# Ascertaining the Progress and Challenges of Implementing Data Mining Technology in the Accounting Information Systems of Public Sector Functions in Developing Countries

Thesis submitted for the degree of Doctor of Philosophy

by

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## DECLARATION

This work does not include any material that has been previously accepted in substance for the granting of any degree, nor is it being submitted simultaneously for any degree.

Signed..... (Candidate) Date.....

Signed.....(Supervisor) Date.....

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## DEDICATION

I dedicate this work to the Almighty God, who deserves all the praise, for granting me the grace and strength to complete it. This work is dedicated to my parents for making me who I am today. This piece is dedicated to my brothers and sister.

**ABSTRACT**

Modern technology has made it possible to generate and analyse vast quantities of data. This is because information technology is required in all fields for management to make vital choices. In addition, data has grown into a crucial tool in the modern business environment, and the ability to use this data efficiently has become critical. This research examines the preparedness to integrate data mining technologies inside the accounting information systems of the Malaysian public sector and the degree to which these technologies are used. Few research have examined data mining deployment in Nigeria. This previous research were conducted in the private sector. In the public sector, none have occurred. This research helps to close this knowledge gap by examining the influence of technology, organisational and human resources, and external factors such as political action. Also explored are the characteristics of persons who chose or would be eager to accept this technology, as contrasted to those who do not. Combining information and communication technologies (ICTs), knowledge management (KM), data warehousing (DW), and data mining (DM), a data mining utilisation model is created for use in the Nigerian public sector, and the advantages of adopting such a model are discussed. Using both online surveys and online interviews, the research is triangulated. The online survey had a 68% response rate, and 15 semi-structured interviews were conducted. Issues investigated were respondents' perspectives on the significance and significance of elements in assessing the accounting information system, the degree of knowledge, attitudes, and preparedness to apply data mining technologies in the public sector. SPSS was used for analysis, whereas NVivo was used for interview data.

This survey found that thirty of the one hundred and twenty-nine respondents were adopters and had expertise about the adoption of this technology inside their departments. Most respondents were unaware that data mining technologies existed. Moreover, although respondents were generally satisfied with the present accounting information system, they noted enhancements and modifications that would be beneficial. For both current users and non-adopters of data mining technologies, key factors such as technical, organisational, and human resources played a part in the choice to use or not use such technology. Significant reasons cited by non-adopters for not implementing data mining technology were a lack of support from senior management, a lack of accessible funds to build up the required infrastructure, and human resource challenges, including a lack of expertise of the technology. In terms of preparedness to apply data mining technology, the research revealed no difference between gender, job function, or utilisation groups. However, there was a difference in education level and experience working with the AIS. Using this sort of technology was discovered to be correlated with the performance of the AIS. It was determined that the optimal strategy for implementing data mining technologies in the public sector would consist of a centralised data repository connected to a well-managed data warehouse that integrates a few current systems with data mining technology.

**TABLE OF CONTENTS**

**LIST OF FIGURES**

**LIST OF TABLES**

## List of Acronyms and Abbreviations

| IT | INFORMATION TECHNOLOGY |
|---|---|
| AIS | Accounting Information System |
| DM | Data Mining |
| KDD | Knowledge Discovery in Databases |
| AMS | American Mathematical Society |
| CIS | Cooperative Information Systems |
| AI | Artificial Intelligence |
| ERP | Enterprise Resource Planning |
| TAM | Technology Acceptance Model |
| ICT | Information and Communication Technology |
| NMS | New Management Styles |
| TRI | Technology Readiness Index |
| ASE | Amman Stock Exchange |
| DMRI | Data Mining Readiness Index |
| FA | Factor Analysis |
| KMO | Kaiser-Meyer-Olkin |
| MIS | Management Information Systems |
| BW | Business Warehouse |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Introduction

Over the last two decades, the problems of advancements in information technology have been significant and have lately garnered worldwide attention (Danziger and Andersen, 2002; Su-Chao et al., 2003; Venkatesh, Thong and Xu, 2012; Awang, 2014). Information technology is necessary for every field for crucial decisions making by managers (Andersen et al., 2010)**.** Such developments have made it possible to process information more effectively using Information Technology, including accounting and business information. Data mining technology is one of the ever increasingly popular emerging technologies. It is the method implemented to comprehensively review the data (Goebel & Gruenwald, 1999)**.** For instance, financial data accessible to an organisation enables it to choose information (by detecting patterns and connections between data) that users need, thus enhancing the information available for decision-making. A data mining strategy should use various computing tools and methodologies to analyse the data (summaries, comparisons, observations, predictions, estimates). The technology industry faces a difficult balancing act: it must continue to advance disruptive technologies while also addressing the global economy's consequences of such breakthroughs.

Information Technology is a broad term that refers to any physical or intangible technology that allows the gathering, processing, storage, dissemination, and exchange of data and other digital material (Venkatesh, et al., 2012b)**.** According to Kaplan et al. (2012), accounting information systems are concerned with maintaining and generating the data that a business needs to plan, analyse, and diagnose the complexity of its operations and financial situations. The term "data mining" refers to identifying genuine, new, potentially valuable, and eventually comprehensible patterns in data (Schutt & Chambliss, 2011).

This study explores, from an organisational management standpoint, the adoption and use of information technology and data mining inside the Accounting Information System in the Nigerian public sector. The government sector may use data mining technology in several ways. Detection and identification of fraud will assist E-Government activities during audits and inspections of government projects and services, for instance. This study suggests that enterprises and the public sector are under pressure to integrate data mining and information technology into their accounting information systems. However, quality is predicated on a deep grasp of the adoption process, both human and technical. By integrating the organisational context into the Information Technology and Data Mining adoption strategy, an examination of the internal organisational background and management will aid in the development of a persuasive Information Technology and Data Mining adoption strategy. Using multi-method integration and triangulated analysis, a Research Model for Data Mining Utilization (DMU)

was studied. The evolution of the research model has included related fields, such as information and communication technology (ICT), data mining technology, knowledge management (KM), and even accounting information systems (AIS).

From a theoretical standpoint, many methods explain why businesses embrace or reject DM strategies and define their role in their implementation (Nemati & Barko, 2003; Su-Chao et al., 2003; Ying Wah & Abu Bakar, 2003). However, a preliminary review of the literature revealed few examples of research examining the effect of information technology and data mining on accounting information system strategies; those identified were published from various perspectives and had little in common regarding methodology and findings. As a result, research is needed to establish a conceptual framework for the public sector's adoption of IT and data mining in developing countries, particularly Nigeria, and to examine the relationship between data mining and accounting information system outcomes in Nigeria's public sector.

**1.2 Background of the study**

The technology of the present age has enabled the generation and processing of enormous amounts of knowledge. Additionally, information has evolved into a key tool in today's corporate environment and utilising this information has become essential. Organisations are interested in creating methods for reviewing this information strategically to enhance decision-making. In the corporate sector, for example, information gained through market segmentation, customer profiling, trend forecasting, and cross-selling may assist decision-makers in learning more about their customers. Information gleaned from comparable public sector activities enables the identification of customers' citizens') requirements and the identification of methods to improve delivery systems. Technology enables the selection, categorisation, and manipulation of this vast information store.

The Accounting Information System (AIS) is one of the systems used by organisations to gather and identify data. This software provides financial data that may be used to plan, monitor, and analyse the impacts of operational operations and identify the organisation's financial health. Given the enormous amounts of data these systems collect today, data mining methods can 'intelligently' analyse this data — sophisticated and efficient state-of-the-art technology that enables the extraction of hidden predictive information from a big database (Burnes, 2004).

Because this technology is relatively new, it needs technical expertise, openness to adoption, and skills development necessary for its effective usage. One important problem is comprehending and embracing this new technology. Each consumer of digital technology must behave as a key factor to maximise the value of the technology. The accounting information system will profit from the data mining technology characteristics since it will offer feedback for the decision-making process. With rapid technological

improvements, the Accounting Information System has taken on a greater importance, providing new informational options that may help and improve decision-making. Utilizing information technology enhances the Accounting Information System. Accountants and other stakeholders in the AIS must be aware of the potential afforded by technological advancements and understand how technology will affect their decisions. For example, data mining may play a significant part in decision-making. It provides a method for resolving issues, evaluating, preparing, diagnosing, tracking, incorporating, avoiding, learning, and developing (Hedelin & Allwood, 2002; Liao, 2003).

Data mining may be used to investigate the past (what occurred), the present (what is occurring), and the future (what might happen) (Nemati & Barko, 2003). Information mining and associated technologies such as data warehousing, database marketing, and predictive sales analysis are just a few of the ICT tools that help firms to integrate and access their past or current information more efficiently. Data mining licences include the power to monitor and uncover 'hidden' relationships inside massive data sets. This successfully conceals previously undisclosed facts, hence facilitating decision-making.

According to Carlson (1999), information and communication technology (ICT) may improve efficiency by encouraging reforms and improving labour force skills. Data mining is a subset of information technology widely utilised in various business applications, most notably to improve organisational intelligence and decision-making and to assist organisations in becoming more flexible.

**1.3 Background of Nigeria**

Nigeria is Africa's most populous nation and the world's sixth-most populous. Nigeria is in western Africa's Gulf of Guinea region. The nation, divided into 36 states and the Federal Capital Territory (Abuja), declared independence from the UNITED KINGDOM on October 1, 1960, and became the Federal Republic in 1963. With a population of about 206.1 million (world meter, 2020). The Gross Domestic Product (GDP) in Nigeria was worth US$448.10 billion in 2019, according to official figures from the World Bank and Trading Economics estimates. Nigeria's GDP constitutes 0.37% of the global economy (World Bank, 2020). Nigeria's 2019 HDI of 0.539 is also above the average of 0.513 for low human development countries and below the average of 0.547 for sub-Saharan African countries. Nigeria is compared to sub-Saharan Africa, the Congo (the Democratic Republic of the Congo) and Ethiopia, with HDIs, ranked 175 and 173, respectively (UNDP, 2019).

Nigeria has 923,768 square kilometres of land, including about 13,000 square kilometres of water. The governing All Progressives Congress Party (APC) holds 217 of 360 National Assembly seats, 64 of 109 Senate seats, and 19 of 36 state governorships. Christianity and Islam are the two major faiths in Nigeria (BBC, 2019). It is bordered by the Republic of Benin (west), the Republic of Niger (north), Chad (northeast), Cameroon (east), and the Atlantic Ocean (south).

While certain regions of the nation (particularly the South-South and South-East) have reached record levels of school enrolment, the country's general literacy rate remains low. For example, between 1991 and 2015, a study on Nigerian youth illiteracy found an increase in the number of illiterate young Nigerians. This figure increased from 5.19 million in 1991 to 9.43 million in 2015 (Knoema, 2020).

### 1.3.1 Historical Background

Several major historical developments in Nigeria are critical for comprehending contemporary Nigerian politics and society. Second, the spread of Islam began a millennium ago, mainly in the north but subsequently in the southwest of Nigeria. The creation of the Sokoto Califate during the jihad (Holy War) of 1804–1808 united a large portion of Niger and Cameroon's northern and surrounding regions under a single Islamic authority (BBC, 2019). Islam's rapid expansion in modern-day Nigeria goes back to the eighteenth century and the establishment of the caliphate. This history seems to demonstrate the north-south divide and the divisions within the north that were so evident throughout the colonial and post-colonial eras. Second, both the Sahara Desert and the Atlantic Ocean slave traders had a significant impact on virtually every region of Nigeria. Indeed, between the 1650s and 1860s, transatlantic trade facilitated the forced migration of about 3.5 million people. At the same time, a continuous supply of enslaved people flowed north across the Sahara for a millennium, eventually ceasing only at the turn of the twentieth century (BBC, 2019). Slavery was widespread in Nigeria and had unintended societal effects. Conversion to Islam and Christian propagation are inextricably linked to issues of slavery and efforts to promote political and cultural autonomy.

Third, although the colonial period was brief, spanning just around six decades or so depending on the region of Nigeria, it wrought such profound changes that its full impact is still felt in the modern-day. Nigeria was created because of British colonialism, merging diverse peoples and areas into an abstract political entity devoid of any sense of traditional Nigerian identity (BBC, 2019). Inconsistencies in British politics have exacerbated ethnic animosities by attempting to preserve each country's old customs while incorporating modern technology and Western political and social ideas. In the north, claims to Islamic authority sustained the reign of the Emirs, resulting in strongly anti-Western nationalist sentiments. Southern new nationalists, inspired by European ideas, opposed indirect authority, which maintained an outdated ruling elite in power and brought down the Westernized Nigerian establishment (BBC, 2019).

### 1.3.2 Language

Nigeria is a bilingual and cosmopolitan country comprised of over 250 ethnic groups. Nigeria is home to 521 languages, nine of which are now extinct. In some parts of Nigeria, ethnic groups speak many

languages. English, Nigeria's official language, was selected to foster the nation's cultural and linguistic unity after the end of British rule in 1960 (OSGF, 2018). Numerous French speakers from neighbouring nations have influenced the English spoken in Nigeria's border areas, and some Nigerians have been proficient enough in French to do business in neighbouring countries. While French in Nigeria may be mixed with certain indigenous languages, it is mostly spoken in the Benin dialect. French may also be used in conjunction with English, as it is in Cameroon (OSGF, 2018). Nigeria's primary languages include three broad families of African languages: Igbo, Yoruba, Hausa, Fulani, Igala, Kanuri, Tiv, Ibibio, Ijaw, Edo, Efik, Urhobos, Idoma, and Itsekiri are the major ethnic groups (OSGF, 2018)

### 1.3.3 Climate

Nigeria has a desert climate in the north, a tropical climate in the centre, and an equatorial climate in the south. The interplay of the tropical southwest monsoon and the dry northeast winds determines the variations. The typical maximum temperature in the south is 30o C–32o C, whereas, in the north, it is 33o C–35o C. The south has high humidity from February to November and June to September. North. The dry season is linked with low humidity. Annual rainfall decreases as one moves north; precipitation varies from about 2,000 millimetres in the coastal area (averaging more than 3,550 mm in the Niger Delta) to 500–750 millimetres in the north (OSGF, 2018).

### 1.3.4 Natural Resources

Agriculture is one of Nigeria's major economic practices. Nigeria's natural resources are natural gas, petroleum, tin, iron ore, coal, limestone, niobium, lead, and zinc. Nigeria has proved its oil reserves of 36.2 billion barrels, the tenth highest in the world. Proven natural gas reserves are measured at 182 trillion cubic feet, the seventh highest in the world and the largest in Africa. Estimates for oil and gas reserves are as of January 2007. The country also has a surplus of arable land (OSGF, 2018)

## 1.4 Research Problem

The significance and need of data mining in the implementation of accounting information systems in businesses, especially in Nigeria, are crucial in the current day. However, little study on the use of data mining technologies in the public sector inside the AIS has been published in Nigeria. Numerous studies have shown that workers in a variety of contexts have embraced and embraced new technologies. In addition, it is planned to build a model to facilitate the implementation of data mining in the Nigerian public sector. In the 1950s, mathematicians, logicians, and computer scientists collaborated to create artificial intelligence (AI) and machine learning, laying the groundwork for DM approaches (Buchanan, 2005). The term Knowledge Discovery in Databases (KDD) was coined, and the first Knowledge Discovery in Databases workshop was held in the early 1990s (Fayyad, Piatetsky-Shapiro, and Smyth, 1996)

According to studies on data mining in other countries, organisational complexity, history, disposition of computer assets, and decision-making style all play a role in the decision-making process (Su-Chao et al., 2003). Several elements recognised as affecting the decision to adopt include, among others, the organisation, policy, organisational processes, intellectual resources, technical concerns, and global environmental competitiveness (Spanos et al., 2002; Su-Chao et al., 2003; Ying Wah & Abu Bakar, 2003).

For instance, methods to implement Data Mining in an organisation often focus on elements influencing the choice to adopt DM technology, such as the organisation's size, culture, strategy, and technical considerations (Su-Chao et al., 2003; Ying Wah & Abu Bakar, 2003). Despite these improvements in knowledge, there has been little, microscopic analysis of the application of IT and DM inside the AIS in public sectors in developing countries, either theoretically or practically. A cursory review of the literature reveals that few studies examine the effect of IT and DM on Accounting Information Systems strategies; those identified were authored from various viewpoints with nothing in common regarding methodology or results. As a result, a need for research providing a common conceptual framework for implementing IT and DM in public sectors in developing countries was recognised, as well as a study examining the connection between DM and AIS results.

In summary, many publications have discussed the effect of information technology and data mining on accounting information systems, while some have concentrated on the public sector (Spremic & Jakovic, 2012). There are few study types and theoretical insights available in the literature on the interplay of IT, DM, and AIS in developing countries. This section discusses the requirements and potential problems associated with adopting this technology. This thesis will examine the relationship between the social control schemes prevalent in Nigeria's public sector and managers' views toward IT and DM. The critical research problem addressed in this study is a dearth of knowledge regarding applying information technology and data mining techniques to accounting information systems in the public sector of developing countries, particularly Nigeria, from an organisational management perspective. The advantages of adopting such technology and establishing the optimal strategy for deployment in Nigeria. Therefore, this research will examine the installation and use of Data Mining Technology inside the Nigerian Public Sector's Accounting Information System (Ministry of Education and Ministry of Youth and Sports Development).

### 1.5 Research Aim

This study aims to ascertain the progress and difficulties associated with integrating data mining technologies into the Accounting Information Systems of public sector activities in developing nations – specifically, the instances of Nigerian ministries.

### 1.6 Research Objectives

To explore the research problem, the focus of the study is on seven main research objectives:

- To ascertain the dominant management style in the Nigerian public sector.
- To ascertain if there is a relationship between managers' attitudes towards Data mining and their management styles.
- To ascertain the degree of knowledge, attitudes toward data mining, and preparedness for data mining adoption and implementation in the Nigerian public sector.
- To explain the effect of data mining on the accounting information system's decision-making process.
- To define the success criteria and variables that contribute to the success of public sector accounting information systems.
- To develop a data mining model based on best practices for the Nigerian public sector Accounting Information System.

### 1.7 Research Question

The study intends to find answers to the following questions:

- What is the dominant management style in Nigeria's public sector?
- Is there a discernible correlation between managers' attitude about IT and DM and their management styles?
- Do management and employees in the Nigerian public sector understand data mining and recognise its significance in day-to-day accounting activities?
- How might, or does, data mining affect the efficiency of public sector decision-making in Nigeria?
- Is the capability to use data mining methods a critical criterion for evaluating the Accounting Information System's success in the Nigerian public sector?
- To ascertain which model would enable the Nigerian public sector to execute more effective data mining techniques for the purpose of preserving high-quality knowledge inside the accounting information system.

### 1.8 Research Justification

Most IT and data mining research focus on the deployment and evolution of IT and data mining technologies and applications in data quality, advertising, forecasting, interaction, health care management, software integration, failure prediction, and hypermedia (Liao, 2003). Garcia and Lampe (2011) addressed Data Mining issues that internal auditors in small and big organisations should

consider. Numerous studies demonstrate the use of data in evaluating a company's financial reports and estimating the time series exchange process (Kloptchenko et al., 2004; Kim et al., 2012).

In developing nations, research has tended to concentrate on the impact of cultural and social values on IT adoption. For instance, Davis (1993) argued that social and cultural attitudes are critical factors affecting information technology in the African continent. Carnoy (1997)found that a lack of highly trained management and an agile, self-confident labour force were major impediments to developing nations' adoption of modern technologies. Qatanani et al. (2015) argued that human resource problems impede IT adoption in Saudi Arabia's public sector.

Qatanani et al. (2015), the abundance of publications on information technology has mainly concentrated on developed hemisphere businesses. Even in the little literature on information technology in developing nations, academic studies seldom address the problems of information technology assimilation in these countries' organisations. Many of the results are descriptive.

Data mining technology is still in its infancy and has received little attention from academics in developing nations. This study aims to contribute to the body of knowledge on Data Mining in developing countries such as Nigeria and to close a gap in the literature by providing insight into the adoption and application of Information Technology and Data Mining techniques within Accounting Information Systems, as well as to establish a useful framework for Data Mining implementation in the public sector in developing countries. Additionally, the study would assist in defining the status of data mining usage, the preparation and comprehension of data mining by public sector employees, and the impact of data mining on the accounting information system and decision-making process (Abd Rahman, 2008). In summary, this work will likely assist senior management in accounting and audit departments and information technology personnel within these departments in the public sector. This is to understand better the issues surrounding implementing information technology and data mining technology in accounting information systems.

**1.9 Research Context**

A study of the literature on IT and DM implementation within the AIS reveals a focus on technology performance as the primary push and a driving factor behind the technique of amendment inside organisations. However, the current organisational setting's ability to allow variation and interactions between organisational components and management, and therefore the application of DM within AIS, has received little consideration in the prior research. Therefore, the researcher was prompted to investigate the existing organisational management environment and its relationship to IT and DM deployment at AIS intervals. The interplay between management designs and managers' attitudes

regarding deploying IT and DM in public sector companies in Nigeria offered a method for achieving this goal.

### 1.10 Research Methodology

The study adopts a cross-sectional approach survey design. According to Downes et al. (2016), Kesmodel (2018), Cui et al. (2020), and Wang and Cheng (2020), cross-sectional surveys are often fast, simple, and inexpensive to conduct. They are often the result of a questionnaire survey. There will be no data loss because participants will be questioned just once. While a longitudinal approach would have been more suitable, time constraints precluded the use of this study method. The cross-sectional design of this research allowed for sufficient data collection through questionnaires and interviews.

A combination of quantitative and qualitative techniques will be used. Based on the study's breadth and lack of clarity about the state of information technology and data mining, a survey will be conducted. Personal interviews and questionnaires are appropriate methods of data gathering. These methods can allow the researcher to engage directly with participants to get a deeper grasp of the context and issue. An online platform called SurveyMonkey will be used to collect and monitor answers to questionnaires, while interviews will take place on ZOOM.

The quantitative data will be analysed using SPSS. At the same time, qualitative interviews will be utilised to supplement the survey data and delve into various problems raised by the survey answer to the quantitative data. Within the SPSS framework, various analyses will be performed, including Cronbach's alpha, individual t-tests, correlations, factor analysis, Kaiser-Meyer-Olkin, Bartlett's Test of Sphericity, bivariate analysis, and the Mann-Whitney U test. The sample size will be restricted to public employees at the level of 10 to 17 since they are the primary decision-makers in the sector's administration. The accounting and auditing managers and information technology professionals from each ministry's accounting and audit divisions participated in this research. They were selected as the target responders because they represent the company's main accounting information system stakeholders and should have a better grasp of the information problems surrounding DM within each ministry.

### 1.11 Research Ethics

Although this is a concern, any feelings of discomfort can be avoided by following the ethical guidelines of the university. First, participants will be completely aware of the research and how it will be used for this work. Second, the participants' anonymity will be secured, and any data obtained will only be used for research purposes and destroyed after the study has been completed. Third, all participants will be

allowed to withdraw from the course at any time and notify researchers that they are unhappy with being used as part of the study if there is any detail.

### 1.12 Justification of the Project

This research would be replicated in various contexts, including publicly traded businesses, the public sector, and the private sector in various nations, to offer fascinating insights into national comparisons and international patterns. Comparative research on the degree of preparedness, the model used, and the effect of such adoption and usage on decision-making across countries and cultures.

### 1.13 Contribution of the study

Research in the Data Mining and Accounting Information System (AIS) is now gathering momentum; as a result, studies in the area worldwide are few (Patel, 2015). Besides their scarcity, current research is mostly qualitative, with a few quantitative studies being purely descriptive. As such, the initial contribution of this article is that it advances existing knowledge. This is because the SEM examines both novel and established hypotheses. SEM's result is much more dependable than that of multiple regression. This research established that SEM is preferable to regression since fundamental statistical techniques such as bivariate correlation or regression "only need a small number of variables. Utilising a limited number of variables to comprehend complicated events is restrictive. The research will assist organisations' management in making educated data management choices in both education and sport in Nigeria.

Additionally, given the paucity of management studies in this study's specific setting (Nigeria) and its broader context (African nations), this research makes a unique addition to the management literature. The breadth of industries covered in this study, the relatively high number of participants, and the specific analytical techniques utilised to analyse the data.

The research gives insight into the status of technology adoption and use (i.e., data mining technology) in Nigeria's public sector accounting information system. It offers insight into critical problems; data mining should be used in the public sector in Nigeria. The research assesses public sector workers' willingness to adopt data mining technologies. It also elicits responses about respondents' perceptions of the effect of data mining technologies, creating a methodology for using data mining technologies successfully inside the Accounting Information System (AIS). Independent software is often used in data mining operations. It may be preferable to utilise this standalone programme for departmental-level data mining operations, also referred to as DM offline software structure (Buczak & Guven, 2016). There are recommendations for expanding the internal capacity of the existing data warehouse to do data mining operations. This organically developed data mining framework, referred to as DM in place software structure, can handle more data than independent applications.

(Buczak & Guven, 2016). Regardless of the method, the software should be capable of executing various functions at various levels, be simple to use and understand, be upgradeable, and be cost-effective. Adopting and using data mining technologies will subsequently improve the Accounting Information System (AIS) performance and decision-making processes.

This research contributes by providing insights into the top management of departments, accountants, auditors, information technology people, and academics, as well as a better knowledge of the problems surrounding the use of data mining technologies in accounting information systems.

**1.14 Thesis Layout**

This study is divided into eight chapters:

Chapter One provides an overview of the dissertation (Introduction). It communicates the research history that adds to the country's background, the study's purpose and goals, and the study's difficulties. This chapter also discusses the reason for the study and the methods involved and provides descriptions. Additionally, it details the dissertation's structure and organisation.

Chapter Two (Literature Review: Data Mining Technology and Accounting Information System Implementation) discusses ICT literature analysis, accounting information systems, data mining, financial reporting, and the King report. It establishes the model for future public sector data mining usage. This results in the creation of a broad notion of data mining and its use inside the AIS to develop research models.

Chapter Three: (Literature Review II) presents people's management styles and attitudes toward Information Technology and Data Mining from a management point of view. The generated ten research hypotheses for the study.

Chapter four: The theoretical framework adopted in the study was discussed here.

Chapter Five: (Research Design and Methodology) explains and defends the methodology used to gather data using a triangulated approach. The research discusses the creation of instruments, the data collecting method, and the analytical test used in this study.

Chapter Six: (Results, Findings) examines survey data. SPSS software is used to analyse quantitative data. The survey respondents are profiled demographically.

Chapter Seven: (results, findings) examines interview data. NVivo software is used to analyse qualitative data. Quotations from the interviews are provided to bolster and supplement the survey's

research results. In addition, interview data can serve as a valuable source of information for addressing final study questions.

Chapter Eight: (Results, Findings, and Testing of Hypotheses) summarises the findings from assessing the study hypotheses established in Chapter 3. It uses comparison techniques such as the t-test, variance analysis (ANOVA), and correlation analysis to test and assess ten hypotheses.

Chapter Nine: (Conclusions, Limitations, and Future Research) summarises the research's main findings. Each research topic is addressed and explored in more detail. This study makes significant additions to the corpus of knowledge. Finally, along with future research recommendations, this study's limitations are discussed.

**Conclusion**

This chapter sought to establish the foundation for future study by supplying background information and discussing research and research problems. The purpose of this study is stated along with the scientific contributions. Then it discusses the approach and technique for doing the analysis. Finally, the research outline is discussed.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

This research aims to examine the application of IT and data management inside AISs in the public sector of a developing nation – Nigeria. Additionally, it evaluates the literature on the selected nation's background, AIS, DM, and the connection between IT and its organisational components – structure, process, and management. The authors critically assess IT and DM implementation models to identify key themes that would aid in selecting a suitable model for use in a developing nation such as Nigeria and re-examine the King report on South African partnership governance.

## 2.2 Accounting Information System

Accounting information systems are a subset of information technology. This section is concerned with reporting, categorising, summarising, and verifying financial transaction information for businesses. These jobs were performed for different groups within the businesses that were tasked with financial reporting, management accounting, and tax compliance responsibilities (Al-Delawi & Ramo, 2020; Meiryani & Lusianah, 2018). Various descriptions of the accounting information system (AIS) have been made. However, it has always been a subsystem of information management systems (IMS) (Pramuka & Pinasti, 2020).

Over time, the AIS has been characterised in various ways. For instance, records, methods, and management processes are utilised to generate accounting papers that aid decision making (Susanto & Meiryani, 2019). Due to the need to integrate these often-different systems, accountants place a premium on shared resources that offer a consistent view of the organisation's information, minimise duplication, and resolve data disputes (Deni Iskander, 2015).

According to Sajady et al. (2008), the accounting information system provides financial data for administrative functions such as scheduling, tracking, reporting on deviation quality, and making specific reports on issue areas. Likewise, Mamić et al. (2013) defined the AIS as the process of storing and generating data that a business uses to plan, analyse, and understand the complexity of its operations and financial situations. Therefore, *acc*ounting information systems are a critical source of information for decision makers in businesses and not-for-profit organisations (Sajady et al., 2008; Mamić et al., 2013; Deni Iskander, 2015; Ghorbel, 2019).

Hall (1998) defined four main accounting information system sub-systems:

- The Cash Management System, which facilitates day-to-day business activities with various records and communications for customers across the organisation
- The General Ledger / Financial Reporting System, which generates conventional financial statements such as income statements, balance sheets, cash flow statements, tax returns, and other regulatory reports
- A fixed asset system that manages the purchase, maintenance, and disposition of fixed assets
- A management reporting system that delivers financial reports and information to internal management for decision-making purposes, including budgeting, variance reports, and transparency reports

The AIS is defined in this report as a comprehensive system developed and implemented inside the Accountant General's Office, which includes accounting systems, payment systems, spending and loan management, and financial management. These systems are intended to gather and combine data from departmental databases in preparation for storage in a centralised data warehouse. This is the location of all information to make it available for future research and decision making.

Esmeray (2016) sought to establish the impact of accounting information systems on the financial performance of small and medium-sized businesses in Turkey. To accomplish the research goals, a descriptive-analytical method was used, which included developing a questionnaire and sending it to the study sample of 60 businesses in Istanbul. The study discovered a statistically significant positive correlation between the use of accounting information systems and revenue, return, and consumer numbers of growth rates.

Kpurugbara et al. (2016) sought to ascertain the impact of accounting information systems on the authoritative adequacy of Nigeria's small and medium-sized businesses. They followed an obvious logical approach to accomplish the study goals by designing a survey and administering it to 156 representatives of small and medium-sized organisations in Port Harcourt. The investigation discovered that using accounting data frameworks increases an organisation's profitability and capability to manage expenses.

Patel (2015) examined the effect of accounting information systems frameworks on organisations' benefit. The research depended on a hypothetical, logical way to arrive at the outcomes by assessing past investigations and bookkeeping data frameworks, the nature of the bookkeeping data frameworks, and the connection between bookkeeping data frameworks and the benefit of organisations and dynamics. The

outcomes indicate that bookkeeping data frameworks influence the productivity of organisations and dynamics. Additionally, the bookkeeping data frameworks contribute important data to settle on monetary and financial choices.

Qatani and Hezabr (2015) examined the effect of accounting information systems on the value chain of Bahraini businesses. They organised and distributed a poll to 60 employees from 23 mechanical organisations to accomplish the study's goal. The findings indicate that the fundamental components of accounting information system frameworks are inaccessible. Additionally, there is a need for the quality of accounting data to enhance the value chain for company associations in contemporary public shareholding organisations in the Kingdom of Bahrain. Regarding the commitment of accounting data frameworks to value, they found that improvement was insufficient.

Rapina (2014) aimed to ascertain the variables that influence the quality of accounting information systems in Indonesia. The research sampled accountants from 33 cooperative institutions in Bandung City, giving a questionnaire to ascertain the information required for the study's objectives. The findings indicate that management commitment, organisational culture, and structure all significantly influence the quality of accounting information systems; furthermore, the quality of the accounting information system influences the quality of accounting information.

Moqbel (2014) attempted to establish the effect of accounting information systems on Jordanian e-commerce. A descriptive-analytical method was developed to accomplish the research goal by administering a questionnaire to the study sample of 75 finance managers employed by 25 service firms. The findings indicate that accounting information systems have a statistically significant beneficial impact on e-commerce in Jordan's service businesses.

Harash et al. (2014) investigated the effect of accounting information systems on the performance of small and medium-sized businesses in Iraq. This study used a theoretical, analytical approach to arrive at its conclusions, including a review of prior research, examining the idea of accounting information systems and the nature of small and medium-sized business performance. The findings indicate that accounting information systems, as defined by their features (reliability, significance, and timeliness), influence the performance of small and medium-sized businesses in Iraq.

Rachmawati and Lasniroha (2014) investigated the influence of administrative accounting information systems, the quality of accounting information management, the quality of services offered on user

satisfaction, and their effect on Indonesia's decision-making process. The research sample was drawn from the employees of the State Bank in Bandung City, who were given a questionnaire to ascertain the data required for the study's objectives. The findings showed a 62% effect on the quality of administrative-accounting information systems and services offered in the decision-making process.

Shagari et al. (2017) investigated the impact of using accounting data frameworks on the form of budget summaries in Jordan's Income and Sales Tax Department. To accomplish the research goal, a descriptive-analytical method was developed by sending a questionnaire to the study sample of 50 accountants from the Amman Governorate's Income and Sales Tax Department. The findings show that using accounting information systems impacts the quality of financial statements produced by Jordan's Income and Sales Tax Department.

Spremic and Jakovic (2012) investigated the influence of accounting information systems on a Croatian company's e-commerce efficiency. They sent a questionnaire to the research sample of 252 businesses to gather the data necessary to accomplish the study's goals. The findings indicate that the usage of accounting information systems influences the effectiveness of a company's e-commerce in Croatia.

### 2.2.1 Accounting Information Systems Data Quality

According to some academics, the value of information is determined by its "fitness for use," or the ability of data gathering to meet consumer requirements (R. Wang et al., 1998). Indeed, many specific essential data quality criteria have been established to produce high-quality data.

**Table 1*:* Data quality dimensions. Adopted from Strong (1997)**

| Dimensions | Definitions |
|---|---|
| Accessibility | The degree to which facts are accessible or easily and rapidly retrievable |
| Amount of data needed | The degree to which the quantity of data collected is enough for the job at hand. |
| Believability | The degree to which data are authentic and trustworthy |
| Completeness | It is critical to assess the degree to which information is available and the breadth and depth of the job at hand. |
| Brief description | The extent to which information is communicated in a simplified manner |
| Consistent portrayal | The degree to which information was presented in a consistent manner |

| | |
|---|---|
| Manipulation ease | The ease with which information may be manipulated and adapted for various purposes |
| Free of error | To what extent the information is true and trustworthy |

| Dimensions | Definitions |
|---|---|
| Interpretability | The degree to which particulars are accurate and trustworthy |
| Objectivity | The degree to which the information is objective, impartial, or fair. |
| Relevancy | The degree to which the data are relevant and useful for the job at hand |

Numerous studies have been conducted on the dependability of accounting information systems. One of the first efforts to measure data quality in AIS was a numerical method for calculating faults in internal control system inputs (S. Yu & Neter, 1973). Cushing (1974) created a mathematical model for the internal accounting control system and quality and cost measurements. In addition, scholars discussed data quality concerning audit communities (Johnson et al., 1981; Groomer and Murthy, 2018). Several AIS studies focused on the cost/quality control analysis of information systems (Ballou et al., 1987; Ballou & Pazer, 1985). Other academics created a methodology for management with quantitative measurements of the information system's data quality (Paradice & Fuerst, 1991).

