \beta_2, \text{ \& } \beta_3$  = Beta coefficients;

X1= ICT Resource Factors

X2= Cargo Transaction Tracking

X3= ICT systems management

$\epsilon$  = Error term assumed normal and, independent and identically distributed

The quantitative and qualitative data collected was checked for completeness and was then coded. The codes were entered for analysis in the SPSS. The findings obtained were portrayed using correct graphs, charts and figures to explain the study objectives. Descriptive statistics were important for the analysis of results. Various statistical methods were used to evaluate the shape, spread and center of the distributions which helped in the classification of the results.

### **3.8 Ethical considerations**

O'Leary, (2017) states that it is important to tell the participants that being part of a study is completely voluntary and the results would be referred to anonymously, and there be no intention to harm the study participants. Participation of human subjects in any research should be done cautiously, ensuring that they are protected. This means that even thou the respondents provided personal details, there is no section that required them to input their name or any identification on personal grounds.



## CHAPTER FOUR

### DATA ANALYSIS, RESULTS AND DISCUSSION

#### 4.0 Introduction

This chapter outlines analysis of impact of ICT operational efficiency on warehousing demand at Tilisi logistics park, Kenya. It gives the response rate, demographic information in relation to age, gender, education level and departments from which respondents were selected. The chapter also outlines analysis of specific study objectives;

#### 4.1 Descriptive Statistics

##### 4.1.1 Response Rate

Out of the 196 targeted respondents, there was a positive response on 163 forms which were received for analysis. This was considered to be of success since it represented 83.16% of the sample size that was selected for the study. The results of response rate are presented in table 4.2 below.

**Table 4.2: Response Rate**

	<b>Questionnaires</b>	<b>Respondents</b>
<b>1</b>	Targeted Respondents	196
<b>2</b>	Forms Filled	163
<b>3</b>	No. of unreachable respondents	33
<b>4</b>	Percentage Response	83.16%

##### 4.1.2 Reliability Test

Table 4.3 describes the research results with respect to the examination of reliability and validity. Reliability and validity were guaranteed in this study by pilot testing on a panel of 10

respondents. The pilot study results showed that ICT Resource Factors had a Cronbach reliability of 0.7018, The Cargo Transaction Tracking had an alpha reliability value of 0.7231, and the alpha reliability value for ICT Systems Management was 0.7105, respectively. From the results, the reliability of the Cronbach was higher than 0.70 thresholds which showed that the instrument was accurate and legitimate enough. This is in support of Taber's (2018) study which shows that the reliability value of a Cronbach of 0.70 indicates that adequate evidence exists for the reliability and validity of the test tools.

**Table 4.3: Reliability and Validity Results**

<b>Variable</b>	<b>Cronbach's alpha</b>
ICT Resource Factors	0.7018
Cargo Transaction Tracking	0.7231
ICT Systems Management	0.7105

### **4.1.3 Demographic Analysis**

Demographic analysis generally includes the parameters that allow measure of the dimensions and dynamics of populations. The demographic characteristics of the respondents were analyzed as summarized below.

#### **4.1.3.1 Age of Respondents**

Results in table 4.4 was a cross tabulation of the ages of the respondents. The table shows that majority of the respondents 36.81% were aged 36-45 years followed by 33.13% respondents who were 26.35 years. In addition, 17.79% respondents were aged 46-55 years while 9.20% respondents were aged 18-25 years. Lastly 3.07% respondents were aged 56-65 years. This

depicts that minority who are elderly take part in active economic activities. The findings concur with Giang, et al. (2019) study which demonstrates that elderly people suffer more from age related activities that deter them from taking part in active economic activities.

**Table 4.4: Age of Respondents**

		<b>Frequency</b>	<b>Percent</b>
<b>Age of Respondents</b>	18-25 years	15	9.20
	26-35 years	54	33.13
	36-45 years	60	36.81
	46-55 years	29	17.79
	56-65 years	5	3.07
	Total	163	100.00

#### **4.1.3.2 Gender of Respondents**

The researcher targeted to establish out the respondent's gender of which 57.06% of the respondents were female and 42.94% were male. Study results depicts that there are more males than females that do business, distribution of goods and other activities at Tilisi logistic park. This is illustrated in the table 4.5 as shown below.

**Table 4.5: Gender of the Respondents**

		<b>Frequency</b>	<b>Percent</b>
<b>Gender</b>	Male	93	57.06
	Female	70	42.94
	Total	163	100.0

#### **4.1.3.3 Education Level**

The researcher sought to determine the level of educational of the participants in Tilisi Logistic Park who carry out their daily activities or run business. The findings indicated that most of the

respondents 43.56% had Undergraduate level of education followed by 28.22% respondents who had diploma level of education and 19.02% respondents had postgraduate level of education. However, the proportion of members who had primary level secondary level and certificate level of education was relatively small. Study findings implied that in warehousing management services majority of people involved in the day to day operations have advanced level of education since most of the respondents had diploma undergraduate and postgraduate level of education.

**Table 4.6: Level Education**

		<b>Frequency</b>	<b>Percent</b>
Education Level	Primary	2	1.23
	Secondary	4	2.45
	Certificate	9	5.52
	Diploma	46	28.22
	Undergraduate	71	43.56
	Postgraduate	31	19.02
	Total	163	100.00

#### **4.1.3.4 Department**

The study also aimed at determining departments that are mainly active at Tilisi logistic park. Results showed that majority, 42.94% respondents were directly working within warehouses at Tilisi logistic park. In addition, 24.54% respondent showed that they work in fleet department. However, 17.79% and 14.73% respondents indicated that they work in distribution and trade service departments respectively.

**Table 4.7: Departments where Respondents Work**

		<b>Frequency</b>	<b>Percent</b>
Department	Distribution	29	17.79
	Warehouse	70	42.94
	Fleet	40	24.54
	Trade Service	24	14.73
	Total	163	100.00

**4.1.4 ICT Resource Factors**

Objective one examined in this study was ICT resource factors. Questionnaires were formulated to capture views of respondents on ICT resource factors that impact on operational efficiency on warehousing demand in Kenya such as Tilisi Logistic Park (TLP).

