BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMET OF ACCOUNTANCY

THE CONTRIBUTION OF ARTFICIAL INTELLIGENCE IN DEMAND FORECASTING

BY

DYLAN T MARUFU

(B190556B)

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN PURCHASING AND SUPPLY AT BINDURA UNIVERSITY OF SCIENCE EDUCATION.

JUNE 2024

APPROVAL FORM

With my consent as Academic Supervisor, this study proposal is submitted to Bindura University of Science Education for review as a component of the Bachelor of Purchasing and Supply honors degree.
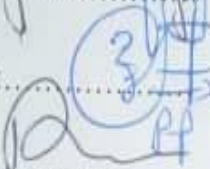
Name of student....Dylan Manyu............ signature ....: date..04/06/2024

Name of supervisor:................ signature.....Ponde: date...11/10/24

Name of chairman :.................. signature............: date..04/10/24

RELEASE FORM

The author of this project grants permission to the Bindura University of Science Education Library to duplicate and lend or sell the copies of the project for private, scholarly, or scientific research purposes only. However, the author's explicit consent is required for any form of transmission, including photocopying, recording, or use of any other information storage or retrieval system. The author also retains other publication rights.

Student Name   : Dylan T Marufu

Registration Number   : B190556B

Date   : June 2024

Student signature   : ....

DEDICATIONS

This research is dedicated to my parents, and my siblings Lisa Mubwandarikwa and Christwish Marufu. I dedicate this project to you because you have been always there for my support and motivated me to go through with the project. Mostly I recognize your prayers and words of advice to me. You have mentored me to being a stronger person and versatile in whatever I do or embark. May the good Lord bless you abundantly. Surely goodness and mercy shall follow you all the days of your lives.

ACKNOWLEDGEMENTS

ABSTRACT

This study investigated the contribution of Artificial intelligence in Demand forecasting using a case study of Kenac computer systems. According to Chase(2013) forecasting in the last twenty years has become more complex due to fast paced business environment. The study seeks to unveil how the new processes of demand forecasting, from traditional methods to new AI technologies have contributed to change in Kenac Computer systems towards reaching their goals. The study sought to describe how practically AI has affected or improved demand forecasting. Due to high competitiveness in the market Kenac needed to be able to improve their demand forecasting using AI as it records less errors and can be more accurate, hence reducing obsolesce or providing incorrect data. This study, however will point out how the introduction of AI has improved the company"s sale and have more customer satisfaction. Despite the development of AI, however the role of AI remains understudied which bring about the research of this particular project. The study involved proper planning of literature in order to identify what improvements are expected from using AI. More so interviews were carried out at Kenac Computer systems with individuals from the institution. The findings presented gave an overview of the contributions Artificial Intelligence had in the various processes of demand forecasting. Issues pertaining to performance objectives were discussed vis a vi the findings and the study conclusions were mirrored with existent literature. The study also concluded that in order for AI to play a significant role in demand forecasting there need to be complementing technologies. The study revealed that necessary hardware and software was a requirement needed to achieve accuracy and proper demand forecasting outcomes. The issue in handling large data sets and also clean data that will reflect true market dynamics. Conclusively the study highlighted the contribution of AI in demand forecasting and how it corresponds to issues that deal with demand forecasting itself as an activity.

ABBREVIATION AND ACRONOMY

AI	Artificial Intelligence
ICT	Information Communication and Technology
ANN	Artificial Neural Networks
KYC	Know your Customer
ML	Machine Learning
AMI	Anti Money Laundering

Contents

RESEARCH TOPIC

THE CONTRIBUTION OF ARTIFICIAL INTELLIGENCE IN DEMAND FORECASTING. A CASE STUDY OF KENAC COMPUTER SYSTEMS

CHAPTER ONE

INTRODUCTION

1.0 Introduction

The term Artificial Intelligence in essence of its development can be defined as the theory and development of computer systems with the ability to undertake tasks that normally performed requiring human intelligence (Akerkar, R. 2019). These include facets such as decision making, visual perceptions, speech recognition and translation. These facets of artificial Intelligence (AI) resonates to machines that have the capabilities to learn from experience, accomplish intended tasks without manual intervention at the same time adapting to new inputs (Jaipurira, S., & Mahapatra, S. S. (2014). Demand forecasting is an important activity for manufacturing or service delivering companies. By tapping into customer profiles and preferences, computer systems can package products and services based on personalized needs (Pan, Y. (2016). According to a 2018 report published by the World Economic Forum, in collaboration with Deloitte, 76 per cent of Chief Executive Officers in the service oriented industry agree that AI is a top priority because it is critical for differentiation (Martinsson, T., & Sjöqvist, E. 2019).

Artificial intelligence still is a new phenomenon in Zimbabwe. Given the rapidly changing business environment, the need to adapt to different situations in order to increase reliability, flexibility and convenience is more critical than ever before. Most traditional methods of forecasting use "Deterministic Planning Approaches"; they express plans and forecasts as hardand-fast numbers and do not recognize inherent risks (Murray, 2019). In this hyper-connected rapidly changing world forecasting needs to account for a range of possible outcomes and business decision makers need highly efficient scenario driven planning capabilities (B.J. Copeland.2020). This raises a question concerning potential improvements in demand forecasting in the light of promising emerging technologies like artificial intelligence (AI). The potential of AI in demand forecasting is, therefore, a worthwhile area of research. This study research seeks to understand the contributions of AI in demand forecasting. The study is the case of Kenac Computer systems which is an ICT firm which specializes in information communication technology products, hardware and software with a distinct command also in cyber space products. The cases is profoundly and rightly positioned for the research study due to its nature of services and products in relation to

Artificial Intelligence as a systematic and integrated tool for some products which they offer their clientele. The following sections provide a background on the topic and present the aim and problem statement of the study.

1.1 Background of the Study

Saunders. M et al., (2007) background of the study provides and leads into the scope of the research topic, the background within which this study emanates from. According to Chase (2013), forecasting in the last twenty years has become more complex due to the increased amount of entities that need to be forecasted in globally fast paced business environment.

Today"s market landscape is largely defined by its accelerating scale and speed. Enterprises need to make business decisions and tactical executions in increasingly narrow timeframes across highly complex supply chains. These decisions are not just aimed at increasing sales performance over annual, or even quarterly, business cycles, but at short-term demand with daily or day to day (B.J. Copeland.2020). Consumers are accustomed to searching for and receiving products on time and within a channel they are comfortable with. These business models were consumers buy products anywhere and get them anywhere creates complex difficulties in forecasting demand (Mou, Xiaomin). The traditional siloed channel based demand forecast has had its own short comings. Challenges and complexities in demand forecasting resonates from aspects such as price elasticity, consumer preferences, product life cycle, economic conditions weather and other exogenous factors. Given that the data is available for demand forecasting, making these rapid, data driven predictions can prove to be a challenging task due to the ever increasing numbers (volume), velocity (fast paced ever changing) and varieties of data that modern firms generate (Mou, Xiaomin)

This scenario has created a squeeze in demand forecasting whereby ensuring low forecasting errors is of high significance. The study comes from the backdrop of a global supply chain matrix which is broader and more complicated than ever before. Issues of increased lead times and more communication barriers in the supply chain has led to delays in forecast (longer time frames in a fast paced world) resulting in demand forecasting accuracy being compromised (less accurate) or subjected to undesirable variables. (Chase, 2013). According to Huff and Sultan (2014) once

accuracy has been compromised there are other integrated effects which spiral and spill into firms business trajectory. Poor forecasting accuracy leads to unnecessary costs and expenses for enterprises, which in turn affects their performance. The advent and development of AI and it integration with business models has opened doors to wider and broader spectrum of new innovative business models. This has resulted in a potential for firms to streamline and upgrade their capabilities in every aspect that is structurally and in manufacturing processes. Given this background, this research study seeks to entail the contributions of AI in demand forecasting, this being a case of KENAC Computer systems an ICT firm. This background entertains the notion that firms by integrating these new concepts in their forecasting strategies they become more efficient. AI-based forecast techniques can help either by automating forecasting completely or by efficiently processing big data sets, which leads to cheaper, faster, and more reliable forecasts. According to Dash et al. (2019), reaching almost 100% forecasting accuracy is now possible through new advanced forecasting models utilizing AI. It is within this context that this research seeks to find out how demand forecasting traits or objective have been affected AI

The researcher understands that despite the increased attention of AI in demand forecasting, extant literature provides limited insights into the potentials AI can bring. Yet, there seem to be positive industrial expectations concerning such potentials. Accordingly, the study aims to increase the understanding regarding the potential improvements AI can bring to performance in the context of demand forecasting, in the light of previously mentioned challenges within this area.

1.2 Problem Statement

The study focuses on KENAC Computer systems the gist being that while the firm integrates AI in its core processes of functionality. The study with specifics on demand forecasting seeks to elaborate the transitional mechanics that existed from that shift from old contemporary methods of demand forecasting to adoption of recent technologies that borders on AI. The research seeks to ascertain the broader requirements and changes adopted whilst trying to understand the changes this brought to demand forecasting. By this the research tries to find out how the new processes have contributed to demand forecasting. The practical implications this has made on the competitive advantage of KENAC as a firm. Theoretically there are certain facets that are deemed as prerequisites for adopting AI and also there are performance objective that are linked with

demand forecasting. The study then seeks dwell on the translation of the transition of KENAC Computer systems, what changes and requirement had to be undertaken. Also in application and implementation of these technologies in demand forecasting, the practical implications they have made on the core processes of demand forecasting. The problem statement seeks to describe and dwell on how theoretically and practically as in this case, demand forecasting has been affected by AI technologies. Despite the development of AI, however the role of AI in the improvements of these objectives remains understudied, which presents the foundation for this study's research problem statement.

1.3 Research Objectives
- ➢ To ascertain the extent to which Artificial Intelligence has affected demand forecasting.
- ➢ To determine and understand the changes brought about by Artificial Intelligence in the scope of demand forecasting in companies,

- ➢ To determine the general prerequisites needed successfully apply AI in demand forecasting

1.4 Research Questions
- ➢ What types of improvements, related to the performance objectives, are most expected to be achieved by applying AI in demand forecasting?

- ➢ What are the general prerequisites for applying AI in demand forecasting operations?
- ➢ What positive or negative outcomes have resulted from using artificial intelligence in demand forecasting?

1.5 Significance of the study
In conducting this study it is the aim of the researcher that the information gathered will assist various sectors of the society in the adoption of such newer concepts and its uptake within the social, economic and political realms of our modern society. The findings from the proposed study may contribute in helping the stakeholders in understanding and be aware of the precepts of AI and suggest ways in which it can be utilized to solve challenges and creating better models.

The study will also contribute immensely to the body of literature surrounding the development of AI initiated protocols in demand forecasting. It is the hope of the researcher that the information gathered will assist firms and concept developers in ICT.

Also the research is contributory towards AI regulatory policy frameworks by relevant institutions. By exposing these research gaps the study would be contributing to the body of literature that is available for use to any regulatory institutions. The findings might help improve a process, inform policy, or make a case for concrete change.

The research is also significant in the academic universe it might also assist academics and scholars to further or strengthen a theory or model, challenge current assumptions, or create a basis for further research

1.6 Delimitations

The study focuses on the contributory role played by artificial intelligence in demand forecasting being a case study of Kenac Private Limited. Demand forecasting in this study is to focus on a critically service oriented environment, Since operations like production capacity and product development, not only inventory, need to be planned in line with demand requirements and variability. This allowed for eliciting insights from a reasonable number of uncharted scopes where demand is crucial due to the proper complexity level of their operations.

The addressed geographical area is limited to Zimbabwe within the scope of Kenac Computer Systems Private Limited to control the results considering the allowed time and resources more practically. Above all, Zimbabwe‟s service industry is home for many large and high performing companies operating in many industries such which increase the transferability of the sample of the study to other similar settings.

1.7 Limitations

Time is also going to be a barrier for the researcher. The researcher has limited time to conduct the research. A research of this magnitude requires one to have ample time to gather relevant and factual data that can be deciphered in order for it to have relevance in the area of study.

However, time management and the use of information and technology is going to be utilized to cover the time gap.