For corporate settings in which each organisation has access to internal data, the main goal of AIS data quality management is to continuously monitor and potentially enhance data standards. In cooperative information systems (CIS), which include many organisations sharing data to accomplish a shared purpose, AIS quality assurance needs objective measurements and data quality evaluations that can be transmitted with the appropriate data. Additionally, in an environment where interacting organisations may be unfamiliar with one another, methods to guarantee the quality of AIS data sharing must benefit significantly from the organisations' interactions. It is frequently contended that incorporating DM into the AIS framework will aid in achieving high-quality information from the AIS framework. This high-quality information may include explicit connections between the data, explicit models that recur with the data, explicit examples and categorization strategies, or the disclosure of explicit qualities that fall outside the 'typical' model. Additionally, it enables the exploration of AIS data in novel ways using artificial intelligence and neural networks.

## 2.3 Data Mining

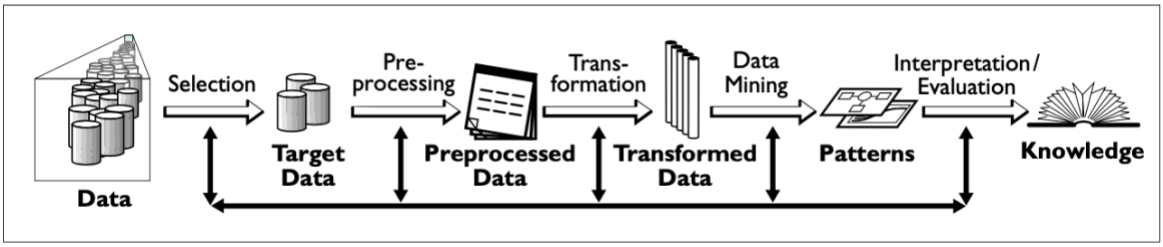
The purpose of aggregating data from many sources and storing it in a centralised data centre is to aid in analysing issues presented by management, for example. A validated technique is utilised to access the data included in the AIS data mining framework. This is critical because exponential advancements in automated data collection have significantly increased the amount of data stored in libraries, data warehouses, and other types of data repositories (Zhou, 2003). Although valuable information may be concealed behind the software, the sheer volume of data makes it difficult for the information to be retrieved without strong resources. To address such a complex but information-deficient problem, a contemporary technique called data mining (DM) was developed in the late 1980s, a process of extracting information from massive quantities of data using a computer (Witten, Frank, and Geller, 2002).

### 2.3.1 Defining Data Mining

Data mining is a technical phrase that can be described in terms of an individual's life experiences. We have a natural propensity to extract information or data from our experiences and make decisions about our actions based on this knowledge. In technical terms, knowledge mining is defined as the process of finding new, useful facts from a massive collection of data (Fayyad et al., 1996; Firestone, 1997; Bal et al., 2011). This will result in improved organisational decision making (Berry and Linoff, 1997; Fong et al., 2002; Nemati and Barko, 2003; Pai, 2004). While data mining is well-known and widely utilised in various fields, including computer vision, natural language processing, and bioinformatics, it has not been widely used in accounting information systems until recently. Indeed, there is a rising interest in creating data mining techniques specifically tailored to the issues encountered in various fields, including the social sciences (Attewell & Monaghan, 2019).

Since the information mining paradigm is structured so that it encompasses a range of techniques and regions, it has meant very different things to different individuals. Therefore, it is unsurprising that alternative ways of thinking have occurred. Another language homed in identifying useful data patterns in data extraction, information discovery, information harvesting, information archaeology, and information pattern process (Fayyad, Piatetsky-Shapiro, and Smyth, 1996). Data mining is a step in the KDD process (see Figure 2.1) that entails the use of data analysis and discovery algorithms to fit a specific set of patterns (or models) across data within acceptable computational efficiency limits (Fayyad, Piatetsky-Shapiro, and Smyth, 1996).

**Figure 1: An overview of steps in the KDD process, Fayyad et al. 1996b: p41**




DM encompasses a variety of methods for efficiently eliciting this important, non-obvious information from such a large body of data. DM has been described in various ways but is mainly concerned with data analysis and using computer methods to discover patterns and regularities in large datasets (Fayyad, Piatetsky-Shapiro, and Smyth, 1996). As a process of extracting new, useful information from a large collection of raw data (Fayyad et al., 1996; Firestone, 1997; Bal et al., 2011), data mining should enable more effective decision making across an organisation (Berry and Linoff, 1997; Fong et al., 2002; Nemati and Barko, 2003; Pai, 2004). The investigation and evaluation of huge amounts of data to uncover important patterns and rules (Berry and Linoff, 1997; Fong et al., 2002; Nemati and Barko, 2003; Han, Kamber, and Pei, 2012) is a process of extracting useful knowledge from massive quantities of data housed in archives, data centres, or other types of information sets.

Researchers in artificial intelligence (AI), statistics, management research, and economics may have varying perspectives on data mining. It may be seen as a synthesis of information technology, statistical and data analysis, and knowledge management (KM). Indeed, Garcia and Lampe (2011) stated that there is a lack of agreement on the definition of data mining. The diversity of interpretations advanced by various academics is shown in Table 2.1 above. The term utilised in this study encompasses all the components described before. These components may be described as the process of identifying, analysing, extracting, and characterising trends or connections in data.

### 2.3.2 How does Data Mining Work?

DM is typically an iterative and collaborative process involving many phases.

1. **Identification and classification of problems**

   The first step is to examine the realm of the problem and formulate the inquiry. This phase is unquestionably necessary for the extraction of valuable information and the subsequent selection of suitable data mining techniques based on the application goal and the type of the data.

2. **Getting and Pre-Processing data**

Data gathering and pre-processing is the second stage. Due to their usually enormous size (sometimes several terabytes or more) and probable origin from numerous, heterogeneous sources, today's real-world databases are extremely vulnerable to noise, missing, and inconsistent data. Pre-processing of data includes data generation, noise or outlier removal, inadequate data processing, data optimisation, and data reduction. This phase often consumes most of the time required for the full KDD process.

3. **Data mining/discovery of knowledge in databases**

   The third stage is data mining, which uncovers hidden patterns and models in the data. This is a critical procedure in which data patterns are extracted using intelligent techniques.

4. **Interpretation and evaluation of results**

   The fourth stage is to comprehend (post-process) the revealed knowledge in terms of explanation and prediction, which are the two main goals of operational discovery procedures. Experiments demonstrate that the patterns or templates identified in the data are not always useful or immediately beneficial and that the KDD process is inextricably iterative due to the assessment of the information obtained. For example, one common method for evaluating induced rules is splitting the data into training and testing sets. This procedure may be repeated for different breaks, and the resulting cumulative numbers can be used to estimate the rules' efficiency.

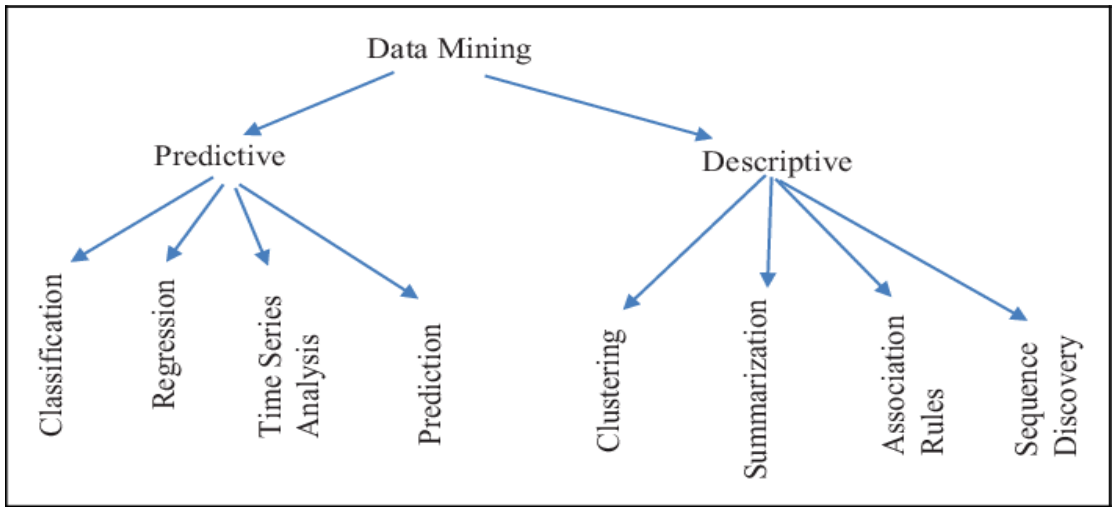
5. **Using the Information found**

   The last stage is to make use of the data that has been gathered. For example, the data gathered by DM may explain current or historical events, forecast the future, and enable decision-makers to make choices based on available facts (Hsiao et al., 2011).

### 2.3.4 Data Mining Tasks and Functionalities

A DM project will often encounter various DM question types or research tasks. Depending on the desired outcome, multiple data analysis techniques with distinct goals may be applied sequentially to reach the intended output. Most DM jobs may be classified as descriptive or predictive. Descriptive mining operations provide information about the general features of the database’s data. Predictive mining tasks conduct inference experiments on existing data to generate predictions (Han, Kamber, and Pei, 2012). Classification, grouping, regression, association rules, sequence discovery, and prediction are some DM functions (methods) that may be classified according to the various mining tasks (Dunham, 2006). In addition, DM functions are used to define the template forms to be included in the DM tasks (Han, Kamber, and Pei, 2012). The DM functionality is shown in the figure 2 below.

**Figure 2: Data mining functionalities, Adopted from Dunham (2006)**




According to Berry and Linoff (2018), classification, estimation, prediction, affinity grouping, associating rules, clustering, description, and visualisation are all critical tasks of the DM. The first three are examples of guided DM, in which the objective is to determine the significance of a certain target variable. Affinity grouping and clustering are undirected activities aimed at revealing data structure in the absence of a particular goal variable. Profiling is a simple procedure that may be led or unguided.

- **Classification:** Data maps are classified into specified categories or groups. Classification algorithms need the definition of classes based on the values of data attributes (Hamsa, Indiradevi, and Kizhakkethottam, 2016). Additionally, we define such groupings by highlighting data characteristics previously identified as belonging to the category. The following methods are used for classification: CART, C4.5, and Bayesian Classification consisting of two types – I Bayesian Classification and Bayesian Belief Networks – as well as neural networks, support vector machines, associative classifiers, and lazy learners (or Learning from Your Neighbours). Classifiers of k-Nearest Neighbours, Case-Based Reasoning Additional Classification Techniques include Genetic Algorithms, Rough Set Techniques, and Fuzzy Set Techniques (Traore et al., 2017). Classifications include categorising credit applicants as low, medium, or high risk, determining the information to display on a web page, and determining which phone numbers match fax machines. In certain instances, there is a limited number of groups, and each record is expected to be assigned to one or more of them (Jeong et al., 2015).
- **Estimation:** Estimation is concerned with outcomes that are constantly appraised. The estimate gives a value to an unknown continuous variable based on input data, such as income, height, credit

balance, or contribution amount. Classification and estimation are often used in conjunction, as when DM is used to predict which donors are likely to react to charity fundraising efforts and to track the amount of money collected by each contributor (Yu and Neter, 1973; Yu et al., 2016). Examples of estimating tasks (Hsiao & Yang, 2011; Leu et al., 2017) include calculating the number of children in the family, the family's total household income, and the customer's lifetime worth.

- **Prediction:** Numerous real-world data mining applications may forecast future data states based on historical and present data. Forecasting is a categorization technique (Moro, Rita, and Vala, 2016). The difference is that a forecast predicts a future state, not the present one. Additionally, there is a shift in emphasis, as forecasting operations categorise documents based on some anticipated future action or estimated future value. With forecasting, the only method to ensure that the categorization or estimate is consistent is to apply the formula and then evaluate if the experiment's result was as anticipated (Moro, Rita, and Vala, 2016). If the forecasting challenge is to forecast which consumers will respond to the next marketing campaign and purchase a new product, the only effective way to determine the model's success is to wait until after the promotion to determine how many of the target customers ultimately purchased the product. Prediction requires the recognition of speech, machine learning, and patterns (Carneiro, Figueira, and Costa, 2017). Predictive function types (García-Rudolph & Gibert, 2014) forecast, for example, which customers will leave within the next year and which telecom users will seek a new feature, such as voicemail.
- **Affinity grouping or association rules:** Affinity analysis is another term for association rules. A rule of association is a paradigm used to identify certain data relationships (Deng et al., 2017). They are often used in retail sales to indicate frequently purchased goods. Affinity grouping aims to ascertain which objects belong together (e.g., what usually goes together in a supermarket shopping cart). Additionally, affinity groups may be utilised to discover cross-selling possibilities and create visually appealing bundles or groupings of products and services (Deng et al., 2017).

The Association Mining Rule's original description, as given by Mehta, Agrawal and Rissanen (1996), is repeated to explain the basic algorithm described in this study:

Let I = $\{i_1, i_2, i_n\}$ be a set of n binary features called *items*.

Let D= {t$D = \{t_1, t_2, \ldots, t_m\}$ be a series of transactions called databases.

Each *transaction* in $D$ has a special transaction ID and includes a subset of the objects in it $I$. A rule is defined by its structure:

Where $X, Y \subseteq I$ and $X \cap Y = \emptyset$.

$X \Rightarrow Y$

Each rule comprises two distinct collections of objects, collectively as item *sets*, $X$ and $Y$, where $X$ is referred to as preceding or left-hand-side (LHS) and $Y$ after or on the right-hand side (RHS). Let $X$ an item-set, $X \Rightarrow Y$ an association rule and $T$ a collection of transactions in a certain database.

**Support**

The assistance value of $X$ with respect to $T$ is defined as the percentage of database transactions that include the item-set $X$.

**Confidence**

The confidence level associated with a rule, $X \Rightarrow Y$, regarding a collection of transactions, is the percentage of the transactions that contain $X$, which also includes $Y$.

Confidence is defined as:

$$\operatorname{conf}(X \Rightarrow Y) = \operatorname{supp}(X \cup Y) / \operatorname{supp}(X).$$

Confidence may be thought of as a probability estimate for a conditional probability $P(E_Y|E_X)$, the chance of discovering the rule's RHS in transactions that also include the rule's LHS.

**Lift**

$$\operatorname{lift}(X \Rightarrow Y) = \frac{\operatorname{supp}(X \cup Y)}{\operatorname{supp}(X) \times \operatorname{supp}(Y)}$$

Alternatively, the lift of a rule is defined as the ratio of actual support to anticipated support if X and Y were independent.

**Conviction**

A rule's conviction is defined as $\operatorname{conv}(X \Rightarrow Y) = \frac{1 - \operatorname{supp}(Y)}{1 - \operatorname{conf}(X \Rightarrow Y)}$.

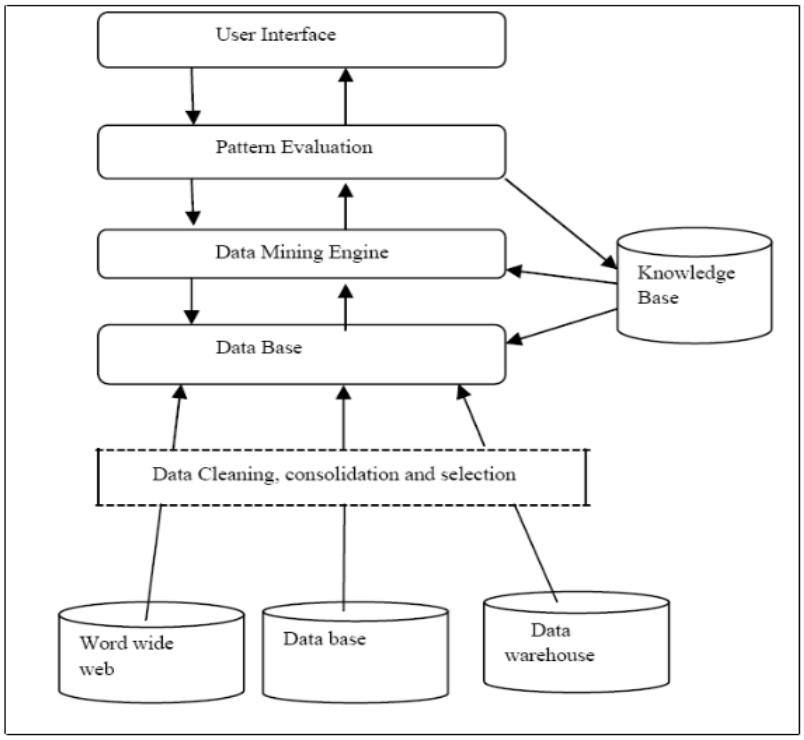
Additionally, it may be understood as the ratio of the anticipated frequency of occurrence of X in the absence of Y (i.e., the frequency at which the rule makes an erroneous prediction) divided by the actual frequency of incorrect predictions. It is worth noting that this fundamental association rule algorithm was created by Mehta et al. (1996) and has been expanded to incorporate a priori and sequential patterns. Apriorism is the most well-known method for determining mine association rules (Costa et al., 2017; Chatterjee et al., 2019). The rules with 100% certainty were intriguing, employing a breadth-first search method to count the support for the item set and a candidate generation function that uses the support's bottom-up closure. However, association rules must be implemented cautiously due to their inherent limitations, which include the acquisition of uninteresting laws; the discovery of many rules, which contributes to uncertainty in the detection of rules useful for mining activities; and a low-performance algorithm – for example, productivity.

- **Clustering (Unsupervised learning):** Clustering is the division of a big group into several more closely linked subgroups or clusters. What distinguishes clustering from the classification is that it is not predicated on pre-set classes, instances, or target ideas. Clustering is a technique for analysing data without relying on a predefined class identification. Class names are typically not contained in the training data (Majumdar, Naraseeyappa, and Ankalaki, 2017). Clustering or grouping objects is based on maximizing intraclass similarity and minimizing interclass similarity. That is, item clusters are formed so that objects within a cluster have a high degree of similarity but are very unlike objects in other clusters. This cluster may be considered a collection of objects from which rules can be derived (Lee et al., 2014; Panda et al., 2017). Clustering is sometimes done as a prelude to another kind of DM or modelling. Cluster approaches are partitioning K-means and K-medians, linear, mass-dependent, and pattern-oriented (Yu et al., 2016). The k-means clustering method was chosen since it has been widely utilised in the literature (Ma et al., 2017) and was therefore chosen for examination in this study.
- **Description and Visualisation**: Occasionally, the purpose of data mining is to explain what happens in a complex database to enhance our knowledge of the people, products, or processes that produced the data in the first place. A sufficiently detailed description of the behaviour often suggests an explanation for it or, at the very least, where to begin searching for it (Lee et al., 2014).

### 2.3.5 Components of Data Mining

The major components of a conventional data mining program's architecture may be visualised, as shown in the Figure 3 below.

**Figure 3: Data mining architecture (Source: Han and Kamber, 2011)**




The components shown in Figure 3 are discussed below to help visualise the data mining process. This description is necessary to understand the present level of knowledge about data mining, the anticipated advantages of using the data mining process, the limits of using the data mining process, and the possible gaps in knowledge regarding data mining.

1- Database: This refers to data warehouses, websites, spreadsheets, or other kinds of information repositories. Data must be cleansed and integrated utilising data cleansing and integration methods.
2- Database: The database is responsible for gathering the necessary data in response to the user's data mining request.
3- Knowledge base: This is the subject-specific knowledge base utilised to guide the search or evaluate the worth of the ensuing trends. This awareness may comprise hierarchies of definitions used to classify characteristics or attribute values according to their degree of abstraction. Knowledge such as customer expectations may be used to forecast trends.
4- Data mining engine: This consists of a set of practical modules for performing data mining operations such as grouping, affiliation, characterisation, cluster analysis, and evolution and deviation analysis.

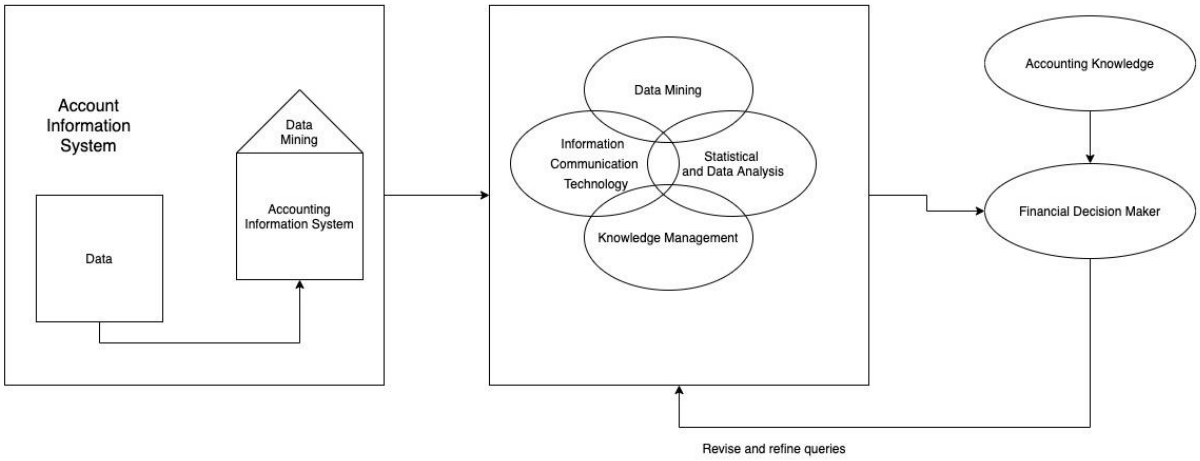
5- Module for Pattern Evaluation: This module employs advanced metrics and interacts with data mining modules to narrow the search to interesting patterns.
6- User interface: This programme establishes communication between users and the data mining framework, enables users to connect to the system through a data mining query or mission, and displays trend information or data mining results. Indeed, this enables users to see database and data warehouse schemas or data structures, compare mined patterns, and visualise patterns in various configurations.

With the growth of massive amounts of data dubbed ‘big data’ over the last couple of years, there has been a global trend toward the usage of data mining. These data are produced through various activities, including commercial transactions, widespread use of social media, data recording by computer system users, and the creation and usage of multimedia files by various sectors of people. The term ‘big data’ refers not only to the amount of data but also to the degree of data collection and the variety of the data. Additionally, although data is gathered and data mining allows for the use of such data in daily life, researchers (Gupta et al., 2017; Khan et al., 2021) argue that no one kind of data mining applies to all forms of data, meaning, or purpose. For instance, data mining techniques used to uncover knowledge in a dataset about medicine are different from those used to discover knowledge in a dataset about education, as the secret information in the two datasets are different.

### 2.4 Data Mining used within the Accounting Information System (AIS)

This section develops a paradigm for describing the application of data mining technologies in accounting information systems (see figure below). The flow of data from accounting systems to the capacity to make educated choices is shown in the figure 4 below.

**Figure 4: Data mining use within accounting information systems**




The accounting system handles transactions, generates reports, and performs other tasks that may be linked with the agency's different systems. This process includes the Financial and Management Accounting System (FMAS), the Payroll System (PAY), and the Branch Accounting System (BAS), all of which contribute to the information contained in Centralised Information Systems (CIS). The Investment and Loans System (ILS) and the Subsidiary Ledger Accounting System are then integrated (SLAs).

As shown in this scenario, the CIS feature would act as a centralised database or data warehouse (DW) for all data originating from various accounting systems. They would be able to improve the accounting knowledge of the related decision-making process by adopting data mining technologies that integrate ICT, statistical data analysis tools, and information management.

### 2.5 Data Mining in the Accounting Information System

Data mining, which is unique to the accounting information system, is the process of storing, collecting, and reviewing accounting data to disseminate it in a way that enables evidence collection and knowledge development through the application of this information to the public sector's decision-making process. Within the enterprise, data mining operations (i.e., summaries, analyses, predictions, and estimates) should adhere to current methods for data analysis and applications, which may include the use of ICT, advanced statistical analysis, and the knowledge management (KM) principle by database management to extract information from large database systems (Ayoade et al., 2018). These three factors majorly affect the success of AISs (Jia et al., 2017, 2018; Kang et al., 2017; Chouat and Irawan, 2018; Aversa et al., 2021). It is conceivable that adopting these technologies will influence accounting procedures, increasing the

demands on accountants and auditors. AIS can provide fast, accurate, comprehensive, and consistent data for decision-making purposes using various technologies. Today, most accounting information consumers need immediate and continuous data (Collins, Onwuegbuzie, and Sutton, 2006), including public sector organisations and authorities who need this information to make decisions.

Decisions made with AIS data are contingent on the trustworthiness of the data given and the ability to verify its accuracy – for instance, insurance evaluations with respect to the financial statements' substance. With the proper data, an outstanding financial statement may be prepared. Organisations have also been under strain by the need for integrated systems capable of generating timely information and meeting reporting deadlines (Spanos et al., 2002; Ghamghami et al., 2019). Appropriate deployment of new technology and agency upgrades inside the core financial management system will enhance financial reporting capacity, enabling managers to make more informed choices while meeting the accelerated reporting requirements. The AIS will use ICT infrastructures to gather, exchange, and coordinate data, as well as to coordinate operations and communicate information (Liao, 2003; Abraham, 2012; Yang et al., 2018).

This means that an accounting system capable of storing huge quantities of transaction data is critical for decision makers to produce information that will assist them in selecting the optimal course of action. This is where using mathematics and data analytic techniques, in conjunction with a thorough understanding of management processes, would be advantageous. This is when data mining comes into play. Weber (2002) finds that data mining is useful for financial auditing as a transaction monitoring technique and overall system and for control testing to guarantee that the business produces accurate financial statements.

By incorporating this technique into the AIS, the accounting department will be able to expand the range of information accessible for decision making. The increased availability of accounting information over the Internet has necessitated the use of data mining to ensure that users may obtain accounting facts with a high degree of accuracy and dependability (Debreceny et al., 2001). Additionally, it improves the AIS's ability to help effectively process transaction data, provide information to decision makers, and maintain internal controls (Debreceny et al., 2001).

Stakeholders in accounting information systems across commercial and public sector businesses will embrace data mining in their operations and decision-making processes. Accurate accounting information, as given by the AIS, combined with research provided by data mining tools, will aid financial decision making. In addition, data mining enables the replication of processes, enabling users to update and optimise their searches on this data.

The AIS gathers various transaction data and serves as the main source of information for an entity's goal and priority achievement. This approach would be enhanced if data mining methods were integrated into the accounting information system. Tao, Yang, and Feng (2020) suggested that using data mining technologies may strengthen the department's position as a source of information for decision makers since most accounting software do not have built-in data mining capabilities.

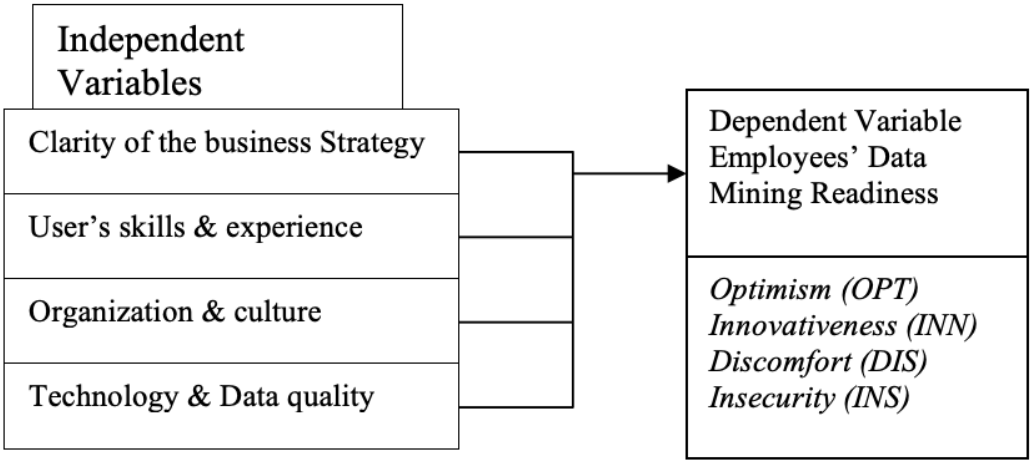
### 2.6 Data Mining Readiness

The group's capacity and willingness to explore technology are critical in determining its preparedness to adopt data mining methods. Human resources, mainly due to their readiness to embrace data mining technologies, may be a critical factor to consider while embarking on or implementing new technology inside any organisation (Dahlan et al., 2003; Ying Wah and Abu Bakar, 2003). This study would need to address issues of technical readiness and adoption by people who presently use and embrace such technologies. For instance, Wah and Abu Bakar (2003) examined the impact of end users (warehouse managers and decision makers) on the adoption of data mining tools. They recognised that the end user was critical to successfully implementing data mining tools. They identified issues specific to end users (a lack of knowledge about data mining and a lack of required skills) as major variables influencing the choice to adopt data mining.

An exploratory study by Dahlan et al. (2003) centred on workers' willingness to embrace data mining technology. The Data Mining Readiness Index (DMRI) was developed to assess workers' Data Mining Readiness (DMR). A higher score indicated that the employee was more likely to promote data mining effectively. The study examined contextual factors (organisational, cultural, and strategic) that influence employees' DMR, using frameworks to examine change management problems, including the Organizational Readiness Model, the Technology Acceptance Model (TAM), and the Analytical Capacity Model.

The dependent variable (employee DMR) and independent factors (business policy, user capabilities and knowledge, organisational and community, and technology and data quality) utilised in their study are shown in the figure 5 below.

**Figure 5: Data mining readiness framework adapted from Dahlan et al. (2002)**



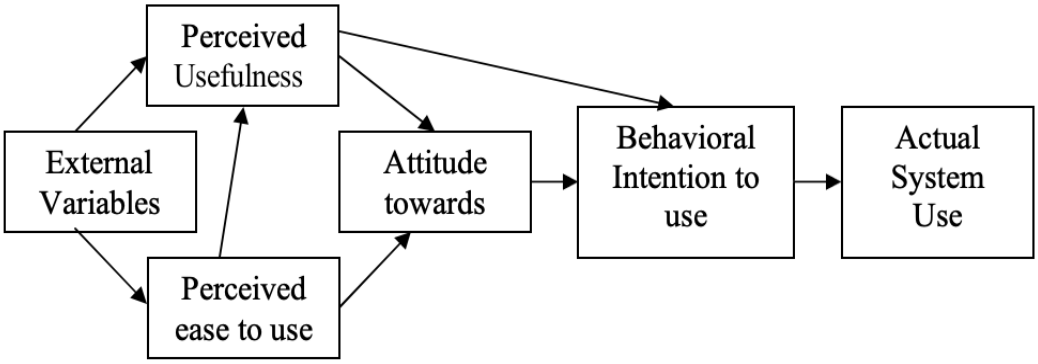

Preparation was quantified on four dimensions. (1) Optimism refers to an optimistic perspective of technology and the belief that it empowers individuals and provides them with more stability, security, and productivity in their life. (2) Ingenuity refers to a desire to be a creator and a thinker. (3) Discomfort refers to a perception of technology's lack of impact and a feeling that it is intimidating. (4) Uncertainty refers to suspicion of technology and scepticism about its ability to behave properly (Parasuraman, 2000). These four aspects were subdivided into two technological sector emotions. Parasuraman (2000) included them in his Technology Readiness Index (TRI). The term 'technology ready' refers to a person's proclivity to embrace and utilise contemporary technologies to accomplish personal and professional objectives (Parasuraman, 2000, p. 308).

The Technology Adoption Model (TAM) is an extremely useful analytical tool for identifying and characterising information technology adoption (IT) activities. Statistics-based research has shown that the tools serve as a helpful guide (Legris et al., 2003; Oly and Jantan, 2003) for the deployment of calculative technology. Much of the literature on information technology deployment is devoted to acceptance patterns, which relate to expectations and assumptions about behaviours, behavioural objectives, and the use of technology (Dahlan et al., 2003; Legris et al., 2003; Oly and Jantan, 2003; Zain et al., 2005).

TAM denotes two behavioural assumptions (perceived utility and perceived ease of use) that reflect an individual's behavioural intention while interacting with technology (Legris et al., 2003; Riemenschneider et al., 2003; Amoako-Gyampah and Salam, 2004). The perceived utility of technology is defined as the degree to which a potential viewer believes it can offer an advantage over other methods

of accomplishing the same job. In other words, it is 'the extent to which an individual believes that using a certain gadget would improve the effectiveness of his or her job' (F. D. Davis, 1989), while perceived ease of use refers to the degree to which an individual can assume a position and believes using a specific instrument to be pleasant and relatively easy.

**Figure 6: Technology acceptance model adapted from Legris et al. (2003)**




Technology based on data mining is seen as helpful, simple to use, and less complex, making it more likely to be adopted and implemented by prospective consumers. Additionally, positive emotions (optimism and creativity) enhance their receptivity to new technology (Zain et al., 2005). Therefore, workers with strong beliefs and a willingness to use technology are more likely to accept technology. The willingness to embrace data mining will be assessed in this research using two readiness drivers (optimism and innovation) and two behavioural beliefs (perceived usefulness and perceived ease of use).

Two preparedness drivers indicated by the Technology Readiness Index (Parasuraman, 2000) used to determine attitudes towards computer-based technology were implemented in a ready-to-use analysis by Dahlan, Ramayah, and Mei (2003) in Malaysia. These two factors were acceptable indicators of respondents' preparedness for data mining. Several technological adaptation studies have tested the two perspectives on behavioural value, as described in detail below (Legris et al., 2003; Riemenschneider et al., 2003; Amoako-Gyampah and Salam, 2004). High usefulness and simplicity of use expectations are expected to enhance the desire to adopt data mining technology, for example. This analysis would benefit from a synthesis of these two preparatory variables and two personal values. Thus, readiness to apply data mining is defined as an individual worker's favourable attitude toward adoption or use, including both confidence and inventiveness, strong positive expectations of acquiring new skills, perceived ease of use, and value of data mining technology.

## 2.7 Individual Differences

Innovativeness is a critical component of the data mining preparation process. The research on innovation dissemination has shown that different factors such as age, income, gender, and location within an institution are all drivers of innovation. For example, there have been disparities in attitudes about information technology and in the adoption and usage of information technology in information system research (Agarwal and Prasad, 1999; Venkatesh et al., 2003; Kay, 2006). This concept of the critical role of human diversity in accepting any technological advance has become a recurrent topic of research across a wide range of disciplines, including information technology, development, and marketing (Agarwal & Prasad, 1999). Individual differences are one of the four major independent variables documented by Trice and Treacy (1988), whose literature review classified independent factors into four broad categories: method design and execution variables, information system features, individual differences, and mission characteristics.