**Table 4.8: ICT Resource Factors**

<b>Statements</b>		<b>Frequency</b>	<b>Percent</b>
Organizations embrace the use of ICT all the time to enhance its operational efficiency.	Strongly Agree	20	12.3
	Agree	93	57.1
	Neutral	36	22.1
	Disagree	11	6.7
	Strongly Disagree	3	1.8
	Total	163	100.0
I rely on ICT platforms to access cargo transaction services promptly	Strongly Agree	19	11.7
	Agree	74	45.4
	Neutral	59	36.2
	Disagree	11	6.7
	Strongly Disagree	0	0.0
	Total	163	100.0
Warehouse invests its financial resource in ICT to streamline inventory management	Strongly Agree	23	14.2
	Agree	82	50.3
	Neutral	47	28.8
	Disagree	11	6.7
	Strongly Disagree	0	0.0
	Total	163	100.0
ICT technical resources utilized by warehouses include cataloguing,	Strongly Agree	20	12.3
	Agree	94	57.7
	Neutral	36	22.0

classification, and indexing	Disagree	12	7.4
	Strongly Disagree	1	0.6
	Total	163	100.0

Source: Research data (2020)

Results in table 4.8 indicates that majority of the respondents 57.1% agreed while 12.3% strongly agreed that organizations embrace the use of ICT all the time to enhance its operational efficiency. However, 6.7% and 1.8% disagreed and strongly disagreed respectively with the statement that organizations embrace the use of ICT all the time to enhance its operational efficiency. Responses recorded a standard deviation value of 0.84.

In addition, findings showed that majority of the respondents 45.4% and 11.7% agreed and strongly agreed with the statement “I rely on ICT platforms to access cargo transaction services promptly.” In contrary, minority 6.7% of the respondents disagreed that they rely on ICT platforms to access cargo transaction services promptly.

Moreover, results indicated that 14.2% respondents strongly agreed while 50.3% just agreed that warehouse invests its financial resource in ICT to streamline inventory management. Furthermore, 6.7% respondents disagreed, that warehouse invests its financial resource in ICT to streamline inventory management. The responses recorded a standard deviation value of 0.79. Lastly, on the statement “ICT technical resources utilized by warehouses include cataloguing, classification, and indexing” responses were obtained at 0.79 standard deviation value. The majority 57.7% respondents agreed while 12.3% respondents strongly agreed that ICT technical resources utilized by warehouses include cataloguing, classification, and indexing. However,

7.4% respondents disagreed that ICT technical resources utilized by warehouses include cataloguing, classification, and indexing.

#### 4.1.5 Cargo Transaction Tracking

Objective two examined in this study was on Cargo Transaction Tracking. Questionnaires were formulated to capture views of respondents on Cargo Transaction Tracking that impact on operational efficiency on warehousing demand in Kenya such as Tilisi Logistic Park (TLP).

**Table 4.9: Cargo Transaction Tracking**

		<b>Frequency</b>	<b>Percent</b>
ICT systems are necessary for effective warehousing management and cargo transaction tracking	Strongly Agree	22	13.5
	Agree	88	54.0
	Neutral	39	23.9
	Disagree	13	8.0
	Strongly Disagree	1	0.6
	Total	163	100.0
Use of ICT systems lowers cargo transaction tracking cost at warehouses.	Strongly Agree	20	12.3
	Agree	77	47.2
	Neutral	56	34.4
	Disagree	9	5.5
	Strongly Disagree	1	0.6
	Total	163	100.0
Regulated Cargo Transaction system increases customers' confidence in warehousing management.	Strongly Agree	21	12.9
	Agree	84	51.5
	Neutral	46	28.2
	Disagree	12	7.4
	Strongly Disagree	0	0.0
	Total	163	100.0
Online cargo transaction handling tracking and management is more secure	Strongly Agree	18	11.0
	Agree	98	60.2
	Neutral	33	20.2
	Disagree	14	8.6

than the manual management system	Strongly Disagree	0	0.0
	Total	163	100.0
ICT utilization increases Cargo Security	Strongly Agree	27	16.6
	Agree	85	52.1
	Neutral	42	25.8
	Disagree	8	4.9
	Strongly Disagree	1	0.6
	Total	163	100.0

Source: Research data (2020)

Table 4.9 presents results on Cargo Transaction Tracking and how Cargo Transaction Tracking that impact on operational efficiency on warehousing demands in Kenya such as Tilisi Logistic Park (TLP). Findings indicated that 54.0% and 13.5% respondents agreed and strongly agreed respectively with the statement “ICT systems are necessary for effective warehousing management and cargo transaction tracking.” However, a good proportion, 23.9% respondents expressed that they were neutral to the statement Cargo Transaction Tracking that impact on operational efficiency on warehousing demand in Kenya such as Tilisi Logistic Park (TLP).

Secondly, with regard to statement “Use of ICT systems lowers cargo transaction tracking cost at warehouses,” findings indicated that 12.3% respondents strongly agreed and 47.2% just agreed that use of ICT systems lowers cargo transaction tracking cost at warehouses. In contrary, 5.5% respondents just disagreed while 0.6% strongly disagreed that use of ICT systems lowers cargo transaction tracking cost at warehouses. Finding was in support of Zhou, et al. (2017) study which established that in the contemporary world, use of ICT systems lowers cargo transaction tracking cost at warehouses.



Moreover, with regard to the statement “Regulated Cargo Transaction system increases customers’ confidence in warehousing management,” results indicated that 12.9% respondents strongly agreed while 51.5% just agreed that Regulated Cargo Transaction system increases customers’ confidence in warehousing management. Furthermore, 7.4% respondents disagreed that Regulated Cargo Transaction system increases customers’ confidence in warehousing management. Lastly, 28.2% respondents gave neutral views that Regulated Cargo Transaction system increases customers’ confidence in warehousing management.

In addition, with regard to the statement “Online cargo transaction handling tracking and management is more secure than the manual management system, 60.2% respondents just agreed while 60.2% respondents expressed that they strongly agreed. However, 8.6% respondents disagreed whereas 20.2% were neutral in giving their view.

Lastly, based on the question “ICT utilization increases Cargo Security,” 52.1% respondents just agreed followed by 16.6% respondents who strongly agreed that ICT utilization increases Cargo Security. However, 4.9% respondents just disagreed while 0.6% strongly disagreed that ICT utilization increases Cargo Security. Finding concurred with Altayeb, et al., (2017) study which stated that RFID technology is a non-contact and automatic identification technology that uses radio signals to classify, track, sort and detect a variety of objects, including people, vehicles, products and assets, without the need for direct contact thus enhancing cargo protection.