As far as this study is concerned, it being a case study (KENAC Computer Systems Pvt Ltd), there is no guarantee that drawn conclusions can be generalized and applicable to all across the business landscape.

1.8 Chapter Summary

The chapter firstly outlined the overview of the whole chapter followed by the background of the study and highlighted the statement of the problem. The research question and sub-research questions were illustrated. The value to different stakeholders of this study was set out in the significance of the study. Delimitations and limitations of the study were explained established. The subsequent chapters of the study are; literature review, methodology, analysis, discussion, and conclusion. The literature review provides a theoretical framework and empirical evidence, identifying study gaps in already existing literature. It will also highlight on the prerequisites required for the, implementation and the beneficial application of AI in demand forecasting.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This Chapter contains the study‟s literature review. The goal of the literature review is to highlight the academic gaps from existing literature by means of appraising the significance as well as limitations of established theories (Saunders et al 2007). It will also look into empirical evidence equally, will highlight and identify areas of legitimatizing this research, deduced from the review of existing body of literature. The initial stages will review on the concept of demand forecasting. The study will dwell on past traditional methods, and how they contribute to operational performance outcomes. The study will go on to define Artificial intelligence (AI) and the related technologies. The concluding section will highlight theoretical framework based on existing empirical evidence concerning the changes brought about by Artificial Intelligence in the scope of demand forecasting in companies and the requirements when applying AI in demand forecasting. The review basically will revolve around literature on our research goals and research questions.

2.1 Demand Forecasting

In order to define the term demand forecasting and understand it is critical to understand the scope with which it exists. The current market land scape is characterized by accelerated dynamics that involve fast paced decisions. Business decisions and tactical maneuvers are increasingly undertaken in narrow timeframes across highly complex and dynamic supply lines. According to Kilger and Wagner (2008), the basis for supplying goods and management of that supply side is to give customers what they want (customer demands). Before a cooperate procure whatever is required by their customers the goal of supply side management is to fulfill customer demands. In order to achieve this, many decisions must be made before the customer demands the products thus the activity demand forecasting.

According to Chase (2013), demand forecasting is a vital process in a variety of industries since accurate demand forecasts help in achieving quite a lot in the supply chain. He went onto further

suggest that these activities are not just aimed at increasing sales performance over certain timelines or specific business cycles, but at understanding the demand spectrum. Aspects such as product life-cycle, price elasticity, customer preferences, economic conditions, the point in the business cycle factors such as weather and other exogenous factors create complexities in product demand (Bernard Marr 2018).

However demand forecasting even with adequate and best data to forecast on these things, making rapid data driven forecasting can be challenging for most cooperates. These predictions can be challenging due to the ever increasing speed, volumes and the varying nature of data modern firms generate. (Jake FrankenField 2020) assets that while information or data in picking up small and emerging changes in demand is crucial in a business world that runs on real time customer engagement, it is acting on it that matters the most. He further assets that it is about utilizing the abundant data in such a way that enables rapid and agile responses to capture narrow windows of opportunity. (Jake FrankenField 2020).

Enterprises can no longer plan and fulfill demand over quarters but will have to ensure their product and services are available in real-time at the location of the consumers" choice, and in whatever quantity they desire (Heath 2018). They also have to choose the demand to serve due to possible operational, logistic and procurement constraints. So the task is really to know and predict the demand behavior in order to be able to choose how to serve it and how much to serve of it profitably. Demand forecasting need to be connected to supply and fulfillment decisions to ensure an efficient value chain that meets the customer and the firm"s profitability requirements (Takyar 2020)

Thus, demand forecasting has an impact on many functions like capacity and material planning. Long-term strategic decisions are also based on forecasts, such as expanding to larger offices or constructing new plants (Chase, 2013).

2.2 Traditional Methods and Models for Demand Forecasting

The above definition of demand forecasting enabled us to understand that the activity exists in a rapid changing environment, thus the need to adapt to different situations in order to increase

reliability, flexibility and convenience is more critical than ever before. Most traditional methods applied in demand forecasting are Deterministic Planning Approaches (Swaminathan & Venkitasubramony, 2023). They went on to assert that in this hyper-connected rapidly changing

world forecasting needs to account for a range of possible outcomes and business decision makers need probabilistic scenario driven planning capabilities (Swaminathan & Venkitasubramony, 2023). The main premise of any forecasting method is that the actual demand will follow some pattern, often associated with a trend, seasonality, or causal relationships (Chase, 1997). The pattern is then complemented with some random influences. According to Chase (2013), forecasting methods can be divided into two main categories, qualitative and quantitative methods.

2.2.1 Qualitative Methods

Qualitative methods are defined as those that rely on the subjective assessments of a person or group of persons (Chase 2013). (Moroff et al., 2021) Assets that qualitative methods are used when the available data is insufficient for a quantitative analysis or when qualitative information is likely to improve forecast accuracy. Expert opinions or knowledge of special events are examples of qualitative methods.

Studies have shown that the most common qualitative forecasting methods are juries of executive opinions, committee judgment, independent judgment and sales force estimates (Chase, 2013). There is also the Delphi Technique (Chatfield, 2000). These techniques hinge on judgments or estimates done by either committees or individuals in different departments of the organization. They are based on knowledge or gut feelings. (Chase,2013). These qualitative methods differ in terms of who is undertaking these forecasts and which operation oversees it. For instance sales estimates are done by those in Sales while top management undertake juries of executive opinion. On the other hand the Delphi technique distinguishes itself slightly from the other methods. It is an iterative process whereby experts are drawn in for their expert opinion and share feedback with each other so as to reach consensus (Chatfield, 2000).

The qualitative methods of forecasting have disadvantages such as bias, short term validity and limited processing capacity. Chase (2013) asserts that forecasts based on qualitative methods are

biased towards the individuals that developed the forecasts. Additionally Sander and Manrodt (2003) resonate with the above saying qualitative methods relies on the limited human capability of considering and processing information since qualitative data is mostly knowhow knowledge or textually descriptive (Sanders & Manrodt, 2003). They also depend upon observations and understandings of the market trends and dynamics. These methods are overly subjective and are not consistently accurate. (Chase, 2013).

2.2.2 Quantitative methods

The quantitative methods of forecasting in contrast make use of historical data. They analyze historical data (time series) or specific relationships that exist between system elements (causal models). Chase 2013 defined them as those that rely on past sales history alone or are built on a relationship between past sales and some other variable(s).

These quantitative methods are divided into two categories time series and causal (Chase, 2013). Time series methods assume that future sales will follow the same pattern as past sales. Some classes of time series methods are naive or random walk, moving averaging, exponential smoothing, decomposition, and ARIMA (Caniato et al., 2011). The casual methods use assumptions that future sales are closely related to changes in other market variables. Simple regression, multiple regression, unobserved components model and ARIMAX are the most common methods. Disadvantages of quantitative forecasting include dependency on input data quality and the relationship between the dependent and independent variables, large data set requirements, and low long-term accuracy.

The dependency on data means that quantitative methods are only good as the data they use. This means if the data is bad that means the whole forecasting process is compromised.(Caniato et al., 2011). In using the time series method large historical data is required and it tends to adjust slowly to changes. Meanwhile its accuracy is mostly compromised when the forecast horizon is a long period and also fluctuations in data. As for the causal models, forecasting accuracy is dependent on the relationship between independent and dependent variables (Chase, 2013). The independent variables need to be identified and estimated accurately and they require more time to develop, a strong understanding of statistics, and large data storage. According to (Hofmann & Rutschmann,

2018). Time series methods can be classified into traditional and modern methods (machine learning and deep learning). Besides, modern methods can be regarded as AI methods.

Sanders and Ritzman (2004) argue that inorder to rely on forecasts for decision making accuracy needs to be ensured. Several ways can be used to measure accuracy. The traditional way of combining qualitative and quantitative forecasting methods firstly by performing the independently then combine them objectively or subjectively (Sanders & Ritzman, 2004). An example of objective combining is simply calculating averages between quantitative and qualitative forecasts while subjective combining involves consideration of contextual information. The combining reduces the effects of forecast bias, model errors as well as inaccurate assumptions. This provides a check system were the two will cancel each other‟s errors. However, according to Sanders and Ritzman (2004), the combination method can lead to a low sense of ownership due to the high objectivity, which is a disadvantage with the method.

2.3 Performance Objectives

These are objectives that are directly related to the activity of demand forecasting. These objectives serve as guidance for a business to differentiate itself from its competitors. (Nyoni 2019) in his study electricity demand forecasting in Zimbabwe found that the activity is vital for increasing energy productivity. According overestimation of electricity consumption would lead to superfluous idle capacity which means wasted financial resources, whereas underestimation would lead to higher operational costs for the energy supplier and would cause potential energy outages. Therefore, accurate and reliable modelling and forecasting of electricity demand in Zimbabwe is inevitably vital in order to avoid costly mistakes. According to Slack et al. (2013), a business‟ operations goals can be summarized in five performance objectives: speed, dependability, quality, flexibility, and cost.

Speed

According to Slack et al. (2013), the performance objective "speed" is defined as the time between the customer order entries to order delivery. The aspect of fast decision making and a good supply chain are vital aspects to secure quick response to customer needs. Aminov, De, and Mendelsohn

(2019) argue that urgency regarding a company''s decision-making process is strongly associated with the company''s overall performance. Their study further showed that the companies that made quick decisions were twice as likely to make high-quality decisions, which could hence generate higher returns. Since improved demand forecasting implies greater support to make quick decisions, it arguably leads to improved operational performance.

Flexibility

Slack et al. (2013) described flexibility as an indicator on how well the supplier can change the process in an operation. This includes the ability to realize time compression or increased production scales to deliver certain orders, the ability to rearrange the production processes to meet heterogeneous customer demand or high product variety, and the ability to show resilience against disturbances. According to Bursa (2013), many markets of today call for substantial flexibility as they are characterized by uncertain demand and fast changes, and to compete in such environments, companies must sense and foresee market changes, where forecasting is crucial, and quickly adapt to these changes.

Dependability

According to Slack et al. (2013), the performance objective dependability measures to what extent customers can rely on the supplier to deliver the products or services when needed or as previously agreed. This includes delivering orders, with the right quantities, to the right destinations, at the right time, and as specified by customers and promised by suppliers. Some studies refer to dependability as perfect order fulfillment Hofman, (2004). Dependability is often achieved through efficient utilization of resources, which eventually leads to time and money savings (Slack et al., 2013). In this respect, improved demand forecasting can lead to improved dependability provided that the improved forecast accuracy leads to better use of resources.

Cost

The performance objective cost comes in the sense that lowering costs provides benefits. This comes in both ways in terms gaining better profit margins and gaining a competitive advantage. This makes firms less vulnerable to price fluctuations and other causes of instability (Slack et al., 2013). Improving the demand forecasting process along the supply chain can reduce supply chain costs by enabling lower inventory requirements (Jaipurira & Mahapatra, 2014)

 Quality

Quality as a performance objective depends entirely on customers" expectations on the product or service (Slack et al., 2013). So in this respect quality, depends on the performance of the other mentioned objectives above.

The above objectives as discussed relate to improved demand forecasting which can lead to improved speed, dependability, flexibility, and cost. The coming sections discuss AI and how it can enable improvements in these performance objectives by improving demand forecasting.

2.4 Artificial Intelligence

According to the definition given by Sabouret (2021), Artificial Intelligence (AI) is defined as the building of computer programs which perform tasks which are, for the moment, performed in a more satisfactory way by humans because they require high-level mental processes such as perception learning, memory organization, and critical reasoning. The above definition gives us an insight that AI requires a written program that can perform information processing therefore, we can call it an Artificial intelligence program Sabouret (2021),

Moghaddam (2020) goes on to give a definition that is simpler and understandable. He defines it as the overall concept of machines being able to process data fed to them and perform useful tasks that are otherwise done by human beings or typically the reproduction of human intelligence through machines. The definition provides the general aspect of machine being able to adapt and learning as the human intelligence do.

Furthermore Addo (2019) described it as the science and engineering enabling computer programs to replicate human intelligence. Interfacing as a computer it understands and reason to human intelligence and other living things. In other ways, science and technology has worked a way and found how machines can be taught in the ways of human beings. He went to say that computers on their own are not intelligent but depend on human input that means program created by humans execute the functions they perform, thus AI.