Individual differences affect perspectives, behaviours, expectations, and thus how the knowledge system is used. Sex disparities, for instance, have been addressed in studies on programming skills, behaviours, and usage (Agarwal and Prasad, 1999; Venkatesh et al., 2003; Kay, 2006). Schooling level has been significantly connected with confidence, temperament, and capacity to use technology in training settings. In replicating previous research, Agarwal and Prasad (1999) found that the quality of education negatively correlates with machine anxiety. Indeed, higher education promotes the development of more complex cognitive systems, which lead to a greater capacity for learning in diverse settings. This is because differences in cognitive style may influence one's attitudes (Taylor, 2004). Another aspect of human diversity is experience. Numerous studies have shown that knowledge is positively associated with how people respond to technology (Agarwal & Prasad, 1999; F. D. Davis, 1989; Venkatesh & Morris, 2000). Past encounters may have a good or bad impact on how technology is approached, which can affect an individual's confidence in the use or potential of information technology.

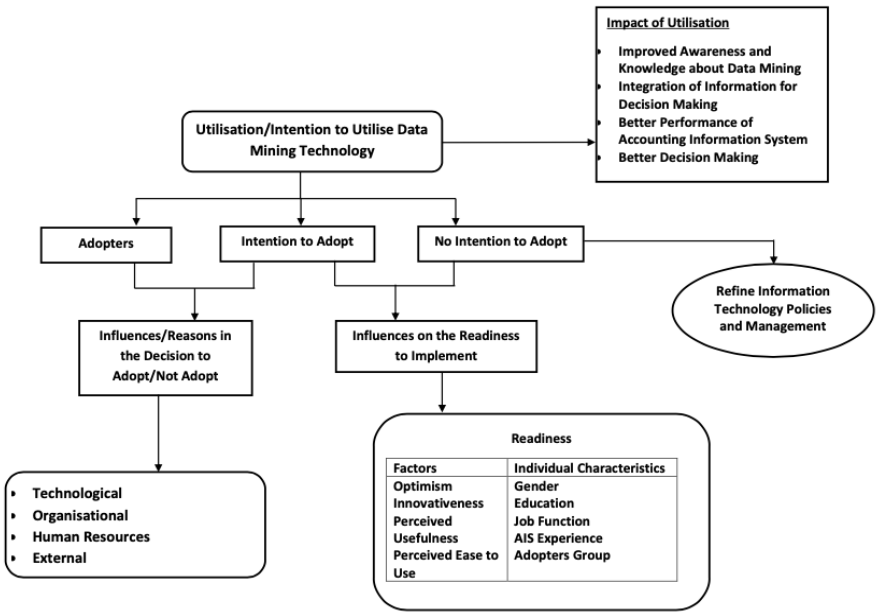
The following research hypothesis was thus developed: *There is a significant gender disparity in terms of willingness to adopt and use data mining technologies.*

## 2.8 Data Mining Utilisation Research Model

This section explains the model of data mining that will be utilised in this research. Figure 2.7 depicts the data mining technique used or explored for centralization inside the application. The term 'impacts on usage' refers to the causes or explanations that have been discovered in prior studies as influencing use decisions. Readiness to use is also included in a paradigm that considers the factors and effects known to

influence an individual's readiness to use data mining technologies. The last component of the model addresses the model's possible effect on the use of data mining techniques.

**Figure 7: Data mining utilisation model**




The four key issues identified in the literature as influences or reasons for the use of knowledge mining technology (technological, operational, human capital, and external factors) were developed as a composite of variables affecting ICT implementation (Hu et al., 1999; Ang et al., 2001; Spanos et al., 2002), DAA technology in an organisation (Hwang et al., 2004; Nemati & Barko, 2003; Su-Chao et al., 2003), and knowledge management technologies in the public sector environment (Omar and Rowland, 2004a; Omar and Rowland, 2004b). The reasons for not adopting technology mostly focus on the first three elements rather than on external issues. According to previous studies, issues such as inexperience and a lack of top management support have been major barriers to adopting data mining methods (Ying and Abu Bakar, 2003). In this context, the Nigerian government must solve these issues to properly integrate data mining methods into Public Sector Accounting Information Systems.

This model represents the pre-processing of data mining. Class, education level, position within the organisation, years of experience in the AIS profession, and membership in the adoptive community are all cited as possible factors. The guiding criteria were suggested by Parasuraman (2000) and utilised by Dahlan, Ramayah, and Mei (2003), and perceived usefulness and simplicity of use were taken from the Product

Adoption Paradigm (TAM). Preparation should boost enthusiasm for the technological strategy (Davis, 1989; Legris et al., 2003; Riemenschneider et al., 2003; Amoako-Gyampah and Salam, 2004).

According to this model, these four variables were the primary determinants of public sector workers' and managers' readiness for data mining. Individual characteristics are required for people to react to, utilise, and adapt to information technology. Human traits may help differentiate between groups of people (adopters, those wishing to adopt, and those with no intention of adopting) and their willingness to adopt the technology. Previous research examined sex and educational attainment (Agarwal and Prasad, 1999; Venkatesh et al., 2003; Kay, 2006), which are believed to impact how people feel about technology. Additionally, by categorising the preparation of various job duties and skills in terms of their location in the accounting information system, the image of preparedness among public sector workers and managers may be widened, as numerous studies have shown a link between knowledge and a favourable view of technology (Davis, 1989; Agarwal and Prasad, 1999; Venkatesh et al., 2012a).

Finally, the model considers the future impact of data mining. The effect of data mining technologies on the Nigerian public sector is vital (Xiao, Jones, and Lymer, 2005). The Accounting Information Framework would benefit from improved decision making and efficiency and a better grasp of the benefits of adopting this technology. Using and leveraging technology has increased business efficiency (Poston & Grabski, 2001). It has improved market efficiency and consumer happiness in the business environment (Pan & Lee, 2020). Accounting firms and related organisations said that technological advancements should enhance efficiency (Christensen, 2010). Technology advancements may influence public sector accounting standards. The enhanced output of the AIS would result in more relevant, accurate, complete, and trustworthy information to assist the decision-making process, as most accounting applications need knowledge of present and continuous types (Atkinson et al., 2008).

Carrigan et al. (2003) concluded that contemporary technology and financial management programmes would increase financial reporting capability by enabling managers to make better decisions by gathering timely information and motivating them to meet the accelerated reporting deadlines. The DMU research model would describe relationships, examining human traits and the degree of preparedness to analyse the impact of data mining on the efficiency of AIS and decision making. This approach may also be used to assess how well public employees comprehend and use technology. The level of expertise and preparedness should reflect the agency's goal. The findings may further improve the agency's information management policy.

## 2.9 Utilising Data Mining in the Public Sector

The public sector is promoting the use of data mining technology due to the potential for study in the following areas:

- ***Audits, state contracts, and reports.***

Data mining technologies will increase confidence by streamlining the audit process and conducting investigations into government projects and initiatives (Kaur & Wasan, 2006; Lartey et al., 2021). For example, the US General Accounting Office used data analysis to conduct audits and reviews of federal credit card programmes, payment and travel card programmes, Department of Defense vendor pay systems, military pay systems, housing and economic planning programmes, and Department of Energy national laboratories. Data mining was also used in the public sector through a demonstration programme sponsored by the US Naval Research Office (Choi, Lee, and Irani, 2018). They determined that text mining would be beneficial for connecting their databases, assisting with strategic choices, and allowing for the development of functioning databases. Among the early data mining users were NASA, the National Institutes of Health, intelligence agencies (e.g., FBI, CIA), and the Department of Defense (Army, Navy, Air Force, and Marine Corps).

***- Fraud Prevention and Detection***

Data mining technology can profile typical use situations and detect and analyse new or unique patterns (Klievink et al., 2017; Merhi and Bregu, 2020). In the United States, the Illinois Department of Public Aid used data mining to identify health care providers that billed for more than 24 hours of services in a single day. This allows for the identification of offenders and the referral of cases to law enforcement authorities (Bănărescu, 2015; World Bank, 2017).

***- E-Government initiatives***

Data mining technology can transform data into actionable information that the government may employ to alter how service users interact (Devadoss, Pan, and Huang, 2003). This medium enables the government to effect beneficial changes in response to prospective requirements. For example, tax authorities in the United Kingdom and Australia often utilise data processing techniques to assist them in identifying taxpayers who have breached obligations and making appropriate resource allocation choices (Belachew, 2010; Lessa and Lemma, 2019). Additionally, using data mining software's predictive modelling capabilities, tax authorities may more accurately and efficiently identify non-compliant taxpayers. Finally, data mining technology is anticipated to assist businesses in fine-tuning their current audit selection processes to provide more accurate findings.

Organisations such as the Ministry of Infrastructure and Transport (MIT), the Republican Police Department, the Immigration Department, the National Registration Department, the health departments, and other departments and ministries may become future users of data processing and synthesis technologies (Guijarro, 2007). For example, the Ministry of Health is collecting scientific data to enhance the health systems and medication required to treat various illnesses. Data mining may be used to assist in making decisions about the best medicine to utilise for certain illnesses.

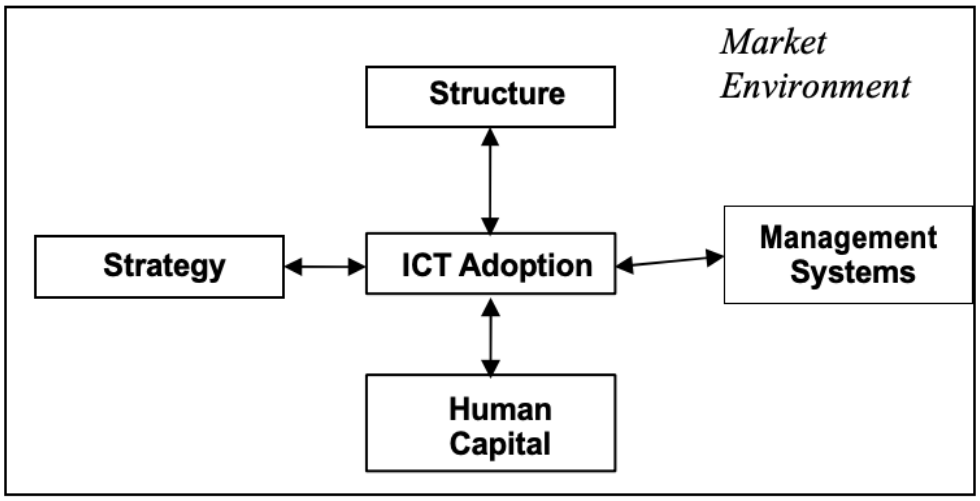
The accounting generals' department, the audit generals' department, and the finance ministry all keep their financial records. These organisations may use data processing technologies to synthesise all relevant financial data that can aid in decision making and support the entities that rely on it (Devadoss, Pan, and Huang, 2003). This study will focus on the complexity of public sector accounting systems and potential data mining applications inside such systems in Nigeria.

### 2.10 Information Technology Management and Organisation's Capability to Use It

Jia et al. (2017) have recognized the importance of information and communication technologies (ICTs) in transforming the economic environment, changing the way we live, learn, work, and play (Nielsen et al., 2016). Additionally, ICT has aided in reshaping businesses (Healy & Iles, 2003). According to researchers, ICT influences the advancement of socio-economic development. The technological revolution is fundamentally altering civilization. When used and directed properly, information and communication technologies have the potential to change every aspect of our physical, economic, and cultural life (Meso & Jain, 2006). Numerous studies have been conducted to determine the impact of ICTs (Danziger & Andersen, 2002; Gurbaxani & Whang, 1991; Healy & Iles, 2003) and to assess the variables that influence ICT adoption in a variety of settings, including health care (Hebert & Benbasat, 1994), the management of business establishments (Chau and Tam, 1997; Spanos et al., 2002), and the legislature, public businesses, and the judiciary.

Spanos et al. (2002) and Jia et al. (2018) performed a comprehensive study of the relationship between information technology deployment and management perspectives on modernisation and reorganisation. Atkinson et al. (2008) and Klievink et al. (2017) developed and presented an empirical approach for defining the complicated connections between ICT adoption and management initiatives. Morton's thesis states that an organisation is created by five elements – technology, policy, process, management structures, and people (Spanos, Prastacos, and Poulymenakou, 2002). Spanos et al. (2002) utilised these five technology-based capabilities (ICT adoption) as a lens through which to examine the connection between ICT adoption and the other four variables (see Figure 8).

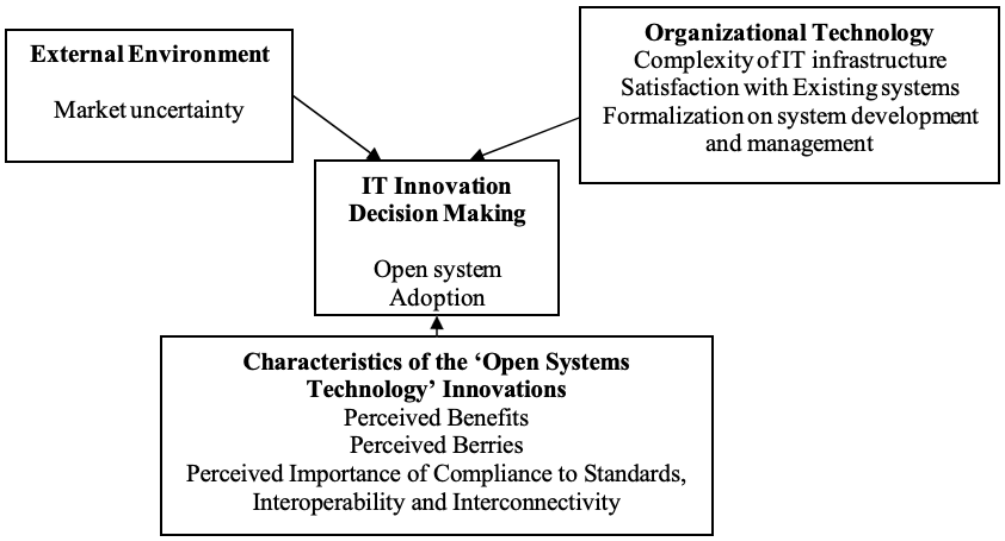
**Figure 8: Theoretical model - Spanos et al. (2002)**




They discovered that future data access and analysis (DAA) use was highly associated with a strategy shift toward innovation as businesses continued to embrace foreign data access and analysis techniques. Implementing ICTs that enable access to and retrieval of information has been linked to obtaining strategic advantages. This was reflected in the growing expectation that the ability to extract useful information from massive amounts of business data would result in competitive advantages. There is a strong connection between current and future decreases in hierarchy rates and DAA usage. This implies that using ICTs would facilitate the efficient delegation of corporate decision making and the uniformity of activity implementation. DAA was positively associated with interventions in management processes such as strategic planning, budgeting, and personnel management. Technology enables the gathering, analysis, and simulation of large amounts of data, laying the groundwork for the methodical identification and evaluation of alternative courses of strategic action. Human resources, namely the intellectual skills gained by employees, have been proven to be highly linked with an enterprise's use of ICTs (Spanos, Prastacos, and Poulymenakou, 2002).

In general, the findings indicate that current and future use of DAA technology is associated with substantial changes in policy, corporate structure, management procedures, and human resource capabilities. The approach addresses two primary topics: operational issues (strategy, function, and management systems) and human resource concerns. Based on the model created by Chau and Tam (1997), we evaluate the elements influencing the decision to adopt an accessible technology, the social environment, and the technical features of organisational technology and technological features (see Figure 9).

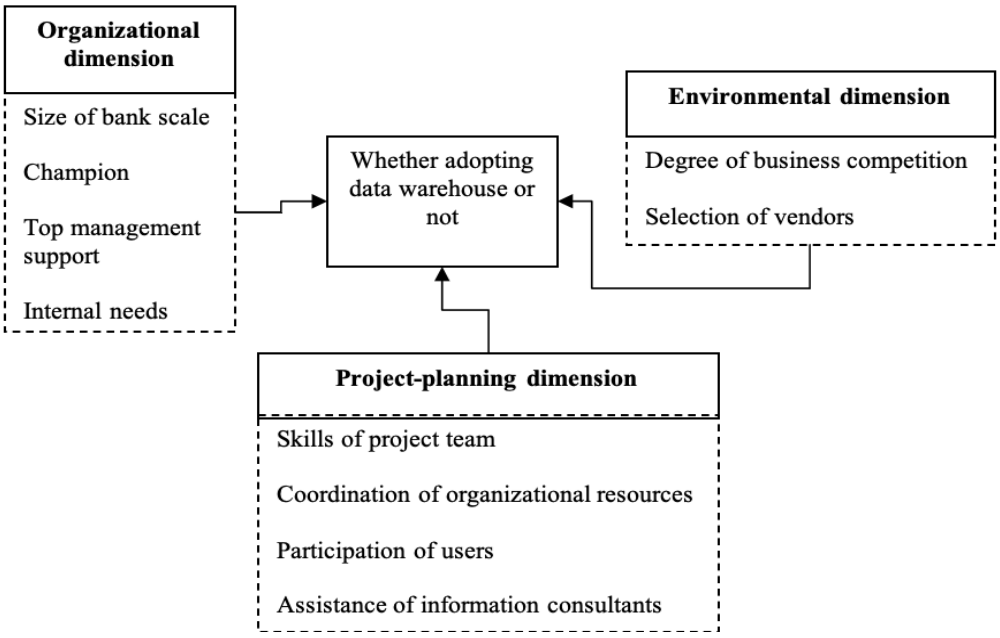
**Figure 9: Model for the adoption of open systems adapted from Chau and Tam (1997)**




Chau and Tam (1997) are concerned about two basic issues: external difficulties (market insecurity) and technological difficulties (characteristics of that technology and organisation of that technology). This means that while doing research or evaluating the application of technology, it may be seen from various perspectives. In contrast to Chau and Tam's (1997) examination of technological and environmental issues, Spanos et al. (2002) examined human resources and internal issues.

Hwang et al. (2004) examined the critical variables influencing data warehouse technology adoption, one of the DAA technologies. They discovered three dimensions – organisational, economic, and project-planning aspects – which are shown in the figure below (Hwang et al., 2004). In the project-planning element, this model represents external concerns (e.g., environmental concerns), internal concerns, and human capital problems (e.g., project management expertise, customer participation).

**Figure 10: Research model adapted from Hwang et al. (2004)**

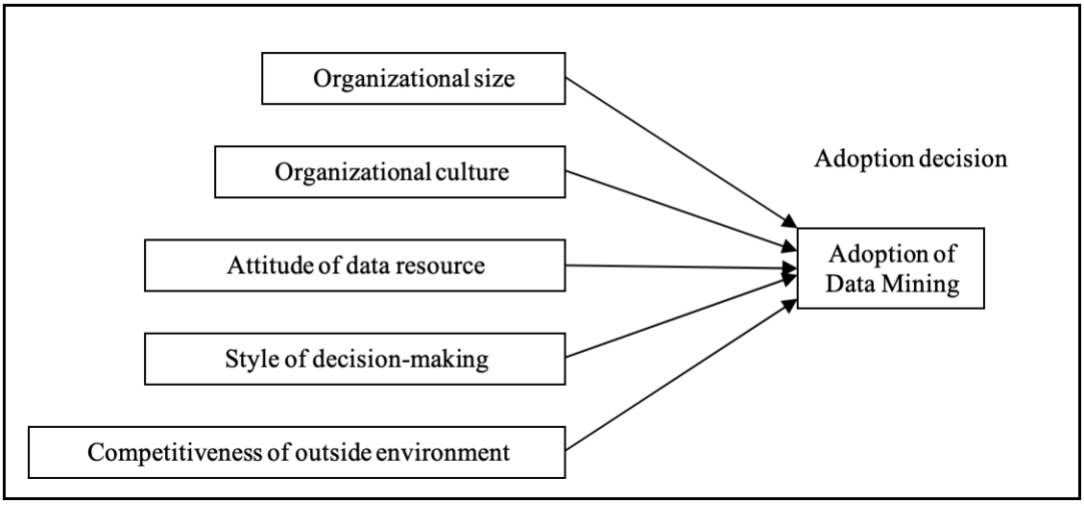



Kang et al. (2017) addressed this issue explicitly in their research on data mining methods. They examined scale and community as organisational characteristics, human resource management through data technologies, and decision making and external factors that affect competitiveness.

The variables they examined may be interpreted in three distinct ways: operational, individual, or societal. They developed their approach by revising the analytical program of Venkatesh, Thong and Xu (2012a) and conducting in-depth interviews with domain managers. They discover that adoption of data mining is highly dependent on the organisation's size, attitude toward data services, and type of decision making. Since data mining is an IT-based framework that is costly to implement and maintain, its significance is linked with economies of scale in technology deployment. Data mining was previously seen as a data-centric activity, and users' high optimism about the re-use of data will be needed to influence their choice to embrace the technology.

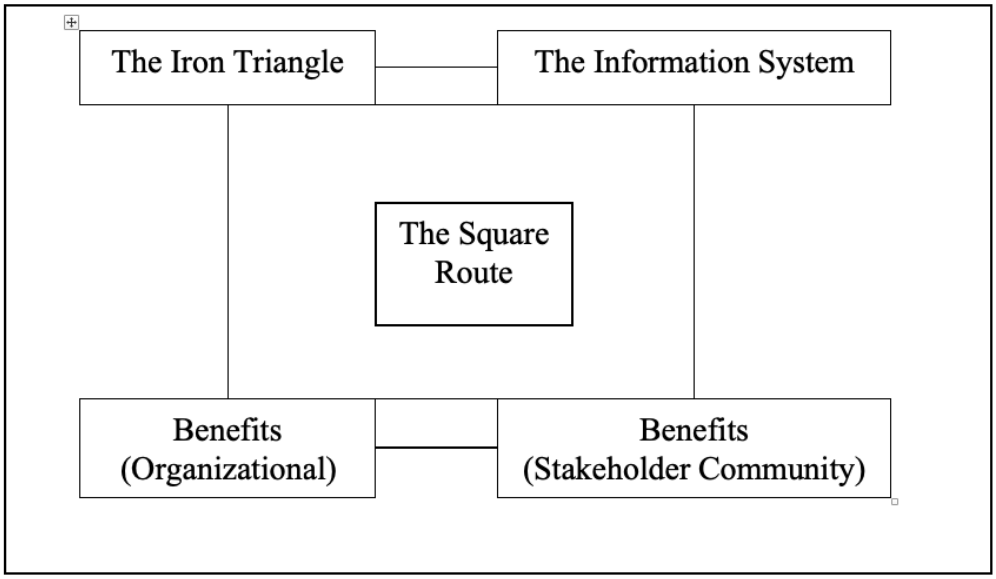
Additionally, the study discovered that individuals who made less systematic decisions were more likely to pursue data mining. This implies that the decision maker likes to make decisions based on the available data rather than on their expertise (Kang et al., 2017). However, no statistically significant relationship existed between the two other variables (organisational culture and external competitiveness) and the choice to adopt data mining. Their research background is shown in Figure 11.

**Figure 11: Research framework adapted from Chang et al., 2003**




In comparison, Nemati and Barko (2003) showed how a more competitive global marketplace (the outside environment) has compelled corporate decision makers of all sizes to develop and use data mining technologies to leverage data resources and enhance decision-making skills. Their study made use of the Square Route System. They proposed that this method would involve an empirical examination of various important connections and factors that influence the use of data mining technologies in today's corporate environment.

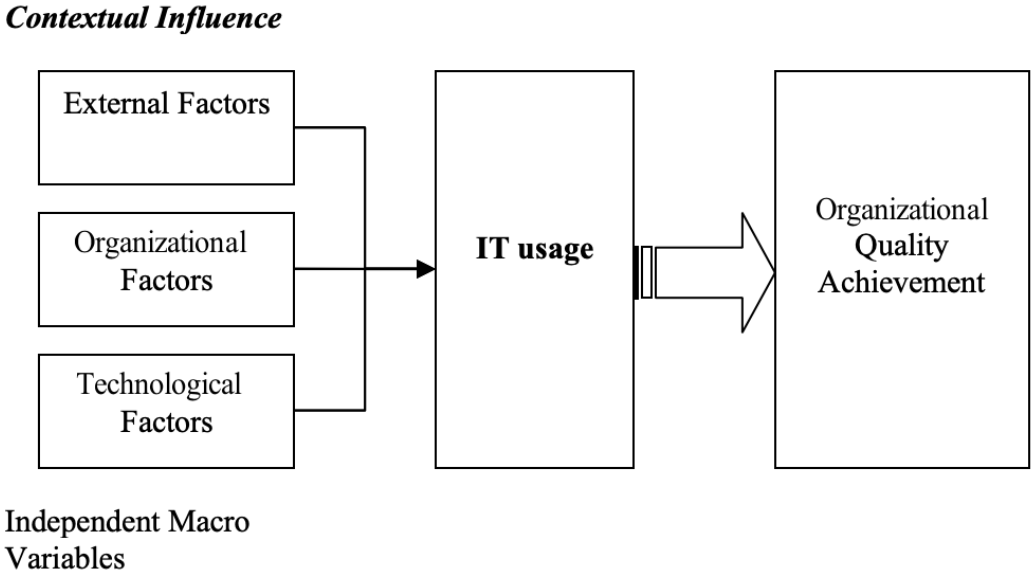
**Figure 12: The square route framework adapted from Nemati and Barko (2003)**



The Iron Triangle (money, schedule, and quality) was a key element in evaluating the project's success (Nemati & Barko, 2003). The context includes data and technological architecture, operational issues, and stakeholders (people). The study focused on information management (technical) issues with the assumption that data consistency, data creation, technical alignment, and level of competence all contribute to the moulding of actual project outcomes (Nemati & Barko, 2003). Organisational concerns include the existence of a well-established data mining approach consistent with organisational goals, the reengineering of business structures to accommodate data mining systems, existing compensation programmes to accommodate data mining systems, and a data mining outsourcing policy. Finally, regarding human resources issues, they felt that a collaborative effort between an influential director, the degree of end user experience, and non-IT help (end user, market analyst) would be beneficial (Nemati & Barko, 2003).

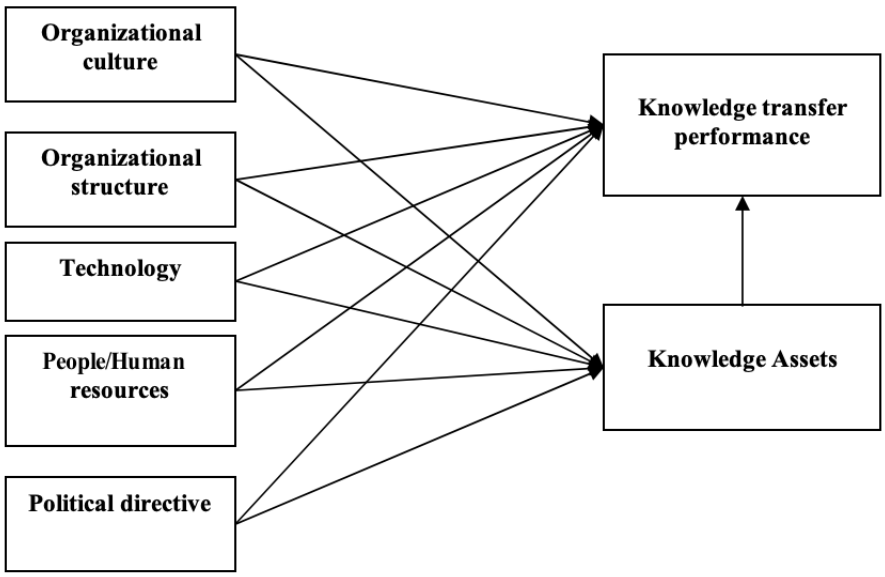
The preceding research focused on the establishment of businesses or the private sector. For the public sector, Ang et al. (2001) studied the variables affecting the use of information technology in Nigeria's public sector and saw similarities with the commercial sector. Their study included three sets of variables: external (economic environment, IT competition, regulatory impact, public transparency, inter-operation, and cooperation), operational (structure, capacity, IT management expertise, top management assistance, financial capital, goal alignment budgeting method), and technical (IT experience, IT services, consumer assistance, and IT incorporation). Figure 2.13 illustrates this structure. However, human resources issues were not discussed separately in this study.

**Figure 13: Theoretical framework adapted from Ang et al. (2001)**



Omar and Rowland (2004) identified these four issues while assessing the Nigerian public sector. Their study categorized five variables to assess the state of information management in the Nigerian public sector. Corporate culture (collaborative culture, individualism), corporate framework (document secrecy status, contact flow), technology (IT networks, IT software, IT know-how), people/human capital (employment, recruitment, and personnel turnover), and policy directives (politician guidance) were all considered (see Figure 2.14). These five dimensions correspond to the four previously discussed issues of organisational, economic, human resources, and environmental concerns. For example, the community and framework (see Figure 2.14) both address operational difficulties, while the other three may be technological issues, human resources issues, or regulatory requirements

**Figure 14: Conceptual framework adapted from Omar and Rowland (2004)**




According to the study mentioned before, four critical factors may affect technology adoption: (a) technical problems, (b) organisational issues, (c) human resource concerns, and (d) external issues.

### 2.11 The King Reports on Corporate Governance

In 2009, the King III Study was published. King IV revised the research in November 2016. Each section is followed by the King III Review, which focuses on environmental and sustainability issues. The next section will begin with a study of the King IV Report, emphasizing the remedies it recommends for transparency, corporate governance, monitoring, and disclosure. Additionally, the section will discuss King IV's philosophy.

### 2.11.1 King Report III

Before delving into the ideas and regulations included in King IV, it may be beneficial to begin by discussing how King III impacted South African news. The King III study was commissioned in response to the implementation of the Companies Act, which was discussed in depth in the preceding section. As previously stated, the King III report was founded on the application or explanation concept. As the King Report III states:

> *Under the 'apply or justify' approach, the Board of Directors may determine collectively that adopting a proposal is not in the company's best interests under certain situations. The Panel may opt to implement the Recommendation differently or in a manner inconsistent with the overarching corporate governance principles of justice, accountability, and openness* (IoDSA, 2016).

This implies that the Board has the option to apply or disregard the principles if a reason for doing so can be shown. Additionally, King III's research asserts that there is a significant correlation between values and regulations. King III's defining characteristics include sound government and strong leadership, prosperity as a contemporary environmental need, and corporate citizenship as a constitutional requirement (Judin, 2020).

#### 2.11.1.1 King Report III and Integrated Reporting

As of 2015, South Africa requires integrated reporting. For a recession-stricken economy, it leads the globe. The King III Report often discusses development, climate change, equitable commitments to stakeholders, and collaborative reporting. King III's second major discursive change was the application of the codes to all people regardless of their formation (IoDSA, 2016). Due to the research objective of broad coverage, this study placed a premium on the King III Study. As mentioned, King III intended to harmonise the laws with the Companies Act and other recent changes.

A central tenet of King III is integrated reporting, which means 'a complete and detailed depiction of a company's performance in terms of both operations and profitability' (IoDSA, 2016; Judin, 2020). To foster trust, communication with consumers should always be open, and the information provided should be clear and truthful. Companies must report requests for information and suggestions not approved in the Unified Report under King III. The Board is responsible for the Integrated Report's integrity, and the business is responsible for implementing controls to guarantee that the Integrated Report's content is accurate.

King IV also laments the changes in the way commerce is handled. Transitions from financial capitalism to inclusive capitalism, from short-term to long-term sustainable markets, and from silo to integrated reporting have occurred (IoDSA, 2016). Additionally, there have been seismic shifts in stakeholder policy, infrastructure regulation, and strategy. Another significant change in King IV was the introduction of the concept of application and explanation, signalling a departure from the application or description of King III's dictum.

#### 2.11.1.2 King Report III and Sustainability Reporting

According to King III, the Board must delegate the duty of investigating sustainable aspects to the audit committee. King III recommends issuing the Unified Report regularly and providing detailed information on the company's viability and financial performance. The emphasis should be on the substance, not the form (IoDSA, 2009).

The financial statements should contain the company's performance strategy. The Board of Directors will state the financial performance of the business, including the status of the industry in which it operates and how the firm generates revenue. Equally critical is the proactive approach that the company takes to mitigate undesirable consequences. The audit committee will monitor performance reports, including the consolidated study's analysis, and ensure that non-financial and financial information is provided appropriately. Quality assurance is also required for the audit committee's involvement in sustainability reporting (IoDSA, 2010).

### 2.11.2 King Report IV

The King IV Report, released in November 2016, is now a hot topic of discussion in business news. It included most of the International Integrated Reporting Framework's principles and developed sector supplements to meet the requirements of not-for-profit organisations, municipalities, pension funds, small and medium-sized businesses, and state-owned companies (IoDSA, 2016a; IoDSA, 2018). King IV reigns during a period of tremendous worldwide change, including financial crises, climate change, the growth of social media, technological changes, the transition to the fourth and fifth industrial revolutions, and generational transitions (King IV Report on Corporate Governance of South African 2016, 2016). As King IV put it, 'Explanation often tries to persuade businesses that corporate governance is not an act of mindless compliance, but rather something that produces benefits only when done thoughtfully and with appropriate regard for the organisation's circumstances' (King IV Report on Corporate Governance of South African 2016, 2016). The new edict will go a long way toward ensuring that people responsible.

#### 2.11.2.1 Accountability and corporate governance

King IV establishes the concepts of corporate governance and openness. King IV asserts that responsibility 'refers to the obligation to react to the fulfilment of duties. Without abdicating responsibility for delegated duty, accountability cannot be given' (IoDSA, 2016a; Judin, 2020). This is a very helpful concept since governance and transparency are fundamentally about accountability.

The second intriguing definition is that of corporate governance, which is described as 'the practise of ethical and effective leadership by the governing body to achieve the following governance outcomes: an ethical culture, high performance, effective control, and credibility' (IoDSA, 2016a). According to King IV, corporate governance distinguishes it from other types of governance. In this sense, it refers to an organisation governed by a governing board.

The third significant concept is corporate citizenship, defined as 'an entity's awareness that it is an integral component of the larger society in which it operates... with benefits but also with duties and obligations' (IoDSA, 2016a). The private citizen receives their consent to live from other people.

King IV is comparable to the International Integrated Reporting Framework in many ways. For instance, many concepts, such as integrated coverage and analytical learning, have been left undefined in the specific context. King IV describes the governing body's duties and obligations as (a) guiding and establishing strategic direction; (b) ensuring accountability; (c) regulating and monitoring; and (d) accepting strategy and preparedness. King IV continues by emphasising that 'the governing body ultimately ensures accountability for business performance via, among other things, monitoring and openness', which is one of King IV's primary goals (IoDSA, 2016a). King IV repeatedly said that the report was intended to raise the threshold if the law lowered it. Nonetheless, if there is an obvious contradiction between the law and King IV's regulations, the law will take priority and govern over King IV; therefore, 'where there is a conflict between the law and King IV, now or in the future, the law will triumph' (IoDSA, 2016a). This is critical, since King IV applies to state-owned entities, such as national museums, that are governed by law and may want to implement the King's conclusions.

According to King IV, holistic news is inextricably connected to the philosophy of sustainable development, which views the business as a member of its community and places a premium on holistic learning, corporate responsibility, and stakeholder engagement. King IV advises the governing body's legal and effective leadership. This kind of leadership should be characterised by honesty, competence,

accountability, fairness, and transparency (IoDSA, 2016a). Strategy, execution, and monitoring should all be seen as phases of value generation.