#### 4.1.6 ICT Systems Management

Objective three examined in this study was on ICT Systems Management. Questionnaires were formulated to capture views of respondents on ICT Systems Management that impact on operational efficiency on warehousing demand in Kenya such as Tilisi Logistic Park (TLP).

**Table 4.10: ICT Systems Management**

Statements	Responses	Frequency	Percent
ICT systems makes planning of daily operational activities quite easy	Strongly Agree	20	12.3
	Agree	86	52.8
	Neutral	43	26.3
	Disagree	12	7.4
	Strongly Disagree	2	1.2
	Total	163	100.0
ICT systems used simplifies directions taken to manage warehousing demand operational	Strongly Agree	20	12.3
	Agree	73	44.8
	Neutral	56	34.3
	Disagree	14	8.6
	Strongly Disagree	0	0.0
	Total	163	100.0
ICT systems make controlling of warehousing activities easy.	Strongly Agree	23	14.1
	Agree	87	53.4
	Neutral	42	25.8
	Disagree	11	6.7
	Strongly Disagree	0	0.0
	Total	163	100.0

Source: Research data (2020)

Table 4.10 presents results on ICT Systems Management. Findings indicated that 1.2% and 7.4% respondents strongly disagreed and disagreed respectively with the statement “ICT systems makes planning of daily operational activities quite easy.” Moreover, 52.8% and 12.3%

respondents agreed and strongly agreed respectively with the statement “ICT systems makes planning of daily operational activities quite easy.” However, 26.3% respondents expressed that they were neutral, could neither agree nor disagree with the statement that ICT systems makes planning of daily operational activities quite easy. This implies that ICT systems management is critical in warehousing management because they ease warehouse daily activities. The finding concurred with Flores Martín, (2019) study which established that ICT solution can make people's lives easier.

Secondly, with regard to the statement “ICT systems used simplifies directions taken to manage warehousing demand operational,” 8.6% respondents just disagreed. Moreover, 44.8% of respondents and 12.3% respondents agreed and strongly agreed respectively with the statement that ICT systems used simplifies directions taken to manage warehousing demand operational. In contrary 34.3% respondents indicated that they were neutral as far as ICT systems used simplifies directions taken to manage warehousing demand operational.

Lastly, based on the statement, “ICT systems make controlling of warehousing activities easy,” majority 53.4% respondents agreed while followed by 14.1% who strongly agreed that ICT systems make controlling of warehousing activities easy. However, 6.7% respondents just disagreed that ICT systems make controlling of warehousing activities easy. Lastly, 25.8% respondents indicated that they had neutral opinion. Study findings give an implication that CT systems are very important since CT makes controlling of warehouse activities easy.

#### 4.1.7 ICT Operational Efficiency on Warehousing Management

Objective four examined in this study was on ICT Operational Efficiency on Warehousing Management. Questionnaires were formulated to capture views of respondents on ICT operational efficiency on warehousing demand in Kenya such as Tilisi Logistic Park (TLP).

**Table 4. 11: ICT Operational Efficiency on Warehousing Management**

		Frequency	Percent
ICT increases profitability of warehousing operations	Strongly Agree	26	16.0
	Agree	81	49.7
	Neutral	45	27.6
	Disagree	10	6.1
	Strongly Disagree	1	0.6
	Total	163	100.0
ICT promotes investment in warehousing and service logistic	Strongly Agree	22	13.5
	Agree	83	50.9
	Neutral	45	27.6
	Disagree	12	7.4
	Strongly Disagree	1	0.6
	Total	163	100.0
ICT platform leads to increased customers base for warehousing services.	Strongly Agree	21	12.9
	Agree	88	53.9
	Neutral	42	25.8
	Disagree	12	7.4
	Strongly Disagree	0	0.0
	Total	163	100.0
ICT platforms contribute to reduced transaction cost of warehousing and logistic services.	Strongly Agree	22	13.5
	Agree	89	54.6
	Neutral	39	23.9
	Disagree	13	8.0
	Strongly Disagree	0	0.0
	Total	163	100.0

	Strongly Agree	25	15.3
	Agree	93	57.1
ICT usage makes warehousing and logistic services affordable to customers	Neutral	31	19.0
	Disagree	13	8.0
	Strongly Disagree	1	0.6
	Total	163	100.0

Table 4.11 presents results on the ICT Operational Efficiency on Warehousing Management at Tilisi Logistic Park. Findings indicated that 49.7% and 16.0% respondents agreed and strongly disagreed respectively with the statement “ICT increases profitability of warehousing operations.” Moreover, 0.6% and 6.1% respondents strongly disagreed and disagreed respectively with the statement “ICT increases profitability of warehousing operations.” However, 27.6% respondents expressed that they had no opinion.

Secondly, with regard to the statement “ICT promotes investment in warehousing and service logistic,” results indicated that 50.9% just agreed while 13.5% respondents strongly agreed that ICT promotes investment in warehousing and service logistic. In contrary, 0.6% strongly disagreed whereas 7.4% respondents just disagreed that ICT promotes investment in warehousing and service logistic.

Moreover, results indicated that 12.9% respondents strongly agreed while 53.9% just agreed that ICT platform leads to increased customers base for warehousing services. Furthermore, 7.4% respondents disagreed that ICT platform leads to increased customers base for warehousing services. However, 25.8% respondents were neutral in giving their views. Results give implication that the use of ICT lead to better services offered to customers. The study was also in

support of Sharma, (2019) who observed that any institution that fails to embrace technology offers sub-standard service thus deters people from seeking their services.

In addition, with regard to the statement “ICT platforms contribute to reduced transaction cost of warehousing and logistic services,” 54.6% of the respondents just agreed while 13.5% expressed that they strongly agreed with the statement. The study finding was in agreement with Trappey, et al., (2016) who observed that ICT initial costs may seem high but in the long run they drastically reduce costs of operation. Furthermore, 8.0% disagreed that ICT platforms contribute to reduced transaction cost of warehousing and logistic services. However, 23.9% respondents expressed neutrality to the statement “ICT platforms contribute to reduced transaction cost of warehousing and logistic services.”