According to Schuett (2019), he gives a better definition in which he traces back to the term AI. The term surfaced in 1955 and since then carious definitions have sprung up. The most common definition is AI means the science and engineering of making intelligent machines. Intelligence is then defined as the computational part of the ability to achieve outcomes. Pan (2016) in an article says AI is defined as the ability of machines to understand, think, and learn in a similar way to human beings, indicating the possibility of using computers to simulate human intelligence.

He also goes to elaborate that AI has experienced continuous development since its advent and has expanded into several research fields, including machine translation, machine learning, intelligent controls, pattern recognition and expert systems (Pan, 2016).

According to Andersen et al. (2019), the development of faster, smarter, and more powerful computers enabled rapid development of AI. He asserts that the technology is increasingly becoming useful for „cognitive‟ tasks previously considered restricted to humans.

The bulk of the research done on AI in relation to demand forecasting has mainly been on machine learning and artificial neural networks.

Machine Learning

According to Moghaddam (2019) defined machine learning is the main application that AI uses and AI enables the machine to use data processed by itself. Moreover, researchers (Addo 2020) defined ML explores the study and construction of algorithms that can learn from data and make decision and prediction by building models. The main goals are for the machine to predict matters in a correct way. Machine learning is the ability of a machine to study data by utilizing data.

Therefore there is no need to be programmed for performing a specific job. Among other machine learning uses, it is used for teaching computers by example to recognize patterns, with no specific rules. The creation of algorithm rule and make a prediction. Moghaddam (2019) presented three categories of ML which are defined shortly below:

Supervised learning this depends on existing data to reach a predictable conclusion.

Unsupervised learning- This is when the AI agent process predictable outcomes without previous training to do the task.

Reinforcement learning - this subcategory is working as a trainer of AI algorithm identifies rewards and punishment to provide solutions for any challenges accurately.

Figure 1 below shows the categorization of machine learning as explained above
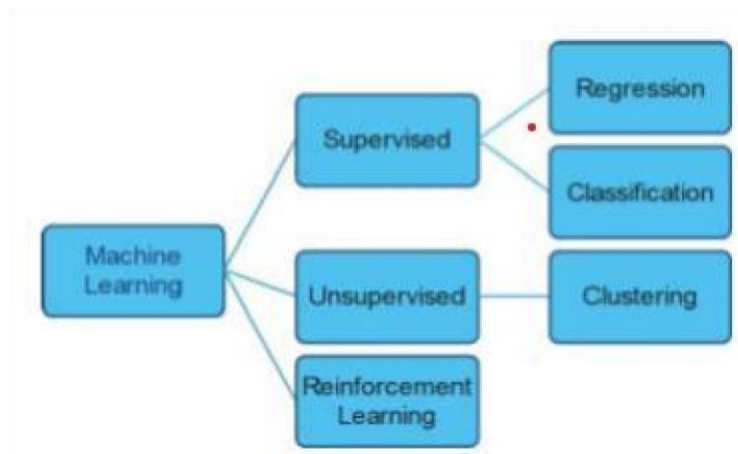
Source: P Rieva 2020

Another view by Murphy (2012) defines machine learning as a set of methods that can automatically detect patterns in data, and then use the uncovered patterns to predict future data, or to perform other kinds of decision making under uncertainty. That is, machine learning provides automated methods for analytics of big datasets. According to Mello and Ponti (2018), the area of

machine learning can be divided into supervised learning and non-supervised learning. In supervised learning, the algorithm receives training sets consisting of input-output pairs and intends to converge to the best possible function. The aim is for the algorithm to be able to predict the outputs for previously unseen inputs with high accuracy. Non-supervised learning refers to the process of building up models after analyzing the similarities and patterns in the input data.

Artificial Neural Networks

This is an algorithm that copies or mimics the way the human being's brain works, a "neural circuit," for example, human sense, events, feeling, and other human traits. Techslang,(2020). For deep learning to work it needs artificial neural networks. It adapts neurons or human cells.
The things we find in our biology inspire artificial neural networks, and there are applications of computer and math ideologies in the neural net for coping with how the human brain works (Techslang,2020).

Abiodun et al., (2018).State that there are three layers in neural networks. Inside neural networks there are three layers which are the hidden layers, input layers, and output layers. These layers are constructed with a large number of nodes. The data are fed inside through input layers with a certain weight. The nodes multiply input weight on the way on their way until reaching the required information units. The information is passed to the next layer. The outputs are weighed by machine for comparison if there is a difference that requires corrections (Abiodun et al., 2018).

2.5 Demand Forecasting and the use of Artificial Intelligence (Empirical)
This section of literature reviews demand forecasting and the advent AI. Also the accompanying prerequisites related to Artificial Intelligence, this being framed into a framework

According to Dash et al. (2019), AI can contribute to accurate and reliable demand forecasts by processing, automatically analyzing, and predicting great amounts of data. In their study they emphasized that the application of AI in demand forecasting does not only incorporate historical sales data but can also use near-real-time data to improve forecasting accuracy. Such data can be

prices, advertising campaigns, local weather forecasts, or any data regarding variables connected to changes in demand. (Duan, Edwards, & Dwivedi, 2019)

Furthermore, the study found out that AI reduces manual work which facilitates companies" usage of data to make predictions, leading to reduced costs for making predictions (Duan, Edwards, & Dwivedi, 2019). A more accurate and reliable forecast, achieved by using AI, allows businesses to optimize their sourcing, which helps reduce costs (Dash et al., 2019). In another study Feizabadi and Shrivastava (2018), made a comparison of forecasting accuracy in demand forecasting. They used traditional methods against a method based on machine learning. They sought to find out how accuracy in demand forecasting can be increased by using machine learning. In the study by applying machine learning, the accuracy of demand forecasts was improved by 6,4% on average, which led to a progress in working capital efficiency. Feizabadi and Shrivastava (2018)

The study further revealed that the bullwhip effect can be mitigated to some degree when using machine learning in demand forecasting. When the bullwhip effect is mitigated, inventory fluctuation can be decreased which can lead to reduced inventory costs. Literature has also supported this as explained by Yufei, & Jinpeng, 2013 machine learning in demand forecasting improves accuracy and efficiency.

(Shambira 2020) in his study the adoption of Artificial intelligence in Zimbabwe Banking Sector revealed AI in the banking sector in Zimbabwe is still in its infancy and the adopted services are to enhance bank processes, so as to enhance the efficiency of banking processes, process automation/optimization, reporting, predictive maintenance in IT, complaints management, document classification, automated data extraction, KYC (Know-Your Customer) document processing, credit scoring, etc. They have also adopted AI to enhance security and risk control so as to enhanced, compliance monitoring, any kind of anomaly detection, AML (AntiMoney Laundering) detection and monitoring, system capacity limit prediction, support of data quality assurance, fraud prevention, payment transaction monitoring, cyber risk prevention. The study revealed that the drivers for adopting AI are customer satisfaction, cost reduction and the need to better manage risk and the barriers to adoption of AI are lack of AI knowledge, lack of resources including AI talent and establishing governance for ethical AI, data privacy and other security issues. According to McKinsey (2017), implementing AI in demand forecasting can decrease

forecasting errors by 30-50%. AI enables access to real-time data, which can be used to adjust the forecasts automatically and continuously, leading to improved availability of products. Therefore, the stock-out situations are expected to decrease, reducing the costs of lost sales by up to 65%.

In another study by Nyoni Thabani 2020 in which he was researching the adoption of AI demand forecasting methods for Zimbabwe Electricity Supply Authority The objectives of his study were 3-fold and these are: to analyze electricity consumption trends in Zimbabwe, to develop a reliable electricity demand forecasting model for Zimbabwe based on the Box-Jenkins ARIMA technique and to project electricity demand in Zimbabwe over the next decade (2015 – 2025). The study basically found out that demand forecasting is important for strategic planning which involves capacity expansion, power system planning, power security and supply reliability.
In addition, AI handles unforeseen events efficiently by flexibly adapting to changes in the product mix or distribution network. Furthermore, transportation and administration costs can be decreased with more accurate forecasts. AI can be useful when forecasting products or services with rapid changes in demand, since it enables quick responses to the changes (Calatayud, Mangan, & Christopher, 2019; Praveen, Farnaz, & Hatim, 2019). Hence, AI contributes to a selfthinking supply chain with great agility, adaptability, speed, and responsiveness.

Efendigil, Kahraman, and Önüt (2009) also discuss the usefulness of AI in the form of artificial neural networks. Their study illustrated that artificial neural networks, compared to quantitative forecasting methods, are more efficient for data affected by the special case, such as unforeseen events or promotion. This allows companies to be flexible and prepared for quick changes. A more accurate forecast, accomplished by applying AI, can also lead to reduced inventory costs (Amirkolaii et al., 2017).

Errors in demand forecasting means a difference between the forecasted demand and the actual demand, and according to Praveen et al. (2019), these errors can lead to high inventory costs, which could have been avoided with a more accurate forecast. The article describes a model, utilizing artificial neural networks, that was developed to increase the forecasting accuracy. By using the model, minimizing the mismatch between supply and demand, and hence the related costs, was possible, leading to an increase of the profit margins.

Moreover, Ali, Sayin, Woensel, and Fransoo (2009) support this standpoint by concluding it is clear that the accuracy of the forecast directly contributes to higher profits by reducing stock-out situations and lowering the level of safety inventory

2.6 Prerequisites for Adopting Artificial Intelligence in Demand Forecasting

Extant literature shows that prerequisites needed for adoption of AI within a business can be classified into different categories. For example, Giada, Rossella, and Tommaso (2020) used the classes Technological, Economic, Organizational, and Cultural. These classes were deemed suitable for mapping the prerequisites in the study. However, due to the complex nature of AI, the category Knowledge was added in order to appropriately classify the prerequisites related to adoption of AI.

According to Nilsson and Gerdtham (2018) they argue that for any firm to adopt AI there is need sufficient quantity and quality data. They state that it is the most vital constituent for problem solving using machine learning, and that incomplete data generates unreliable results from the AI algorithm. Chui, Manykia, and Miremadi (2018) add that the data must be labeled to be usable for machine learning. In a study they conducted they found that 24% of the respondents in their study claimed that "lack of available data" was a significant barrier in adopting AI, and 20% claimed that "limited usefulness of data" was another significant barrier. This highlights as to what is really required for the correct adoption of AI.

However, gathering or creating large amounts of data can be difficult for businesses since every new potential use case will need a new dataset, which challenges existing technological infrastructure for data storage Chui & Malhotra, (2018). To handle all the data, Nilsson and Gerdtham (2018) claim that the collected data need to be consolidated in data warehouses for the business to ease availability and get an overview of the data. This means that reliable infrastructure must be in place for the company to be able to store and quickly access the data. The above notion give raise to the fact that there should be technological infrastructure that should be able to complement the large data being accumulated. Technological hardware and software is vital Chui & Malhotra, (2018).

Furthermore, Makridakis, Spiliotis, and Assimakopoulos (2018) present that machine learning methods require significantly more computational capacity than traditional quantitative methods.

Implementing machine learning methods effectively means increasing businesses" computational infrastructure for demand forecasting or finding ways to reduce the methods" complexity. This would require testing in order to decide on the trade-off between accuracy and lowered computational time. Chui and Malhotra (2018) found that lack of supporting technological infrastructure to support AI is one major barrier to adopting AI in their business.

Ali et al. (2009) found that performing demand forecasting with machine learning techniques can increase accuracy during periods with promotions, but it also brings additional costs. Data preparation, maintenance, and setup costs prevent adoption of new demand forecasting methods. Data preparation costs are significant and dependent on the model's complexity and the amount of data needed.

Makridakis et al. (2018) found similar results showing that machine learning forecasts require extensive data pre-processing for optimal results. One technical obstacle of new advanced forecasting techniques using machine learning is the lack of traceability. Makridakis et al. (2018) explain that further work is needed to assist forecasting practitioners in understanding how machine learning methods are generated. Obtaining numbers from a black box is not acceptable to practitioners who need to know how forecasts arise and how they can be influenced or adjusted to arrive at workable predictions. Chui et al. (2018) refer to this issue as the explain ability problem, which arises from that deep learning and large or complex AI models have become opaque. Because of this, explaining how, why, and when a decision was reached is difficult. In order to overcome this obstacle, one prerequisite for implementing machine learning in forecasting is sufficient technological competence within the company Chui et al. (2018).