To be more precise, King IV recommends that 'the governing body will guarantee that the company's reports allow stakeholders to make informed judgments about the organisation's performance and short, medium, and long-term prospects' (IoDSA, 2016a). The governing body should guide the company's reporting process, including developing a structure that complies with applicable laws and stakeholder reporting obligations. The governing board must guarantee that the organisation publishes an integrated report each year, which may stand alone or be included in another report. The regulating authority should approve the document's correctness and quality. The consolidated study, yearly financial results, and other reports to interested parties should be made accessible on the Internet. Additionally, the Committee is responsible for dealing with stakeholders. The rest of King IV is like the International Unified Reporting System and, to a lesser extent, parts of the PFMA, Public Audit Act, and Companies Act requirements.

## 2.12 Factors Influencing Data Mining Adoption internally

### 2.12.1 Organisational Components

Extensive corporate and IT research studies are being conducted to better understand the relationship between IT and DM implementation and organisational components. Martín-García et al. (2019) developed two perspectives to view the connection between information technology and business. The first is concerned with the impact of information technology on organisations, implying that IT causes changes in the corporate sense and is regarded as having a substantial influence on the organisational environment. From this vantage point, the partnership is an impact arrangement in which IT serves as both a catalyst for change and a key determinant of the corporate components. The second perspective elucidates the reciprocal connection between technological advancement and organisational transformation.

While IT is seen as a change agent, an understanding of organisational factors is also necessary to effectively apply any technology, such as DM, or any desired improvement. In other words, how a business utilises IT resources has a major impact on the firm and its components, including its layout, personnel, activities, and community (Huang, Liu, and Chang, 2012). To address these assumptions, it is necessary to update and sometimes rebuild hierarchical types, processes, systems, and policies. The operational aspects will drive the IT and DM adoption cycle and implement strategies to guarantee its success. The connection between DM and the organisation is interactive in this way, and businesses must grasp this connection to flourish in an ever-changing global business climate.

Huang et al. (2013) concluded that enterprise-wide adoption of information technology is necessary for advancing organisational structures, methods, and strategic techniques aimed at increasing operational efficiency through reducing administrative and transaction costs and differentiating products and services. Effectively, DM implementation leads to changes to an organisation's structure, form, and management and to operational changes associated with processing organisational outputs, such as products and services. With the widespread adoption of DM, all operational layers will be affected and may need to be rebuilt to accommodate the new internal environment created by DM.

The new information processing and information flow mechanisms inside the organisation have resulted in recent developments that have shortened communication lines across all organisational levels. The significant distance between these levels will no longer suffice, since information can be transmitted easily, seamlessly, and rapidly across all corporate divisions, without the need of conventional modes of communication such as paperwork or face-to-face encounters. All these traditional methods may be renovated using the new balanced reporting system enabled by IT and DM. Thus, with the strategic use of IT and DM, such as the adoption of teleworking or computer-supported collaborative work processes, such modes of communication may be minimised or even eliminated (Rath et al., 2012).

### 2.12.2 Information Technology and Management

IT and DM will have a major effect on the growth and management of the organisation, including the rise of new organisational structures and their impact on individual job performance, the creation and composition of organisations, and the type of supervision and management positions required (Alsalim, 2020). In terms of organisational management, technology will fundamentally alter the notion of leadership, shifting it away from people and capital regulation (centralisation) and toward engagement and delegation (decentralisation). On this topic, two schools of thought have developed. The first school argues that by handling IT as an internal weapon, IT has aided in the consolidation of the business. The second school believes that information technology reduces the centralisation and availability of information to other employees of the organisation, allowing them to engage in formerly complex activities, such as the Enterprise Resource Planning System (ERP). Therefore, senior managers feel more comfortable delegating part of their duties to lower-level team leaders. Indeed, using information technology reduces the time required to complete some tasks. This enables those who do such tasks to perform extra work that managers previously performed.

At the operational level, integrating IT and DM into an organisation alters how an entity conducts business and redefines critical management tasks such as planning, monitoring, decision making, and administration. To begin, Milis and Mercken (2002) argue that information technology erodes the position of middle

management, dramatically increasing communication efficiency between senior and line managers by eliminating superfluous intermediary steps. Nonetheless, one could argue that implementing IT and DM strengthens the role of middle management by requiring them to perform more strategic management than ever before.

However, this requires empowering the organisational culture to enable the transfer of strategic tasks from top to middle and bottom-line operational management. The extent to which this is affected is determined by the kind of corporate governance in place and its capacity to devolve institutional authority to lower-level organisational leaders. Furthermore, numerous issues, such as morale, honesty, improved collaboration between people and groups within an organisation, and the requirement for skilled personnel and innovative management, have become more critical than ever (Vinacke et al., 1966; Wang and Clegg, 2002). Therefore, top management is urged to examine and support the development of key performance factors to increase the adoption of IT and data management solutions.

Indeed, the transition process inside the company should be explained in more detail to give a comprehensive picture of the situation both within and outside the organisation. Chmielarz (2015) and Zakirova and Zunnunova (2020) assert that postmodern changes need a period of industrial institution reconciliation. This may enable management to react to any transitions inside or outside the organisation's borders, which may lead to the adoption of DM as an effective automated data analysis technique inside AIS. This assertion is substantiated by Chmielarz (2015), who states, 'The advancements we are seeing are not due to information technology. However, nothing could alter our lives without contemporary information and communication technologies'.

Alsalim (2020) argues that some types of technological change, such as process reengineering and networked organisations, need the creation of a new ecological enterprise to replace conventional organisational structures. Indeed, information technology enables businesses to be more available to their customers, suppliers, shareholders/stakeholders, and representatives by removing some previously imposed constraints, such as shorter working hours and traditional direct contact. This is now feasible due to the widespread usage of Internet technology (e.g., e-commerce, e-government, and e-business).

IT and DM have clear advantages, and any hazards or failures can be avoided through the interpretation, awareness, and acceptance of IT and DM. Management should be seen as a key element in defining and affecting the AIS IT and DM processes' capacity to support or hinder them. To accelerate the adoption of IT and DM, it is essential to see top managers as strategists and lower managerial levels as decision makers and intermediaries between top management and workers.

### 2.13 Data Mining Awareness and adoption

Awareness of an individual's knowledge and intent to utilise DM technology should make it easier for the Nigerian public sector to accept or reject DM adoption, since both personal awareness and purpose are hypothesised to be significant determinants of this acceptance or rejection (Davis et al., 1989; Davis, 1993; Pavlou, 2003). Additionally, the study would aid in identifying the factors that contribute to this approval or rejection. The choice to utilise technology is guided by the Technology Acceptance Model's two basic personal values of usefulness and ease of usage (Legris et al., 2003; Riemenschneider et al., 2003; Amoako-Gyampah and Salam, 2004; Hsiao and Yang, 2011). Therefore, understanding the terms of DM will help increase the likelihood of adopting the technology.

#### 2.13.1 Process of adopting IT and data mining

Information technology is a broad and multifaceted term that encompasses a variety of components and their associated applications on both an individual and an organisational level. This necessitates the use of hard components (software and hardware) that serve as the foundation for various applications ranging from the personal to networking and the Internet. All these systems rely on computer technology to perform human or organisational activities. IT, under this study's definition, refers to the use of information and communication technology (ICT) to enhance how publicly traded companies operate and how their executives interact through inter-organisational activities and networking technologies.

In industrialized nations, significant studies have been conducted on IT adoption (e.g., (Fichman, 1992; Ahmed et al., 2007; Cavusoglu et al., 2010; Ewusi-Mensah, 2012; Chatterjee and Das, 2021).

- The cycle of IT adoption has been studied in various disciplines, from anthropology and sociology to technology research (Greenhalgh *et al.*, 2004). It is a method for communicating a new concept or style of an individual or organisational behaviour amongst people.
- The context and social context in which IT is implemented are determined by the individual's characteristics, which are critical in determining the individual's response to the adoption (Rogers, 1995).
- Uncertainty in the usage of information technology is anticipated to be a major limitation in situations where people view the use of information technology with mistrust and uncertainty (Ganglmair-Wooliscroft and Wooliscroft, 2016). However, as Rogers argues, the degree of uncertainty is determined by the information available about each adoption. Thus, it asserts that although technology implementation reduces uncertainty by representing information, it simultaneously generates another category of ambiguity about the possible consequences of what

it names, innovation-assessment data (Dolezel and McLeod, 2019). In this regard, it can be said that the degree of uncertainty is determined not only by the availability of information but also by the complexity of the implementation phase (planned or spontaneous) and other operational factors that must be handled. The most critical of these factors is the core of corporate governance, which defines the extent to which information is communicated and available.

The features of IT and DM adoption are often instructive in determining the adoption rate. Individuals anticipate that IT adoption will occur more quickly than other types of adoption because it has a greater relative benefit, dependability, testability, observability, and less ambiguity (Değerli, Aytekin and Değerli, 2015). Chatterjee and Das (2021) believe that the process of information technology adoption is a distinct kind of communication in which the message's content refers to a novel concept communicated to one or more people. They argue that effective interaction between people requires the consideration of both similarities and dissimilarities between individuals in areas where information technology is conveyed.

On the one hand, similarity in certain aspects of individuals (e.g., job, social position, and age) is a suitable foundation for sharing information about IT and DM adoption, since people who are similar are often more attracted to and influence one another than dissimilar people. On the other hand, the differences between people in specific areas relevant to IT and DM adoption (e.g., familiarity with IT and DM adoption and technological expertise) may allow for the sharing of new information during the contact phase between the more experienced and knowledgeable members of a social organisation and the less professional and familiar members.

### 2.14 Approaches to model development

In their literature review on IT adoption, Doe et al. (2019) developed two fundamental models that inspired this literature. The first paradigm regards information technology deployment as a mode of connection and power. Through their contact with previous users, people are educated about new technologies and persuaded that they will embrace them. The second model views IT adoption as an economic process in which the choice to embrace or reject new technology is determined by the costs of adoption and the benefits associated with adoption. Indeed, one might argue that the success of IT and DM adoption is determined by both the availability of efficient communication enabling the sharing of information on IT and DM adoption and the economic advantages that may be realised because of IT and DM adoption.

Economic advantages may be realised via an efficient communication strategy. On the other side, poor or inadequate communication may result in the failure of the IT and DM processes, resulting in the loss of

economic advantages. On the other hand, economic advantages will encourage a cooperation mechanism that will likely result in greater development and use of IT and DM. The organization's administrators determined the economic advantages of IT and DM adoption and the effectiveness and dependability of the contact system that accelerates IT and DM adoption (Doe *et al.*, 2019). Thus, IT and DM deployment were impacted implicitly or overtly by corporate management's perception of the benefits of IT and DM and their management styles, which shape the organization's coordination, precipitation, and information-sharing structures.

Indeed, many academics have developed frameworks for IT adoption that may aid in comprehending the process. The first is the systemic model, which describes the IT acceptance cycle as a systematic process comprised of many stages (Damanpour, 1987; Walker et al., 2007; Damanpour, Walker and Avellaneda, 2009; Prause, 2019). The second is the socio-technical paradigm, which provides a more comprehensive perspective of the information technology life cycle and considers human, societal, and technological factors (Davis, 1989; Viswanath Venkatesh *et al.*, 2003; Lai, 2017).

### 2.14.1 Structural model

Until 1973, IT adaptation studies determined that the entity was the key unit of analysis. Damanpour (1987) expanded his viewpoint from an entity-level study to include the enterprise as the main unit of acceptability. The process method was used to explain why information technology was adopted. According to this approach, IT implementation consists of a succession of stages or phases aligned with the desired period's temporal dimensions. Nonetheless, they emphasised that the performance of information technology should be seen as an interconnected and dynamic set of capabilities that evolve.

This viewpoint emphasises the need to see IT adoption as a systemic process that begins with a knowledge-based sub-stage and concludes with ongoing adoption (Damanpour, Walker and Avellaneda, 2009). Rogers (1995) endorses the assertion that the IT cycle consists of five distinct stages that often occur in chronological order: information, justification, decision-making, implementation, and validation. This categorization is exemplified by Prause (2019), who views information technology adoption as a collaborative process that includes the introduction, absorption, and penetration of information system technology across the organisation.

Lai (2017) proposed a systematic approach for IT deployment that would include the following four metrics.

1. Identifying and preserving technologies and comprehending how to use new technologies.

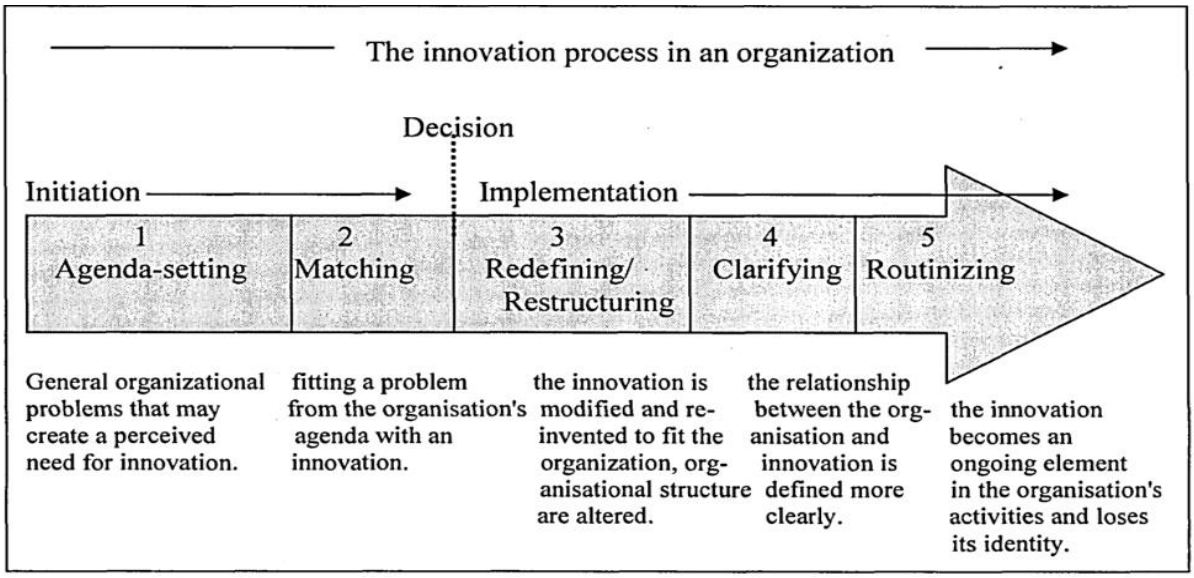
2. Experimentation, comprehension, development, and customer awareness of the new technology and the problems it can solve.
3. Justification and organisational oversight include training employees to an acceptable degree of expertise and enabling them to engage with and monitor technology.
4. The widespread dissemination of technology and the magnitude of technical benefits conferred on other groups.

This paradigm relies heavily on innovation to ensure a fruitful IT adoption process. This adds to the expense of implementing IT. Additionally, it maintains the concept of technology as the initial stage of the information technology cycle while ignoring key human elements, such as corporate management comprehension and technical abilities among users of new technology. This may result in a breakdown of the information technology cycle.

Atkinson et al. (2008) provide an overview of the IT adoption process. According to their paradigm, IT adoption begins with a sense of urgency to change (initiation stage). This compels the organisation's leaders to make decisions about the manufacture, installation, and maintenance of new technologies, as well as the creation of new operational procedures, to support this shift (adoption background and adaptation stage). When customers adopt this technology (acceptance stage), it becomes ingrained in their daily lives (routinisation stage). The last stage is infusion, which is the integration of contemporary information technology into operational structures to enable greater rates of organisational activity. The model is more comprehensive than earlier versions and includes all the stages necessary to complete the IT and DM adoption processes. Additionally, it acknowledges the selective introduction of new technology to accelerate the cycle of IT and DM adoption.

Before the adoption process, which involves the creation, installation, and maintenance of new technology, it is necessary to evaluate the user acceptability of the newest technology. This may help shorten the implementation cycle by allowing users to participate in the method's development. Additionally, it may help decrease IT and DM performance costs by facilitating decision making and increasing customer resistance to new arrangements that may be implemented due to the deployment of new technologies. According to Rogers (1995), IT adoption inside a company is a two-stage process that includes introduction and implementation and the standard five-step sequence. The widespread adoption of technical innovation serves as the greatest illustration of the process of redefining innovation and transformation in a business, in which any computerised programme is created or, in most instances, customised to meet organisational needs (Davis, 1993; Rogers, 1995).

**Figure 15: Organisational innovation process, Rogers 1995: p392**




As the IT and DM implementation cycles continue, the misunderstanding around the idea will be minimised by establishing a common understanding of the innovation. An appropriate social structure and organisational resources are required to enhance this technique. Design becomes a practise and an integrated part of the regular business routine when all creative issues are addressed. It is acknowledged that the systemic model of information technology adoption has been used to characterise information technology implementation as a systematic process that follows these stages.

However, this viewpoint provides little information since it ignores the social elements of organisations and the critical interrelationships that occur before their implementation. One of the main disadvantages of the conventional view of information technology as a relational paradigm is that individuals embrace it for their autonomous purposes rather than as members of a broader community of interdependent consumers (Değerli, Aytekin, and Değerli, 2015). Thus, the impact of one business community on others must be recognised. Since managers wield power and are influenced by company practises and their bosses' activities, their behaviour and interpretations of IT and DM adoption should be considered and investigated. This metric is a good indicator of an organisation's inventiveness and preparedness to embrace IT and DM.

Assuming that the mechanism of IT adoption is a set of standardised procedures occurring inside the social system, however, omits the fundamental idea of IT adoption as a changing feature influencing the social network in a specific context. Successful IT and DM implementation will analyse and comprehend

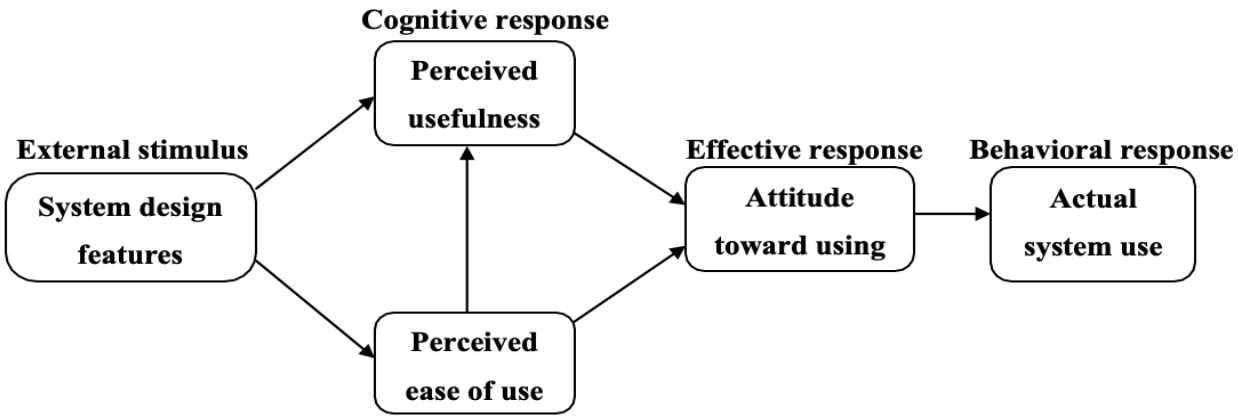
the various social facets of this ever-changing environment. The socio-technical paradigm was conceived as a means of bridging this gap.

### 2.14.2 Socio-technical model

The Technology Acceptance Model (TAM), which was developed by Davis (1993), is a model of IT adoption and service to describe how computers are used. This model establishes a causal connection between the system's functioning, perceived usefulness, perceived ease of use, attitudes toward service, and actual user behaviour. It is mainly used to explain the effect of device characteristics and end user activities on the program's practical usage. The figure below shows the model's main components and connections.

This model mimics human behaviour by downplaying the importance of ease of use and emphasising the relevance of anticipated benefit. Although this hypothesis may be correct, since some individuals possess the degree of competence necessary to comprehend and evaluate the efficiency of the target system, individuals who lack the necessary knowledge to examine the advantages of this approach can only be inspired by the system's ease of use.

**Figure 16: Technology acceptance model, Davis (1993; p476)**




The emphasis on the connection between attitudes and behaviour often overlooks the reality that attitudes will not be associated with behaviour if individuals are not free to behave according to their views (Winter, Chudoba, and Gutek, 1998). Furthermore, by focusing exclusively on perceived usefulness and ease of use as factors influencing attitudes toward new technology use, this model overlooks other possible influences, such as management approach, external social pressure exerted by specific individuals and groups within

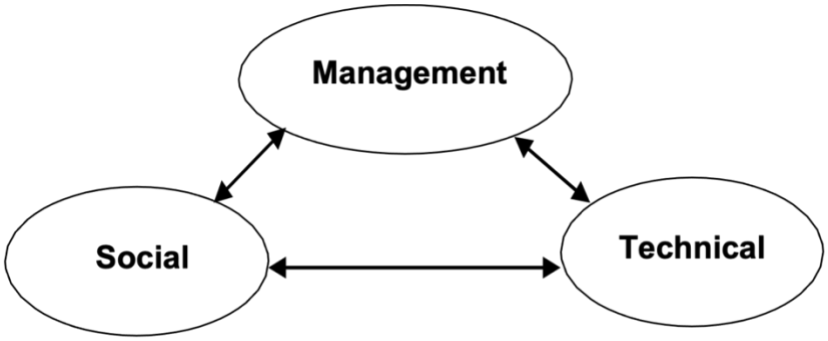
the organisation, cultural conflicts, and the personal characteristics of technology users. For instance, Straub et al. (1997) examined the TAM's ability to explain IT adoption and usage in the United States, Switzerland, and Japan. While the TAM explains IT adoption and use in the United States and Switzerland, it does not offer a foundation for the Japanese experience. We hypothesise that characteristics of Japanese culture, such as uncertainty avoidance, greater power disparity, collectivist sentiments, and masculinity, may contribute to the TAM's failure to predict computer use behaviour in Japan. Their study demonstrates the critical nature of cultural variations in the context of studies on IT adoption.

While this model incorporates some aspects of the social context into the structure of the adopted community, it omits several critical organisational features and does not account for how these features render the process incapable of achieving its natural and theoretical conclusion following this or any other model of IT adoption. This is often the situation in certain large hierarchical organisations, when senior executives make adoption choices without consultation or additional preparation (Qatanani, 2015).

In his review of the IT adoption literature, Fichman (1992) argues that a significant portion of the IT adoption theory was created in the context of individuals making a free choice to accept or reject adoption based on the expected advantages. The TAM is a marker for this kind of route. Nonetheless, he observes that human adopters will never have full control over the installation and use of information technology. As leaders of control at all organisational levels, managers may play a critical part in the IT and DM cycles. To begin, they are responsible for assessing the economic advantages of IT and DM deployment and possess the ability to promote efficient communication among business stakeholders. Individuals' attitudes regarding the usage of IT and DM may also be influenced by their management styles and knowledge of IT and DM.

Değerli et al. (2015) offer a more comprehensive overview of the IT implementation cycle and emphasise the critical role of management in an information systems environment. Their findings imply that organisational complexity regarding information system administration is associated with and influenced by three main components. The first is a social component related to consumers' desire to incorporate information technology into their everyday job (user expertise and knowledge). The second component is technical in nature, including hardware and software technologies. The third component is the management component, which serves as the mediator in their maturity model. Finally, the human aspect encompasses managerial and social components and their reciprocal relationships with the technical detail. These organisational components must be balanced to successfully execute the development plan or any prospective information technology project. This pattern is shown in the figure 17 below.

**Figure 17: Maturity of the organisation regarding information technology management and usage Ruohonen and Auer 1996: p6.**




The strategy has not established clear partnerships and connections between information technology deployment and organisational management. Investigating this connection is important because the government may directly or indirectly support the execution of goals and instructions (Fichman, 1992). Managers who have a favourable attitude toward IT and DM are anticipated to play a major role in convincing other organisational members to embrace the usage of IT and DM in their daily operations. Because of this study, a paradigm will be developed that incorporates classical IT adoption theories that place a premium on individual consumer desires and contemporary IT adoption theories that see IT adoption as an organisational process controlled by corporate governance.

As mentioned before, the existing models of IT adoption have been created based on research. Therefore, a study of the literature on IT adoption in developing nations may shed light on this problem.

### 2.15 IT Adoption Process in a Developing Country

Only a few studies have addressed problems surrounding the deployment of information technology in underdeveloped nations (Youssef, 1996; Ewusi-Mensah, 2012; Abdallah, 2013; Harash et al., 2014; Shagari et al., 2017; Singh et al., 2017; Choi et al., 2018; Chouat and Irawan, 2018; Riza and Hafizi, 2019). Doe et al. (2019) explored the TAM's applicability (Davis 1989; Davis 1993) to IT in the African world. We claimed that social and cultural values are critical for implementing IT in African countries.

Nonetheless, their study made no mention of specific social or cultural variables. In his examination of Turkey's information systems, Harash et al. (2014) examines the relationship between management practises and information technology implementations and finds that knowledge is most often transferred in one way (from top to bottom) inside the business through directives and orders. Additionally, he believes

that since individuals in developing nations are often reluctant to take risks, there is a misunderstanding regarding preventative measures (Atkinson *et al.*, 2008; Cavusoglu *et al.*, 2010; Venkatesh, Thong and Xu, 2012b). The need to minimise risk and uncertainty creates a significant barrier to entry for developing nations' information systems (Besley and Case, 1993). Carnoy (1997) shows that a major impediment to adopting sophisticated technologies in developing nations is a lack of highly skilled management and scalable self-confident labour. According to Aladwani (2001):

> *The plethora of IT literature has mostly concentrated on organisations located in the developing hemisphere. Even with the little study on information technology in underdeveloped nations, academic studies seldom address problems of IT assimilation into these countries' institutions. Most reviews are descriptive in tone.*

Aladwani (2001) stated in their study on IT assimilation in Saudi public organisations that the most important impediment to IT assimilation in Saudi public organisations is human resource issues. Regarding the impact of IT adoption on the situation in developing countries, Besley and Case (1993) differentiate three research sources. This study's primary and most significant source is a worldview that exaggerates technology's one-way influence. In his view, the information revolution would enable poorer nations to produce, and eventually, the world's countries would become more equitable. The second layer assumes that information technology will aggravate inequalities and power imbalances between rich and developing nations. The third branch of science views technology as an integral element of civilization that would be useless without the other components.

According to this source, the belief in an autonomous or self-directed system is a misconception since technology cannot function independently of its environment unless it understands certain aspects. The second source seems appropriate since it is politically motivated and contributes to transferring technology to developing nations. That is not to say, however, that IT deployment should be shunned entirely. On the contrary, one might argue that developing nations can utilise IT and DM successfully if they build an effective IT and DM foundation centred on a high-quality economy and self-sufficiency. Furthermore, developing nations should consider their unique requirements and the features of their contextual frameworks (socio-cultural traits unique to each area), independent of political or economic pressure from rich countries.

Among the issues confronting developed countries and impeding their successful use of information technology are a lack of technological skills among managers and civil servants, a lack of awareness about

the proper application of technology, and a lack of capacity to develop and improve their technologies (Besley and Case, 1993). Hanna et al. (1995) believe that several structural obstacles impede the adoption of information technology in developing nations. These impediments include a slow reaction to digital technology, poor telecommunications infrastructure, insufficient technical and management skills, an ineffective regulatory environment, and low domestic demand for information technology. Another limitation Heeks and Stanforth (2007) found is the rationale for technological usage. Attaining the financial cost-cutting goal is dubious in developing nations since the financial cost of substituting cheap labour with costly ICTs is unlikely to be justified.

On the other side, equipping pricey people with low-cost ICTs reduces costs in underdeveloped nations. The emphasis in developing nations should thus be on other achievements (e.g., increasing operational efficiency and service quality) to provide the groundwork for automation. According to their study of the development of e-government in developing nations, Heeks and Stanforth (2007) indicate that the few successful floors mentioned in certain research are an exception, not the rule, for two reasons. The first refers to a lack of electronic access, while the second pertains to a dearth of data and analysis that might assist these nations' e-government efforts. As a result, it results in discrepancies in design reality.

In a study performed by two international information technology firms, Shagari et al. (2017) discovered that the primary weaknesses in the African world's IT sector are a lack of technical know-how, a lack of planning and strategy, a lack of Nigerian coordination, a lack of funding, a lack of policy and bureaucracy, erroneous thinking and bad leadership, a lack of infrastructure, language issues, and a lack of cooperation with foreigners.

When 210 IT professionals were asked to identify the critical qualities that the Nigerian world could include in its IT development strategy, they suggested the following: human capital and personal talents, financial resources, a common language, a large African market, scientific and technical advancements, cooperation among African nations, and natural resources. Only 24% of respondents identified technical and technology-related issues as weaknesses in the African IT landscape. Hill et al. (2014), who examined the Arab community and its effect on IT transition, discovered that the Arab institutions that have successfully adopted IT had given more attention to their cultural values.

Additionally, they identify particular social and cultural factors that influence IT transfer. Social components include socioeconomic status, personal connections within workgroups, and educational levels. Cultural elements include face-to-face interactions, loyalty to family and family groupings, a sense of time, and religion. Finally, they identified many impediments to IT transfer to African nations based on

their field research. These include a lack of financial resources, a conflict with personal beliefs, a lack of knowledge and experience, a lack of training, a lack of education, a fear of identity loss, and a fear of power. As mentioned before, prior research has found several obstacles to IT adoption in developing nations. These obstacles may influence the public sector's adoption of DM inside AIS in Nigeria, since DM and AIS are part of IT.

### 2.16 Remarks and Insights

The limited studies conducted on IT adoption in developing nations have given a gloomy assessment of the present state of IT adoption in these countries (Besley and Case, 1993; Vatanasakdakul et al., 2004; Molla and Licker, 2005). They often exaggerate their weaknesses and downplay their strengths. This does not seem precise and indicates that developing nations are inadequate at utilising contemporary technologies. On the other side, one might argue that information technology has aided in developing essential changes to company strategies and overall operational performance in several industrialised nations. Among several instances provided by Kaul (1997) is the Nigerian Government Public Service Network, which enables government entities to provide services online. The Singapore government's experience demonstrates how the civil service system-generated S$2.71 for every dollar spent on computerisation. In contrast, other countries, such as Ireland, have built their entire development and investment strategy around a viable and readily accessible information technology industry (Al-Jaghoub and Westrup, 2003). Additionally, India is considered a technologically sophisticated country (Kirlidog, 1997); it is relocating highly trained workers to industrialised nations like Western Europe and the United States.

These nations are seen as credible examples of the potential of developing a profitable information technology-based economy in countries with no natural resources other than their skilled technical workforce. In addition, robust cooperation between these countries' governments, low wages, and a large local market in some developing countries (e.g., India) facilitate the development of some local IT firms. A multi-cultural population in some developing countries is viewed as an important factor in enhancing their ability to adopt effective IT.

However, the few available studies on IT adoption in poor nations have lacked depth for three reasons. The first reason is that the information technology industry is still a young phenomenon in most emerging nations. As a result, the period has presented a brief window of opportunity to examine IT problems, including IT and DM acceptability. The second reason is that most academics who have conducted such studies have been unconcerned with the theoretical environment in these countries. As a result, they are more likely to represent their theoretical understanding of their study, which may be drawn from their own

qualitative and managerial experiences. However, due to cultural, administrative, financial, economic, and technical constraints and differences, the proclivity to follow the results of such research cannot be genuine (Kirlidog, 1997).

The third reason is that approach researchers and, in some cases, organisations that have investigated the field of information technology in this region of the world are more likely to be motivated by economic interests than by human or administrative growth (i.e., real value for these countries), owing to the enormous potential for IT demand in this environment, which is home to 80% of the world's population, and the relatively low level of employment. These characteristics are important for small businesses seeking to grow their market share and extend their operations. One indication of this is the study by Straub et al. (2020), which examined the investing practises of multinational corporations in seven Arab nations. It became clear that these firms were often not interested in expanding export-oriented industries but rather interested in replacing indigenous manufacturers as suppliers to the home market. Additionally, production procedures appeared to be extremely confidential and technology transitions seemed to be designed to fit the requirements of these companies.

To accomplish these goals, researchers in developing nations will design culturally appropriate research techniques. We will most likely be better equipped to implement the economic and coordination procedures necessary for DM adoption during the AIS phase. However, the key issue is: Where will this work begin?

The lack of adoption of IT and DM within AIS studies, which consider organisational management perspectives and effects, is a major source of worry in developed and developing nations. Pinsonneault and Rivard (1998) imply that the current state of empirical research results from a failure to comprehend the connection between information technology and the complexity of managerial work. Therefore, this study views organisational management as a critical element influencing corporate actors' perceptions and behaviours towards adopting IT and DM inside AIS. By evaluating managers' attitudes about IT and DM, as well as the relationship between these attitudes and management styles, we may better understand the possible impact of management on IT and DM adoption within AIS and the managerial position throughout the adoption cycle. These are well-established as critical drivers of business success.

In previous studies, managers as policymakers, decision makers, and implementers, as well as important core organisations, have received little attention in both developed and developing nations. The study of the connections between their perceptions of IT and DM acceptability inside AIS and their management styles – which determine the manner and course of interaction, engagement, and participation – is seen as

a critical contribution with significant policy implications. This pattern can be described as a return to the fundamental principles of adoption, which view IT and DM adoption as a social process rather than a technological process. It can contribute significantly to IT and DM adoption work in developing countries and the existing literature in developed countries.

Given the increasing significance of IT and data management in the process of public sector transformation and the public sector's unique contextual and cultural framework, this study will concentrate on the public sector. In this context, the current trend toward public sector reform and the extent to which IT and DM are being used inside AIS make the findings of this study more relevant. In summary, this study broadly analyses the African experience as a paradigm in relation to Nigeria and emerging nations. Nigeria is a developing African nation that has just recently started investigating the use of information technology to accelerate economic growth and successfully integrate into the global environment (Al-Jaghoub and Westrup, 2003). The choice of this setting is anticipated to enhance the study's contribution, since little research has been conducted in general on the background of developing nations, and the opposite viewpoint has been emphasised directly or implicitly. Indeed, the researcher's experience, knowledge, and awareness of the Nigerian context all contribute to gathering this background information.

### 2.17 Information Technology Pace Change and Size Change

The Information System is a set of interconnected components that collect, process, store, and disseminate data inside an organisation to facilitate decision making and control (Meeßen, Thielsch, and Hertel, 2020). Over the years, IT has evolved dramatically. This is because the world has changed dramatically, and we now live in a global environment in which information technology is transforming how companies generate and capture value, how and where people work, and how we connect and communicate.