Lastly, based on the statement “ICT usage makes warehousing and logistic services affordable to customers,” 19.0% respondents gave a neutral response. In addition, 57.1% respondents just agreed while 15.3% strongly agreed that ICT usage makes warehousing and logistic services affordable to customers. The outcome was in support of Yazdani, et al., (2017) that established that ICT makes warehousing services effective and affordable. However, 8.0% respondents just disagreed while 0.6% strongly disagreed that ICT usage makes warehousing and logistic services affordable to customers.

## 4.2 Inferential Statistics

### 4.2.1 Correlation Analysis

The study sought to evaluate the effect of operational efficiency of ICT on demand for warehousing at Tilisi Logistic Park in Kenya. Study of Pearson Correlation was used to achieve this end at confidence levels of 95 per cent. The correlation analysis enabled the testing of study's hypotheses that states that ICT systems has significant impact on ICT operational efficiency on warehousing demand at Tilisi Logistic Park in Kenya.

Table 4.12 illustrates significant, positive but low linear relationships between ICT Operational Efficiency on Warehousing Management and: ICT Resource Factors ( $R = 0.44$ ); Cargo Transaction Tracking ( $R = 0.45$ ) and ICT systems management ( $R = 0.34$ ). The hypothesis stated that ICT systems have significant impact on ICT operational efficiency on warehousing demand at Tilisi Logistic Park in Kenya. The study established a positive coefficient significant at  $\alpha = 0.05$ . Thus, the null hypothesis is rejected. This implies that an increase in utilization of ICT systems increase Operational Efficiency on Warehousing Management.

**Table 4.12: Correlation Analysis**

	ICT Resource Factors	Cargo Transaction Tracking	ICT systems management	ICT operational efficiency
ICT Resource Factors	1			
Cargo Transaction Tracking	0.48	1		
ICT systems management	0.38	0.33	1	
ICT operational efficiency	0.44	0.45	0.34	1

## 4.2.2 Regression Coefficients

**Table 4.13: Regression Coefficients**

	Un-standardized Co-efficient		Standardized Co-efficient	t	Sig
	B	Std Error	Beta		
<b>Constant</b>	9.134	0.312		2.432	0.031
ICT Resource Factors	0.213	0.301	0.063	1.431	0.039
Cargo Transaction Tracking	0.431	0.411	0.057	1.352	0.042
ICT systems management	0.321	0.452	0.069	1.541	0.046

**Source: Research Finding**

The study model will therefore be;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where: Y = Operational Efficiency of on Demand Warehousing

$\beta_0$  = Constant Term;

$\beta_1$ ,  $\beta_2$ , &  $\beta_3$  = Beta coefficients;

X1= ICT Resource Factors

X2= Cargo Transaction Tracking

X3= ICT systems management

$\varepsilon$  = Error term assumed normal and, independent and identically distributed

Operational Efficiency = 9.134+ 0.213 (ICT Resource Factors) + 0.431 (Cargo Transaction Tracking) + 0.321 (ICT systems management). The Standardized Beta Coefficients provide a measure of each variable 's contribution towards the model. A large value means that a change in unit in this predictor variable has a great impact on the variable of criterion.



The values t and Sig (p) provide a rough indication of the influence of each predictor variable – a large absolute t value and a small p value indicates that a predictor variable has a significant effect on the criterion variable. At a meaning level of 0.05 and a trust level of 95 per cent, ICT Resource Variables had a meaning level of 0.213; Freight Transaction Monitoring had a meaning level of 0.431 and ICT device management had a meaning level of 0.321.

### **4.3 Discussion of the Results**

#### **4.3.1 ICT Resource Factors**

The study established that organizations embrace the use of ICT all the time in order to enhance their operational efficiency. In addition, the use of ICT platforms by warehouses and logistics firms promote prompt access cargo transaction services on time. Furthermore, the study established that most warehouses invest their financial resource in ICT to streamline inventory management. Lastly, warehouses mainly adopt the use of technical resources such as cataloguing, classification, and indexing.

The findings of this study concurred with other studies (Leinbach, et al., 2014; Muturi, et al., 2014 and Monyela, et al., 2019); who stated that the use of ICT in warehouses promote efficient cargo services. ICT factors are commonly believed to have a direct influence on the performance in Inventory Management among many global supply chain Logistics. Moreover, Monyela, et al., (2019) support that use of ICT enhances cargo cataloguing for ease of identification.

### **4.3.2 Cargo Transaction Tracking**

On Cargo Transaction Tracking, this study established that ICT systems are necessary for effective warehousing management. In addition, the use of ICT systems lowers cargo transaction tracking cost at warehouses. Moreover, results from the study showed that regulated Cargo Transaction system increases customers' confidence in warehousing management. Lastly findings of the study revealed that an online cargo transaction handling, tracking and management is more secure than manual management system.

Consequently, ICT utilization increases Cargo Security. The study results are in tandem with Cragg, and McNamara, (2018) study that established that an ICT-based framework play a vital role in improving warehousing management as well as supply chain integration. Similarly, Scholliers, et al., (2016) claims that ICT helps in improving the security of containers in port related supply chains hence supporting that ICT can be used for high cargo security.

### **4.3.3 ICT Systems Management**

The Results on ICT Systems Management indicated that ICT systems make planning of daily warehouse operational activities quite easy. In addition, ICT systems simplify directions taken to manage warehousing demand operational. Lastly, the study established that ICT systems make controlling of warehousing activities easy.

These findings are consistent with a study by Brem and Wimschneider, (2016) who observed that ICT systems are improving resource utilization in such a way that rivals are unable to replicate their performance, which effectively provides a competitive advantage. The study also

agreed with (Wiesner, 2017) findings which suggest that the use of ICT systems helps to reduce transaction costs associated with transaction management and effective communication.

#### **4.3.4 ICT Operational Efficiency on Warehousing Management**

The study established that adoption of ICT systems by warehouse management increases profitability of warehousing operations. Furthermore, study findings revealed that ICT promotes investment in warehousing and service logistic, ICT platform leads to increased customers base for warehousing services. Moreover, the study established that ICT platforms contribute to reduced transaction cost of warehousing and logistic services thus makes warehousing and logistic services affordable to customers.