Andersen et al. (2019) argue that knowledge regarding the benefits of integration of AI in businesses is one of the necessary building blocks for the adoption of AI. Furthermore, the authors claim that top management needs a coherent strategy and a long-term vision to benefit from adopting AI at a large scale, which is only attainable if the top management has a holistic understanding of the technology and its benefits. AI capabilities must hence be integrated into the core of the organization to realize the technologies" full value potential. Andersen et al. (2019)

Lorica and Nathan (2019) confirm that the most prominent bottleneck that prevents the adoption of AI is that the company culture does not recognize the potential of AI technologies. Chui and Malhotra (2018) point out that one of the most significant prerequisites for successful adoption of AI within a company is the technical competence required for AI technologies. The lack of skilled employees is one of the key factors slowing down the adoption of AI within organizations

(Lorica and Nathan, 2019). Further, the employees" willingness to change is of high importance to achieve a successful adoption of AI (Duan et al., 2019). Human decision makers are more likely to accept AI if it is viewed as an assisting tool for decision making, rather than as an automated decision-making process. (Duan et al., 2019).

Table 1

Type of Prerequisite	Prerequisite	Description
Technological	Data availability and quality of data	The data needs to be accessible, clean and of high quality
	Sufficient Technological Infrastructure	The technology needs to be able to store, access and process available data.
Economic	Available economic resources to adopt AI.	Cost due to data preparation, system maintenance and setup of complex models
Knowledge	Awareness of the benefits of AI.	Top management needs to have a holistic understanding of the benefits with AI.
	Technical competences required for AI.	For successful adoption of AI, there is a need for appropriate competencies about AI technologies within the company.
Organisational	Top management"s ambition to change	The organisation must recognise the need for AI and have a leadership with high commitment to AI.

	Overarching AI strategy	There is a need to understand how and where AI can be applied within the organisational structure.
	Integration of AI into the core of the organisation.	I capabilities should be integrated into the core to promote the value potential and buyins that the organisation does
	Sharing of data between stakeholders in the supply chain	Sharing of data between trading partners and stakeholders can improve visibility since more data is available
Cultural	Employees willingness to change.	It is important for employees to accept the different roles AI can play in the decisionmaking process.

2.7 Chapter Summary

In summary, this Chapter has identified relevant literature that discussed demand forecasting as a supply side activity undertaken in relation to productivity. The dynamics involved and how they affect the productivity of the firm. It also looked into empirical evidence. The chapter also looked at dependent and independent variables of the study, review on the concept of demand forecasting. The chapter also dwelt on past traditional methods, and how they contribute to operational performance outcomes. The chapter went on to define Artificial intelligence (AI) and the related technologies. The concluding section looked at past related studies based on existing empirical evidence concerning the changes brought about by Artificial Intelligence in the scope of demand forecasting in companies and the requirements when applying AI in demand forecasting.

<center>**CHAPTER THREE**</center>

<center>**RESEARCH METHODOLOGY**</center>

3.0 Introduction

This Chapter will constitute the research design used in this research. We will discuss the adoption of a proper technique for use in this study. In addition, this Chapter will examine the data collection methods. It will also examine the data presentation and analysis methods. The ethical considerations for the research will be discussed. According to Shanda (2016) the goal of the methodology section of the research project is to authenticate that the research – the research followed a design and process and was not just conducted without thought which would have otherwise rendered such a research study unreliable.

3.1 Research Design

Mauch& Park (2003) argued that one research approach may prove more suited to a given problem than another. Thus, it is essential to choose the investigative approach that best promises to match the problem and its setting and to result in the most believable and dependable solution. In this instance, a qualitative design may well be the approach of choice. Answering the research questions requires an in-depth analysis of the study case Kenac Computer Systems Pvt Ltd perceptions of, and opinions about, improvements and prerequisites.

According to Kothari (2004), a subjective assessment of attitudes and opinions can be achieved by conducting qualitative research. Based on this, a qualitative approach seemed appropriate and will be selected for the study. To collect the necessary primary qualitative data of opinions, attitudes, experiences, processes, behaviors", or predictions, an exploratory design is to be adopted since the field of artificial intelligence is in its initial stages and at the same time in its technical development and application phase. A term which the researcher coined in order to develop the scope of our research design and methods to be applied to acquire the necessary data for this research. To have a better reach of our research objectives and to answer our research questions the study will be done in three phases.

The first phase will involve panning literature in order to identify what improvements are expected and what prerequisites are general. According to Paré, Trudel, Jaana, and Kitsiou (2015), a literature review can be used for evaluating tendencies appearing within a research field. which in turn will be used as a guidance to collect and analyze data and to answer the research questions.

The second phase will involve conducting interviews with individuals from the case institution. According to Rowley 2012 in order to collect necessary primary qualitative data of opinions, attitudes, experiences, processes, behaviors, or predictions, interviews are suitable . Hence, interviews with representatives from Kenac Computer Systems are to be conducted.

The third phase will involve substantiation of findings and here a convergent design to compare findings from data sources from the research and empirical sources. . This study relies on the assumption that a researcher can obtain in depth and extensive data from ordinary conversations with people. Qualitative research is aimed at describing and understanding individuals experience through a descriptive process. So by using in- depth interviews the researcher will be able to gain useful information about the contributions of artificial intelligence in demand forecasting. The methodology of the research is summarized diagrammatically by figure 3 below.
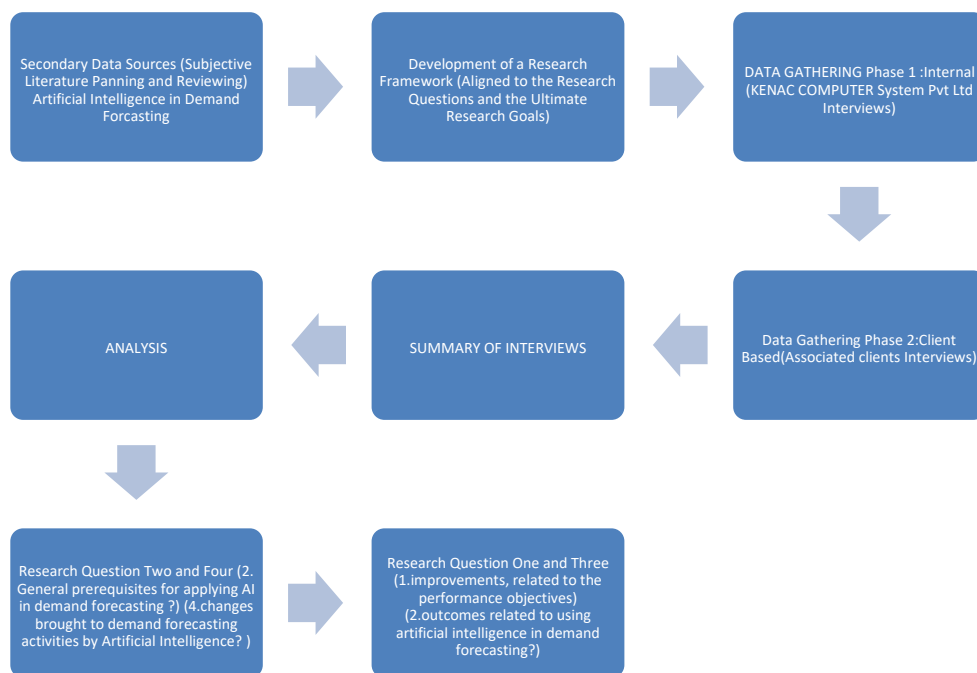
Figure 2 :Summary of the methodology of the Study.

3.2 Data Collection Methods

This study is based on both primary and secondary data that are collected from various sources.

Primary data will be collected by use of various techniques such as:

1. Input obtained from the various iterations of the interviews.

Secondary data collection, published data will be used and these are collected from:

1. Various publications on the area of Artificial Intelligence and Demand Forecasting related material (e.g. articles, research papers among many other necessary documents)

2. Various research reports prepared by research scholars, universities, various sources from university libraries, as well technical and research journals, previously published articles, thesis, conference document

The secondary data from literary sources will mainly focus on academic articles and research papers about the usage of AI within demand forecasting. They will be collected from different databases such as Google Scholar and Scopus which provides a powerful search engine that allows different search para-meters such as "Document search", "Author search", "Affiliation search", and "Advanced search" for many fields such as "Article Title, Abstract, Keywords", "Source Title", "Year of Publication", etc. amongst other research oriented websites. In order to streamline our scope on the research subject keywords will be utilized such words as "Demand forecasting using Artificial Intelligence", "Prerequisites for applying AI in demand forecasting",

"Improvements of Demand Forecasting using AI", "Artificial Intelligence", "Implementing AI in Demand Forecasting", and "Prerequisites for Implementing AI". Also localized independent publications from institutions such as University of Zimbabwe, Midlands State University, NUST

and other local tertiary institutions will also be used. The results of the review will be synthesized into a framework based on our research questions.

The researcher will draw classification based on our research questions. Potential improvements brought about by AI will address Research questions 1 and 3 while prerequisites of AI implementation in demand forecasting will address research questions 2 and 4. By this the study will classify potential improvements in terms of their contribution towards earlier alluded performance objectives. The improvements alluded will be classified based on speed,

dependability, flexibility, and cost while the identified prerequisites will be classified in terms of their types ; "Technological", "Economic", "Knowledge", "Organizational", and "Cultural". The framework serves as a baseline for the interview guide.

3.3 Target Population

The target population used in this research study will be two fold. There is the internal cluster, with individuals from KENAC Computer systems. Te research sought to acquire information related to the study from staff members. The second cluster sought to acquire information by interviewing associate organizations that conduct business with KENAC Computer Systems as to ascertain on the improvements and requirements. According to De Paulo (2011) the target population should be small in order to obtain quality, in-depth and information that will be representative enough to draw an outcome.

3.4 Sampling

Sampling refers to the process of selecting participants of the research study. (Hoover 2018). For this dissertation, the researcher used convenience sampling because of restrictive time limit as well as budget constraints. According to Fiona (2017), convenience sampling is the best approach for research that needs to be completed within a short amount of time because it depends on participants that are of close proximity to the researcher. Of course, convenience sampling is often accused of researcher bias (Cane 2017) and not authoritative because of its reliance of subjects that are close by not really useful or relevant to the study per se (Yen 2016). In order to curb these

potential drawbacks, the researcher modified the convenience sampling method by incorporating some of the mechanisms of purposeful sampling thus:

a. The participants were chosen because of convenience but were made part of this study if they satisfy the purposeful criterion.

b. The purposeful criterion was rounded off by the participant exposure to the research dynamics of demand forecasting and artificial intelligence.

3.5 Research Instruments Interviews

Data will be gathered by conducting interviews with associate clients of Kenac Computer Systems, which will be randomly selected based on convenience. The selected companies need to be businesses located in the Harare area. It is of importance that the companies are of considerable business association with the case company. This selection criterion provides a foundation for mapping the usage of AI in demand forecasting. Lewis (2009) argue that usage of multiple sources, such as several interviews, improve the external validity, which refers to how well the results can be generalized across social settings..

The interviews are to be semi-structured interviews since this, according to Rowley (2012), gives room for a comparison between interviews and the possibility for the interviewee to elaborate on certain topics, in order to gain further insights. A semi-structured interview is described as a combination of a few well-formulated open/closed-ended questions.

Furthermore, the approach allows for some flexibility during the interview, including spontaneous follow-up questions, and changing the order or the questions asked.

Interviews will also be conducted with Kenac Computer Systems where the interviewees will have to be within decision making in demand forecasting. Supplemental information regarding , market areas, customer base, and portfolios, will collected. This will contribute to a greater understanding and make it possible to triangulate certain findings from the interviews.

3.6 Validity and Reliability

Several methods can be used to improve the validity and reliability of a study. According to Glesne (2011), one approach is triangulation, using multiple sources to assure that the information is supported by several publications. Another one is using peer-reviewed literature, which will be prioritized since the information has been approved by other researchers and thus can be considered credible. This research adopted this method in assuring validity and reliability of the information.