Although mainframe computers were formerly thought to simplify things, cloud and mobile computing, big data and machine learning, sensors and intelligent manufacturing, sophisticated robots and drones, and clean energy technologies are increasingly reshaping the foundations of global business and organisations. These breakthroughs enable individuals to work more efficiently and effectively, and they also enable significant changes in the organisation's function: 'Taken together, these advancements are catapulting us into a new industrial revolution. Corporate executives that are astute understand that they must either find out how new technologies will change their companies or risk being disrupted by those who do' (Gavurová et al., 2018). This conclusion is reaffirmed in the academic medical literature (Gavurová et al., 2018), engineering (Šmite et al., 2010), science (National Research Council, 1999), and social sciences (Castells, 1996; Haythornthwaite and Wellman, 2008). The shift in the speed and scale of information technology

does not impact business alone. Although information technology is rapidly eclipsing energy in terms of infrastructure requirements, Barley (2015) shows that little research has been conducted on how it affects work processes or the jobs that people do.

Numerous stages in corporate operations have been automated through information technology. Previously, credit checks, invoice generation, and shipping orders were carried out manually. But information technology today is capable of much more; the flow of processes has been altered by information technology, enabling more individuals to access and exchange information. This has replaced the sequential processes used to execute activities concurrently, thus eliminating decision-making delays. Downloading a Kindle e-book from Amazon, purchasing a computer online from Best Buy, or downloading a music track from iTunes are all new business models or business processes that would not have existed without information technology. Changes in information technology also have an impact on the agricultural and industrial sectors. This has facilitated the acquisition of fresh information and expertise by each industry. They have all necessitated and allowed the development of novel economic systems, social revolutions, cultural changes, and labour patterns.

**Table 2: Empirical Studies**

| Author (s) & Year | Topic | Methodology | Recommendation |
|---|---|---|---|
| **AFRICA** | | | |
| Esmeray (2016) | Effect of the utilisation of accounting information systems on the monetary execution of little and medium-sized organisations in Ghana. | The descriptive-analytical approach was applied (questionnaire). The study sample, which consisted of 60 companies | Statistically significant positive association between the usage of accounting information systems and the growth rate of revenue, returns and consumer numbers. |
| Nwinee et- al (2016) | Effect of the utilization of accounting information systems on the authoritative adequacy of little and medium-sized organizations in Nigeria. | The logical methodology was trailed by planning a survey | Utilisation of bookkeeping data frameworks improves the profitability of organisations and upgrades the capacity to oversee costs |

| | | | |
|---|---|---|---|
| Patel (2015) | Effect of accounting information systems frameworks on organisations' benefit in South Africa | The hypothetical, logical way to deal with arriving at the outcomes by assessing the past | There is an effect of bookkeeping data frameworks on the productivity of organisations and dynamics. |
| Biwott (2015) | Impact of AIS on public procurement in Kenya. | Quantitative data | AIS has a high impact on public procurement |
| Hunton (2002) | Relationship between automated accounting information system and organizational effectiveness in Uganda | Quantitative data | There was a strong relationship between accounting information systems and organizational effectiveness |
| **ASIA AND EUROPE** | | | |
| Hezabr & Qatanani (2015) | Impact of accounting information systems on improving the value chain in companies in the Kingdom of Bahrain | A perceptive technique was used by developing a poll and distributing it during the assessment test. | There is an absence of accessibility to the basic segments of the accounting information systems framework. |
| Rapina (2014) | Factors affecting the quality of accounting information systems in Indonesia | A questionnaire was given to a group of accountants working at 33 cooperative institutions in Bandung City. | The commitment of management, organizational culture and structure greatly impact the quality of accounting information systems. |
| Moqbel (2014) | Impact of accounting information systems on e-commerce in Jordan | Analytical descriptive approach | There is a statistically significant positive effect of accounting information systems on e-commerce in service companies in Jordan. |

| | | | |
|---|---|---|---|
| Harash et al. (2014) | Impact of accounting information systems on small and medium-sized companies' performance in Iraq | Theoretical, analytical method | There is an impact of the accounting information systems, represented by their characteristics (reliability, importance, and timing), on the performance of small and medium-sized companies in Iraq. |
| Jakovic and Spremic (2012) | Impact of the use of accounting information systems on the company's e-business effectiveness in Croatia | Quantitative method | There is an impact on the use of accounting information systems on the effectiveness of the company's e-business in Croatia. |
| Dahlan et al. (2002) | Readiness to Adopt Data Mining Technologies: An Exploratory Study of Telecommunication Employees in Malaysia | An exploratory study | |
| Chun & Kim (2004). | "Data mining for financial prediction and trading: application to single and multiple markets in China | Quantitative method | The effective harnessing of data mining positively affects |
| Nur Azizi & Kynk (2005) | Effect of integrated information systems literature of management accounting in Malaysia | Quantitative analysis | AIS enhances management accounting |

The review of various literature brings some key gaps that must be stressed. Key among them is a methodological gap. Most studies either used quantitative or qualitative data. This study intends to use a mixed method as a measure to bridge the gap. Furthermore, the study further identifies theoretical gaps in the other studies reviewed. Finally, this study combines three theoretical frameworks for maximum understanding.

## 2.18 BENCHMARKING Nigeria, South Africa, and New Zealand

Nigeria is blessed with many sports talents, from boxing, kickboxing, judo, marathon, and football. The successes of Nigerians in these disciplines are apparent, from winning the African Cup of Nations in 2013 and the remarkable kickboxing successes of Israel Adesanya and Kamaru Usman. It is fair to say that Nigeria is a hub of talent in African sports in the disciplines stated above. Although it is promising, the truth is that Nigeria's growth in the sporting sector is underdeveloped due to poor allocation of funds and poor accountability. When funds intended to support the growth of a particular discipline are allocated, those in charge of the funds do not allocate all the funds, using some for personal gratification. In this dire situation, an accounting information system can ensure accountability, transparency, and proper management of funds.

It is important to note that, although AIS is critical to the success of the sports business or ministry, data mining also contributes significantly to the sector's development and success, as a process of obtaining and identifying hidden patterns in data. When the researcher examined Nigeria's success in sports, it became clear that the highlights were relatively few in an area with numerous disciplines. Nigeria's last African Cup of Nations victory occurred seven years ago; strong data mining and analysis will ensure continuing success in a talented but stagnating country (Omondi-Ochieng, 2019). There is more to sports than just kicking or tossing the ball, and data mining considers the factors for guaranteeing success. Data mining is used to visualise events and players and to offer sports advice. Throughout the years, in the absence of data mining, predictions about sports were made primarily on gut instinct and intuition. We now know what happens when we exclusively depend on emotions to make decisions (Atkinson et al., 2008).

A preliminary examination of the literature found few examples of studies on the impact of IT and DM on AIS tactics; those discovered were written from a range of viewpoints and shared nothing in terms of methodology or results. As a result, a study examining the connection between DM and AIS results highlighted a need for research establishing a shared conceptual framework for IT and DM adoption in publicly traded businesses in developing countries. In summary, it seems as if there is little literature on the effect of IT and DM on AIS, though some exist regarding the Malaysian public sector (Abdallah, 2013). Additionally, there are few studies and theoretical insights in the literature on the interplay of IT, DM, and the AIS in the context of emerging countries and their industries.

Nigeria was categorised as a developing country by the International Monetary Fund (IMF) and the American Mathematical Society (AMS) in 2008. It has an economic infrastructure that comprises international corporations and financial institutions; as a result, there is likely to be some awareness of the

use and adoption of IT and data management technologies (Nielsen, 2011). Additionally, the researcher's identity as a Nigerian enhances their capacity to study this environment and evaluate the probable scenario in relation to the researched topics. Nigeria is home to one in every four Sub-Saharan Africans, making it the most populated nation in Africa and the sixth most populous country in the world. According to the United Nations, Nigeria will grow to be the world's third biggest nation by 2050, with a population of 399 million (Nielsen, 2011).

Economically, the nation is also gaining traction. It surpassed South Africa as the continent's biggest economy in mid-2016 and, until recently, was widely seen as having the capacity to become a global economy. Nigeria's heavy reliance on oil revenue has undermined this potential; a sharp decline in crude oil prices from 2014 to early 2016 catapulted the country into recession, compounding the country's already long list of problems, including the violent Boko Haram insurgency and the challenges common to many Sub-Saharan countries – low life expectancy, the inadequacy of public health systems, and income inequality.

Government services throughout the country have been impacted by severe cutbacks to public expenditure in the aftermath of the recession. The scenario has compounded existing difficulties in the education system. For years, Nigerian colleges have been plagued by student demonstrations and strikes, a sign of a poorly underfunded higher education system. The Nigerian government's austerity efforts in response to the present crisis have further reduced education funding. In 2016, students at several public institutions saw an increase in tuition prices and a deterioration in basic facilities, a textbook case of not receiving value for money invested.

Additionally, the conflict depleted scholarship funding for overseas study, putting a brake on Nigeria's international student influx. Despite these limitations, the country is expected to continue growing at a rapid rate in terms of foreign students. This is mainly due to the enormous and unmet demand among college-age Nigerians. The higher education system in Nigeria has been overwhelmed by rapid population expansion and a sizable 'youth bulge' (more than 60% of the nation's population is under the age of 24). Successful implementation of a good and sophisticated accounting system is not a matter of trial and error or something to install and then worry about; nations such as New Zealand and South Africa have benefited from these change processes regarding accounting and data mining.

Modifications to New Zealand's GAAP for public benefit companies happened between 2011 and 2012, when the New Zealand External Reporting Board (XRB) established a distinct public sector reporting

structure. The Revised Zealand Minister of Commerce approved the new Accounting Standards Framework for New Zealand in April 2012, bringing further modifications to public sector reporting. The XRB then published a bundle of exposure documents on new rules for public benefit organisations in June 2012. These exposure draughts, dubbed the Public Sector PBE Package, are the second of five packages developed by XRB to operationalize the new Accounting Standards Framework. Finance and educational achievement are positively linked, and the correlation is readily apparent, with Nigeria serving as a great example. The reporting system in the New Zealand public sector has evolved through three stages and is set to enter its fourth. The first three stages were: cash accounting until the late 1980s, accrual accounting in conjunction with sector-neutral standards from the early 1990s to 2005–2007, and modified IFRS from 2007 to 2012. The new fourth phase involves IPSAS-based standards with several levels that will be utilised in New Zealand's public sector reporting. It is depressing to learn that Nigeria's has remained largely unchanged despite its tremendous population growth.

New Zealand has also seen an increasing trend in sports, most notably rugby, football, basketball, and baseball. While these advances are self-evident, it is interesting to notice that they want to continue improving with the assistance of data mining. To ensure that New Zealand continues to thrive in the future, a move toward sectors that make more efficient use of resources may be required to balance the economy and provide greater value (Vuolteenaho, Wolny, and Puzey, 2019). This transition will take time and require substantial political and institutional changes. If New Zealand's economy can be transformed into one that generates more money and riches, the effect on the sport may be significant. The increase was mostly due to the addition of additional employees and the use of data mining to conduct in-depth analyses of these sports. New Zealand Rugby has teamed with Wellington-based data science and artificial intelligence companies to develop a new analytics platform, 'Play in Grey'. The technology, hosted on the public cloud of Amazon Web Services, leverages computer vision and machine learning to provide coaches with 'near real-time' statistics derived from game videos (Smith and Garnham, 2006).

Besides New Zealand, South Africa has a remarkable sporting sector, an incredible feature for Africans to admire. Whereas sports in Nigeria are in desperate need of assistance, South Africa's success in sports is evidenced by the salaries and working conditions of their footballers, not to mention on-field triumphs such as Mamelodi Sundown's conquest of Africa and the South Africa National Rugby tea (Prather-Kinsey and Shelton, 2005). All these accomplishments would not have been possible without AIS and DM. South Africa has been actively engaged in and supportive of International Accounting Standards Board (IASB, formerly the International Accounting Standards Committee [IASC]) activities for many years. As a result of these strong ties, South Africa was an early adopter of the International Financial Reporting Standards

(IFRS). The IASC's and subsequently the IASB's standards have thus had a major impact on financial reporting in South Africa. Initially, the IASC standards functioned as a guide for developing domestic accounting standards, the SA GAAP (Coetzee and Schmulian, 2013).

The education system in South Africa is divided into three levels: elementary, secondary, and postsecondary. Before 2009, the National Department of Education oversaw all aspects of education, including higher education and primary and secondary education (Hassan and Yonah, 2014). Since then, supervision has been divided to allow for a stronger emphasis on drastically diverse educational systems and to direct the government's attention toward postsecondary education. The Department of Basic Education (DBE) currently administers elementary and secondary education. The Department of Higher Education and Training (DHET) is responsible for postsecondary education, which includes both academic institutions and technical training (Hassan and Yonah, 2014)

The South African government in 2014 committed significant resources to education. It spent 19.7% of its overall budget on education in 2013 – a very high number by worldwide standards and about 6% of the country's GDP. The primary and secondary school systems, which are controlled by provincial governments, get the lion's share of the national education budget. In 2013–2014, 57.7% of funds were spent on elementary and secondary education. However, this proportion is projected to decline in future years in favour of increasing expenditure on postsecondary education.

**2.19 Conclusion**

This study contributes to a debate on data mining tools in the public sector by providing a comprehensive picture of the accounting information architecture. By encouraging the use of this technology, the public sector in Nigeria has the potential to increase its productivity and effectiveness. As with the private sector, the public sector accounting information system is a major source of information, and data mining capabilities may be critical in the decision-making process. Data mining was proposed to maximise accounting knowledge and improve the department's ability to make financial decisions. However, there seems to be a lack of awareness in Nigeria about the function of data mining operations and their usage of accounting information. The study of comparable accounting departments' usage of data mining methods, such as the Accountant General's Office, the Auditor General's Office, and the Ministry of Finance, will also shed light on the implementation and purpose of technology and data mining techniques.

# CHAPTER THREE

## Management Styles and Development of Data Mining Adoption Model

### 3.1 Introduction

This chapter discusses managerial styles and the use of information technology in change management. There is significant research on management styles (Buchholz, 1977; Stewart et al., 1992; Yang and Wang, 2018), and studies have been conducted on new management styles (NMS) adapted for the technology era. This chapter first analyses modern management paradigms in the developed country context. Second, it specifies the features of NMS and compares them to those of conventional models, once again regarding developing nations. Finally, it presents a thorough assessment of the management literature in Nigeria. The research problems about the adoption of IT and DM, as well as management styles, are developed using the Nigerian public sector as a case study. This chapter will examine the connection between managers' views and demographic factors (age, gender, educational level, non-IT organisational experience, and scope of control). This study adds to developing research topics about managers' attitudes regarding DM implementation and the impact of selected demographic variables on these views.

### 3.2 Management Styles

Each management style is characterized by distinct behaviour patterns, rituals, and shared ideals (Bertrand and Schoar, 2003). The table below summarizes the key characteristics of each management style, including a description and significant breakthroughs. The metaphors employed are color-coded, ranging from the most primitive (red) to the most sophisticated (teal) (Sulich and Rutkowska, 2019). These are represented by a spectrum of fundamental colours that progresses to more complex hues created by modifying extremely basic hues. Orange, for example, is the consequence of combining the two primary colours, red and yellow. The colour and guiding metaphors are inextricably linked (Banner, 2016). For example, the red organisation is a wolf pack organised around the leader's desire; resisting or negating it will result in 'bloody' vengeance. Thus, this colour metaphor reflects both the organisation and its culture. However, there are significant distinctions between the organisations shown by the colours in terms of their overall commitment to the implementation of 'brown' and green (pro-environmental) policies (Ryszawska, 2019). The colours assigned to the strategies in the table below correspond to the distinction between brown economies (based on a linear approach and resource-intensive, based on fossil fuel use) and green economies, where green refers to sustainable, ecological, and pro-environmental economies (Ryszawska, 2019).

**Table 3 Management styles classified by colour taxonomy adopted from (Sulich and Rutkowska, 2019)**

| Management Style Colour | Description | Metaphor Guide | Significant Breakthroughs | Current Illustrations | Decision Metaphor | Tactics |
|---|---|---|---|---|---|---|
| Red | The chief's constant use of authority to keep foot troops in line. Adapts well to turbulent situations. | Lion Pride | Labour division; Command power; Despotism | Criminal groups; street gangs; militia forces. | Will. | Brown |
| Amber | Roles with a high degree of formality within a hierarchical pyramid. Command and control from the top. The future is just a replication of the past. | Airforce | Structured roles (stable and scalable hierarchies); Stable and repeatable procedures. | Armed forces; most government agencies (public schools, police departments); religious groups. | No discussion of the pattern/scheme. | |
| Orange | The objective is to outperform the competition; to generate profit and growth—management according to goals (command and control over what, freedom over how). | Machine. | Accountability; Meritocracy; Innovation. | Corporations with global reach; charter schools; investment banks. | Consultations; Strict Procedures; Machine Oil | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Green | To increase employee engagement, place a premium on culture and empowerment. Stakeholders are the main objective. | Family. | Stakeholder model; empowerment; egalitarian management. | The company is well-known for its idealistic methods. | Dialogue; Democratic decision-making; Consensus. | Green |
| Teal | The hierarchical pyramid is replaced by self-management. Organizations are seen as living organisms that strive to achieve their full potential. | Vivant organism. | Self-management; Integrity; Evolutionary goal. | Several trailblazing organisations. | Self-reliance; Mindfulness. | |

As Table 3 indicates, some companies have the option of changing their management styles while others do not. The feasibility of change is contingent upon internal and external causes, the organisation's declaration of the need for change, and self-awareness of the possibility of greener, pro-ecological transformation. Numerous variables may be identified as affecting the potential of altering management style (Smith, 2003). This significantly impacts the organisation's 'colour' or metaphor.

As stated in the preceding instances, certain industries use management techniques that differ from those in use. Reluctance to alter one's management style may occur for various reasons. The most critical factor seems to be the absence of change: 'We do not change because we are not required to' (Beliaeva et al., 2020). These companies use a management style that is compatible with their requirements, objectives, and plans. It is also critical that the management style has been shown throughout the organisation's history, enabling it to survive and grow. Changes in the environment have little significance for this kind of organisation. Even global developments may be expected to have a limited effect on the sector's management style (Chen, 2011). The management style translates into the organisation's strategy; an

environmental strategy may be reactive or proactive. The red and orange styles influence the decision to pursue a reactive or brown approach, in which businesses rarely act in response to external pressure to develop an environmental plan (Kulhánek and Sulich, 2018). Green and teal management approaches continue to be diametrically opposed to the brown method. They exemplify an active, transparent approach to green strategy because of the organisation's goals, principles, and openness to novel ideas and circumstances for sustainable growth (Ryszawska, 2019).

### 3.2.1 Traditional Management Styles

Since the late nineteenth century, the management literature has been vast. Many management theories have been proposed to explain managerial behaviours and their organisational context. Bureaucracy is the most traditional organisational and administrative thinking style. According to Max Weber, bureaucracy is any large organisation's ideal shape or paradigm. It is an organisational system based on hierarchical authority structures and highly specialised functional divisions of workers (Stewart et al., 1992).

Bureaucratic organisations are founded on the impersonality of their members' relationships, necessitating the distinction between private and official types of social interactions. Thus, in theory, officials and management executives are recruited based on their aptitude and professional competence, not on nepotism or personal connections. Furthermore, bureaucratic organisations are intended to be highly rationalised, so members are compelled to act logically and objectively in all circumstances. However, the characteristics listed above are for the ideal hierarchical organisation; they seem more abstract than practical. No business can operate or be organised successfully if it depends entirely on these factors. Therefore, impersonality and strong logic should be used sparingly inside the organisation, and only with the permission of top management. Such characteristics, it seems, do not provide an impartial picture of each organisation's current state. Wilson (1993) argued in favour of this argument: 'Not only were individuals unable of responding rationally in general, but even organisations were institutionally incapable of acting incorrectly'. Additionally, organisational work performance is relatively unyielding in bureaucratic organisations, where rules and instructions govern organisational operations and managerial choices.

The authoritarian style of management is another classic management style. Managers that use a hierarchical approach establish basic rules for workers and expect them to obey the law and the authority of the boss without regard for human aspects. This strategy emphasises centralised authority, standardised norms and processes, top-down policies, distinct lines of authority, and specialisation (Kravos, 2019). Administrators exercise complete control in this approach, and the personnel follows and implements orders. As a result, the corporate environment is stable, and members are prepared to watch for any potential

changes. For example, under this management style, senior managers and supervisors would decide to adopt IT and DM without consulting their subordinates, as well as incentives for compliance with regulations and punishments for violations.

This approach was unworkable because it demotivated workers and created a 'us versus them' attitude between management and personnel. Therefore, a paradigm dubbed the human-centred model was developed, which focuses on human resource development to increase productivity and emphasises the significance of group behaviour and employee happiness (Kravos, 2019). The deployment of IT and DM as part of this plan will be determined through a collaborative process including representatives from different organisational levels. However, Buchholz (1977) indicates that the dominance of the humanistic value paradigm has not changed management's perception of employee participation in decision making. As a result, managers are often reluctant to modify the existing authority structure to allow employees to participate fully in decision making.

In pursuit of a thorough categorization of management styles and their effect on IT and DM adoption, Fonceca et al. (2017) identified four fundamental management styles. The first is a distinct manager tasked with enforcing compliance with the rules or principles. According to their administrative standing and operational legislation, the boss must have a varied level of power. The second is the attached boss, who is aware of and responsive to the needs of others – indeed, they are human beings, not merely professionals. The third basic form, according to Fonceca et al. (2017), is a dedicated leader who leads the work of others and accomplishes goals to achieve organisational aims. They have considerable field experience and often apply that expertise to identifying and resolving problems. The fourth type is an embodied boss who utilises both activity and relationship alignment and attempts to foster a cooperative environment to achieve organisational goals. To do this, they implement a variety of participative methods and bridge power disparities between themselves and employees. Integrated management best represents the diversity of management styles because it includes different aspects critical for managers in certain situations. It describes a 'no perfect design' philosophy utilised as a scalable and flexible style of management thinking.

Diskiene et al. (2018) offer a more precise but narrower definition of management types based on their analysis of the decision-making styles of Chinese and Australian administrators, finding significant differences. Wang and Clegg (2002) proposed four distinct management styles, considering specific cultural factors based on research on types of management:

1.) When a boss is autocratic, they make decisions unilaterally and with little concern for subordinates.

2.) As a delegate, the boss solicits input and ideas from the business before passing judgment on the community but ultimately makes a choice for the community.
3.) In a joint, the employer compels employees to participate in decision-making; therefore, everything is determined by a majority.
4.) Delegate, in which the management delegates decision-making authority to one or more workers while remaining accountable for their actions.

Managers should utilise a range of involvement in decision making to foster high-quality decision making and a high level of cooperation and commitment on the part of participants. Participation in the decision-making process is also critical for identifying distinct management styles. Wang and Clegg (2002) distinguish four modes of decision-making participation: formal engagement, informal engagement, direct involvement, and indirect involvement. As the term implies, informal engagement is an interpersonal relationship between the management and the employees. For example, the manager may get advice through casual conversations or informal group gatherings.

In contrast, official participation includes a set of legal rules and laws governing how actions will be taken and who should be consulted. As Wang and Clegg (2002) state, both direct and indirect modes of interaction raise issues related to who ultimately makes decisions. Through their feeling of active involvement, employees assist their boss in deciding and often make a choice themselves. When conditional participation is used, the staff provides advice and assistance to decision makers who make the final decisions on their own. The method of participation influences the degree of commitment to the activity.

Hofstede (1993, 2005) shows that the degree of individualism or collectivism within a culture and the distance of power may influence the extent to which individuals participate in organisations and the type of relationships within the organisational environment. For example, Wang and Clegg (2002) assert that the features of Chinese culture (collectivist and high-power distance) may limit decision-making participation. However, an empirical study of China's decision-making process discovered that Chinese managers participate in structured ways, such as through technical consultation or organised staff meetings (Worker Congress). As a result, authoritarianism continues to be prevalent among many Chinese managers. In this regard, factors such as loyalty-based management, the importance of confidence and hard work, the valuing of family relationships over contractual relationships, and reverence for middle and senior management roles all contribute to the differentiation of Chinese management and the introduction of those management styles. Any of these organisational concepts are prevalent in African governments.

Earlier management methods and corporate philosophies (i.e., centralised and authoritarian) were oriented toward established power structures and the presumption of consistency in interpersonal and human behaviour (Stewart et al., 1992). As a result, we have been unable to strike a balance between organisational goals (e.g., production, efficiency) and human requirements (e.g., an acceptable social climate, personal autonomy).

Furthermore, these management strategies were developed during an era when manufacturing was dominant. Therefore, they may not be entirely applicable to a very different market based on information and computing technology because they lack the degree of adaptability necessary for organisations to adapt to an ever-changing world (Javed, Malik, and Alharbi, 2020). Stewart et al. (1992) emphasise the importance of understanding the history of organisations and recommend that administrators depend on internal resources. The objective here is to foster individual growth and a collective culture inside the organisation as a cohesive social unit. Additionally, they argue that the post-modern enterprise's manufacturing structure would be altered to be more customer-oriented than the mass-production approach. Managers must therefore consider and evaluate various management styles to recognise the client's desires and appreciate the preferences, expertise, and future participation of organisational participants, all of which are highly dependent on selecting appropriate management styles.

One might argue that a good management style balances people's wants and organisational functions. The complexity and variety of management styles come from people's many perspectives about how they want to be treated to operate effectively and efficiently. While some people, for example, like to work in teams, others may prefer to be provided detailed instructions or operate alone (O'Reilly et al., 1991). A unique set of guiding principles will define the management style, including the criteria and indicators for effective management practise (Purcell, 1987). However, certain levels of participation and effective communication are needed to enable the exchange of ideas and input into the organisation's implementation of plans.

Today's organisations are undergoing rapid transformation and becoming bigger and more diverse. These advances broaden the breadth of information that managers must deal with daily, and the danger of knowledge overload is imminent (Hedelin and Allwood, 2002). These advancements emphasise the need to use IT and DM as resources for information processing and decision making. The next section discusses NMS with a focus on the connection between IT, DM, and management styles, as well as the role that IT may play in enhancing NMS. Variation between the two distinct management approaches is anticipated.

### 3.2.2 The New Management Style

Organisational management styles have evolved dramatically throughout time. Organisations must adjust work circumstances and the atmosphere in which relationships are formed to meet the requirements of society as a socioeconomic environment that is a resource for employees and consumers (Bertrand and Schoar, 2003; Bulgaru, 2015). New management styles (NMS) appear to result from global competition, economic influences, and increased public engagement. In addition, business demands the improvement of the quality of public services, making it more difficult for publicly traded companies to remain hierarchical and paper-driven organisations (Flynn, Schroeder, and Sakakibara, 1995). Therefore, it is critical to develop a strategic management vision. This strategic perspective will enable managers to comprehend the opportunities and risks associated with new technology and enhance their ability to connect with and recognise different perspectives inside their organisations (Mintzberg, 2005; Yus, 2018).

Numerous studies have been conducted to better understand NMS responses and prepare for future operating circumstances, such as adopting contemporary technology such as DM. Yus (2018) indicates that as the business environment has grown more complicated, managers' roles have changed to become more flexible, regionally organised, and independent, simplifying the implementation of IT and DM.

Jassawalla and Sashittal (1998) classify management thought in terms of organisational adoption of IT and DM into two distinct categories. The first is based on what they refer to as paranoid management thought, while the second is based on pronoic managerial thought (Table 3.2). They suggest the adoption of a pronoic organisational philosophy to assist in the reorganisation of the business because of technological change. This implies that management efforts should move away from a mechanical focus (as dictated by classical ideas) and toward an ecological focus (Halal, 1998). The mechanical model emphasises bureaucratic administration, formalised contact structures, and regulations, while the organic model emphasises the network's power and authority framework.

**Table 4 : Pronoia Vs. paranoid managerial thinking: Adopted from Jassawalla and Sashittal (1998)**

| Paranoid thinking | Pronoia thinking |
|---|---|
| Anti-innovation defensive procedure | Sustaining routine by facilitating access to knowledge that fosters innovation and creativity. |

| | |
|---|---|
| Managing people entails persuading them to perform as anticipated. The behaviour of employees is governed through instructions, incentives, and punishments. | Managing people entails creating an environment where they place a premium on self-expression, personal development, and progress. |
| Managers serve as knowledge and resource planners, consultants, and decision-makers. | Managers need a collective mentor, someone who serves as a facilitator and encourages employees to be creative. |

Additionally, based on his examination of the manager's responsibilities and abilities in a learning organisation, Darwin (2000) categorises the skills of new managers into the following seven groups.

- Leadership and direction via the development of a shared vision, the establishment of goals, and the promotion of inspiration and commitment.
- System thinking involves the capacity to read the environment, manage remotely, and take a helicopter perspective of the organisation to evaluate its characteristics and stakeholders.
- Managing complexity depends on a capacity to tolerate uncertainty and retain flexibility.
- Professional knowledge, which includes personal ambition, strategic awareness, listening and negotiating skills.
- Creativity, which entails the capacity for experimentation and the use of mental models to promote creativity, learning, and invention.
- Teamwork, which entails the capacity to collaborate, form teams, sell ideas to others, and influence them.
- Networking, which entails contact with others and the formation of a unified reality.

It often recognises specific abilities, such as the capacity to accept unpredictability and weigh ambiguity while developing policies in dynamic situations. However, Darwin (2000) argues that pursuing such abilities should not be motivated by a desire to reject traditional ones. Rather, the new skills should be seen as a complement to established management practises.

Brookfield (2000) claimed that managers with the ability to influence human behaviour must create competent work practises or change current practises inside bureaucratic organisational structures. Non-numerical techniques such as encouragement, inspiration, cajoling, and confidence building are excellent ways to address issues. Numerous future consequences and enhancements to public listed entity management that could have an impact on the implementation of IT and DM include the restructuring of

the system of publicly listed entities into more autonomous and regional structures where policymaking and service delivery are combined.

Other studies investigated the impact of IT adoption, such as DM, on management practises to formulate management reactions and define the current form that management would take (Willcocks and Mason, 1988; Lu and Wang, 1997; Jassawalla and Sashittal, 1998; Lynn Kaarst-Brown and Robey, 1999; Piercy, 2018). For example, Willcocks and Mason (1988) asserted that major fundamental problems persist and stem from managers' limited expectations and understandings of what new technology such as DM would accomplish, as well as their negative views about IT and DM use. Numerous scholars (Orlikowski and Baroudi, 1991; Wyk and Chair, 2008) researched the impact of IT on traditional management functions like planning, directing, managing, coordinating, and decision making, and the need for an NMS that takes this influence into account. Lu and Wang (1997) examined the proliferation of information management systems in Taiwan by researching the connection between management styles, user engagement, and programme performance. They attempted to establish distinct management types for each stage of the information technology process, discovering that different management information system development stages need distinct management styles.

Additionally, managers may be flexible and scalable to meet the requirements of all levels. According to Lu and Wang (1997), there are six distinct stages: initiation, contagion, power, incorporation, data, and maturity. They assert that the management styles required to foster user involvement and ensure programme success range from person-oriented to task-oriented. Transferring management activities from one place to another may seem difficult, which this paper does not address.

The New Management Style believes that the usage of IT within organisations has shifted the conventional function of management from managing and coordinating to promoting and improving (Kakabadse, Korac-Kakabadse, and Kouzmin, 2003). However, these results and many others support the idea that IT should be taken for granted while all other operational concerns, including management, should be adapted. Scholars such as Preece (1995) approach this issue by dividing new organisational philosophies (schools of thought) into two categories regarding the integration of IT:

- The deterministic technical school of thought, which views information technology as the single most important factor in determining an enterprise's effectiveness.

- An approach for civic action that views information technology as inspiring rather than deterministic. Administration, the external environment, and society all have a major influence and should be considered and assessed first.

The first perspective ignores other organisational inputs and views IT as a magical instrument capable of resolving all organisational problems while devoid of all other organisational components. This may lead to IT and DM adoption failure since no supporting organisational structure has been established.

This study takes a second perspective that seems to be more appropriate when the relationships between IT, DM, and organisational components are examined. This creates an efficient and supportive environment conducive to the IT and DM adoption phases. Additionally, technology may be created to encourage more efficient corporate and administrative operations and modify or improve inefficient practises. Additionally, businesses must develop a business-driven strategy to achieve coherence in IT and DM adoption. This involves understanding the organisational structure and the complexities inherent in the interaction between IT, DM, and the many components of this environment, including management.

Another significant aspect of the management literature is the fact that most of it was developed in developing nations and has been distributed globally to explain and organise management procedures and research. However, because of these countries' economic, political, and administrative differences, the research results may not be reliable or accurate. To obtain a comprehensive perspective on current management strategies in organisations in developed countries, the definition of management characteristics must be founded on an empirical assessment involving real action. Without empirical data on prevalent management models in industrialised nations and the potential connection between IT, data management, and organisational management, implementing an IT strategy or another organisational approach would be misleading and may result in costly failures. However, the abundant management literature from industrialised nations may offer basic managerial knowledge that can aid in studying managerial theory in emerging countries.

Numerous writers have attempted to approach the subject of leadership and management in industrialised nations on this premise. These activities are discussed in more detail in the next section. This section will provide a theoretical foundation and demonstrate how far established country management methods have strayed from the current perspectives. As a result, the histories of African nations are given more weight. This will be utilised to define certain variants and provide a complete picture of the research.

### 3.3 Management Styles in Developing Countries

The transfer of management ideas developed in the United States and Western Europe to underdeveloped nations is particularly suspect (Law, 2011). Hofstede and Hofstede (1993, 2005), who conducted a study on cultural and socioeconomic inequalities in 50 nations across three areas of the globe, believe that these differences render most of the advanced countries' management and organisational concepts inapplicable to non-developing countries and provide little reference to what makes sense. The influence of a country's dominant national culture must thus be addressed in terms of successful management practises and organisational operations. The underlying premise of this concept is that the environment in which a person lives and works significantly impacts the beliefs, views, and behaviours that shape their individual actions, regardless of whether the individual is a boss or an employee in an organisational sense.

Various scholars (e.g., Zeffane and Rugimbana, 1995; Youssef, 1996; Kirlidog, 1997; Heeks and Stanforth, 2007) have examined management problems in developed countries. For example, Youssef (1996) examined Egypt's reform process for public businesses, noting that reforming public businesses is expected to be a key focus of policy development in industrialised nations, with most efforts directed toward repairing inefficient bureaucracy. However, while the public sector in developed countries appears to be more intelligent, efficient, and capable, the dominant modes of organisational action in developing countries are hierarchical, conventional, and heavily influenced by social order (top-down management approach), in addition to other political, economic, and religious factors affecting management and organisations (Zeffane and Rugimbana, 1995).

In addition, Polidano (2001) states that a lack of knowledge, the insufficient functioning of information technology, and the existence of a strict contradiction between structured and informal rules in industrialised nations' organisations all work against successful management reform adoption. The fast-changing technological environment creates more challenges for developing nations than for rich ones, as 'Developing nations begin with a low base of spending on information technology, a lack of public interest in contemporary communication infrastructure, and a dependence on international companies' (Zeffane and Rugimbana, 1995).

Zeffane and Rugimbana (1995) have argued that developing nations' knowledge and management of such tools, and the acknowledgment of their impact, are more critical than developed countries', due to their lack of capital and the need to maximise the benefits available from the adoption of these technologies. In addition, they reported that developing managerial capacity is one of the most important challenges for developing nations' successful use of new technologies, asserting that management in developed nations

will recognise that the IT and DM cycle needs systemic change and customer participation throughout this period.