These study findings captured the impact of ICT operational efficiency on Tilisi Logistics Park warehousing demand in Kenya. The study established that ICT systems are necessary for effective warehousing management and cargo transaction tracking. Furthermore, study results indicate that ICT systems makes planning of daily operational activities quite easy. The finding was in tandem to Flores Martín, (2019) which argue that ICT solution can make people's lives easier. According to Mostafa, et al., (2019), there is a huge impact of Internet of Things as a result of ICT adoption on supply chains management.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter provides for a summary of the findings, conclusions and recommendations of the report. The study examined and presented results that centered on formulating a model that can be used to illustrate the effects of ICT operational effectiveness on Kenya 's demand for warehouses. A conceptual model was developed using data obtained from participants in the research, and a model was evaluated based on study results.

#### **5.2 Summary of the Findings**

This research was designed to evaluate impact of ICT operational efficiency on warehousing demand at Tilisi Logistics Park in Kenya. The study focused on how the ICT Resource Factors, Cargo Transaction Tracking and ICT Systems Management affect Operational Efficiency on Warehousing Management. The research reviewed earlier studies with a view to recognizing learning gaps that were attempted to resolve in the present study. This was done using research libraries.

This study adopted a descriptive survey template and applied the analysis-directing approach to quantitative research. The study focused on the Tilisi Logistic Park managers, politicians, workers employed and business people. In order to obtain data quality, the questionnaires were administered. Data was summarized and presented in tables in frequencies and percentages.

Study findings summarize that majority of study participants were aged 26-45 years and most of respondents from TLP were females. Study findings indicated that in warehousing management

services majority of people involved in the day to day operations has advance level of education (diploma, undergraduate and postgraduate level of education). Study also established that departments within TLP were warehousing, fleet, distribution and trade service departments respectively.

### **5.3 Conclusion**

The study's regression coefficients reveal that the ICT systems at Tilisi Logistic Park in Kenya have a major impact on operational efficiency in warehousing demand. This illustrates the ICT systems have a positive impact on warehousing demand in terms of operating performance.

Furthermore, study revealed that the variable correlated statistically and positively with ICT operating efficiency on demand for warehousing, such as Tilisi Logistic Park. The study further found that use of ICT influences operational efficiency in Kenya's warehousing demand. The study's regression coefficients indicate that resource planning affects substantially organizational efficiency in state companies. This shows that the preparation of distribution in state organizations has been statistically, significantly, positively associated with the organizational productivity.

The study concludes that in order to achieve integration, minimize connectivity costs, and boost productivity and increase knowledge sharing, Tilisi Logistics Park will invest more in emerging technologies such as information communication technology which will eventually lead to improved operational outcomes.

#### **5.4 Further Research Study Areas.**

- i. ICT utilization by stakeholders' is an area that needs to be researched. This study therefore suggests the need to carry out a study to establish how stakeholders are utilizing ICT for efficient inventory management in on-demand warehousing.
  
- ii. Another area identified in this study is that there are some loopholes that come along the implementation processes of ICT techniques. This study thus suggests the need to conduct a study to determine loopholes to efficient utilization of ICT techniques for inventory management in on-demand warehousing.

## REFERENCES

- Abushaikha, I., Salhieh, L., & Towers, N. (2018). Improving distribution and business performance through lean warehousing. *International Journal of Retail & Distribution Management*.
- Adams, C. M. (2017). *Assessing 'readiness for change' in organisational culture: a descriptive study using a sequential explanatory mixed method design* (Doctoral dissertation).
- Alfares, H. K., & Ghaithan, A. M. (2016). Inventory and pricing model with price-dependent demand, time-varying holding cost, and quantity discounts. *Computers & Industrial Engineering*, 94, 170-177.
- Ali, A., & Haseeb, M. (2019). Radio frequency identification (RFID) technology as a strategic tool towards higher performance of supply chain operations in textile and apparel industry of Malaysia. *Uncertain Supply Chain Management*, 7(2), 215-226.
- Altayeb, M. A. W. T. E., Al-noor, A. A. A., Dafa-allah, M. S. H. A., & Mustafa, M. H. A. (2017). *Automatic Number Plate Recognition Using Radio Frequency Identification* (Doctoral dissertation, Sudan University of Science and Technology).
- Angelos, V. M. (2017). The contribution of Key Performance Indicators (KPIs) in the context of Supply Chain Management.
- Apiyo, R. O., & Kiarie, D. M. (2018). Role of ICT tools in supply chain performance.
- Archetti, C., & Peirano, L. (2019). Air intermodal freight transportation: the freight forwarder service problem. *Omega*, 102040.
- Attaran, M. (2017). Additive manufacturing: the most promising technology to alter the supply chain and logistics. *Journal of Service Science and Management*, 10(03), 189.
- Ayers, J. B., & Odegaard, M. A. (2017). *Retail supply chain management*. CRC Press.
- Bahr, W., Mavrogenis, V., & Sweeney, E. (2019). Gamification of Warehousing Activities: Exploring Perspectives Of Warehouse Managers In The UK.
- Baruffaldi, G., Accorsi, R., & Manzini, R. (2019). Warehouse management system customization and information availability in 3pl companies. *Industrial Management & Data Systems*.
- Berhanu, A. (2017). *Effectiveness of Warehouse Management in Save the Children Ethiopia A Case of Gambella Emergency office* (Doctoral dissertation, Addis Abeba University).
- Biswal, A. K., Jenamani, M., & Kumar, S. K. (2018). Warehouse efficiency improvement using RFID in a humanitarian supply chain: Implications for Indian food security system. *Transportation Research Part E: Logistics and Transportation Review*, 109, 205-224.
- Brem, A., Maier, M., & Wimschneider, C. (2016). Competitive advantage through innovation: the case of Nespresso. *European Journal of Innovation Management*.
- Chen, W., & Kamal, F. (2016). The impact of information and communication technology adoption on multinational firm boundary decisions. *Journal of International Business Studies*, 47(5), 563-576.
- Christopher, M. (2016). *Logistics & supply chain management*. Pearson UK.
- Cont, R., & Kukanov, A. (2017). Optimal order placement in limit order markets. *Quantitative Finance*, 17(1), 21-39.
- Cragg, T., & McNamara, T. (2018). An ICT-based framework to improve global supply chain integration for final assembly SMES. *Journal of Enterprise Information Management*.

- Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- David, R. A., & Muthini, J. N. (2019). Influence of green supply chain management practices on procurement performance of private health institutions in Kenya: A case of Aga Khan Hospital Kisumu. *The Strategic Journal of Business & Change Management*, 6(2), 1378-1396.
- De Koster, R. B., Johnson, A. L., & Roy, D. (2017). Warehouse design and management.
- Dima, A. M., Begu, L., Vasilescu, M. D., & Maassen, M. A. (2018). The relationship between the knowledge economy and global competitiveness in the European Union. *Sustainability*, 10(6), 1706.
- Duan, S., & Xu, Y. (2016, January). Construction of intelligent logistics warehouse management information system based on RFID technology. In *International Conference on Education, Management, Computer and Society*. Atlantis Press.
- Durst, S., & Evangelista, P. (2018). Exploring knowledge management practices in third-party logistics service providers. *VINE Journal of Information and Knowledge Management Systems*.
- ElKhouly, S. M. E., & Elkomy, Y. A. M. (2019). The Impact of Enterprise Resource Planning Systems (ERP) Effectiveness on the Supply Chain Competitiveness in the Courier Services Sector (An Empirical Case Study). In *Competition Forum* (Vol. 17, No. 1, pp. 88-104). American Society for Competitiveness.
- Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal*, 5(6), 00149.
- Fawcett, S., Jin, Y. H., Fawcett, A., & Bernardes, E. (2018). Technological game changers: convergence, hype, and evolving supply chain design. *Production*, 28.
- Flores Martín, D. (2019). *Can the Internet of Things make people's lives easier? A business approach based on an ICT solution* (Master's thesis).
- Govindan, K., Khodaverdi, R., & Vafadarnikjoo, A. (2016). A grey DEMATEL approach to develop third-party logistics provider selection criteria. *Industrial Management & Data Systems*.
- Gunasekaran, A., Subramanian, N., & Papadopoulos, T. (2017). Information technology for competitive advantage within logistics and supply chains: A review. *Transportation Research Part E: Logistics and Transportation Review*, 99, 14-33.
- Haddud, A., DeSouza, A., Khare, A., & Lee, H. (2017). Examining potential benefits and challenges associated with the Internet of Things integration in supply chains. *Journal of Manufacturing Technology Management*.
- Hazwani, K. N., & Fitri, A. R. N. S. (2018). Warehousing Productivity Assessment on Logistics Service Sector. *Advances in Transportation and Logistics Research*, 1(1), 889-903.
- Jabbar, S., Khan, M., Silva, B. N., & Han, K. (2018). A REST-based industrial web of things' framework for smart warehousing. *The Journal of Supercomputing*, 74(9), 4419-4433.
- Janssen, S. J., Porter, C. H., Moore, A. D., Athanasiadis, I. N., Foster, I., Jones, J. W., & Antle, J. M. (2017). Towards a new generation of agricultural system data, models and knowledge products: Information and communication technology. *Agricultural systems*, 155, 200-212.



- Johnson, A., Mccurdy, D., Schechter, D., & Loch, K. (2020, January). Hot or Cold... How Ready are Third Party Logistics Cold Storage Companies to Implement Blockchain?. In *Proceedings of the 53rd Hawaii International Conference on System Sciences*.
- Karim, N. A., Nawawi, A., & Salin, A. S. A. P. (2018). Inventory management effectiveness of a manufacturing company—Malaysian evidence. *International Journal of Law and Management*.
- Kern, H. L., Stuart, E. A., Hill, J., & Green, D. P. (2016). Assessing methods for generalizing experimental impact estimates to target populations. *Journal of research on educational effectiveness*, 9(1), 103-127.
- Khalilpourazari, S., & Pasandideh, S. H. R. (2019). Modeling and optimization of multi-item multi-constrained EOQ model for growing items. *Knowledge-Based Systems*, 164, 150-162.
- Khan, F. A., Ahmad, A., Imran, M., Alharbi, M., & Jan, B. (2017). Efficient data access and performance improvement model for virtual data warehouse. *Sustainable cities and society*, 35, 232-240.
- Kim, H., Sefcik, J. S., & Bradway, C. (2017). Characteristics of qualitative descriptive studies: A systematic review. *Research in nursing & health*, 40(1), 23-42.
- Ko, H. S., Azambuja, M., & Lee, H. F. (2016). Cloud-based materials tracking system prototype integrated with radio frequency identification tagging technology. *Automation in Construction*, 63, 144-154.
- Kong, X. T., Zhong, R. Y., Xu, G., & Huang, G. Q. (2017). Robot-enabled execution system for perishables auction logistics. *Industrial Management & Data Systems*.
- Kumar, V. V., & Muthuvelayutham, C. (2018). Review of Literature on the Study of Information and Communication Technology in Logistics Industry. *Asian Journal of Research in Business Economics and Management*, 8(1), 48-73.
- Lakerbaya, L. (2017). The Necessity of Supply Chain Planning Software in Modern Business: Quintiq Company Case Study.
- Lau, H., Nakandala, D., & Shum, P. (2016). A case-based roadmap for lateral transshipment in supply chain inventory management. *JISTEM-Journal of Information Systems and Technology Management*, 13(1), 27-44.
- Lee, C. K. M., Lv, Y., Ng, K. K. H., Ho, W., & Choy, K. L. (2018). Design and application of Internet of things-based warehouse management system for smart logistics. *International Journal of Production Research*, 56(8), 2753-2768.
- Leinbach, T. R., & Bowen Jr, J. T. (2014). Air cargo services and the electronics industry in Southeast Asia. *Journal of Economic Geography*, 4(3), 299-321.
- Liu, W., & Atuahene-Gima, K. (2018). Enhancing product innovation performance in a dysfunctional competitive environment: The roles of competitive strategies and market-based assets. *Industrial Marketing Management*, 73, 7-20.
- Liu, Z., Prajogo, D., & Oke, A. (2016). Supply chain technologies: Linking adoption, utilization, and performance. *Journal of Supply Chain Management*, 52(4), 22-41.
- Luvaha, D. A., & Ayienga, E. (2016). Implementation of RFID Technology to Improve Efficiency of Serving Customers-A Kenya Supermarket Case Study. *International Journal of Computer Science and Information Security*, 14(2), 1.
- Maata, S. W., & Ombui, K. (2018). ROLE OF THIRD-PARTY LOGISTICS SERVICES ON SUPPLY CHAIN PERFORMANCE IN DISTRIBUTION SECTOR IN KENYA: A