To ensure the reliability of the academic sources, the publications will be evaluated based on the corresponding number of citations, and the respective academic journals were evaluated based on the corresponding impact factor. The reliability of the reports and independent publications, on the other hand, will not be assessed based on the number of citations since recent publications would be disadvantaged.

Internal reliability refers to how well interpretations of the data match (Bryman, 2012). To ensure internal reliability, the interviews will be recorded in case of missing details. The researcher will also accord the interviewees opportunity to confirm interpretation in order to further improve the internal reliability of the data; this will make it easier for analysis. This will enhance internal validity regarding both the data gathering and data analysis, which refers to the reliability of the conclusions drawn from the study (Slack & Draugalis, 2001). According to Mane (2017), internal validity of a research study is important as it demonstrates that other people other than the researcher examined the process of the research study writing hence the final output is not purely subjective

According to Bryman (2012), external reliability means to what degree the study can be repeated. Since the common knowledge about AI implementation in demand forecasting may differ in the future, the external reliability of the data cannot be guaranteed.

3.7 Ethical Issues

Regarding the interviews, some ethical challenges need to be taken into consideration. To prevent breaches of personal privacy and leakage of sensitive information, the companies and

employees interviewed are to be kept anonymous. According to Doster (2017) ethical considerations are key foundations of a sound research study

3.8 Data Analysis and Presentation

The data analysis will be conducted using content analysis, where the first step will be to compile the interview responses into texts, and the recordings will be used to complement any missing information. Flick, von Kardorff, and Steinke (2005) state that content analysis is useful for structuring communicative material. Further, content analysis aims to sort out various parts of the material, which can then be compared and analyzed based on predefined criteria, i.e. the framework in this study.

In the second step, the interview notes are to be used to summarize the primary narrative of the detailed interview, while the reflections and perceptions of participants are to be used to corroborate a narrative. When discrepancies are found, the interviewees will be referred to. This method involves the reformulation of stories presented by respondents considering context of each case and different experiences of each respondent. In other words, narrative analysis is the revision of primary qualitative data by researcher. Narrative sources are open to the central qualities and are exceptionally modest. Also, such records can be a massively reliable wellspring of information; therefore, they are progressed for national or global purposes. (Amonashvili 2011)

Moreover, the detailed interview description will be reviewed by the interviewees to obtain higher accuracy. As for researcher biases, the researcher will utilize a peer student to analyze the data of the interviews using the study adopted theoretical framework, and the student will jointly assess and refine the elicited improvements and prerequisites of AI implementation in demand forecasting.

Accordingly, the final interview-based answers to the research questions will be introduced after iterations of inductive coding as recommended by Glaser and Strauss (2017). For example, to identify the potential improvements of AI implementation in demand forecasting, the relevant text be coded and, if applicable, related to the framework categories. To ensure the relevance of

the improvements, it needs to have an impact on the performance. Evidences from the data of the interviews will have to motivate how AI led or may lead to increased or reduced performance.

 Apart from the answers to be obtained from interviews with the associate cluster of companies that deal with Kenac. Primarily, aspects representing the planning environment and demand forecasting process at each company will serve as dimensions. For instance, when an interviewee, unlike interviewees from other companies, downplays the improvement role of AI implementation in demand forecasting at his or her company, aspects like demand variability, and market conditions may explain such opinions. That is, comparable aspects across interviewees were also considered to provide a further contextual understanding of the interviewbased answers to the research questions.

 3.9 Chapter Summary

The chapter highlighted the research methodology that will guide collection of data required by the study. It explained the use of the qualitative research design and the case study research approach that will be employed by the researcher. The chapter also justified the use of various techniques that will be used in the study. Furthermore, the chapter explained the use of interviews as a data collection instrument. The chapter also set out the reliability, viability and ethical issues related to conducting the study.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

The preceding chapter outlined the research methodology to be used in this study. This chapter will analyze data, responses and feedback from interviews which were conducted. Data collected using the interviews will be presented in this chapter in an exploratory way. The data will then be analyzed in order to satisfy the research questions and objectives set in chapter one of this research. The interviews were analyzed and interpreted in relation to the research objectives and research questions, and the results that emerged were presented.

4.1 Response Rate

Saunders *et al*. (2016) argue that a response rate of more than 60% of the generally targeted sample is considered representative of the population, with a lower response rate considered to be biased, and not fully representative enough for the generalization of results. Basing on Saunders *et al*. (2016), the researcher since he was applying the convenience sampling method and interviewees were approached based on their appropriateness to the research mechanics and dynamics. The researcher‟s prerogative took precedence and interviewed as much people as he can that are directly linked to demand forecasting in the supply chain of the company. The researcher took a representation of 21 participants which he considered to provide the necessary response rate to give a fair representation of the study, and therefore used it as the basis for data analysis. The presentation of the 21 participants had 14 interviewees from KENAC Computer systems conveniently chosen. 7 associate interviewee from associate companies that either directly or indirectly conduct business with the case company.

4.2 Demographic characteristics

The information from demographics as stated by Leroy (2016) gives data regarding the unit of data and helps to determine whether the participants in a particular study represent a sample of the target population thus balanced. Information in demographics is independent variables therefore cannot be skewed. The researcher found it necessary to record demographics such as age and gender of the people being interviewed as he deemed this information might be useful to future studies by other researchers in the social science spectrum.

4.2.1 Age

The age of respondents is significant in understanding opinions about a problem. When examining the responses age it becomes important to ascertain the levels of understanding and stratification of a concepts and its uptake (Chavez, 2017). This can determine technological responsiveness especially for this study. The representation of the age distribution of the interviewed participants is presented as follows.

Table 2

Age	20 -30	31 - 40	41- 50	51 and Above
No of Participants	8	7	4	2

The above distribution presented on the chart below. Fig 3

Age Distribution
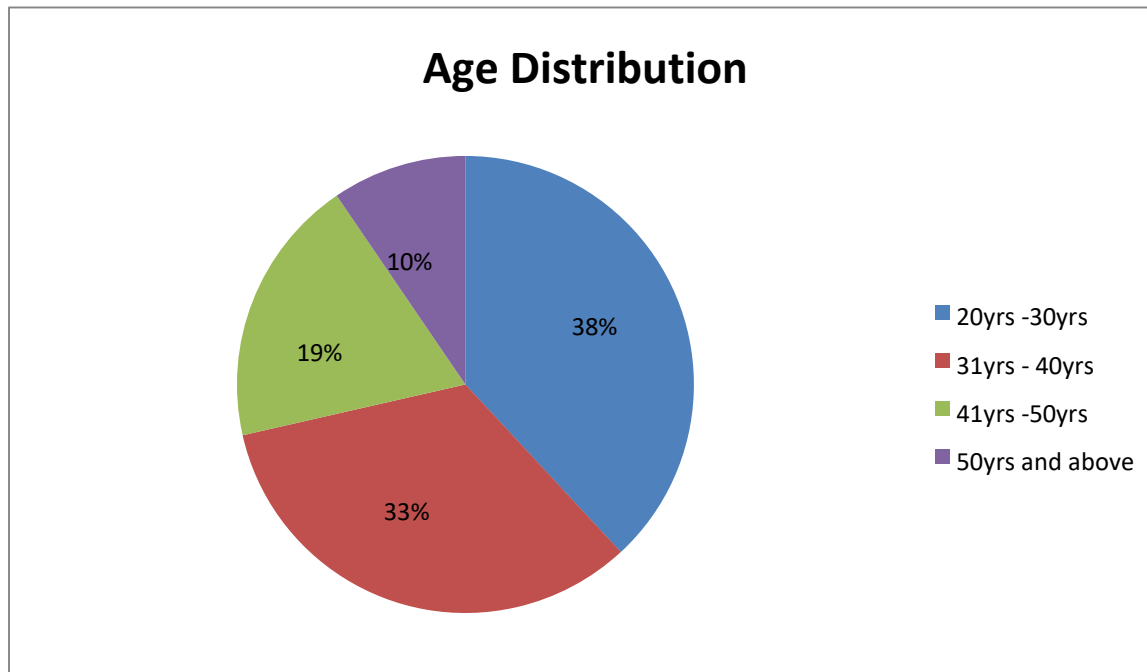
The above chat shows that 38% of the respondents were of the age range 20years to 30years while 33% ranged between 31years to 40 years. The above 50years constituted 10% of the study respondents while 19% ranged on the 41 to 50 years. On analysis the range of 20years to 40 years constituted the bulk of the age range in this study suggesting the active age.

4.2.2 Gender

According to Palgrave (2017), it is critical for modern studies to be gender sensitive in order to give a balanced view this also enables researcher to understand the social dynamics distributed by the study. The gender distribution of the participants was not structured in any way by the researcher. It distributed as follows 7 of the participants were female while 14 were male participants. This representation is diagrammatically illustrated below. Fig4

Gender Representation
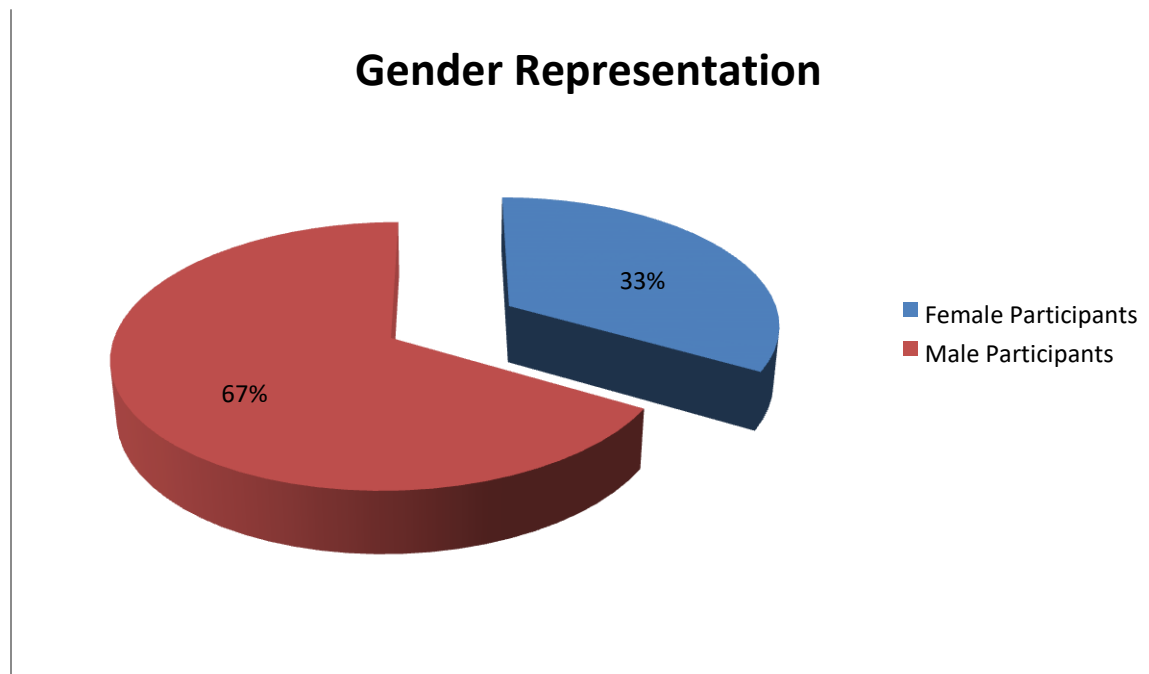
The above diagram shows that 33% of the people interviewed were female while 67% of them were male. The gender distribution as highlighted above was construed such that the study would be gender sensitive.

4.3 RESULTS OF THE STUDY – CONTRIBUTION OF ARTIFICIAL INTELLIGENCE IN DEMAND FORECASTING

This section will present data gathered and provide an analysis on how Artificial Intelligence plays a role in demand forecasting. The results will be presented in such a manner that first we will give a summary of the information gathered through interview the followed by its discussion and analysis. This will be hinged on the premise of our research questions with the overview of achieving the research objectives of this study.

4.3.1 Summary of the Interviews

The following sections include a summary of the interviews and an analysis of the contributions and prerequisites. The interview answers are compared with each other in the analysis of

contributions and prerequisites. They are presented in a way that differentiates those from KENAC Computer Systems from those of associate companies and these will be presented respectively.