A few scholars (Hofstede and Hofstede, 1993, 2005; Kirlidog, 1997; Daft, 2007) have focused on the relevance of developed country literature to developing country literature. They concluded that Western cultures' individualistic existence – which is based more on ego goals and successes than on collective values (collectivism) – limits the validity of administrative or organisational ideas established in these cultures and frequently results in misunderstandings among observers. While familial and personal connections are important in the organisation of group-oriented cultures (e.g., nepotism), they play a minor role in Western society (Zeffane and Rugimbana, 1995). Marshall and At-Twaijri (1996) agreed with this argument, saying that Saudi managers prioritise personal relationships and interests above business objectives and deliver on them. However, the community's strength inside an African collectivist culture will promote cooperation and team management. Corporate executives' social interactions are believed to significantly impact individual perceptions of IT and DM applications. They may therefore be utilised effectively as a tool for corporate change. It is critical, then, to create research methods that address these features to understand the nature of management in developed nations. This is discussed in more detail in the next section, which also reviews the African management literature.

### 3.4 Management styles in West African countries

Until recently, little research was conducted on African administration. Numerous management textbooks have failed to mention Africa (Hutchings and Weir, 2006). Atiyyah (1992) believes that favouritism, nepotism, and familial ties all significantly impact management systems in West African nations. He argues that these detrimental behaviours sometimes result from cultural pressures such as strict parenting and social relationships. In African nations, factors such as extended family, caste, clan, and religion all play a major influence in group life and individual relationships. Thus, rather than practical or academic skills, family connections and ideological affiliations have a major influence on managers' recruitment and promotion choices (Piercy, 2018). Agnaia (1997, p. 117) points out that 'the difficulties that west African organisations have in managing training and development programmes stem from the characteristics of West African administrators who value seniority over competence, centralization over decentralisation, and nepotism over fairness, among other things.

Based on his assessment of various research, Atiyyah (1992) identified two prevalent management styles in West African nations. The first is the authoritarian management style: sometimes known as top-down or micromanagement, this type requires employees to do what they are told, with little opportunity for

disagreement or discussion. The second kind is consultative, which is associated with religions that value consultation. Atiyyah (1992) notes that West Africa's forms of government are generally connected by society. He asserts that a prominent indicator of this is the low emphasis placed on preparedness by West African managers, which he attributes to the underlying fatalistic views prevalent in African culture. According to Atiyyah (1992), organisations in West African nations place a premium on discipline and adherence to established rules and regulations. This hierarchical institutional structure strongly resists implementing novel management and operational methods and procedures. While his research demonstrates the diversity of management styles through the existence of hierarchical and consultative management styles, it paints a poor picture of West African management. This view is no longer very compelling, considering the nature of this study and the technological and systemic change that has occurred in recent years.

In their study of West African management education, Ali and Camp (1995) claim that the region has three challenges: unprecedented growth, poor quality, and a lack of vision. Thus, they imply that most management education programmes fail to meet the demands of contemporary corporate activity and the requirements of the younger generation. Their study of eight West African institutions' management programmes shows that none provide a course on management community or African climate.

Yousef (1998) investigates the impact of corporate culture and the extent to which a company utilises technology as a determinant of decision-making styles in West Africa. He shows that, in addition to decision makers at the educational and managerial levels, these variables are significant determinants of decision-making styles in that area. He also notes that participative management remains popular among young, middle-aged, and well-educated West African managers. His study distinguishes between autocratic, pseudo-consultative, consultative, participative, and delegatory modes of decision making. Although this study provides important insight into West African management, the fact that one statement was used to quantify style based on a self-reported definition diminishes the perceived effect and trustworthiness of the findings.

Throughout the process of elucidating the core of West African management, Galdeano et al. (2019), based on their study of the literature on West African management, offers a theoretical framework for comprehending West African management. The model is centred on understanding the primary sources of West African management, which include people's religion, West African society, the impact of Westernisation, and West Africa's political, economic, and social institutions. It identifies four major impediments to administrative and organisational development in West Africa (Galdeano et al., 2019):

- The discontinuity of management growth initiatives and the lack of well-designed and articulated short, medium, and long-term plans.
- The tension between traditional and novel methods is because of inefficient corporate capital allocation.
- The hegemony of human loyalties and alliances which have a greater influence on interpersonal interactions than on organisational connections.
- The lack of standardised administrative and operational frameworks that clearly define role structure, performance assessment procedures, preparation, and growth requirements.

It is worth noting that many of the studies utilised religious concepts to explain certain disparaging behaviours shown by West African managers. However, these heinous acts do not constitute a significant portion of the West African population. This misconception has been exacerbated by some administrators' misinterpretation and insufficient implementation of such ideas. In support of this, Ali and Camp (1995) and Ali (1996) studied the forces that determine the path of West African management. They identified many important factors that influence West African management thinking, arguing that cultural discontinuity is the most important impediment to the growth of West African management. They believe that existing research on West African management has shown that the present management styles prevalent in West African organisations have been susceptible to external influences and a loss of connection to West African cultural heritage and values.

Additionally, they emphasise the great dedication of West African managers to the religious work ethic. This commitment reaffirms that justice and compassion in the workplace are essential components of community health. As a result of this commitment, management recognises the relevance of individual interests in achieving any prospective development, the critical nature of communication skills and effective public relations in implementing any change, and the significance of systemic improvement that benefits society.

Additionally, the few studies available and the little work relevant to West African management have been conducted utilising a very straightforward and simple approach regarding the techniques and observations made (Ali, 1996). The cultural features of West African civilizations have been mostly ignored and misinterpreted (Ali and Camp, 1995; Ali, 1996), and considerable research (Atiyyah, 1992; Hutchings and Weir, 2006; Galdeano et al., 2019) has been devoted to a theoretical examination of the essence of West African management in the absence of empirical evidence. Indeed, many of these studies have battled with a single component of management practice, even though there is a need to study the impact of management

on various organisational issues, such as IT and DM acceptability. Management research initiatives in West African nations are often thwarted and undermined by a slew of misconceptions about their existence and interference by other sociocultural variables (Al-Okaily et al., 2020).

Additionally, there is a disconnect between religious values and governance systems in West Africa. This may result in West African administrators misinterpreting and even misappropriating religious values. One possible explanation is the lack of management research that considers West African governance as a synthesis of religious and cultural values that are susceptible to external repercussions that may favourably or adversely influence the behaviour of West African managers.

Finally, by examining technology as a reform agent, management models in the literature should be updated to include IT and DM adoption as a significant guiding element in the corporate environment. The study of management types and their relationship to management attitudes toward IT and DM is intended to open new doors, since this connection has not been established in the prior research. According to Galdeano et al. (2019), the increasing number of potential financial, political, economic, environmental, and legal consequences associated with some major management decisions, the increasing sophistication of knowledge, and the ever-increasing pace of change necessitate a thorough rethinking of management objectives. Therefore, greater attention should be paid to the connection between management styles and the deployment of information technology and data mining in this context. This work will analyse management types and their attitudes toward information technology and data mining, defining any recent developments through an examination of previously identified management styles and thereby establishing a link between management styles and attitudes toward IT and DM adoption.

### 3.4.1 The Importance of Attitudes

Attitudes toward IT and DM are multifaceted and reflect a general acceptance of new technologies, a risk-taking proclivity, and/or a drive for creativity (Gallivan, Spitler, and Koufaris, 2005). Individuals' attitudes toward information technology are now classified into two main categories. The first idea classifies behaviours into three distinct categories: perceptual, emotional, and behavioural (Reece and Gable, 1982; Kwon and Vogt, 2010; Schutt and Chambliss, 2011; Venkatesh et al., 2012a). The cognitive component refers to how a person perceives an event, regardless of its reality. The affective component refers to an individual's belief in an item, which influences their judgement of that thing. The behavioural component captures the individual's actual behaviour regarding this item.

It is critical to consider these three components and their connection. For instance, cognitive and emotional components may influence real behaviour when individuals are free to act. Indeed, having a positive attitude toward IT may not be sufficient to influence people's behaviour when using IT resources such as DM. Other variables, such as IT literacy and the availability of IT tools, affect how much information technology is used (Gallivan, Spitler, and Koufaris, 2005). According to analyses of IT and DM adoption, citizens are not a significant part of this cycle (Dunham, 2006; Green and Salkind, 2016). In such instances, the importance placed on their actual behaviour, or the behavioural component of their attitudes, is exaggerated. In contrast, their attitudes' cognitive and emotional components are undervalued or ignored entirely. In the long run, ignorance of both cognitive and emotional components of behaviour will have a detrimental effect on real behaviour and may result in resistance to DM adoption.

The second notion concerns behaviours associated with a particular entity's liking, fear, confidence, and utility (Loyd and Gressard, 1984; Loyd and Loyd, 1985; Francis, 1994; Saeed and Abdinnour-Helm, 2008). The introduction of this notion may be seen as an attempt to highlight the critical nature of the perceptual and successful components of attitudes. Additionally, one might argue that this theme complements the first, which, as previously stated, focuses on the behavioural component of attitudes.

The second research question of this study is the manager's attitudes. This conclusion presupposes that an individual's attitudes toward an item reflect their emotions and ideas about that thing. Recognizing such characteristics substantiates an individual's desire for a certain behaviour toward a particular object. In other words, the first idea is based on the second theme, which gives a more complete picture of the mental and analytical attitudes of information technology professionals, allowing them to either reject or embrace and encourage the use of DM.

Individuals may oppose the adoption of IT, DM, or any other planned change if they think it will have an adverse effect on their economic, social, or personal requirements (Harrison and Leitch, 2000). In addition, changing the existing process structure often raises concerns about future courses and occurrences. Pheng (1999) discovered many variables contributing to people's resistance to change. The following causes include avoiding behavioural habits and complexity, safety (the safe old method), fear of the unknown (uncertainty-avoidance), and selective information processing. Certain kinds of transition responses, including IT and DM use, as described by Patterson et al. (2009), include:

- Aggression on the part of those who believe it is necessary to reduce prices to create more jobs.
- Apathy on the part of those who continue to believe their words are irrelevant.

- A lack of cooperation among individuals who feel insufficient and fear that they will be unable to adapt to the new system of procedures or risk losing their jobs.
- Enthusiasms of optimistic individuals who view change as an opportunity to expand their experience and advance their careers.

It is necessary to investigate these possible reactions to maximise the likelihood of achieving the desired results. Any negative reaction can be eliminated with the assistance of top management, employee-manager engagement, transparent contact processes, and a favourable compensation environment (Pheng, 1999). The methods for minimising workers' opposition to a new programme such as DM may be closely related to the management style in place at the company where the new method or reform is implemented. It is therefore critical to develop strategies for growing and mitigating resistance to change. As a result, it is critical to examine the relationship between management styles and attitudes toward IT and DM.

Based on the rational behaviour principle and the impact of employee values and attitudes on the exchange of organisational knowledge, Kolekofski and Heminger (2003) have shown that the function of attitudes throughout the information sharing phase is more complex than previously thought. Learning about and incorporating these perspectives and behaviours provides a qualitative and credible source of information that is critical to consider when discussing the advancement of IT and DM implementation strategies. Given the social environment in which an individual behaves, and the benefits stated for an attitude variable, it can be said that attitudes may be used to anticipate people's responses and behaviour. Numerous variables are at play in the context of a particular entity, and each of them influences the individual's behaviour. Thus, a person's behaviours are better viewed as promoting triggers for a specific action (Moon and Kim, 2001). Given the widespread use of IT today, it is reasonable to assume that citizens have developed some attitudes toward IT and DM. The thoughts and responses of individuals to IT software such as DM are often well-known (Shaft, Sharfman, and Wu, 2004), which is one of the study's central issues.

### 3.4.2 The Attitude of the Person Towards it and Data Mining

Throughout his examination of the variables affecting an individual's perception of digital technologies, Bill (2003) noted that several factors affect the evolution of attitudes toward information technology. Among these factors are the organisation's beliefs and ideals, size, gender, and cognitive capacity. Bill (2003) noted that younger generations are more optimistic than their elders. He also noted that several studies indicated that males, regardless of their level of technical experience, appeared to have more favourable attitudes toward IT than females. Conversely, as familiarity grows, female views become more favourable. Due to the demanding nature of technology, low cognitive abilities result in negative attitudes

toward information technology. A better understanding of these factors may thus serve as a foundation for improving the adoption of IT and DM in organisations (Avgerou, 2008).

The significance of this idea is based on the premise that people's reactions to information technology vary according to the impact of IT adoption on their work practices and the unique circumstances of their organisations. Many literature reviews have identified numerous IT implications for employees and managers. Several of these effects are detrimental to workers and management, including reduced staff numbers, decreased employee privacy, and social isolation. Other effects may result in improved working conditions, increased productivity, and more worker control (Brynjolfsson and Hitt, 2003). Understanding the organisation's internal characteristics before embarking on the DM adoption process will improve the effectiveness of any future DM adoption approach. Choosing the most successful integration strategy entails a comprehensive study of business participants' behaviour and attitudes about engaging with or learning new technologies such as DM. Worries regarding these effects include:

- How are people inside organisations supposed to react to these implications?
- What are the rationales for the different possible responses?

These and other issues form the basis of this research. Cukier and Middleton (1996) found that managers' views about the use of information technology such as DM inside their organisations were influenced by their perceptions of the benefits and drawbacks of IT in their own work activities. They differ according to the manager's preferences. Categorizing managers according to their demographic features may offer a useful data source for developing inclusive organisational policy.

To classify managers according to their demographic characteristics within the context of this research, five relevant demographic characteristics will be identified through a review of the available literature: gender, age, educational level, organisational experience, and scope of control. These characteristics will be used to categorise managers in the Nigerian public sector. The purpose of analysing the relationship between these qualities and managers' attitudes about IT and DM is to offer a credible data source for the strategy development phase. The following section summarises such connections as addressed in the literature and proposes various research questions to re-evaluate the findings of prior studies; then, it explores such links within the context of the Nigerian public sector.

### 3.4.3 Attitudes of Managers towards Information Technology and Data Mining

Lin and Chen (2000) used the socio-technical system to demonstrate the critical importance of the social elements of the information technology process. According to the socio-technical system, an organisation

is comprised of two interconnected subsystems. The first is a technical system in which equipment, procedures, and technology are emphasised. The second kind of system is the social system, which is concerned with the views and interactions of individuals inside the organisation. The study yielded several significant findings. Management methods have been found to explain about 24.1% of the development of IT adoption. Community factors and organisational impacts combined account for 35.3% of the variance in IT adoption success. As a result, analysing managers' perspectives on IT and DM adoption is a critical task that should not be overlooked.

Hanna et al. (1995) examined the history of a few industrialised countries, including Canada, Germany, Ireland, the Netherlands, Sweden, the United Kingdom, the United States, and Japan. They concluded that managers in developing countries are likely to avoid imperatives such as knowledge exchange and collective decision making, which could influence the implementation of IT in these countries. Nonetheless, other factors, such as 'technical culture' – which may be defined as the cultural influence and familiarity of people with technology developed in other nations – must be considered (Straub, Loch, and Hill, 2001).

In addition, professional preparation may change an IT manager's viewpoint. For example, research undertaken by Straub et al. (2001) discovered that in five African countries, a distinction could be made between the experience of senior IT managers and that of lower-level managers and staff. They believe senior executives are generally enthusiastic about IT adoption because of the technology 'culture' process affecting them. This cycle will significantly impact how IT and DM are implemented in developing countries, as most senior managers receive their education in developed countries. Indeed, African nations are not an exception.

The views at a lower managerial level are likely to be more impactful than top management's formal strategies, since lower-level managers are directly involved in the practical aspects of IT and DM adoption through their daily use and engagement with employees and service users. More importantly, given the scarcity of scientific studies, no one can assert that structured proposals for computer systems developed by top-level executives accurately reflect the reality; they should rather be focused on people who operate or interact with IT and DM. Therefore, this research will make a significant contribution by examining the attitudes of low-level and middle-level managers toward IT and DM and the effect of management styles on managers' attitudes toward IT and DM as a dependent variable.

### 3.5 Demographic Characteristics

#### 3.5.1 Gender

According to research, men and women have distinct attitudes toward information technology. Men have more favourable attitudes toward information technology regardless of their level of familiarity, whereas the attitudes of women become more favourable as their level of familiarity increases (Schumacher and Morahan-Martin, 2001). Igbaria and Chidambaram (1997) examined the impact of gender on information technology usage and concluded that there are substantial gender disparities. For instance, on average, women were somewhat less experienced and younger than men, with lower incomes and fewer chances to connect with individuals beyond their departmental boundaries. Santos and Santana (2019) stated that men and women absorb information differently and that men possess more analytical and mathematical abilities than women, according to an examination of the low representation of women in computer studies, programming, and other IT-related courses. Consequently, they believe that women are more likely to experience computer anxiety.

Forster (2000), meanwhile, believes that new communication technology may be a significant ally for women in the workplace, since organisations' work will increasingly depend on intellectual capacity. Consequently, conventional organisational barriers between men and women will be eliminated. Kay (2006) examined the methods used to investigate gender differences in computer-related behaviour and discovered that, of the 98 attitude measurement studies, 48 revealed that men had more positive attitudes toward IT, 14 revealed that women had more positive attitudes, and 36 revealed no differences. The incompatibility between IT and gender indicates the need for further research and a more precise categorization of attitudes.

The scarcity of studies on information technology in African nations is a significant problem. In African culture, men are generally more engaged in their social lives than women, which may result in some variations in their perceptions of IT and DM use, since men are more exposed to debates about and the use of IT and DM. However, women's usage of certain basic computer programmes for secretarial work may help bridge this divide and foster positive views about more sophisticated computer applications like DM.

#### 3.5.2 Age and organisational experience

According to Gardner et al. (1993), there is a positive correlation between information technology contacts with machines and individuals' expectations, while bad IT encounters are linked with unfavourable views and attitudes about technology. As a result, those with good experiences share positive ideas and attitudes. According to Santos and Santana (2019), inexperienced consumers perceive IT as impersonal, inaccessible,

difficult, or boring, requiring a high degree of technical skills and computer expertise to utilise. Carnoy (1997) showed that computer knowledge might help decrease opposition to new technology adoption. Thus, more senior, and experienced managers are more likely to encounter issues with IT literacy, causing them to reject the use of technology (Carnoy, 1997). Certain authors asserted a connection between experience, age, and IT literacy, suggesting that older managers may be unable to fulfil technical criteria associated with IT adoption, such as having adequate IT literacy (Kaul, 1997; Bennett and Muraleedharan, 2000; Kakabadse and Korac-Kakabadse, 2001). As a result, these managers will likely be replaced by younger, more technically savvy employees (Jasperson, Carter, and Zmud, 2005).

### 3.5.3 Educational Level

Another significant factor influencing managers' views toward IT and DM is their educational level. Prior research indicates that people with a higher level of formal education are more likely to embrace new technologies sooner than those with a lower level of formal education (Rogers, 1995; Hong and Kim, 2002). However, education is a more prevalent factor in developing nations, where individuals have fewer chances to pursue higher education due to financial constraints and expensive school costs. The situation is very different in industrialised nations, where education is more readily accessible at a reasonable cost. This, in turn, may result in significant variations across nations regarding the effect of age and educational levels on IT and DM adoption. Thus, it is unsurprising that several studies performed in wealthy nations (e.g., Tabak and Barr, 1999) have not discovered a statistically significant connection between education level or age and the desire to innovate.

### 3.5.4 Span of control

The term 'control span' refers to the organisational structure of relationships between leaders and subordinates. When a manager supervises many subordinates, the range of control is broad; when a manager supervises a small number of subordinates, the control range is limited. Consequently, a broad range of control is seen as a valuable source of information and expertise, including technical knowledge, which may inspire managers to adopt behaviours throughout the organisation – including any possible IT or DM adoption (Hill and Hoskisson, 1987; Lawler and Worley, 2012). As a result, this study is a chance to highlight a problem that has received little attention in prior research.

## 3.6 Research Gap

The review of various literature brings some key gaps that must be addressed. Among the most important is a methodological gap—most previous research employed either quantitative or qualitative data. In addition, the study identifies theoretical gaps in the other reviewed studies. Another significant gap that seems to exist in prevailing literature is the influence of political and administration bias that tend to

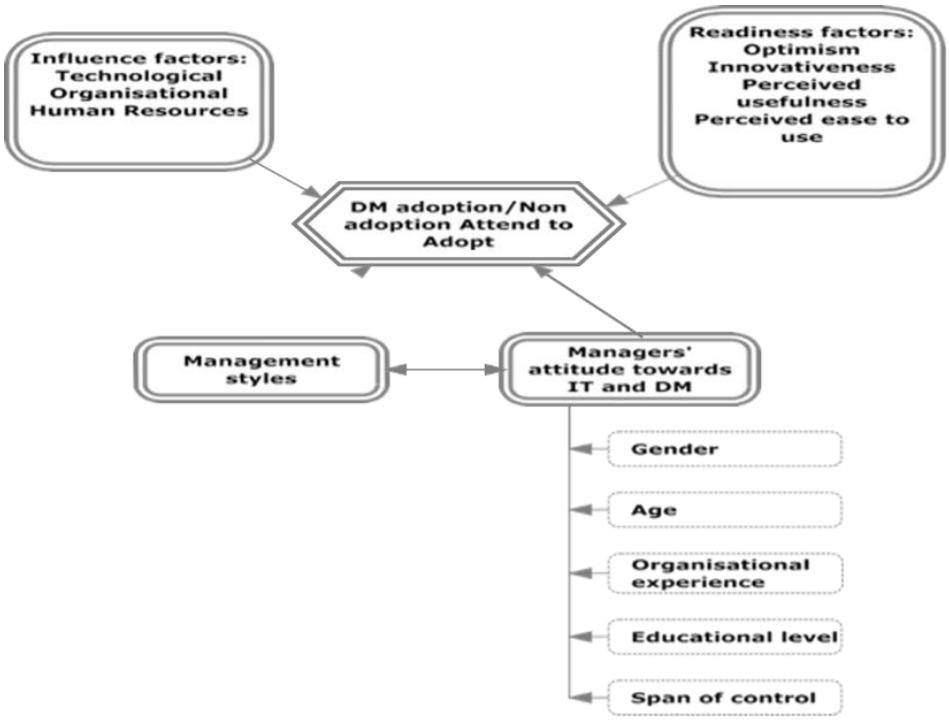
undermine credible data for the personal gains of public servants. Including this relevant factor will clarify the triggering setbacks in AIS application, especially in developing countries, when considered. Also, strong cultural sentiments could limit the efficiency of these accounting systems, which could hinder adaptability to this novel practice, which is not accounted for in existing literature.

In certain developing nations, attempts to obtain demographic data are outlawed as breaches of moral rights, especially in gender-biased religious practices, affecting data mining's inclusiveness. In addition, fast-evolving data mining technologies could make past studies obsolete or useless when evaluating new research, ethics, and algorithms that redefine AIS systems in complicated public services. Most literature expounds on the benefits of implementing AIS systems in public sectors. However, there seems to be a neglect of measuring the political will in implementing these systems through data mining, a critical component of AIS implementation success. This indicator varies across countries, which this study aims to elaborate on in a deeper analysis.

### 3.7 Conceptual Framework

Based on the literature evaluation provided in the last two chapters and the research questions suggested.

**Figure 18: Research Conceptual Framework**



This model examines the relationships between demographic features and attitudes of information technology and data management managers. Additionally, it indicates a potential correlation between IT and DM managers' attitudes and management styles. The Data mining adoption, non-adoption and the intend to adopt are the dependent variables while the influence factors, readiness factors, management styles and managers attitudes towards information technology and data mining are the independent variables.

### 3.8 Research Hypothesis

A collection of research hypotheses is provided based on the preceding examination to explain how the above factors are expected to influence a manager's choice against using DM technology. Each hypothesis is a connection between a dependent concept and an independent concept, either positive or negative. Each idea represents one of the established issues, and each theory implies a hypothesis or connection rather than a cause.

**Individual characteristics in data mining readiness**

Human characteristics such as age, class, education, and job duties are said to influence creativity, which results in a willingness to embrace technology (Trice and Treacy, 1988; Agarwal and Prasad, 1999; Venkatesh and Morris, 2000; Taylor, 2004; Kay, 2006). For more than three decades, specific differences in customer preferences have been included in computer management analyses (Taylor, 2004). Cognitive ability was one of the perspectives on personality differences that were believed to impact the design and implementation of the information system. Understanding these human characteristics and variances is likely to improve the understanding of public sector employees' overall readiness to adopt data mining technology. In addition, human variability often influences how people acquire beliefs, form behaviours, and choose behavioural objectives (Gefen and Straub, 1997).

According to the limited existing studies, there is evidence that attention has been given to the gender effect on technological expectations and results. For instance, several studies have shown disparate views toward technological development (Venkatesh and Morris, 2000; Kay, 2006). In addition, although Nigeria has a policy of equal opportunity for men and women to work in government and hold positions in government agencies, there is an implicit gender divide in data mining in the Nigerian public sector. Thus, the following hypothesis is proposed:

***H1: There is a significant gender disparity in terms of willingness to adopt and use data mining technologies.***

**Factors influencing the decision to Adopt data mining**

Technology is a critical enabler in the execution of any initiative, system, or policy. Assuming that ICT is the most efficient method of collecting, processing, converting, and disseminating information (Sharifuddin and Rowland, 2004) results in the actual outcomes of any operational effort (Nemati and Barko, 2003). In general, the structures inside an organisation will affect the choice to adopt contemporary technology. Ang et al. (2001) found that a company with many well-organised technical issues is more receptive to new technology. In addition, certain technical considerations, such as the appropriateness of professional help, the compatibility of programmes with current operating systems, and the availability of current ICT infrastructure, will affect the choice to adopt data mining technologies.

Spanos et al. (2002) imply that operational issues, such as policy, governance, and management procedures, were significant organisational factors. Hwang et al. (2004) have examined the features of organisations, such as complexity, top management assistance, and organisational needs. They identify certain organisational influences – including scale, the presence of champions (individuals who consistently embrace the introduction of digital technologies in an enterprise and typically inspire their associates and employees to endorse their ideas), top management support, and a company's internal requirements – as significant factors that influence implementation.

Human resources are another critical element that must be handled through new technologies such as data mining. It is consistent with the idea that development endeavours need the participation of individuals, particularly those who are experienced and competent in adopting the technologies. Spanos et al. (2002) studied human resource features and discovered a strong correlation between employees' analytical skills and the use of DAA technologies in information management. The findings indicate that a business with employees with the necessary analytical abilities should be capable of grasping and using cutting-edge technology. Additionally, there is a significant connection between the possibility of using DAA technology and an increased emphasis on leadership abilities. Huang et al. (2012) showed a significant correlation between human resource issues, such as employees' inclination toward data services, and adopting data mining technology.

Ang et al. (2001) described environmental aspects as a collection of factors influencing how technology was used in public sector contexts. This study focused on regulatory advice, public openness, and a more favourable business environment. For example, political influences may significantly impact the decision-making cycle in the public sector. Frequently, unwritten regulations or standards must be applied by government entities (Sharifuddin and Rowland, 2004). Sharifuddin and Rowland (2004) discovered a

favourable correlation between external issues (policy directives) and the growth of information assets through knowledge management technology efforts. According to Ang et al. (2001), civic transparency (external problems) is inextricably related to information technology use. The public sector will generally embrace technology as a means of carrying out their civic responsibilities more effectively. This is because public service agencies are accountable for the money they receive and the execution of departmental programmes (Hyndman and Anderson, 1995). Thus, the following hypothesis is proposed:

***H2: Technological, organizational, and human resources and external issues all have a major impact on the choice to adopt and use data mining technologies.***

**Reasons for not adopting data mining**

The characteristics of technology may also act as a deterrent to implementing contemporary technologies. For example, technical problems such as complexity, the time required, and trouble selecting appropriate software packages have been cited as reasons for failing to adopt contemporary technology (Tan et al., 2016). To begin, a network's complexity must be controlled and tailored to the features of the organisation's current technological infrastructure (Chau and Tam, 1997). Additionally, satisfaction with current procedures and infrastructure will likely dampen the motivation to enhance or convert to new technologies (Chau and Tam, 1997).

Organisational issues, such as commitment to top management, have been characterised as being essential and necessary for propelling the business forward on a certain path, alongside strategic thinking, knowledge, and preparedness (Keen, 1993). The encouragement of top management is critical in determining how new information technologies are implemented (Zmud, 1984; Scott and Bruce, 1994; Hwang et al., 2004). This endorsement implies that the enhancements are required and will be funded. Occasionally, this also means that financial support and other instruments must be made available to ensure the project's success (Dahlan et al., 2003; Hwang et al., 2004; Kim et al., 2004). Calderon et al. (2003) observed that the reasons for not using data mining were linked to resource constraints, namely a lack of resources and top management support.

Several of the primary challenges associated with deploying data mining technologies are related to the workforce – the end user who interacts with technology at the organisational level. It is a human element, as employees must possess the necessary knowledge to be competent in using technology, be aware of the importance of new technology, and develop a favourable attitude toward technological advancement. Where changes in the way new technologies are used are not immediate, they are likely to be postponed

(Spanos et al., 2002; Nemati and Barko, 2003; Hwang et al., 2004; Kim et al., 2004; Sharifuddin and Rowland, 2004). Thus, the following hypothesis is raised:

***H3: Technological, organisational, and human resource problems, as well as external factors, all contribute to the choice not to adopt and use data mining.***

**Knowledge about and intention to adopt data mining**

In terms of information, perception, and desire to adopt data mining technologies, this is the stage at which prospective customers learn about the nature of technological resources and develop an understanding of how this technology will help the business achieve its objectives (Cooper and Zmud, 1990). The objective that will follow is for management to make a constructive choice that, for example, a specific data mining approach and associated software kit should be implemented. Two fundamental behavioural principles of the Technology Adoption Paradigm influence the choice to utilise technology: usefulness and ease of use (Legris et al., 2003; Riemenschneider et al., 2003; Amoako-Gyampah and Salam, 2004). In addition, awareness of data mining terminology and even expertise with data mining may result in technology adoption. More precisely, the established study model will investigate the connection between data mining experience and a willingness to embrace technology. Thus, the following hypothesis is raised:

***H4: There is a correlation between data mining expertise and the desire to adopt and use data mining technologies.***

According to Venkatesh and Morris (2000), quality of education has a role in adopting technology. This argument asserts that better education and job training would result in a stronger preparedness for the advent of data mining technology. The level of schooling obtained is negatively associated with machine fear (Parasuraman, 2000). Quality of education is believed to be indicative of a prospective learner's ability and, therefore, to be highly linked with attitudes and expectations. In terms of cognitive style, there is a greater comprehension and expectation formation ability than what is acquired through higher education (Agarwal and Prasad, 1999). Thus, the following hypothesis is raised:

***H5: There is a considerable variation in how prepared individuals at various levels of education are to use data mining technologies.***

Job role and task intensity correspond with cognitive style (Taylor, 2004). Cognitive style is associated with a person's thinking processes (Hunt, Thomas, and Eagle, 2002). This is linked to how people overcome

obstacles, interact with others, and comprehend issues (Taylor, 2004). Numerous studies have revealed differences in cognitive style across job positions within the same organisation (Allinson and Hayes, 1996). For example, personnel managers are more pragmatic than development, marketing, and financial managers, implying that accountants and bank managers are highly analytical.

The purpose of this study's analysis is to determine respondents' level of involvement with the accounting information system. While accountants, auditors, and information management personnel need distinct and highly analytical cognitive styles, differences in how these groups operate often result in cognitive style disparities. Thus, the following hypothesis is raised:

***H6: There is a substantial disparity between respondents' various work functions and their willingness to embrace data mining technologies.***

Numerous researchers have found that years of experience in various job roles strongly correlate with an individual's attitude toward technology adoption (Davis, 1989; Agarwal and Prasad, 1999; Venkatesh and Morris, 2000). As Agarwal and Prasad (1999) stated, those with direct experience with relevant technology are more likely to have favourable attitudes about new technologies. This indicates the belief that as applied development use increases over time, people will better know the benefits and drawbacks of its use (Venkatesh and Morris, 2000). According to this study, the longer a participant has been with the organisation and is involved in accounting information systems, the more likely it is that they will have a favourable attitude toward adopting data mining technology. Thus, the following hypothesis is raised:

***H7: There is a substantial difference between years of expertise with the AIS and willingness to embrace data mining.***

Adoption groups are classified into three categories based on their reaction: adopters, non-adopters, and 'do not know/are not aware'. This classification assumes that all three courses will have different degrees of preparedness. A lack of knowledge about these technologies will influence their capacity to accept them. Although expert groups are more likely to do so, they have made an informed decision about whether to follow it. To assess the level of preparedness in such courses, the following hypothesis is raised:

***H8: There is a significant disparity in the preparedness of adopters, non-adopters, and do not know (not aware) groups to use data mining technologies.***

The adoption of information technology and information systems may influence the way users of the information system make decisions (O'Donnell and David, 2000). The use of data mining methods would result in improvements in practise and a change in the decision-making process. For example, the use of such technology in investigations has proven critical in identifying fraud (Harding, 2006).

The impact of data mining technology adoption may be studied by examining the efficiency of the AIS and the decision-making process. Gurbaxani and Whang (1991) examined the impact of computer technology on the company and the product's business. They concluded that digital technology has facilitated businesses' ability to handle decision-making processes more efficiently, which has improved the efficiency and speed with which management decisions are made. Adopting information systems and technology has also been shown to reduce the cost of organisational communication.

According to this research, the future impact of data mining will be determined by the effectiveness of the accounting information system and the decision-making process in the public sector. While accounting information is not the main source of knowledge, it is critical to the decision-making process. By implementing new information management rules, it is possible to propose that the accounting information system will generate more relevant data.

These systems store and produce the data that businesses need to plan, analyse, and understand their operational and financial circumstances (Kaplan et al., 1998). The success of the AIS would also have a major impact on the company's overall production and decision-making process. Companies mainly use ICT, decision support systems (DSS), and executive support systems (ESS) to assist organisational decision making. These programmes aid decision making by enabling managers to more easily choose, organise, and display information and analytical results (Kacmar, Fiorito, and Carey, 2009).
Data mining tools may aid decision makers. The use of data processing methods inside the AIS will aid in the production of correct knowledge and the creation of new information alternatives that may influence choices, such as interface functionality and database connections (O'Donnell and David, 2000). This is because different degrees of knowledge about data mining techniques would affect an individual's comprehension of the consequences of data mining. The better one's knowledge of data mining methods is, the more accurate one's forecasting of data mining's future impact on the efficiency of the accounting information system and decision-making process can be. Thus, the following hypotheses are raised:

***H9.a: Respondents with a greater knowledge of data mining technology have a more favourable view or anticipation of data mining's impact on the AIS than those with a lesser comprehension.***

***H9.b: Respondents who are more aware of data mining technology have a better knowledge or belief about the impact of data mining on decision-making than those who have less information.***

Numerous success indicators have been utilised in past studies and may be classified into four broad groups: client retention, programme utilisation, decision-making efficiency, and organisational performance all depend on customer retention (Choe, 2004). In this study, the satisfaction of the AIS client and its assessment of the quality of the data generated by the programme will be used as a proxy for the programme's performance. The accuracy, completeness, and clarity of the findings are all considered to be quality components. The desire of public sector departments to use data processing technology is believed to be related to the success of AIS. Thus, the following hypothesis is raised:

***H10: There is a correlation between the desire to use data analysis and the Accounting Information System's efficiency.***

**3.8 Conclusion**

An earlier study identified organisational styles that fall between task-centred and people-centred orientations. Former management schools were reorganised into one of two types. For example, scientific management schools are concerned with achieving corporate objectives and fundamentally misunderstand worker demands. Public resources and organisational cooperation, in contrast, emphasise the value of human-centred management. Numerous new management studies have elucidated a variety of management styles, ranging from hierarchical and autocratic (task-oriented) to participative and consultative (people-oriented) approaches. The features of the NMS were discovered through a series of studies conducted in emerging nations, with the expansion of digital processing technology serving as a catalyst for developing these traits.