- CASE OF BOLLORE TRANSPORT & LOGISTICS KENYA LIMITED. *International Journal of Supply Chain Management*, 3(2), 22-43.
- Magutu, P. O., Mbeche, I. M., Njihia, J. M., & Nyaoga, R. B. (2016). The relationship between supply chain strategies and supply chain performance among large-scale manufacturing firms: the moderating effect of supply chain technology. *EuroMed Journal of Management*, 1(2), 123-148.
- Manners-Bell, J., & Lyon, K. (2019). *The Logistics and Supply Chain Innovation Handbook: Disruptive Technologies and New Business Models*. Kogan Page Publishers.
- McMurtrey, M. E. (2018). RFID in the Retail Supply Chain. *Journal of Strategic Innovation and Sustainability Vol*, 13(1), 71.
- Monyela, M., & Mutula, S. (2019). Copy cataloguing in the online environment: Do we still need qualified cataloguers?. *Library Philosophy and Practice*, 1-40.
- Mostafa, N., Hamdy, W., & Alawady, H. (2019). Impacts of Internet of Things on supply chains: A framework for warehousing. *Social sciences*, 8(3), 84.
- Muller, M. (2019). *Essentials of inventory management*. HarperCollins Leadership.
- Mutai, C. H. A. R. L. E. S., & Moronge, M. (2017). Influence of warehouse management on organizational productivity in state corporations in Kenya: A Case of Kenya Electricity Generating Company Limited. *Strategic Journal of Business and Change Management*, 4(34), 588-605.
- Muturi, J. F. W., & Namusonge, G. S. (2014). Financial Resources on ICT Performance in Inventory Management by Freight Forwarders in Nairobi, Kenya: A Case Study of Acceler Global Logistics. *International Journal of Academic Research in Business and Social Sciences*, 4(10), 601.
- Nakasumi, M. (2017, July). Information sharing for supply chain management based on block chain technology. In *2017 IEEE 19th Conference on Business Informatics (CBI)* (Vol. 1, pp. 140-149). IEEE.
- Nayak, R. (2019). *Radio Frequency Identification (RFID): Technology and Application in Garment Manufacturing and Supply Chain*. CRC Press.
- Nunes, L. J. R., Causer, T. P., & Ciolkosz, D. (2020). Biomass for energy: A review on supply chain management models. *Renewable and Sustainable Energy Reviews*, 120, 109658.
- O'Leary, Z. (2017). *The essential guide to doing your research project*. Sage.
- Orenstein, D. (2019). *Out of Stock: The Warehouse in the History of Capitalism*. University of Chicago Press.
- Razik, M., Radi, B., & Okar, C. (2017). Maturity of the Warehousing function in Moroccan companies: a case study. In *MATEC Web of Conferences* (Vol. 105, p. 00007). EDP Sciences.
- Reinartz, W., Wiegand, N., & Imschloss, M. (2019). The impact of digital transformation on the retailing value chain. *International Journal of Research in Marketing*, 36(3), 350-366.
- Reis, A., Stender, G., & Maruyama, U. (2017). Internal logistics management: Brazilian warehouse best practices based on lean methodology. *International Journal of Logistics Systems and Management*, 26(3), 329-345.
- Richards, G. (2017). *Warehouse management: a complete guide to improving efficiency and minimizing costs in the modern warehouse*. Kogan Page Publishers.
- Riza, M., & Purba, H. H. (2018). The implementation of economic order quantity for reducing inventory cost. *Research in Logistics & Production*, 8.

- Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, 25(4), 100552.
- Scholliers, J., Permala, A., Toivonen, S., & Salmela, H. (2016). Improving the security of containers in port related supply chains. *Transportation research procedia*, 14, 1374-1383.
- Schwarzkopf, M. (2018). *Operating system support for warehouse-scale computing* (Doctoral dissertation, University of Cambridge).
- Shaikh, A. A. (2017). A two warehouse inventory model for deteriorating items with variable demand under alternative trade credit policy. *International Journal of Logistics Systems and Management*, 27(1), 40-61.
- Sosunova, L. A., Noskov, S. V., Goryacheva, I. A., Astafieva, N. V., & Kalashnikov, S. A. (2018). Improving the management technique of logistics planning in the supply chain. *Problems and perspectives in management*, (16, Iss. 3), 48-62.
- Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6), 1273-1296.
- Taherdoost, H. (2017). Determining sample size; how to calculate survey sample size. *International Journal of Economics and Management Systems*, 2.
- Trappey, A. J., Trappey, C. V., Chang, S. W., Lee, W. T., & Hsu, T. N. (2016). A one-stop logistic services framework supporting global supply chain collaboration. *Journal of Systems Science and Systems Engineering*, 25(2), 229-253.
- Tu, M. (2018). An exploratory study of Internet of Things (IoT) adoption intention in logistics and supply chain management. *The International Journal of Logistics Management*.
- Urbinati, A., Chiaroni, D., Chiesa, V., & Frattini, F. (2020). The role of digital technologies in open innovation processes: an exploratory multiple case study analysis. *R&D Management*, 50(1), 136-160.
- Ventura, B., Vianello, A., Frisinghelli, D., Rossi, M., Monsorno, R., & Costa, A. (2019). A Methodology for Heterogeneous Sensor Data Organization and Near Real-Time Data Sharing by Adopting OGC SWE Standards. *ISPRS International Journal of Geo-Information*, 8(4), 167.
- Vicén Sampériz, M. (2018). *Study of new technological innovations and their possible strategical and operational effects on amazon's supply chain* (Master's thesis, Universitat Politècnica de Catalunya).
- Wiedmann, T., & Lenzen, M. (2018). Environmental and social footprints of international trade. *Nature Geoscience*, 11(5), 314-321.
- Wiengarten, F., Fan, D., Lo, C. K., & Pagell, M. (2017). The differing impacts of operational and financial slack on occupational safety in varying market conditions. *Journal of operations management*, 52, 30-45.
- Wiesner, E. (2017). Transaction cost economics and public sector rent-seeking in developing countries: toward a theory of government failure. In *Evaluation and Development* (pp. 108-131). Routledge.
- Yazdani, M., Zarate, P., Coulibaly, A., & Zavadskas, E. K. (2017). A group decision making support system in logistics and supply chain management. *Expert systems with Applications*, 88, 376-392.
- Zhou, W., Piramuthu, S., Chu, F., & Chu, C. (2017). RFID-enabled flexible warehousing. *Decision Support Systems*, 98, 99-112.