4.3.2 KENAC Computer Systems
Section One: Background Information

The motive of the researcher was to get information that will enable him to identify the contributions of AI in demand forecasting. The starting point was to gather background information of each participant. This information was crucial in ascertaining whether the participant was relevant for the study. According to Younge (2017), a favorable understanding among the participants of the subject matter is imperative as it reflects well on the research. The background information questions hovered around questions such as what is your role in the company, how long have you worked for the company, what you are responsible for and how large a share their department represents in the company.

The response show that there was a varying aspect from the 14 interviewed people which saw 6 of the respondents in response to the first question of their role in the company holding managerial positions and 5 holding operational positions that were directly linked to managerial command chain while 3 were heads of departments. The distribution is illustrated in fig 5. Most of them had span from a lower value of 2years working for the company and an upper value of 6 years working for Kenac Computer Systems. Information on the role and how large a share their department represented in the company, there was a consensus as to the significance of their respective department most of them alluding to the fact that the company worked as a system and the functionality of each unit depends on the operational efficiency of the other. So in summary the research took up the integrated nature of the organization in its operations.

Fig 5
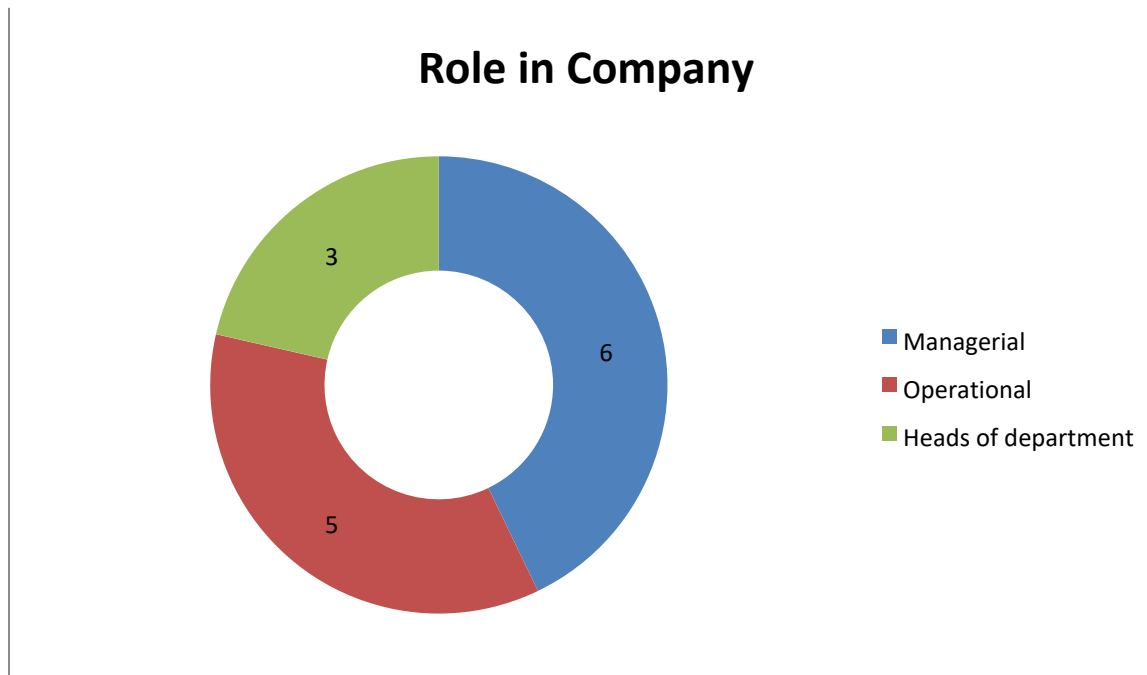
The above illustrates how the respondents were distributed as of their role which they played in the company. The information was summarized to managerial, operational and heads of departments.

Section Two: Follow up Knowledge

This section of the interviews sought to determine and find out the scope of demand forecasting with which the company utilized. Questions such as How would you classify your company's demand, How does your company's demand forecasting work today, how does your company evaluate its forecasts, what information is used in forecasting, how would you appraise your company's current forecasting, how accurate is it? These questions were essential as they act as precursors to the development of our research goal of ascertaining the extent to which Artificial Intelligence has affected demand forecasting. In asking these questions it gave the researcher a clear view of the current scope of demand forecasting at Kenac Computer systems.

In summary most of the interviewed personnel generally classified their demand as above even and gradually on the rise. Most of the interviewed personnel of managerial and department heads

alluded demand of their products to trends. The demand is affected by prevailing market trends. The fact that their business hinges on IT products and service wares, it mimics an ever changing dynamic in demand of their products. Therefore their forecasts are received through various integratory means which utilizes direct communications with end users (customers). The company also utilize network hubs that span from local hubs to regional (Southern Africa) to international hubs. One interviewee alluded to the fact that their forecast are therefore based on information received from these hubs and are projected onto their market dynamics, this being done and determined by capabilities of their infrastructure or can be manually modified subjectively to suit demands.

The research sought to have a clearer understanding on the company"s position on Artificial Intelligence. Interviewees were asked on how much knowledge the company had on AI and whether AI was being used in operationalization as well as demand forecasting. The participant unanimously agreed that AI implementation is a big part of KENAC Computer Systems and it was the future of the company. It is within their long term plans since they act within a technologically intensive field; it is of importance to stay updated.

Section Three: Scope and current application of AI within Demand Forecasting

The researcher keeping in line with the research questions and objectives: What are the general prerequisites for applying AI in demand forecasting operations? Also to determine to determine the general prerequisites needed successfully apply AI in demand forecasting. The interviewees had a general notion that AI within demand forecasting has the propensity to provide beneficial traits to the company that could enable the handling of big data sets and optimize information to provide specific IT products that are coined to the specifications of a particular demand by the customer. In response to the question what are the technologies used for most of the participants seemed to insinuate that AI through customer surveys has been helpful in determining the trends with which software development has been revolutionized to cater for specific of the market place. Big data set handling and self-diagnostics of hardware and software infrastructure has managed to flexibly speedily address to customer needs and wants (virtual assistance).

The question on improvements brought about by AI in the operationalization in their demand supply and maintenance aspect most of the respondents gave a insight that the use of AI within

demand forecasting provide real-time forecasts which are more accurate and within the concerns and convenience of the customer demands. There was also a share view which the researcher summarized to be the adoption of AI on a product specific level. The general notion was this enabled their products and demand specs to be subjective to a particular brand. In line with the research mechanics adopted by the researcher, participants were deliberately directed to discuss issues involving the performance variable and data collected from the participants was summarized as below.

1. Dependability and Quality

   The study found out that AI enhances the authenticity of forecast information. Data collected in real-time mirrors and reflects the market dynamics that are actual. One participant alluded to the fact that the time of predictive analytic using qualitative data is slowly becoming extinct. He molded on the fact that technology is the future and AI provides less room for human error.

   "We expose our clients to our AI integrated Chabot so as to make ask as many questions they want about our products and services."

   More of the participants on the operational side of the company summed up that the AI algorithms provide a way ticket that delivers on the specific demands of the market. This enables them as the service provider to give quality services that is coined to demand specifications. This increased service levels in the supply chain matrix. This resonates similarly to a study that was conducted by (Shambira L 2020) who found that AI can aid in systematically analyzing behavior patterns of customers and offer them a more personalized dependable services to cater their needs.

2. Flexibility and Speed

   The researcher had to navigate the participants to air their view on how AI affects flexibility and speed in the process of demand forecasting. To sum up the data there was a general consensus by the participants that the use of machine learning and artificial intelligence systems can pick up unexpected outcome quickly and provide a relay platform. One participant had this to say.

"These computational methods of demand analysis can quickly pick up abnormalities in demand patterns; counter measures are quickly and flexibly undertaken speedily and in time. Things are changing daily we are living in a fast paced market system"

Another interviewee had this to say.

"The nature of AI computations allows us to have flexible and quick data that allows us to have better downstream planning in our forecast and supply chain."

The above notions gathered in the study augers well with the findings by (McKensly 2017) who found that AI enhances flexibility enabling quick responses to changes in product mix. However there was a particular interviewee who held a differing view which caught the eye of the researcher.

"The technology is good but at times there are special circumstances which require unique decision making, its ability might be compromised."

This notion resonates with the study by Aggarwal and Mittal (2022) who concluded their study as human interaction to be more effective than artificial intelligence.

3. Cost

The study participants from KENAC seemed to allude that their nature of business has a highly erratic demand for their products which makes their demand forecasting a very complex process. To sum up they were of the view that by adopting machine learning there will be reduced cost in their forecasting processes. A particular interviewee took the matter on broader scale in which she insinuated that as much as it reduces costs there is the need to look into the cost of constantly upgrading these AI systems to ensure it handles big data set that compliment demand forecasting dynamics of the market. *"To invest in these technologies might be pretty expensive and the constant upgrading sa well. Most firms in the country are small to medium scale firms, the cost might be expensive"*

This resonates with the notions given by Bhardwaj et al (2020) on the adoption of artificial intelligence he argues that as much as it delivers in different aspects which it is applied organizations are hesitant to use AI because of the costs associated with it.

Section Four: Potential within demand Forecasting

The respondents were exposed to a series of questions that sought to draw out from them the potential AI in demand forecasting. They were exposed to Questions such as which advantages do you believe AI can bring to demand forecasting? Why do you recognize potential from AI within this area? How great potential lies within this area? do you recognize any further areas of demand forecasting where AI could be applied?

The interviewees saw greater potential in applying AI in demand forecasting. Most of the participants believed that issues of accuracy could be guaranteed using this technology. Also internal processes could specifically be directed towards performing brands and services such that firms can concentrate on profitable product lines in the supply chain matrix. Those interviewed in managerial highlighted that with AI product development becomes an easier task. The interviewees seemed to acknowledge that in a chain system AI has the potential to increase the competitive nature on the demand market which leads to better productivity.

"*Demand forecasting sums up to the competitive nature of a particular product on the market.AI with all its facets I think in the long run will improve brand visibility and its competitive nature on the market*"

The research respondents acknowledged that the customer base of firms like them in the IT software development and hard ware distribution is going through a major shift in terms of consumer buying patterns and preference. The digital revolution brought by AI has the potential in product mapping and stratification of services.

"*Computer Systems firms are the backbone and should be able to champion the digital revolution, Digitization and documentation of various AI platforms are within our scope, data and information relay should be able to create information hubs that are streamlined and industry specific for*

example AI in banking sector is way more interactive between service provider and consumer. Their demand forecasting is at the tips of their fingers"

The above notion by a particular interviewee resonates with Shambira L (2020) who states that the adoption of AI may open new opportunities in training and maintenance of these systems

Section Five: Prerequisites

This section the research the interviewees were exposed to the following questions What prerequisites do you think are necessary in order to apply AI? What difficulties do you perceive with implementing AI in demand forecasting? How does your company compare to your competitors with AI. The main focus was to draw responses that answer to the study"s research question what are the general prerequisite for applying AI in demand forecasting operations. To summarize the responses, most of the participants highlighted the need to invest in sufficient IT infrastructure that is capable of handling large data set. They suggested that in order to determine accuracy in demand forecasting proper hardware and software should be the main priority

"Once you have a proper structured data ecosystem and complimenting technological infrastructure I am sure accuracy can be achieved in demand forecasting"

The participants also highlighted that most cooperates view AI in a vacuum but rather it is a branch of artificial knowledge attached to human knowledge in a supply chain dynamic. Knowledge was found to be of key importance and mandatory in implementation of AI in demand forecasting. One participant in the operation section has this to say.

"*We are software developers but in any case if the knowledge we input in these software's while coding is irrelevant to the intentions the software is supposed to serve the whole product loses its authenticity"*

The above notion by the participant gives credit to the study by Shambira (2020) who states that in any case, an AI will fail if the data that is used to train the AI system does not reflect the demographic variables and proper content required by the target population. He gives an example of a Chatbot in that it requires comprehensive information about its operations to provide correct

and accurate feedback data for forecasting as well as correct responses to the customer. If information is distorted the system will fail. Knowledge is a key prerequisite as highlighted above. Cederberg (2020) also states that understanding of the improvements AI can bring is crucial in demand forecasting since AI requires investments, knowledge about the improvements AI can bring is important, in order to ensure return on investment.