It seems implausible to disregard well-established, monitored, and likely increasing management features within this sector. Nonetheless, the fundamental framework of managers' conception of people management needs to be altered to suit the planned innovative transformation. This paradigm combines elements of both conventional and non-traditional management systems, implying a range of management techniques. While certain fundamental organisational characteristics, such as staff and administration – as well as critical organisational processes, such as preparation, coordination, control, and management – have changed significantly, they will continue to be the central focus of the two management philosophical schools that are difficult to distinguish.

Regarding the African environment, the appropriateness of African management features for IT and DM implementation has received little attention in the existing literature. Furthermore, numerous studies have also expressed a negative view of the nature of African management models, elevating western management styles above African management styles. As such, this chapter emphasises the need to conduct an in-depth study on administration in African nations. To this end, this research will examine the characteristics of African governance. Furthermore, it will propose a two-dimensional paradigm for the study's broad framework, namely task-centred and people-centred management styles.

The chapter examined managers' views about IT and data management and the potential influence of demographic factors on these attitudes. Most of the existing relevant research has been performed in developed nations, with just a handful considering a developing country's viewpoint on these problems. The previous analysis of management literature revealed the absence of an optimal management style and the similarities between various management styles. Thus, a new study question is posed to address the current gap in the literature on African management styles in general and the Nigerian public sector more specifically:

- Which management styles are prevalent in Nigeria's public sector?

# CHAPTER FOUR

## Research Theoretical Frameworks

### 4.1 Introduction

This chapter addresses the theoretical frameworks adopted for this study. This research is supported by several theories, including the Stakeholder Theory, the Contingency Theory, and the Agency Theory; these theories are discussed more comprehensively in the subsequent sections.

### 4.1.1 Stakeholders Theory

Stakeholder theory is strategic management that encompasses the organisational theory and organisation ethics (Freeman, Phillips and Sisodia, 2020). Much research on stakeholder theory has concentrated on determining which stakeholders deserve managerial attention (Wood *et al.*, 2021); this is referred to as "stakeholder salience". Most of the research on this subject has been on stakeholder-organization relationships based on power dependencies, legitimacy claims, and urgency (Agle *et al.*, 2008; Miles, 2017). The stakeholder theory asserts that values are an integral component of business and refutes the concept of separation (Freeman, Wicks and Parmar, 2004). Furthermore, the theory argues that ethics and, by extension, stakeholders are critical and essential components of every business. Freeman, Wicks and Parmar's (2004) Stakeholder theory is primarily a normative theory with instrumental and descriptive aspects. It instructs managers and organisations on how to conduct themselves morally and acceptably regarding stakeholders' interests.

Freeman (2016) defined stakeholders as "groups of people that may influence or are influenced by an organization's mission accomplishment." The stakeholder theory is the organisational theory that has been widely utilised to regulate stakeholder management. Stakeholder theory is predicated on the premise that values (ethics) are an inherent and explicit component of conducting business" (Freeman, 2016). The organization's goal with the stakeholder approach DM and AIS is to maximise corporate value generation based on relevant stakeholder interests in terms of comprehensive data and technology management in Nigeria.

This is consistent with Michael Porter's statement that companies "must seek out chances to generate shared value," which includes benefits for the organisation and its stakeholders. This implies that the fundamental business of generating and growing shareholder value is impossible without the proper use of technology and data mining. This research validates the stakeholder theory since the whole ministry of education and sports in Nigeria recognises the importance of Data Mining and Accounting information systems.

An important point of observation is the political interest of stakeholders in the public sector that are associated with partisan ideologies that tend to undermine the efficiency of service delivery in the country's public sector. Since the government appoints senior positions, stakeholders are forced to foster the perceived goals of the administration rather than the constitutional acts upon which these ministries, departments and agencies are established. This will play a key role in this study as it will unfold important political factors influencing Data mining technology and its application in the Nigerian public sector for accountability. For example, the stakeholders in the educational sector are the schools, the teachers and unions, and the stakeholders of the sports sector are the Nigerian football federation, the football teams, coaches, souvenir shops, etc. The decisions from the upper echelon of management significantly affect how the sector will perform. If the decision looks to expose their wrongdoings, the upper echelon will do anything in its power to prevent the implementation of AIS and DM. Since the independence of Nigeria, public administrative issues have changed the bad image of the public sector bureaucracy in the country. The following are some of the main problems facing the public service that the adoption of AIS and DM will address and limit with the assistance of the Allison Ayida Civil Sector Review group from 1994:

(i) The politicisation of the Civil Service's highest echelon
(ii) Financial irresponsibility and impropriety
(iii) Discipline continues to deteriorate
(iv) Corruption has been almost institutionalised at all levels and sectors of the Service
(v) Ignore all rules and regulations
(vi) Directional ambiguity
(vii) The deterioration of efficiency and effectiveness on a broad scale

To address these difficulties, it is critical to adopt AIS and DM. While neither is a safe harbour nor a wonderful grace, they will help to mitigate the problems that have afflicted the Nigerian public sector for the last twenty-five years. Though the problems are not exclusively financial, it is impossible to ignore the installation of AIS and DM since when everything is in sync, issues of direction, effectiveness, efficiency, and corruption are eliminated. Of course, bureaucracy is a problem that may stymie AIS and DM implementation, but the country's rotting integrity could prevent bureaucracy from hurting AIS and DM implementation.

### 4.1.2 Contingency Theory

According to contingency theory, an accounting information system should be adaptable to its environment and organisational structure. Accounting information systems must also be capable of adjusting to the choices under consideration. In other words, accounting information systems must be built on an adaptable

foundation. The first article in the accounting literature to explicitly address the contingency perspective of accounting information systems was "A Contingency Framework for the Design of Accounting Information Systems" (Otley, 2016; McAdam, Miller and McSorley, 2019). This article established a foundation for evaluating accounting information systems from a contingency standpoint. Williams, Ashill and Naumann (2017); Araral (2020) found that environmental unpredictability is a primary motivator of successful companies' management accounting systems design.

While contingency theory has been widely researched over the past two decades, it has received relatively little attention regarding the variables that affect accounting information systems and technology. Additionally, this theory helps the research by allowing for the adoption and use of Data Mining and technology in AIS.

### 4.1.3 Agency Theory

In general terms, an agency connection is any relationship between two parties in which one, the agent, acts as the principal's representative in day-to-day interactions. The principal or principals have engaged the agent to execute service on their behalf. This is critical since a large portion of the reason for technology, accounting, and auditing is to manage incentive issues (Homayoun and Homayoun, 2015; Bendickson *et al.*, 2016; Zogning, 2017). Generally, the principal is risk-averse, whereas the agent is risk and effort averse. Both the principal and agent are self-interested, which often results in competing goals. Compensation contracts reconcile these opposed goals (Homayoun and Homayoun, 2015; Bendickson *et al.*, 2016). A contract, regardless of whether written, is the sharing rule that defines how the result is allocated between the principal and the agent. Thus, agency theory enables a formal, direct examination of the economic components of incentive pay contracts based on effort levels or surrogates for effort levels. This theory provides a framework for addressing these concerns and thoroughly analysing the relationship between accounting information systems, technology, and data mining. The National Universities Commission, the Joint Admissions and Matriculation Board, the National Board for Technical Education, the Tertiary Education Trust Fund, the National Examination Council, and the West African Examination Council are some of the agencies under the Nigerian Ministry of Education.

## 4.2 Conclusion

The theoretical framework adopted for this study is the stakeholder theory. The stakeholders are the most important players in an organisation. The stakeholders in the Nigerian public sector are the taxpayers, the citizens. This theory suits best for this study.

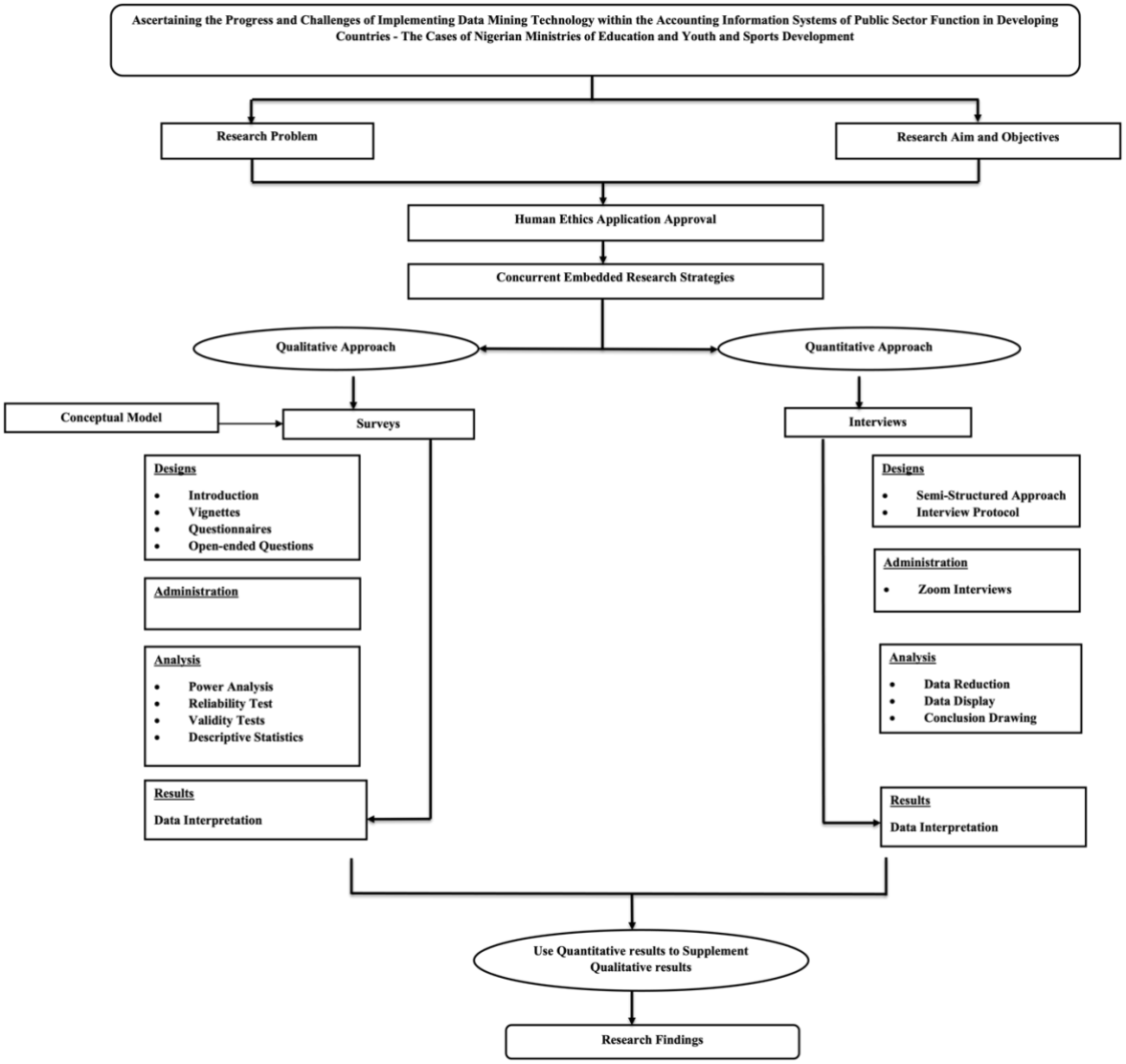
# CHAPTER FIVE
# RESEARCH DESIGN AND METHODOLOGY

This chapter addresses the study design and techniques that will be utilised to execute a triangulated research approach. First, a sample questionnaire will be administered to supplement the data collected, followed by a series of semi-structured interviews.

## 5.1 Research Design

The research design chosen is appropriate for the investigated topic because it is compatible with the study's objectives. In addition, the data collection methods employed are adequate for eliciting responses to the research questions (Bryman, 2003). Creswell (2014) defined the analytical process's sequence as "sequential procedures in which the researcher attempts to expand on or extend the findings of one method with another." According to Creswell (2014), research may begin with a quantitative approach that evaluates hypotheses or concepts, followed by a qualitative approach that includes an in-depth study of a few instances or people. This study began with reviewing literature and creating a quantitative survey instrument to ascertain the variables' relationships. Finally, qualitative interviews were conducted to expand on and improve the quantitative results. The graphic below depicts the study's design structure. Numerous phases in the design of the research are explained and justified.

**Figure 19: Modelling the research design adopted in this Study**




## 5.2 Research Philosophy

Arbnor and Bjerke (2011) identified various interconnected variables influencing how researchers generate information. The researcher's context perceptions, convictions, and paradigms are among these variables. They defined a paradigm as a collection of concepts encompassing an individual's views of truth, science, and scientific ideas and their ethical and aesthetic sensitivities. In the social sciences, Arbnor and Bjerke (2011) and Kuhn (2021) have offered two very separate viewpoints on paradigm development. Kühnle (2010) began by examining how different natural science paradigms evolved. Kühnle (2010) began with mathematics and astronomy and progressed to more recently evolved fields such as motion, fire, historical geology, and biology. According to (Kuhn, 2021), "It remains an open question what parts of social science

have acquired such paradigms at all" (Kuhn, 2021). Arbnor and Bjerke (2011) wrote, “We (along with many others) have found Kuhn's method of research to be gratifying while recognising a major difference between the scientific and social sciences.” In the scientific sciences, established paradigms are gradually superseded by new ones; in the social sciences, established paradigms usually coexist alongside new ones” (Arbnor and Bjerke, 2011).

The literature on DM adoption illustrates the idea that many perspectives may coexist successfully. Depending on the topic under discussion, research on the subject uses a variety of perspectives and analytic methods. Therefore, the ability of an individual researcher to choose from a range of paradigms and methods is seen positively in DM adoption. This skill is well-suited to Greene et al. (2005) "pragmatic stance," which they define as "an open methodological context through which various concepts and disparate approaches can easily exist" (Greene, Kreider and Mayer, 2005).

Historically, positivist, post-positivist, interpretivist, and critical paradigms have been employed in studies of IT and DM adoption (Orlikowski and Baroudi, 1991; Klein and Myers, 2011). While these paradigms are different, they are becoming more confused as the results of one paradigm seem to be blended or amalgamated with those of other paradigms (Myers and Klein, 2001; Neuman, 2011). As a result, mixing several paradigms is popular in IT and DM adoption studies (Mingers, 2001; Myers and Klein, 2001).

### 5.3 Sampling Size and Sampling Technique

Sampling implies selecting some part of an accumulated or totality based on a judgment or inference about the aggregate or totality (Taherdoost, 2018). The sample size aims to have an appropriate number of respondents to participate in the study (Hameed, 2016). Probability sampling was used because this method of sampling uses random selection so that all units in a population have an equal chance of being selected. Under probability sampling, a simple random sampling technique was used. Simple random sampling is where a sample is selected for a study from the population. Everyone is chosen entirely by availability, and each member of the population has an equal chance of being included in the sample (Omair, 2014).

Data was collected from the Nigerian Ministry of Education and Ministry of Youth and sports. In addition, the data was collected from the accounting, auditing, information communication technology and finance department, forming the study's sampling frame. One hundred and twenty-five employees from the total employees were selected as the sample for this study to improve the accuracy of the research and reduce the chances of errors. The sample frame is mostly from 10% to 49% ($10\% \leq x \leq 49\%$) of the total population. This sample frame was undertaken to give the study a high degree of representativeness. The researcher

was not given the total number of employees from each department. The researcher obtained only 129 responses in total, which was half the number of workers from the two ministries in question.

### 5.4 The Paradigms and Approach Adopted in this Study

The post-positivist and interpretivist paradigms were selected to adequately describe the study's aim and accomplish all its objectives. The chosen paradigms and their application in this research are discussed in the next section.

#### 5.4.1 Post-positivism paradigm

IT and DM researchers criticized the attempts to push social science approaches to adhere to natural science standards due to some of the positivist paradigm's fundamental assumptions (Hirschheim, 1992; Vanderstoep and Johnston, 2009). As a result, the positivist paradigm has been criticized from various perspectives. For example, several scholars argue that the model is unsuitable for IT and DM research because it lacks an existing and intrinsically related theory. Therefore, it frequently co-opts theory from a "reference discipline" such as organisational behaviour, management accounting, or computer science (Clarke, 1999; Schutt and Chambliss, 2011). Additionally, since life is a dynamic, cumulative, and multidimensional notion that is not easily or completely reducible to mathematical reasoning, the model often lacks the necessary vision to comprehend social reality deeply (Norreklit, Raffnsoe-Moller and Mitchell, 2016).

A post-positivism movement arose in reaction to increasing criticism of the positivist paradigm and a solution to the positivist paradigm's problems (Guba and Lincoln, 1994). This development was also examined by Collins et al. (2006), who considered the forerunner of more progressive ideologies like interpretivism, constructivism, and naturalism. Post-positivism provides an alternative to positivism's traditions and grounds for conducting rigorous analysis. For the post-positivist researcher, truth is not a fixed concept but a construct of those doing the study. Since existence does not exist in a vacuum and is influenced by its environment, many other realities are conceivable (Snape and Spencer, 2003).

Many elements of positivism are used in the post-positivism model, but it seeks to relax the rigid line that positivism is known for (Neuman, 2011). While this paradigm presupposes factual truth, its adherents see it as an "approximate" reality that can only be understood imperfectly and is open to several interpretations or explanations (Guba and Lincoln, 1994). A researcher's interpretations are neither correct nor incorrect in the post-positivist world; it is distinct from a different perspective (Vanderstoep and Johnston, 2009). Post positivists see themselves as data collectors whose beliefs and the researcher's gender, personality, race, nationality, history, faith, family, and behaviour are inextricably affected (Collins et al., 2006; Vanderstoep

and Johnston, 2009). As a result, post-positivists conclude that it is difficult for a researcher to be completely impartial in their observation of results, except they aim for objectivity concerning the phenomenon they are researching (Paintal, 2004).

Post-positivists attempt generalisation to describe human behaviour in the same way as positivists do, but they insist on discussing how and when distinctions between humans exist (Schulze, 2003). In this model, researchers are generally involved in gathering various participants' experiences in a rigorously disciplined manner. Since all measurements are imperfect and each computation has its own set of flaws, a combination of methods is often employed to acquire more accurate knowledge of a phenomenon by examining it via several measures or observations (Paintal, 2004; Collins et al., 2006; Trochim, 2020). Post-positivism is a philosophy that promotes objectivity by integrating different approaches to reflect multiple viewpoints while being aware of the possibility of prejudice in the analytical method (Guba and Lincoln, 1994; Trochim, 2020).

Within this model, qualitative approaches of low inference are widely used, and formal techniques dominate data collection processes (Paintal, 2004). Despite this, the post-positivist approach favours deductive inference, in which science is motivated by relevant philosophy (Collins, Onwuegbuzie and Sutton, 2006). As a result, rather than qualitative purists, the word "post-positivism" is more often used to describe practising quantitative scholars (Panhwar, Ansari and Shah, 2017; Timans et al., 2019).

### 5.4.2 The Interpretive Paradigm

The interpretative paradigm attempts to explain a phenomenon by examining its meaning and determining what others think it symbolises (Orlikowski and Baroudi, 1991; Klein and Myers, 2011). The interpretative paradigm scholars think that although reality is socially created, it is contextual and contingent upon shared interpretations shaped by shared experience (Myers and Klein, 2001). Whereas positivists emphasise the similarities between objects in the social world, interpretivists recognise the differences (Babbie, 1998). The researcher is mainly concerned with the different viewpoints and diverse perspectives on a phenomenon under this paradigm. As a result, this paradigm is well-suited for studying situations in which many factors impact or influence the phenomena or in which many participants are engaged (Clarke, 1999; Myers and Klein, 2001).

Interpretivism is gaining popularity among academics in IT and DM because of continuing attempts to address dynamic issues requiring integrating diverse knowledge systems and social phenomena such as organisational activities and human behaviour (Klein and Myers, 2011). An interpretivist understands that the subject under consideration is social and that the best method to grasp it will not always be via statistical

and quantitative research (Powell and Ramos, 2012). This may explain why interpretive researchers choose qualitative to quantitative approaches because the former allows for more detailed interpretations and a deeper interpretation of social occurrences (Putney *et al.*, 1999).

### 5.5 Selection and Justification of the Research Paradigms for this Study

Since information systems and technology are fundamentally social rather than computational systems, Hirschheim (1992) found that social sciences strongly influence the epistemology of information systems and information technology. This perspective, which excludes the technical component of information management and information technology analysis, is changing as more academics realise that information systems and information technology must have a technical dimension (Parker *et al.*, 1994; Burstein and Gregor, 1999). Myers and Klein (2001) suggested that discussing shared meanings about the phenomenon of concern is a good way to think about reality. The purpose of this research is to understand better the issues surrounding the deployment of DM technology inside AIS by examining management styles and attitudes toward DM. Therefore, it is reasonable to infer that most of this study is interpretative.

Combining the two research paradigms was anticipated that rich and trustworthy results would emerge. During the early phases of the research, a positivist perspective was used to gather quantitative data. In addition, a series of interviews resulted in an interpretative analysis to better understand the problems. The next section discusses the appropriateness of the strategy and methodology employed in this research, which incorporates quantitative and qualitative data collection methods.

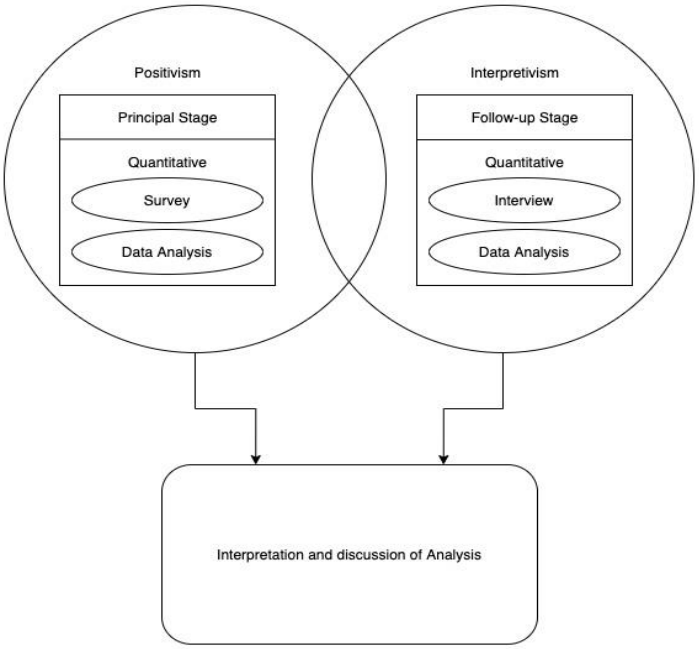
### 5.6 APPROACH

This research collected data in a triangulated fashion. The objective was to gather quantitative survey data and qualitative interview data (qualitative). The survey data provided a foundation for understanding the processes involved in data mining, such as awareness of and attitude toward data mining and software currently in use within the department. In addition, the interviews were designed to enrich the data by providing insights into individuals' perceptions of data mining in their work environments. The survey data aimed to elicit underlying meaning and patterns regarding interviewees' perceptions of technology readiness regarding their daily work activities, the type of training available to upgrade abilities, their perspective on data mining, its use and future in the division, and their perspectives on the best data mining model for the public sector. Matthew (2014) states, "We must recognise that both numbers and language are necessary for grasping the world". Multiple methodological views may be integrated using triangulated measurements to increase the researchers' validity and Reliability (Bryman & Bell, 2015). This is because it enables us to understand Stakeholders' perceptions "from two separate perspectives" (Veal, 2005).

In recent years, the use of mixed methods research has risen in favour. According to Henn et al. (2007), more social researchers argue for more flexible approaches to research techniques rather than sticking to either a positivist-quantitative or an interpretive-qualitative style of study. This position is supported because it produces a more authentic and complete picture of society than possible using a single set of methods (Henn, Weinstein and Foard, 2007). The mixed-method research approach may be used to evaluate the data gathered and their validity and reliability (Henn et al., 2007; Crowther and Lancaster, 2009; Morgan, 2012; Sekaran et al., 2016). It enables the researcher to understand better what is occurring in the real world.

The present research was performed in two stages (primary and follow-up): 1) a quantitative stage using an online survey and heavily affected by the positivist paradigm, and 2) a qualitative stage utilising interviews and heavily influenced by an interpretivism basis (shown in figure 5.2 below).

**Figure 20: Approaches taken in data collection and analysis**




### 5.7 Classifications of Research on Information Technology and Data Mining

According to Neuman (2011), research may be classified as exploratory, analytical, or explanatory based on the researcher's objective - "to find a new topic, identify a social phenomenon, or explain why something occurred" (Neuman, 2011).

### 5.7.1 Explanatory Research

This study is exploratory and explanatory. Explanatory (analytical) analysis needs a high degree of control to validate and justify a theory's predictions. (Neuman, 2011; Norreklit, Raffnsoe-Moller and Mitchell, 2016). The explanatory analysis aims to apply the theory to novel problems or topics, connect these concerns to a broader concept, establish the theory's prediction, and justify or refute the prediction (Neuman, 2011). In addition, the explanatory analysis explains "why" things are the way they are and "how" two aspects of a phenomenon become connected (Djamba and Neuman, 2002). Explanatory research methods are frequently employed in explanatory science because they are an effective tool for assessing hypotheses that still exist and may be validated or refuted using data (Djamba and Neuman, 2002). As a result, quantitative analysis techniques are the most often used method in this research.

### 5.7.2 Exploratory Research

Exploratory research examines a relatively new subject or issue(s) and provides a knowledge foundation for future research (Sekaran et al., 2016). Exploratory research is conducted when there are few or no prior studies to which information may be referenced. Rather than attempting to verify or validate a hypothesis, the objective is to discover patterns, ideas, or hypotheses. Exploration research aims to gain familiarity and knowledge of a subject in preparation for a more in-depth investigation later (Saunders, Lewis and Thornhill, 2016).

As described by Neuman (2013), Neuman (2013), exploratory research is a method for accumulating more organised information over time while simultaneously generating specific questions for future investigation. Typically, exploratory research addresses the "what" question (e.g., what are the barriers to DM adoption in AIS among publicly listed companies in Jordan?) but seldom provides definitive solutions to such problems or difficulties (Neuman, 2013). Rather than being bound by a particular theory or study question, exploratory research often relies heavily on inductive inquiry and qualitative research techniques (Neuman, 2013).

## 5.8 Justification for the Research Classification

The main objective of this study is to get a better knowledge of the adoption of DM technology in AIS in publicly listed businesses in Nigeria. The study also aims to discover the possible connection between management styles and managers' views about DM and its usage.

Due to the use of a more comprehensive explanation of managers' approval or rejection of the use of DM technology within the AIS, this research study includes an explanatory component. This is because it is

necessary to gauge or dismiss managers' acceptance or rejection of DM technology using established theories and models of acceptance within the scope of explanatory studies. The study is considered to have two entwined qualities that work in tandem rather than as opposites since the research is both explanatory and exploratory.

Qualitative research began in the social sciences as a way for academics to better understand social and cultural phenomena (Myers, 1997). Case studies and action research are two well-known qualitative methods that rely on primary data sources such as interviews, questionnaires, observations, texts, and records, as well as the researcher's perceptions and responses (Myers, 1997). Qualitative research may be conducted using any research paradigm, depending on the nature of the study and the kind of information sought by the researcher (e.g., post-positivist or interpretivist).

**5.9 Instrument Design: Questionnaire**

Online questionnaires were utilised for the quantitative portion of this research. Although, there is no right or wrong way to design a questionnaire, lengthy and poorly organised surveys should be avoided since they may result in bias, noncompliance, and annoyance (Nardi, 2006). Numerous changes were made to the questionnaire to get the required information while avoiding possible problems. Online surveys can allow participants to complete them at their leisure. Nardi (2006) emphasised the benefits of an online questionnaire, including the following: When the number of variables (values or response categories) is too large to read during an interview or over the phone; when non-observable attitudes and views are being studied; when describing the characteristics of a large group; and when researching behaviours that may be more stigmatising or difficult for people to express face to face.

The questionnaire for this study was constructed utilising various data sources, including already established instruments by other researchers and a research framework culled from the relevant literature. Most questions were closed-ended and utilised a Likert-type scale. The factors that influenced the organization's decision to use data mining, the reasons for not using data mining and the perception of data mining's impact on organisational performance were all rated on a five-point numerical scale ranging from 1 to 5, with 1 indicating strong disagreement and 5 indicating strong agreement. Additionally, an itemised grading system was developed for a few questions. For example, to evaluate real performance on critical elements of AIS quality, a scale of 1 to 5 was used. A similar scale of 1=infrequently to 5=very often was used to determine the frequency with which AIS data were utilised in certain areas. At the end of the questionnaire, there was a half-page open space for respondents to express any further thoughts. Finally, there was an accompanying supplemental form for respondents who wanted to be interviewed.

*a) Variables Identified Within the Questionnaire*

Numerous variables were taken into consideration throughout the instrument's creation. Five variables were identified: accounting information systems in organisations, data mining readiness, data mining implementers/non-implementers, perception of data mining effect, and demography. Each of them is shown and discussed in Table 5 below.

**Table 5: Categories and variables in the questionnaire**

| Category | Variables identified in a questionnaire |
|---|---|
| 1 | Organization's Management style and Accounting Information Systems<br>• Management style in the organization<br>• Satisfaction with the existing system<br>• Software programs to make use of<br>• Quality Data and performance of AIS of the highest quality<br>• The frequency with which specific regions make use of AIS data<br>• Evaluation of the performance of the AIS |
| 2 | Data Mining Readiness<br>• Awareness about data mining<br>• Managers' attitude toward Data Mining<br>• Level of optimism, innovativeness, perception toward easiness and usefulness of the technology |
| 3 | Variables determined for implementers and non-implementers<br>• Utilization of data mining tools<br>• Number of years the tools in use<br>• Influencing factors that makes an organization implement the technology<br>• Factors or reasons on why not implementing it<br>• Intention to use data mining |
| 4 | Perception of data mining impact<br>• What perception of the impact could data mining give on the performance of AIS? |

| | |
|---|---|
| | • Does decision make process affected by data mining implementation? |
| 5 | Demographic details<br>• Personal information about the respondents<br>• Size of the organization<br>• Knowledge about data mining |

- The first category looks at the characteristics of the department's current accounting information system. The authors examine respondent satisfaction, the software they are presently using, their perceptions of the quality and performance of accounting information systems (AIS), their degree of reliance on AIS data, and how respondents assess the performance of their systems. The frequency with which AIS data was used dictated its dependence - on planning and budgeting, decision making, performance evaluation, and cost management. Four factors affect accounting information system performance: accuracy, timeliness, completeness, and consistency.

- The second category was created to evaluate participants' knowledge, attitude, and readiness about data mining. The included questions were intended to ascertain respondents' general knowledge of data mining and their behaviours and attitudes regarding using technology, particularly data mining. These questions were developed using data from the Technology Readiness Index (TRI), the Data Mining Readiness Index (DMRI), and the Technology Acceptance Model (TAM) (Parasuraman, 2000; Dahlan et al., 2003; Legris et al., 2003). Additionally, questions were designed to gauge an individual's optimism, creativity, usefulness, and usability.

- The third set of variables classified technology adopters and non-adopters. It evaluated the extent to which data mining expertise exists inside the organization and the factors that influence technology adoption/non-adoption. There were discovered several factors/reasons believed to influence an organization's adoption of data mining. Among these reasons were organizational challenges (Calderon, Cheh and Kim, 2003; Dahlan, Ramayah and Mei, 2003; Su-Chao *et al.*, 2003), technical difficulties (Ang et al., 2001; Dahlan et al., 2003; Legris et al., 2003; Oly and Jantan, 2003; Riemenschneider et al., 2003; Amoako-Gyampah and Salam, 2004; Omar and Rowland, 2004).

- The fourth category examined the impact data mining might have on the department's perceived performance.

- Finally, the fifth category elicited information on the respondents' demographic characteristics (gender, age group, level of education, work experience, job function, levels of responsibility, department size and knowledge about data mining).

*b) Coding of measurement scales*

I developed measurement scales and coding for constructs. Management style (30 points), AIS performance (4 points), awareness and comprehension (3 points), data mining readiness (10 points), utilisation (1 point), influence factors (10 points) and reasons (9 points), intention to use (1 point), data mining impact (8 points), and capability to use data mining tools (2 items).

*c)* The instrument's construct reliability and validity

The instrument's reliability and validity were established via a study of the constructs' reliability and validity. The means of the concept measures will be computed to assess internal consistency and validity.

*d)* Pre-testing

Pre-testing was conducted to ascertain if there were any remaining problems with the test equipment (Greene, Kreider and Mayer, 2005). Pretesting was used to ascertain if any questions were confusing or unanswerable, whether the wording or organization of the questions might be improved, and whether others shared the meaning associated with a question. The questionnaire was reviewed and approved by the Research Ethics Committee and my supervisors.

**5.10 Instrument design – the interview guide (Protocol)**

Interview questions were developed to supplement and enhance quantitative data. The timetable of interviews was divided into four parts (see Appendix):

- General information about the interviewee's background, including education, work experiences, organizational roles, and accounting-related tasks.
- Inquiries regarding the organization's current accounting information system (AIS) status.
- This section assessed interviewees' readiness to adopt and comprehend data mining methods and their perceptions of the role and significance of information technology in their everyday work activities.
- The respondents were asked if their department made use of data mining technologies. In addition,

we identified data mining technology adopters and non-adopters. Non-adopters were questioned about the reasons for their lack of adoption, methods of accounting data analysis, and intentions to utilize data mining technologies. At the same time, adopters will be questioned about the conditions and reasons for the department's choice to use data mining, the effect of data mining on AIS performance, and the decision-making process.