- Zimon, G. (2019). The impact of quality management on inventories in commercial enterprises operating within group purchasing organizations. *Problems and Perspectives in Management*, 17(3), 362.
- Zybell, U., & Wallenburg, C. M. (2017). Performance Improvements in Logistics Outsourcing Relationships-The Hampering Role of LSPs' Mindsets. *Kühne-Foundation Chair of Logistics and Services Management Research Paper*, (1).

## APPENDIX I: TIME FRAME

<b>Year</b>	<b>Month</b>	<b>Activity</b>
2020	February	Focusing on a concept paper
	March	Developing a research proposal
	April	Submission of the first draft of the research proposal
2020	May	Presentation to the department
	June	Survey of the study area & collection of the data
2020	July	Field-work data analysis
	August	Submission of thesis
	September	Defense of thesis
	October	Correction and submission of thesis

## APPENDIX II: BUDGET

Item Description	Cost Per Item	Total	
		Ksh	Cts
3 notebooks	100	300	00
A diary	200	200	00
1 dozen of blue pens	20	240	00
5 folders	100	500	00
Flash disk 8 GB	1,500	1,500	00
<b>SUB TOTAL</b>		<b>2,740</b>	<b>00</b>
INTERNET COSTS			
Modem internet browsing (3GB)	3,000	3,000	00
<b>SUB TOTAL</b>		<b>3,000</b>	<b>00</b>
TRAVEL EXPENSES			
Paying research assistants for 1 week	60,000	60,000	00
<b>SUBTOTAL</b>		<b>60,000</b>	<b>00</b>
REPORT PREPARATION			
Photocopying, Printing and Binding Expenses			
i. Questionnaires (388 copies)	25	9,700	00
ii. Proposal (6 copies)	500	3,000	00
iii. Report (6 copies)	1,000	6,000	00
Data Analysis	20,000	20,000	00
<b>SUBTOTAL</b>		<b>38,700</b>	<b>00</b>
<b>TOTAL</b>		<b>104,440</b>	<b>00</b>
Add contingencies 3% of the total cost		3,133	20
<b>GRANDTOTAL</b>		<b>107,573</b>	<b>20</b>

**APPENDIX III: LETTER OF INTRODUCTION**  
**UNIVERSITY OF NAIROBI**  
**SCHOOL COMPUTING &INFORMATICS**

**Dear Respondent**

I am a Master student at the University of Nairobi School of Computing and Informatics and I am conducting an academic research study aimed at “**ASSESSING THE IMPACT OF ICT OPERATIONAL EFFICIENCY ON WAREHOUSING DEMAND IN KENYA**”. I identified Tilisi Logistics Park as my case. Kindly assist with the information that is herein required in this questionnaire. All the information provided will not be recorded or published and will be considered as confidential with utmost confidentiality and will only be used for the purpose of my academic study.

Yours Sincerely,

Name: Amos Kiprono Yegon.

[amoskintyyegon@students.uonbi.ac.ke](mailto:amoskintyyegon@students.uonbi.ac.ke)

## APPENDIX IV: QUESTIONNAIRES FOR STAFFS & BUSINESS PERSONS

This is to kindly request you to devote at least some minutes of your day's program in order to complete this questionnaire. The purpose of this questionnaire is purely to fulfill an academic requirement. Your views will therefore be highly valuable in the study. All the information provided will be treated with the privacy and confidentiality it deserves accordingly.

### SECTION A: PERSONAL INFORMATION

1. Your Name (optional): \_\_\_\_\_

2. Age:

18-25yrs                        26-35yrs                        36-45 yrs                   

46-55yrs                        56-65yrs                        66Yrs and above           

3. Gender:

Male                            Female                       

4. What is the highest level of education you have completed?

Primary school     Secondary school     Certificate

Diploma             Undergraduate     Post Graduate   

Other (specify)

5. Department in the organization

Distribution                     Warehouse

Fleet                             Trade Services

### SECTION B: ICT RESOURCE FACTORS

*The following are ICT Resource Factors in a warehouse. Kindly give your opinion in regard to the ICT usage level in a Likert scale of 1-3 where 1=Strongly Agree, 2=Neutral and 3=Strongly Disagree.*

1. Organizations embrace the use of ICT all the time to enhance its operational efficiency.

Strongly Agree                     Agree                             Neutral

Disagree                             Strongly Disagree

2. I rely on ICT platforms to access cargo transaction services promptly



- Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

3. Warehouse invests its financial resource in ICT to streamline inventory management

- Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

4. ICT technical resources utilized by warehouses include cataloguing, classification, and indexing

- Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

### **SECTION C: CARGO TRANSACTION TRACKING**

*The following are ICT Cargo Transaction Tracking systems adapted by warehouses to enhance cargo security. Kindly give your opinion in a Linkert scale of 1-3 where 1=Strongly Agree, 2=Neutral and 3=Strongly Disagree.*

1. ICT systems are necessary for effective warehousing management and cargo transaction tracking

- Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

2. Use of ICT systems lowers cargo transaction tracking cost at warehouses.

- Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

3. Regulated Cargo Transaction system increases customers' confidence in warehousing management.

- Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

4. Online cargo transaction handling tracking and management is more secure than the manual management system

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

5. ICT utilization increases Cargo Security

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

#### **SECTION D: ICT SYSTEMS MANAGEMENT**

*Below are ICT systems management utilized by a warehouse. Kindly give your opinion on how they impact on operational efficiency of warehousing demand in a Linkert scale of 1-3 where 1=Strongly Agree, 2=Neutral and 3=Strongly Disagree.*

1. ICT systems makes planning of daily operational activities quite easy

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

2. ICT systems used simplifies directions taken to manage warehousing demand operational

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

3. ICT systems make controlling of warehousing activities easy.

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

## **SECTION F: ICT OPERATIONAL EFFICIENCY ON WAREHOUSING MANAGEMENT**

*The following are points related to ICT operational efficiency on Warehousing Management. Based on what you know and experience, please indicate whether you agree or disagree with the following statements by placing a tick (✓) in the box which best reflects your opinion*

1. ICT increases profitability of warehousing operations

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

2. ICT promotes investment in warehousing and service logistic

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

3. ICT platform leads to increased customers base for warehousing services.

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

4. ICT platforms contribute to reduced transaction cost of warehousing and logistic services.

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

5. ICT usage makes warehousing and logistic services affordable to customers

Strongly Agree                       Agree                                       Neutral  
 Disagree                                       Strongly Disagree

***Thank You for Your Time and Participation***