The bulk of the respondents saw economic and cultural being organizational matter that should be prepared to be invested in by any firm that seeks to invest AI in their demand forecasting. One interviewee had this to say:

"The supply chain scope is demand based, organization and management has to understand that for demand forecasting to improve there has to be measures taken in the investment of AI and this means economic resource in the form of capital, change in organisational culture with the way AI is going to handle the various processes which were once done differently. These are all required for AI to make sense in demand forecasting".

These views resonate with Cederberg (2020) in which he states that organizations need to prioritize and allocate resources and adopt shift in their demand forecasting culture to make an implementation of AI possible. To sum up the views on the requirement needed for AI in demand forecasting the researcher presented the data acquired in the following diagram

Fig 6

Summary requirement for AI implementation in Demand Forecasting

4.3.3 Associate Companies

This part of the research the interviewees were drawn an individual each from companies that directly associate with Kenac Computer Systems. They were conveniently used based on the researcher prerogative and those that were at his convenience. In order to protect them the researcher withheld the names of the companies and the rank which the participant held for confidentiality reasons. The researcher adopted an alphabetical order to represent the companies. The companies 7 of them had 2 in the same field of retail so their data was grouped as retail AB, The other 3 were in the financial sector thus Finance CDE, the last 2 were human resources personnel from differing companies thus Human Resources FG. The data collected is summarized in a collective manner and were views differ the research highlighted the uniqueness of the response. The main quest with them was data on how AI has affected demand forecasting and the prerequisite for adopting accurate forecasting using AI. To avoid redundancy the researcher

focused on the information which was unique and differed from that which was gathered from Kenac

The results from the data showed that the application of AI and its functionality in demand forecasting has a universal element in terms of performance objective required in demand forecasting but however the applicability is somewhat different from one area of operation to the other. For example finance CDE included an aspect of a secure system in AI implementation in all operations whether it is demand forecasting or service provision to their customers

"Our is intensive industry that requires secure systems and our demand forecasting is in realtime mechanics"

The above notion is supported by a study by Leonard(2020) exploring the adoption of AI the banking sector which highlighted the industry has adopted AI to enhance security and risk control. The researcher summed up the same data pertaining improvements as that which were highlighted by the Kenac interviewees. On the prerequisite the interviewees had a consensus on issues of IT infrastructure and the adoption of clean data sets. This supports the study held by Jaldi (2023) he states that not only accuracy be guaranteed through infrastructure but also clean data set are essential in improving demand forecasting in supply chain.

4.4 Chapter Summary

The chapter presented data gathered in the field with the aim of drawing up an analysis in the contributions of AI in demand forecasting. Information was presented descriptively and were illustrations were applicable the research used visual aid in the form of diagrams. Information gathered and analyzed was supported using empirical findings. The following chapter will elaborate on a discussion focused on the research findings and the overall research objectives and questions. It will also give recommendation and highlight on areas of further studies and conclusively end the study.

CHAPTER FIVE

DISCUSSION OF FINDINGS CONCLUSIONS

AND RECOMMENDATIONS

5.0 Introduction

Chapter one of this research focused on the introductory aspects of this study. It highlighted aspects of the background of the study, revealing on the research objectives and highlighting the research questions. The second chapter took a niche into the already existing literature on the research subject, giving the research an in-depth literature review on the contributions of Artificial intelligence on demand forecasting (Empirically and theoretically). This was followed by a breakdown of the research methodology highlighting the methods used to conduct this research. This final chapter will look at presenting a discussion of the whole study and findings and give a study conclusions and recommendations. Information in this chapter is based on the research findings obtained from the previous chapter.

5.1 Discussions and Conclusions

The study was guided by three overall research objectives that sought to understand the following: To ascertain the extent to which Artificial Intelligence has affected demand forecasting, to determine and understand the changes brought about by Artificial Intelligence in the scope of demand forecasting and to determine the general prerequisites needed to successfully apply AI in demand forecasting. These objectives are the precursors to the critical research questions that became the basis of this research. The following research questions are the basis with which the researcher will draw a discussion visa vi the data obtained from the case study. The questions are what types of improvements, related to the performance objectives, are most expected to be achieved by applying AI in demand forecasting, what are the general prerequisites for applying AI in demand forecasting operations and what positive or negative outcomes have resulted from using artificial intelligence in demand forecasting?

Research Question One: What types of improvements, related to the performance objectives, are most expected to be achieved by applying AI in demand forecasting? To answer this question the analysis of the data gathered in the study was aligned with the primary data from already existing information. In this case the study demonstrated that with AI the more accurate the demand forecasting system the better the improvements realized in performance objectives. The system becomes cost efficient. To sum up the data the research is of the view that by adopting machine learning there will be reduced cost in forecasting processes; efficiency is one of the improvements related to the performance objectives. This is similar to findings by Sharma et al (2022) that efficiency is enhanced through artificial intelligence.

An explanation for this could be that this improvement is closely related to increased forecasting accuracy. Mupfiga and Fohlo (2015) substantiate this view asserting that companies in Zimbabwe should develop AI programs to complement their demand and customer services so as to improve their quality of service. Artificial intelligence is implemented in automated online assistants that can be seen as avatars, these can avail for enterprises wide opportunities that can reduce operational costs.

The researcher concluded that on speed and flexibility as a performance objective in demand forecasting, AI brings about an element of consistency on demand in the supply chain. Accuracy is also heightened; this case demonstrates that more accurate forecasts can lead to an improvement in both areas. An explanation to this unusual combination of improvements could be that AI generates more accurate forecasts and better information, resulting in improved safety stock planning, reducing both over- and under stocking.

Several improvements found by the research align with existing literature. The issue of quick adaption to the scope in market demand, increases service levels and transparency brought about by AI resonates with research by McKinsey (2017). He implied that issues of accuracy with AI are projected across all the performance objectives associated with demand forecasting. Also Gülen (2023) found that AI can enhance transparency in supply chain management by providing real-

time visibility into logistics and production processes. This can help companies to identify and respond to problems more quickly, reducing waste and increasing efficiency.

Another improvement that the study took up was AI within demand forecasting has the propensity to provide beneficial traits to the company that could enable the handling of big data sets and optimize information to provide specific products that are coined to the specifications of a particular demand by the customer. This will lead to decreased working capital and reduced manual work in demand forecasting. This is supported by Cederberg (2022) in which he concluded that an explanation for this could be that this improvement is closely related to increased forecasting accuracy.

Research Question Two: What are the general prerequisites for applying AI in demand forecasting operations? The study found out that the prerequisites for adopting AI in demand forecasting borders on technical requirements that should be met in order to effectively use AI in demand forecasting. The study had categorized and structured requirements adopted from a theoretical framework which had categorized them to technological, economical, organizational, knowledge and cultural. The study found that the discussion on technological requirements hinged on AI input infrastructure. The requirement to effectively adopt AI in demand forecasting should be initialized by having proper IT infrastructure that can support the AI itself. The study can safely conclude that hardware and software that supports AI initiative is a prerequisite. Also an issue of proper structured data ecosystem and complimenting clean data sets. The research found that these systems must be able to handle big datasets such that data can be converted to useful information that is useful in demand forecasting. This resonates with Chui et al (2018) they state that a significant degree of expertise within the subject of AI is required. Clean and high-quality data and complimenting technologies are also needed in order to use AI and allow it to improve accuracy over time.

The knowledge driven prerequisites found by the research highlighted that most cooperates view AI in a vacuum but rather it is a branch of artificial knowledge attached to human knowledge in a supply chain dynamic. Knowledge was found to be of key importance and mandatory in implementation of AI in demand forecasting. Issues of training and continued appraisal of AI and the human knowledge gap should not be underestimated if accuracy is to be reached. The study

also concluded that AI can improve collaboration between different stakeholders in the supply chain, such as suppliers, manufacturers, and retailers. By facilitating communication and sharing of information, AI can help companies to work together more effectively, leading to improved performance in demand forecasting. The discussion on Knowledge based prerequisite should be focused on the fact that without proper knowledge of what competences are needed for AI, it is difficult to realize proper outcomes, Andersen et al. (2019)

Cultural prerequisite denoted from the study conclusively was linked with organizational culture as represented by their human capital. The study picked up the notion that propermeasures have to be taken to integrate the human aspect with AI, change in organisational culture with the way AI is going to handle the various processes which were once done differently. These are all required for AI to make sense in demand forecasting. There are also similarities between interviews and literature regarding the prerequisites found in the classes of economic, organizational and cultural. These prerequisites were found and supported by existing literature and therefore were presumed to be general prerequisites. Interviews mentioned the need for understanding the improvements AI can bring, which is supported by Lorica and Nathan (2019), who termed it as the awareness of the benefits of AI.

Moreso, on the economical prerequisites to adopt AI the investment aspect is revealed by the study as consistent with proper adoption of AI. The investment aspect sums from technological investment were economical resources should complement the adoption process. The organizational aspect also should hinge on the availability of economic resources to provide the proper shift in different facets of the organization. For example training, among other adaptive measures and understanding the improvements AI can bring,. Literary this is supported by Ali et al. (2009) with literature showing that despite the identified differences concerning the prerequisites required for implementing AI in demand forecasting, there is still agreement in certain areas that are systematic and are prerogatives of the organization. Lorica and Nathan(2019), also referred to it as awareness of the benefits of AI.

5.2 Limitations

The study was limited to specific case. The application of AI in demand forecasting is a broad area of study that has the propensity of revealing industry specific results. Moreover, a study of this magnitude may imply a risk to bias towards their area of responsibility. For example, the case in this research is segmented towards computer systems and their views on the implementation of AI and might overestimate the improvements achieved by the implementation. This might result in misrepresentation of outcomes that are not universally applicable in demand forecasting.

The study presented results that proffered improvements and requirements, the researcher felt that this being a case might have downplayed these aspects in the contribution of AI in demand forecasting activities. An area of limitation which can be rectified through a possible way of conducting an industry wide research targeting more participants or conduct a survey which would have resulted in a broader set of data, possibly by including more companies that apply AI in demand forecasting. A survey would, however, provide less detailed answers and because of this, interviews were considered the most appropriate method for the empirical data gathering.

More over another limitation to the study stems from the fact that AI technologies are at their initial stages. There is lack of exposure to these technologies such that some of the interviewees had no knowledge of the major facets that revolve around Artificial Intelligence this proved to be a challenge which was mitigated by a literature adaptation for the research.

5.3 Conclusion

The study research aimed to understand the contributions of AI in demand forecasting .Artificial intelligence has contributed significantly in various fields Mendelsohn, D et al (2019). The study was guided objectives which hinged on to ascertain the extent to which Artificial Intelligence has affected demand forecasting. To determine and understand the changes brought about by Artificial Intelligence in the scope of demand forecasting in companies. To determine the general prerequisites needed successfully apply AI in demand forecasting. This resulted in the adoption of research questions that sought to understand the changes brought about on performance objectives in demand forecasting. The other aspect was trying to understand the requirement needed for the

successful adoption of AI in demand forecasting. The research took a qualitative study approach which hinged on a framework that identified performance objective and prerequisites in demand forecasting. These performance objectives and prerequisite became subjective variable of the study. They were used to study the changes and contribution AI brings into the scope of demand forecasting.

The results of the study had findings that summed up that the contribution of AI in demand forecasting had improvement on performance objective such as high accuracy in demand forecasting, increased transparency in demand forecasting activities, fast decision making mechanics and adaptations to market changes and also reduction in cost of demand forecasting processes. The findings of the study were highly supported by existing literature which gave relevance to their contribution in demand forecasting.

The research findings on the prerequisite found that requirements for adopting AI in demand forecasting results in significant changes to the processes of demand forecasting. The study had stratified the requirements as Technology, Knowledge, Cultural, Organizational and economic prerequisite. These were guided by existent literature in demand forecasting. Findings concluded that knowledge in understanding of the improvements Ai brings to demand forecasting, training of personnel in handling AI in demand forecasting was requirement. The cultural aspects were found to hinge on organizational culture and the use of AI the shift from people centric demand forecasting to machine embedded demand forecasting required a radical shift in the collective mentality and culture of the firm. The study also concluded that the contribution of AI on the cultural and organizational requirements is hinged on the backbone of digitalization and socialization of the human capital resource towards a technological future (revolution).

The study also concluded that in order for AI to play a significant role in demand forecasting there need to be complementing technologies. The study revealed that necessary hardware and software was a requirement needed to achieve accuracy and proper demand forecasting outcomes. The issue of handling large data sets and also clean data that will reflect true market dynamics is a crucial factor. Conclusively the contribution of AI in demand forecasting corresponds to issues that deal with demand forecasting itself as an activity as highlighted in the study and the necessary structural changes needed by firms to adopt AI as a process of demand forecasting.

Reference List

Aggarwal, R., & Mittal, A. (2022). Adoption of Artificial Intelligence in Human Resource Management: A Study of Indian Organizations. International Journal of Research in Marketing and Human Resource Management, 12(2),

Akerkar, R. 2019. Artificial Intelligence for Business. Springer. Cham

Ali, Ö., Sayin, S., Woensel, T., & Fransoo, J. (2009). SKU demand forecasting in the presence of promotions. Expert Systems with Applications. 39(10), 12340-12348. doi:10.1016/j.eswa.2009.04.05

Aminov, I., De Smet, A., Jost, G., & Mendelsohn, D. (2019). Decision making in the age of urgency.Retrievedfromhttps://www.mckinsey.com/businessfunctions/organization/ourinsights/decision-making-in-the-age-of-urgency

Andersen, J. R., Bughin, J., Chui, M., Poulsen, M., Rugholm, J., & Østergaard, H. (2019). HowartificialintelligencewilltransformNordicbusinesses.Retrievedfromhttps://www.mckinsey.com/~/media/McKinsey/Featured%20Insights/Artificial%20Intelligence/How%20artificial%20intelligence%20will%20transform%20Nordic%20businesses/Howartificial-intelligence-willtransform-Nordic-businesses.ash Accessed 04/03/24

Bryman, A. (2012). Social research methods. Oxford University Press Inc., New York.

B.J. Copeland.2020. https://www.britannica.com/technology/artificial-intelligence Accessed 04/03/24

Bhardwaj, A., Singh, R., & Sharma, A. (2020). Exploring the Use of Artificial Intelligence in Human Resource Management: A Study of IT Professionals. International Journal of Human Resource Studies, 10(1).

Cederberg et al (2020) Towards Better Demand Forecasting Using Artificial Intelligence Chalmers University of Technology Gothenburg, Sweden 2020 www.chalmers.se

Chase, C. (2013). Demand-driven forecasting: A Structured Approach to Forecasting. Retrieved from https://ebookcentral.proquest.com/lib/chalmers/reader.action?docID=1315864 Accessed 15/03/24

Chui, M., & Malhotra, S. (2018). AI adoption advances, but foundational barriers remain. Retrieved from https://www.mckinsey.com/featured-insights/artificial-intelligence/aiadoptionadvances-but-foundational-barriers-remain Accessed 16/03/24

Chase, C. (2013). Demand-driven forecasting: A Structured Approach to Forecasting. Retrieved from https://ebookcentral.proquest.com/lib/chalmers/reader.action?docID=1315864

Chui, M., Manykia, J., & Miremadi, M. (2018). What AI can and can‟t do (yet) for your business. Retrieved from https://www.mckinsey.com/business-functions/mckinseyanalytics/ourinsights/what-ai-can-and-cant-do-yet-for-your-business Accessed 04/03/24

Doster T. S (2017). Research. Orange Press.//http/ books.google.se/books/about/Research. Accessed 02-07-24

Dash, R., McMurtrey, M., Rebman, C., & Kar, U. K. (2019). Application of Artificial Intelligence in Automation of Supply Chain Management. Journal of Strategic Innovation and Sustainability, 14(3), 43-53. Retrieved from https://search.proquest.com/docview/2306438509/fulltextPDF/B3C1F191C8114E88PQ/1?accountid=10041 Accessed 04/03/24

Duan, Y., Edwards, J., & Dwivedi, Y. (2019). Artificial intelligence for decision making in the era of Big Data - evolution, challenges and research agenda. International Journal of Information Management, 48(2019), 63-71. doi: 10.1016/j.ijinfomgt. Accessed 15/03/24

Efendigil, T., Kahraman, C., & Önüt, S. (2009). A decision support system for demand forecasting with artificial neural networks and neuro-fuzzy models: A comparative analysis. Expert Systems with Applications, 36(3). 6697-6707. doi: 10.1016/j.eswa.2008.08.058 Accessed 15/03/24

Enns, S. T. (2002). MRP performance effects due to forecast bias and demand uncertainty. European Journal of Operational Research, 138(1), 87-102 Accessed 15/03/24

Feizabadi, J., & Shrivastava, A. (2018). Does AI-enabled Demand forecasting improve the supply chain efficiency?. Supply Chain Management Review, 8-10. Retrieved from http://proxy.lib.chalmers.se/login?url=http: Accessed 15/03/24

Flick,Uvon Kardorff, E., & Steinke, I. (2005). A Companion to Qualitative Research. Retrieved from https://journals.sagepub.com/

Glaser, B. G. and Strauss, A.L. (2017). The Discovery of Grounded Theory: Strategies forQualitativeResearch.Retrievedfromhttps://books.google.se/books/about/The_Discovery_of_rounded_Theory.Accessed 02-07-24

Huff, R., & Sultan, M. (2014). Impact of Poor Forecasting Accuracy: Gross Margin and Organizational Effects of Poor Forecasting Accuracy. Applied Value LLC. Retrieved from https://pdfs.semanticscholar.org/bc9d/15d73b8de8278f8c2902a2fa2a4a6ffe0ac4.pdf Accessed 04/03/24

Jaipurira, S., & Mahapatra, S. S. (2014). An improved demand forecasting method to reduce bullwhip effect in supply chains. Expert Systems with Applications. 41(5), 2395-2408. doi: https://doi.org/10.1016/j.eswa.2024.07.03

Kilger C., & Wagner M. (2008). Demand Planning. In: Supply Chain Management and Advanced Planning. doi: https://doi.org/10.1007/978-3-540-74512-9 Accessed 15/03/24

Kothari, C. R. (2004). Research methodology: Methods and techniques. Retrieved from https://books.google.se/books?hl=sv&lr=&id=hZ9wSHysQDYC&oi=fnd&pg=PA2&dq=kothari+2004&ots=1sYenGg3z2&sig=zcoN21C4qoJgSx6v6HxIw1RMVJ8&redir_esc=y#v=onepage&q=kothari%202004&f=false

Lewis,J.(2009).Redefining Qualitative Methods: Believability in the Fifth Moment.InternationalJournalofQualitativeMethods8(2),114.doi:https://doi.org/10.1177/160940690900800201

Lorica, B., & Nathan, P. (2019). AI Adoption in the Enterprise: How Companies Are Planning and Prioritizing AI Projects in Practice. O"Reilly Media. Retrieved from http://innovationinsider.com.br/wp-content/uploads/2019/03/ai-adoption-in-theenterprisecompressed.pdf. Accessed 15/03/24

Mane, O (2017). Research Studies. Cambridge University Press.

Martinsson, T., & Sjöqvist, E. (2019). Causes and Effects of Poor Demand Forecast Accuracy:

A Case Study in the Swedish Automotive Industry. (Master thesis, Chalmers University of Technology, Department of Technology Management and Economics). Retrieved from https://odr.chalmers.se/handle/ Accessed 07/03/24

McKinsey. (2017). Smartening up with Artificial Intelligence (AI): What''s in it for Germany anditsIndustrialSector.Retrievedfromhttps://www.mckinsey.com/~/media/McKinsey/Industries/Semiconductors/Our%20Insights/Smartening%20up%20with%20artificial%20intelligence/Smartening-up-with-artificial-intelligence.ashx%20str%209

Mou, Xiaomin . https://www.ifc.org/wps/wcm/connect/7898d957-69b5-4727-9226-277e8ae28711/EMCompass-Note-71-AI-Investment-Trends.pdf?MOD=AJPERES&CVID=mR5Jvd6 Accessed 07/03/24

Mello, R. F., & Ponti, M. A. (2018). Machine Learning: A Practical Approach on the Statistical Learning Theory. Retrieved from https://www.springer.com/gp Accessed15/03/24

Nyoni T (2019) Modeling and forecasting demand for electricity in Zimbabwe using the Box-Jenkins ARIMA technique . Available at https//:www.core.ac.uk Accessed 16/03/24

Nilsson, K., & Gerdtham, V. (2018). Exploring the technology of machine learning to improve the demand forecasting: A case study at Axis Communications. (Lund University, Department of IndustrialManagementandLogistics).Retrievedfromhttp://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8950000&fileOId=89500 08 16/03/24

Pan, Y. (2016). Heading toward Artificial Intelligence 2.0. Engineering, 2(4), 409-413. doi: 10.1016/J.ENG 07.03.24

P Rieva 2020 Understanding AI Based Demand Planning and Forecasting in an uncertain world

Pan, Y. (2016). Heading toward Artificial Intelligence 2.0. Engineering, 2(4), 409-413. doi: 10.1016/J.ENG.2016.04.018 16/03/24

 Paré G., Trudel M.-C., Jaana M., Kitsiou S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. Information & Management. 52(2), 183–199 16/03/24

Praveen, U., Farnaz, G., & Hatim, G. (2019). Inventory management and cost reduction of supply chain processes using AI based time-series forecasting and ANN modeling. Procedia Manufacturing, 38. 256-263. doi: 10.1016/j.promfg.

Paré G., Trudel M.-C., Jaana M., Kitsiou S. (2015). Synthesizing information systems knowledge: A typology of literature reviews. Information & Management. 52(2)

Rowley, J. (2012). Conducting research interviews. Management Research Review, 35(3/4), 260271.Retrievedfromhttps://www.emerald.com/insight/content/doi/10.1108/014091712112101 54/full/pdf?title=conducting-research-interviews

Shambira 2020. https ://www.researchpapers365.co.dw/darkweb4141/European journal of socialsciencesstudies>:Exploring the adoption of artificialInterlligence in Zimbabwebankingsector:pdf Accessed 17/03/24

Saunders. M et al., 2007. https://www.ukessays.com/essays/education/an-overview-ofresearchmethodology-education-essay.php Accessed 07/03/24

Shanda, S (2016). Research Ethics and Study. Orange Press.

Slack, M., & Draugalis, J. (2001). Establishing the internal and external validity of experimental studies. American Journal of Health-System Pharmacy, 58(22), 2173-2181. doi: 10.1093/ajhp/58.22.2173

Appendix 1

Interview Questions

Attachment 1: Interview Guide used for interviews

Section One: Demographics and Background information

1. Gender   **Male**   ☐

          Female   ☐

2. Age

20yrs- 30 yrs	
30yrs- 40yrs	
40yrs- 50yrs	
50y and Above	

3. What is your role in the company?

4. How long have you worked for the company?

5. What areas are you responsible for?

6. How large of a share of the company does your unit represent in the company?

Section Two: Follow up Knowledge

1. **How would you classify your company's demand?**
2. **How does your company's demand forecasting work today?**
3. **How does your company evaluate its forecasts?**
4. **What information is used in forecasting?**
5. **How would you appraise your company's current forecasting? how accurate is it?**
6. **How much knowledge does your company have about AI?**
7. **Is AI used today?**

Section Three: Scope and Current applications within demand forecasting

1. If AI is used within demand forecasting, which AI-technologies are used?
2. What are the technologies used for?
3. Which data is being used?
4. What improvements have you seen from AI? (lead the interview in line with the following issues (a) Dependability (b)Flexibility (c)Cost (d)Speed (e)Quality

Section Four: Potential within demand forecasting

1. Which advantages do you believe AI can bring to demand forecasting?
2. Why do you recognize potential from AI within this area?
3. How great potential lies within this area?
4. Do you recognize any further areas of demand forecasting where AI could be applied?

Section Five: Prerequisites

1. What prerequisites do you think are necessary in order to apply AI?
2. What difficulties do you perceive with implementing AI in demand forecasting? (categorize these challenges as Technological, Economic, Organisational, and Cultural) lead.
3. How does your company compare to your competitors with AI
4. Is there anything that you would like to bring up that we have not addressed during the interview?

THE END