**Table 6: Contrast quantitative and qualitative research methods (Burns & Grove, 2010, p. 18) & (Speziale et al., 2010, p.20)**

| Quantitative | Qualitative |
|---|---|
| Objective | Subjective |
| "Difficult" science | "Sophisticated" science |
| Early in the study, a literature review must be conducted. | A literature review may be conducted during the research or afterwards. |
| Theory of testing | Construct's theory |
| One truth is that concentration is succinct and narrow. | Numerous realities: the emphasis is intricate and wide |
| Minimization, control, and precision | Exploration, description, comprehension, and collaborative interpretation |
| Measurable | Interpretive |
| Mechanistic: the sum of the pieces equals the whole | Organismic: the sum of its components is larger than the sum of its parts |
| Analyse statistical data. The fundamental ingredient of analysis is numbers. | Report with a strong narrative and room for individual interpretation. However, the fundamental component of the analysis is words/ideas. |
| Separate from the researcher | The researcher is an integral component of the process. |
| Subjects | Participants |
| Without context | Dependent on the context |
| Hypotheses | Issues for investigation |
| Logical and deductive reasoning | Dialectical and inductive reasoning |
| Establishes connections and establishes causality | Describes significance and discovery |
| Instrumentalist | Communicates and observes |
| Strives for generalization | Strives for uniqueness |

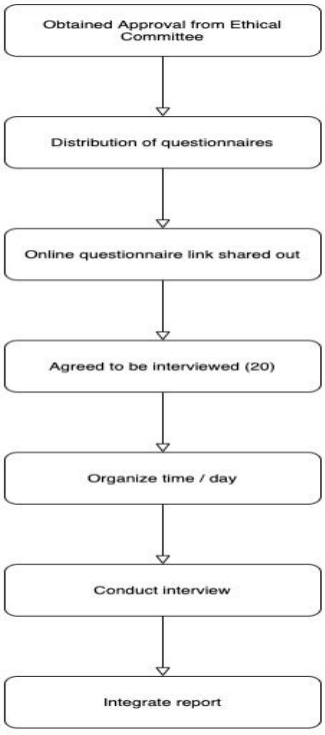
| | |
|---|---|
| Describing, correlating, quasi-experimental, and experimental designs | Designs: phenomenological, grounded theory, ethnographic, historical, philosophical, case study. |
| "Keeps a tally of the beans." | This section contains information on "which beans are worth counting." |

### 5.11 Data Collection

The data collection technique utilized in this research was triangulated, using an online survey followed by numerous semi-structured interviews. The interviews were conducted to supplement the data collected via the questionnaires.

Numerous criteria must be met before data gathering. Permission was obtained for this study, and the ethics committee at Brunel Business School authorized the survey and interview instruments. The methods utilized to gather data for this study are shown in Figure 5.3 below. The approval process required an explanation of the study's objectives and a discussion of how the research will help the department's future well-being.

**Figure 21: Flowchart in conducting survey and interviews**



This online survey comprised closed-ended questions and many open-ended categories that enabled respondents to give more detailed responses. Open-ended questions were used to elicit information on the software used; this function entails using accounting data and the terms used as synonyms for data mining.

The survey was selected as the primary data collecting method because it enables the collection of information at a cheap cost while maintaining anonymity (Bryman & Bell, 2015). One advantage of this survey is that participants can examine the questions and respond at leisure. It was expected that this would result in more meaningful responses.

The survey was administered between March and April of 2021. Respondents were assured that their personal information would remain confidential. Except for the researcher's supervisor and the researcher, no one else used department names or personal identification. The cover letter described the study's objectives, guaranteed the respondents' anonymity, estimated the time required to complete the questionnaire, and specified the anticipated date on which the respondent would finish the questionnaire. Additionally, it praised participants for their time and work spent on the research. The online poll had a logo for Brunel University. It contains the names and contact information of the researcher and supervisors involved in this PhD project. The name and contact details of the ethics committee chairman were also included. A reminder email was sent to all responders about three weeks after the survey link was sent. Finally, an email was sent to express gratitude to individuals who have already completed surveys and to encourage others to do the same.

The next stage in the study was to conduct interviews with those respondents who had been identified and shown an interest in being questioned. Personal interviews benefit from being more adaptable and clarifying questions (Bryman & Bell, 2015). Therefore, the interviews were semi-structured to provide maximum opportunity for issue exploration. This enabled the interviewer to rearrange the questions, clarify their meanings, introduce new terminology, and alter the wording. The way questions were posed, and their order were determined as the interview progressed and new topics emerged and were investigated. Before the meeting, questions were formulated to guide and guarantee that all pertinent topics would be addressed and discussed within the allotted time. All interviews were conducted in real-time with the respondent to elicit information on the respondent's perspectives, experiences, awareness, and attitudes about data mining technologies in their department. Before completing the interviews, participants were given an abbreviated version of the interview questions and a permission form. The interviews were taped with the participants' consent, and notes were made throughout to ensure the accuracy of the recording and transcription.

### 5.12 Rules on Ethics and Confidentiality

The Brunel University Ethics Committee authorized the interviews and questionnaire survey in 2021 to safeguard the participants' rights, freedoms, and safety. Additionally, an information page with the name of Brunel University and the university's logo was produced to explain the study's purpose and ethical standards. This information sheet was sent to each participant as an attachment to the questionnaire link. The participants were told that they were acting freely and ethically and that they would face no psychological, moral, legal, or otherwise hazards. It encouraged the respondent to address any questions or concerns about the study's conduct to the Research Ethics Committee's Executive Officer. A valid email address was supplied.

Personal interviews were conducted with the consent of the participants. Interviewees verified their willingness to participate in an interview on a form linked to the survey questionnaire link. A letter outlining the interview process, a permission form, and a list of questions was sent to selected responders to discuss during the interview. Interviewees were informed of their ability to discontinue participation in the research at any time. Again, participants were fully informed of the research's objectives and ethical standards before completing the personal interviews.

### 5.13 Data Analysis Techniques

#### 5.13.1 Quantitative data

SPSS v26, the Statistical Package for the Social Sciences, was used to examine the quantitative data. Numerous statistical techniques are utilized to explore the research topics and assess the hypotheses. Before extensive study to test the hypotheses, descriptive analysis was used to analyse the data. To identify suitable analytical methods, statistical textbooks were consulted. These books define pertinent statistics for various research topics and hypotheses (Caldas, 2003; Nardi, 2006; Jupp, 2015). Nardi (2006) developed the statistical decision tree, which is very helpful for identifying the most appropriate statistical methods for this study. Most data were collected using a 5-point Likert scale. When answers to several Likert items are aggregated and averaged, they are regarded as interval data indicating the presence of a latent variable.

*a) Factor Analysis (FA)*

Factor Analysis (FA) is particularly helpful for studying the patterns of complex, multidimensional interactions that academics and businessmen face (Deni Iskander, 2015). It is incorporated in the SPSS software as a 'data reduction' method. It takes a large collection of variables and attempts to summarize

them meaningfully using a smaller number of components.

Principal components factor analysis was performed to evaluate if each management style created a 'factor.' This is based on identifying patterns that emphasize the correlations between multiple variables (the 30 items used to evaluate management styles), which enables the items to be further classified based on their connections (Heeks and Stanforth, 2007). The chosen typical items can be utilized in future studies (Green and Salkind, 2016; Berry et al., 2018).

The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were used to determine the appropriateness of factor analysis. KMO is a statistic associated with factor analysis. It is a measure used to determine the appropriateness of factor analysis. High values (between 0.5 and 1.0) indicate the necessity for factor analysis. Values less than 0.5 suggest that factor analysis may be inappropriate (Kaiser 1974). Bartlett's Test of Sphericity is used to determine if the correlation matrix is an identity matrix or a population correlation matrix. A significant result (Sig. 0.05) indicates that the matrix is not an identity matrix; the variables are sufficiently linked for a meaningful component analysis (Smeeton *et al.*, 1984). Both tests show that factor analysis is an adequate method for analysing management style components, with KMO 0.838 and Sig = 0.000.

*b) One-Sample T-Test*

This t-test determines the statistical significance of a difference in the mean of a sample of scores and a specified value. For example, the test value in this research was 3 (The mid-point of the Likert scale). Since three represents a neutral stance, for example, between agree and disagree, if the mean value falls below the test value, it shows that the respondent did not agree with that item or question. This test will examine the first, second, and third research topics and evaluate hypotheses two and three.

*c) Bivariate analysis*

Bivariate or correlation analysis determines the strength of the linear relationships between two pairs of variables in continuous data. Because the variables are intervals, the Pearson product-moment correlation is employed. This is the most often used technique for describing the size of an impact in terms of the strength of a connection (Morgan *et al.*, 2004; Dobler and Rosoff, 2005). "When Pearson r is used, the effect size is always less than 1.0, ranging from -1.0 to +1.0, with 0 indicating no effect and +1 or -1 indicating the maximum effect" (Morgan *et al.*, 2004; Dobler and Rosoff, 2005). Bivariate analysis using SPSS was utilized in this research to examine the relationships between the sums of management styles (task-centred and people-centred management styles) and the sums of attitudes.

Additionally, bivariate analysis was used to ascertain the associations between the five demographic factors

and attitudes toward data mining. Since gender is classified into two categories (male and female), the relationship between these groups and their attitudes toward data mining should be assessed based on their differences rather than their similarities. Therefore, the Mann-Whitney U Test was chosen. The Mann-Whitney U Test is a statistical method used to determine if there are differences in attitudes about data mining between two independent groups on a continuous measure; in this research, it was used to determine whether men and females had distinct attitudes toward data mining. Gamma was also used to determine the degree of correlation in the cross-tabulation method, which also shows the link direction between two ordinal variables (Fettro, 2018).

*d) One-way Analysis of Variance (ANOVA)*

ANOVA is used to evaluate whether there is a statistically significant difference in mean values across several distinct groups. The test is like the t-test in concept, but it is used to determine the significance of differences between three or more (rather than two) group averages. This was done by splitting the total variance in the dependent variable into the impacts of different independent variable values (Davis, 2007). It will be used to test hypotheses 5, 6, 7, 8, and 9, which examine the differences in mean (readiness) between those independent groups. The test will look for differences in the levels of independent variables associated with readiness for data mining technology.

### 5.13.2 Qualitative data

Two widely used methods for analysing qualitative data are content analysis and grounded theory (Lillis, 1999). As Yau (2009) summarized, content analysis is the process of identifying, classifying, and categorizing significant patterns in data. This fundamental concept is based on the work of Schumacker and Lomax (2016), in contrast to other publications, such as Krippendorff (2010), which refer to content analysis as a statistical examination of a significant word or phrase occurrences. This approach combines many methods to draw accurate conclusions from text. According to Lillis (1999), content analysis is also a quantitative technique that focuses on the observable characteristics of text, such as the frequency of word occurrences or the number of words related to themes.

This research aims to qualitatively assess latent characteristics in data, such as classifying themes in longer responses, using content analysis. The primary objective of qualitative data collection was to complement quantitative data collected through questionnaires. NVivo was used to analyse the qualitative data obtained in this research.

*a) The analytical method*

The process for analysing qualitative data starts with the transcription and transfer of all recorded cassettes to Microsoft Word. The qualitative data for this research is derived from transcribed text from nine semi-structured interviews. Additionally, additional written comments on the questionnaires were examined. According to Veal (2005), creating verbatim (word-for-word) transcripts of interviews may be very beneficial. Although transcribing such conversations takes time, Veal (2005) argued that using full verbatim transcripts would be more rational and thorough than just gathering notes.

All data were uploaded to the NVivo program, which facilitated the systematic reorganization of sources and the display of information according to similar themes or topics. The arrangement of text files into distinct themes enables the researcher to focus on the study's objectives. The following steps were taken throughout the analytical procedure. First, predetermined themes were identified, including satisfaction with the current system, readiness to accept new technology, knowledge of data mining terms, perceptions of the impact of data mining, intention to adopt, factors and reasons for adoption, and the best possible data mining model for implementation in the public sector. Small chunks of material, quotations, and phrases were consolidated into a new file under certain themes. The objective was to give a theme code to every connected text.

After the text has been classified into related themes, these extra files will be used to validate and enhance the quantitative results. These quotes, characteristics, and attitudes were included in the research to tie together the quantitative and qualitative results.

### 5.14 Conclusion

This chapter discusses the research design and methods used to address the study's research questions and hypotheses. The next chapter presents and discusses the data collected from returned questionnaires.

# CHAPTER SIX

## Results, Findings, and Analysis

### 6.1 Data Analysis

#### Introduction

In this chapter, the data collected are analysed to enable the researcher to discuss findings and draw conclusions on the research questions. The chapter presents a brief overview of descriptive and inferential data in charts and tables. The analysis in this chapter is presented in order of the research questions. The data used for this study were analysed using Statistical Package for Social Sciences (SPSS) version 23.0, Microsoft Excel 2016. Statistical tests such as mean analysis, RII analysis, factor analysis, bivariate analysis, regression, Chi-square and Kruskal Wallis test were conducted to draw inferences from the data.

### 6.2 Response Rate

The pandemic prevented the researcher from having physical contact with respondents; therefore, the survey was conducted online with an overall response rate of 95%. The inability to hand-deliver surveys appears to have significantly affected the response rate. The response rate for this study is accepted. For example, it has been shown that response rates for online surveys are often low (Nardi, 2006).

### 6.3 Reliability and Validity of Survey Instrument

It is difficult to rule out the dependability and validity of the instruments used in this research, which are evaluated and presented in this part. Nunnally & Bernstein (1994) and Agarwal & Karananna (2005) agree that it is possible and optimal to calculate Cronbach's alpha coefficients for assessing the reliability of multiple-item constructs (1994). The purpose of the reliability test was to comprehend and investigate the internal consistency of the multiple-item scales. 0.6 is acceptable for newly constructed measures, according to Nunnally and Bernstein (1994); otherwise, 0.70 should serve as the minimum cutoff value. As a result, the standard threshold value of 0.7 was selected as the minimum acceptable level. Reliability is the degree to which the measurements in the research instrument are free of random errors and provide similar, consistent findings when repeated on the same population (Zikmund & Babin 2017). The Cronbach alphas are evident in Table 7, and the findings for each construct are more than 0.70. This indicates that the objects associated with each construct serve as a valid measure.

**Table 7: Reliability test**

| Variables | Mean | Actual range | Alpha Cronbach* |
|---|---|---|---|
| Management Styles | 3.113 | 5.07 – 6.62 | .874 |
| Data Mining intention | 3.68 | 3.70 – 4.22 | .824 |
| Influence factor in the decision to utilise data mining | 4.28 | 2.86 – 4.65 | .849 |
| Data Mining utilization | 3.59 | 3.18 – 3.96 | .825 |
| Perceived impact of data mining on AIS | 3.86 | 3.74 – 4.12 | .864 |
| Perceived impact of data mining on decision making | 4.44 | 4.32 – 4.59 | .833 |
| AIS experience | 3.18 | 3.18 – 3.28 | .759 |

### 6.4 Data Characteristics

This section of the research presents and analyses descriptive data, including respondent characteristics such as gender, job experience, and level of education. In addition, nine respondents' biographies are examined.

#### 6.4.1 Background of Respondents

**Table 8: Demographic Data of Respondents**

| S/n | Parameter | Categories | Count | Percentage |
|---|---|---|---|---|
| 1 | Age group | 18-29 years | 22 | 17% |
| | | 30-39 years | 46 | 36% |
| | | 40-49 years | 31 | 24% |
| | | 50-64 years | 19 | 15% |
| | | 65 years and more | 7 | 5% |
| | | Prefer not to say | 4 | 3% |
| | | | | |
| 2 | Gender | Female | 82 | 63% |
| | | Male | 47 | 37% |
| | | Non-Binary | 0 | 0% |
| | | Prefer not to say | 0 | 0% |

| | | | | |
|---|---|---|---|---|
| 3 | Level of education | High School | 1 | 1% |
| | | Postgraduate | 37 | 29% |
| | | Prefer not to say | 12 | 9% |
| | | Undergraduate | 79 | 61% |
| | | | | |
| 4 | Year of work experience | 10 – 15 years | 24 | 19% |
| | | 15 - 20 years | 7 | 5% |
| | | 5 – 10 years | 52 | 40% |
| | | Above 20 years | 2 | 2% |
| | | Less than 5 years | 44 | 34% |
| | | | | |
| 5 | Years in supervisory role | 10 – 15 years | 9 | 7% |
| | | 5 – 10 years | 52 | 40% |
| | | Above 15 years | 2 | 2% |
| | | Less than 5 years | 66 | 51% |
| | | | | |
| 6 | Years of experience in AIS | 1 – 5 years | 71 | 55% |
| | | 5 – 10 years | 18 | 14% |
| | | Above 10 years | 5 | 4% |
| | | Less than one year | 35 | 27% |
| | | | | |
| 7 | Number of years in the division/unit | 1 – 5 years | 65 | 51% |
| | | 5 – 10 years | 26 | 20% |
| | | Above ten years | 3 | 2% |
| | | Less than one year | 35 | 27% |
| | | | | |
| 8 | Job function | Accounting | 24 | 19% |
| | | Auditing | 27 | 21% |
| | | Finance | 33 | 25% |
| | | Information management | 45 | 35% |
| | | Other | 0 | 0% |
| | | | | |

| | | | | |
|---|---|---|---|---|
| 9 | Level of management role | Middle management | 73 | 56% |
| | | None of the above | 28 | 22% |
| | | Top management | 28 | 22% |

From table 8 above, it can be deduced that majority of the respondents are within the age group of 30-39 years, representing about 36%, while the least represented group is 65 years and above. Although generally, 97% of the surveyed respondents indicated to be adults, this reveals that a good and representable amount of the respondents are within age groups believed to have their minds.

The table also presents the respondents' gender for this study. The analysis revealed that the gender of most respondents was Male and Female, accounting for about 37% and 63% of the responses, respectively.
The level of educational qualification of the respondents is shown in table 5.1. About 61% of the respondents have Undergraduate education, while 29% have postgraduate education. This implies that the generality of the respondents has acquired a significant level of formal education and would therefore be able to understand and provide appropriate responses to the various formulated research questions.

Table 8 above presents the years of work experience of the respondents. About 40% of the respondents have 6-10 years of experience, 11 – 15 years' work experience is represented by 19%, while 16 – 20 years by 5%, and about 2% have above 20 years of experience. At the same time, 34% represent those with less than 5 years of work experience. This means that majority of the respondents have had a good number of years of work experience in the corporate industries; thus, their responses would be of immense value to this study.

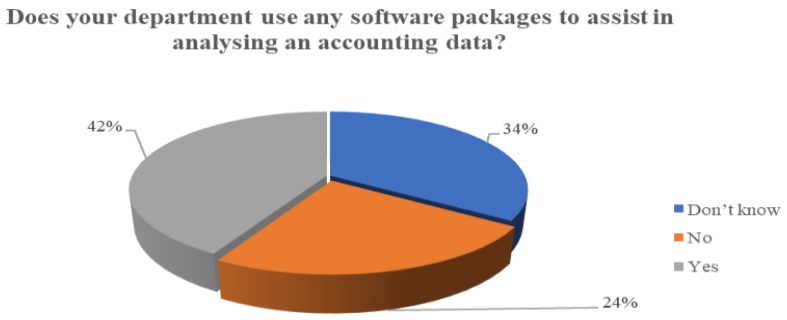
Analysis of the respondent's years in a supervisory role showed that 40% have been in a management role for 5 – 10 years, while 51% for lesser than 5 years. This reveals that a large representative of the surveyed respondents has reasonable years of supervisory roles and, as such, will provide appropriate responses to this research.
Furthermore, table 6.2 shows the years of work experience in AIS and the number of years of work within a division or department. The result reveals that most respondents have worked in AIS within a particular unit for a good number of years and thus believed to have the required information relevant to this study.
Additionally, analysis of the job function and management role of the respondent indicates that the surveyed respondent work in department relating to Accounting, Finance, Audit, and IT. Therefore, not only do they have relevant job functions, but they also perform in the role of Top to Middle management.

## 6.5 Accounting Information System (AIS)

### 6.5.1 Use of Software Packages

The usage of software packages within public sectors in Nigeria was surveyed. The researcher aims to establish public organizations' presence and use of computer-based data analysis software. As shown in figure 6.1 below, 42 per cent of the respondents indicated that some software packages are used in their operations. The findings are summarized in Figure 22.

**Figure 22: Use of data mining software**

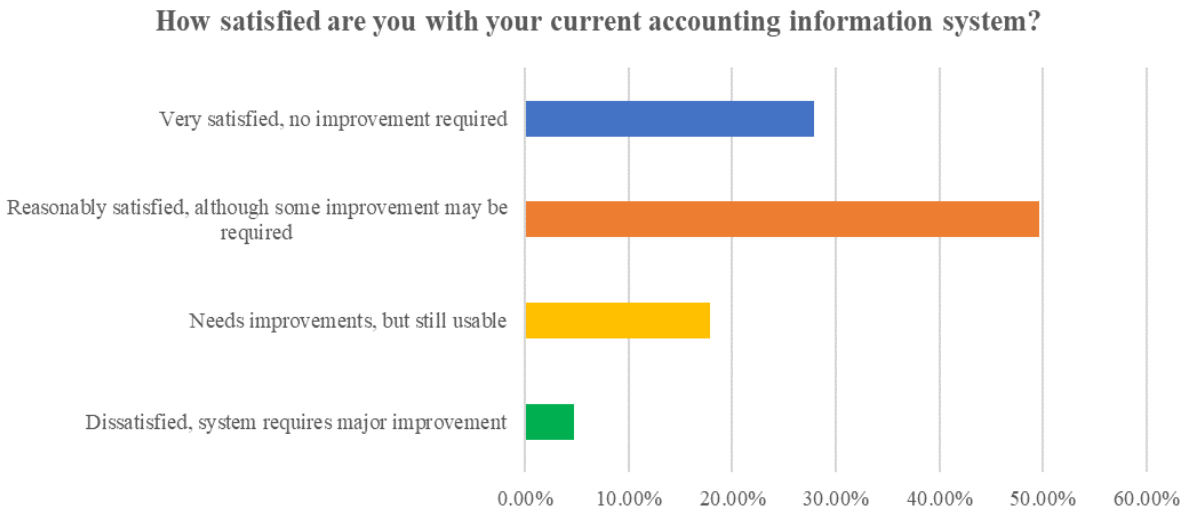



From the survey regarding software programs that aided in analysing accounting data, respondents were questioned on their departmental usage of such software programs. Only 42% of respondents stated that their departments used software programs to analyse accounting data, 24% indicated that they did not, and 34% indicated that they were unsure, given the respondents' positions.

### 6.5.2 Level of Satisfaction with Organisation Accounting Information System

This section discusses the degree of satisfaction with the existing accounting system. Employees who are content with their existing accounting information system will be less receptive/anxious to change. According to figure 6.2, most respondents (28 per cent) expressed satisfaction with the existing system, and about 49 per cent indicated reasonably satisfied with the AIS. In comparison, a few acknowledged the need for change (18 per cent). Only six respondents said that they were dissatisfied with the existing system.

**Figure 23: Level of Satisfaction with Organisation Accounting Information System**




For the researcher to comprehend the respondents' perspectives, an analysis of the interview data was deemed necessary. Regarding the present accounting system, most respondents said they were very pleased by indicating that their organisation uses the best data analysis software for its purpose and would need proof that an alternative system would be superior.

Also, most of the respondents recognized that the accounting systems that have been recommended must be accurate, timely (up to date), and consistent. For instance, one interviewee stated: 'The company's AIS is excellent: "It is critical in my work to have an AIS that can consistently provide accurate, up-to-date accounting data to assist me in making critical financial decisions. I am very happy with the current AIS; I have no complaints; it gets the job done; the current AIS's output is accurate and up-to-date."

Although they believed their accounting information system performed well and were satisfied with the overall system, there was a sense that they needed to guarantee the ongoing development of their accounting systems. For example, another interviewee added that:" The AIS we use in the company is excellent, but it lacks a data filtering option; as a result, I am required to deal with massive amounts of data and perform manual filtering and analysis on the generated data; the AIS we use could be improved to address this issue; we need to include a filter tool within it".

From the surveyed questionnaire, the researcher also enquires to understand the variables influencing the performance of an organisation's AIS. Table 6.3 gives the relative importance index (RII) of the four influencing parameters as gathered from the literature. The relative importance index (RII) was rated using Waziri et al. (2013) guide for rating RII values shown below:

| | |
|---|---|
| 1. 0.76 and above | Most Significant |
| 2. 0.67-0.75 | Significant |
| 3. 0.45-0.66 | Less Significant |
| 4. 0.44 below | Not Significant |

The resulting analysis is shown in the table below:

**Table 9: RII Analysis of Parameters influencing Performance of AIS**

| Parameters | N | 1 = Strongly Disagree | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 = Strongly Agree | RII | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13.2. Complete: all relevance value for a certain variable is recorded | 129 | 3 | 3 | 1 | 12 | 19 | 25 | 40 | 21 | 5 | 0 | 0.62 | 1st |
| 13.4. Consistent: the representation of the data value is the same in all cases | 129 | 2 | 10 | 5 | 14 | 29 | 30 | 14 | 19 | 6 | 0 | 0.56 | 2nd |
| 13.3. Up to date (timeliness): the data recorded in your system is timely | 129 | 0 | 14 | 8 | 20 | 35 | 12 | 23 | 10 | 7 | 0 | 0.53 | 3rd |
| 13.1. Accurate: the data recorded conforms to the actual value | 129 | 11 | 17 | 16 | 7 | 18 | 16 | 15 | 17 | 9 | 3 | 0.51 | 4th |

The performance of the Accounting Information System was evaluated using these four criteria: accuracy, up-to-date, completeness, and consistency. From table 5.3, the RII score for AIS quality criteria ranged from 0.62 to 0.51, representing the less significant zone. From the results obtained, it is safe to state that there is consensus on the importance of these four criteria in maintaining the quality of the Accounting Information System throughout the department.

### 6.5.3 AIS Performance Evaluation Criteria

From an extensive review of literature as discussed in the previous chapter of this study, criteria for evaluating the performance of Accounting Information systems were presented to respondents. They were asked to indicate their level of importance in giving to each articulated criteria on a 10-point Likert scale ranging from very low to very high Importance. The Relative Importance Index (RII) of the criteria was computed and rated using Waziri et al. (2013) guide for rating RII values. The resulting analyses are shown in table 8 below

**Table 10: RII Analysis of AIS Performance Evaluation Criteria**

| S/n | Performance Criteria | N | 1 = Very low importance | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 = Very high importance | RII | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15.2. The systems can automatically validate the data | 129 | 1 | 5 | 7 | 3 | 22 | 30 | 34 | 25 | 2 | 0 | 0.61 | 1st |
| 2 | 15.6. The system has an effective data management approach, such as centralized database and data warehouse | 129 | 0 | 4 | 9 | 10 | 22 | 29 | 27 | 18 | 10 | 0 | 0.61 | 2nd |
| 3 | 15.3. The systems have an adequate and sufficient documentation for employees to follow | 129 | 1 | 10 | 6 | 11 | 28 | 26 | 26 | 15 | 5 | 1 | 0.57 | 3rd |
| 4 | 15.4. The systems are easy to modify and upgrade | 129 | 1 | 8 | 13 | 15 | 23 | 21 | 19 | 22 | 5 | 2 | 0.57 | 3rd |
| 5 | 15.5. The systems implement new data analysis tools (such as data mining) | 129 | 1 | 15 | 12 | 4 | 21 | 21 | 29 | 21 | 5 | 0 | 0.57 | 3rd |
| 6 | 15.1. The systems are easy to use | 129 | 1 | 12 | 18 | 12 | 22 | 20 | 15 | 21 | 8 | 0 | 0.54 | 6th |

The result shows that the respondents rank automatic data validation and effective data management features highest on the list with RII = 0.61, though indicating low significance. A general look at the result also shows that all evaluation criteria listed fall within the low significance level, implying that the respondent does not perceive these criteria fit for the evaluation of the performance of the accounting information system.

### 6.5.4 Frequency of Use of AIS

Accounting data from AIS can be used for wide and varying purposes; the research seeks to establish the use of such data in planning and budgeting, decision making, performance management and cost control within the surveyed organisations. Table 6.5 gives a detailed descriptive presentation of the frequency of use of AIS data in the four stated areas. The ten (10) statements were listed, and the respondents were presented with a 10-point Likert scale ranging from 1 as strongly disagree to 10 as strongly agree. The resulting analyses are shown in the table below:

**Table 11: Frequency of the use of AIS**

| S/n | Area of Usage | 1 = Very frequently | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9 | | 10=Never | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| 1 | 14.1. Planning and Budgeting | 8 | 6% | 15 | 12% | 10 | 8% | 10 | 8% | 18 | 14% | 18 | 14% | 20 | 16% | 22 | 17% | 8 | 6% | 0 | 0% |
| 2 | 14.2. Decision Making | 1 | 1% | 3 | 2% | 6 | 5% | 14 | 11% | 43 | 33% | 24 | 19% | 19 | 15% | 15 | 12% | 4 | 3% | 0 | 0% |
| 3 | 14.3. Performance management | 2 | 2% | 6 | 5% | 18 | 14% | 8 | 6% | 24 | 19% | 27 | 21% | 13 | 10% | 26 | 20% | 5 | 4% | 0 | 0% |
| 4 | 14.4. Cost control | 6 | 5% | 11 | 9% | 7 | 5% | 13 | 10% | 34 | 26% | 23 | 18% | 17 | 13% | 13 | 10% | 5 | 4% | 0 | 0% |

The result reveals that only a few respondents indicated high use of AIS data in neither planning and budgeting, decision making, performance management, or cost control. On the contrary, the majority indicated planning and budgeting, decision making, performance management and cost control as their rare usage for such purposes. Consequently, accounting data from the accounting information system may serve a different purpose than surveyed in this study or may not be put into tangible use within Nigerian public organisations.

### 6.6 Data Mining

#### 6.6.1 Awareness of Data Mining

To investigate the respondents' knowledge of the data mining technology, they were asked to indicate their awareness of the term “Data Mining”. From figures 5.3a and 5.3b, only about 38 per cent of the respondents are familiar with the term, and about 62 per cent are either unaware or do not know a thing about the term. To be more objective in this finding, the research investigates whether the respondent organisation has used a different term to denote data mining. The result in figure 6.3b reveals that only 5 per cent indicates that the term is being represented with different terminology, while 95 per cent are unaware of data mining.

**Figure 24: Awareness of Data Mining**

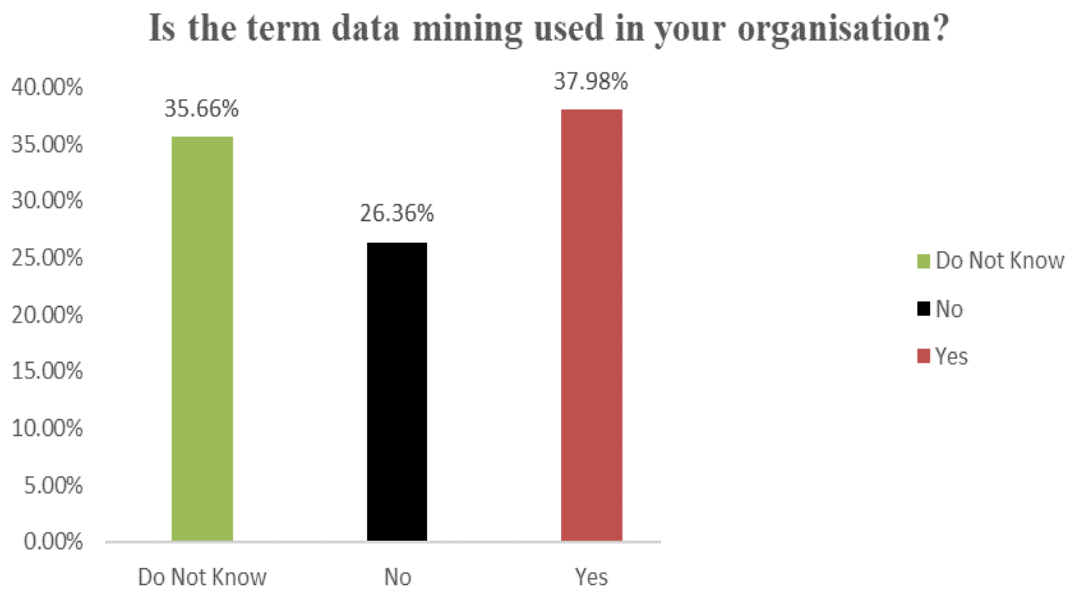
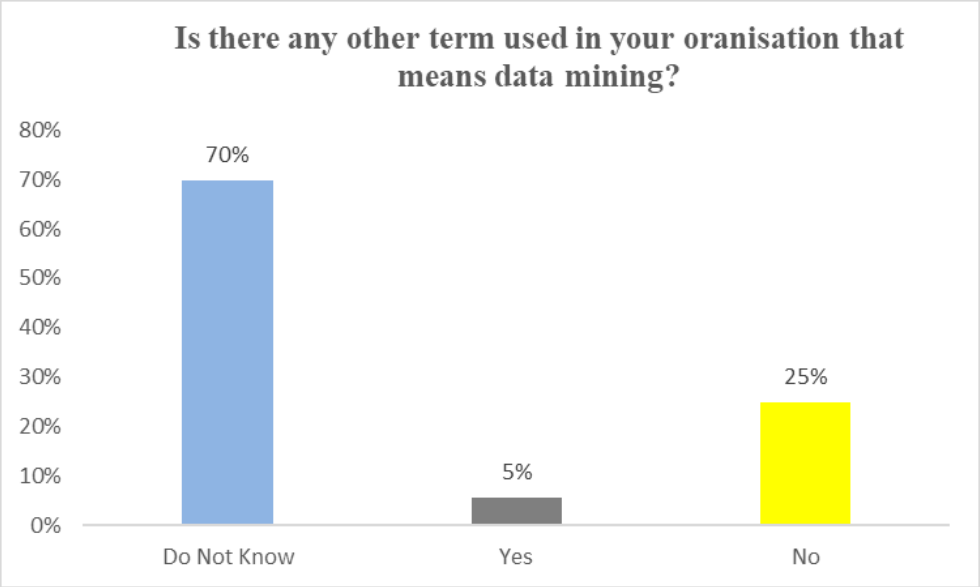


Figure 25: Awareness of Data Mining

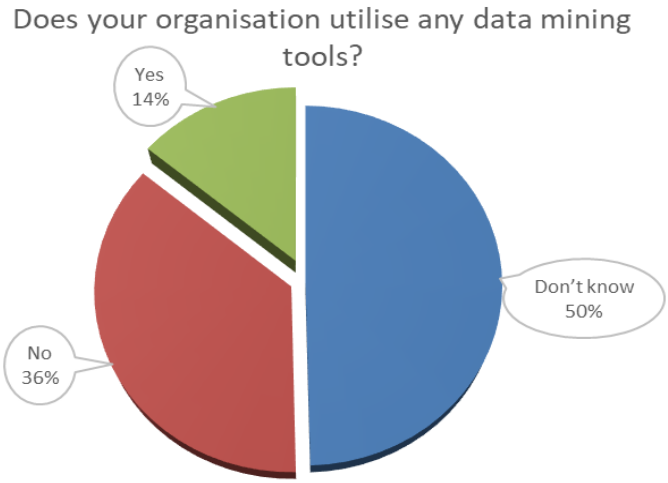



To substantiate the finding of the quantitative data, an interview was also conducted on this question of awareness. Unsurprisingly, only 40% of the interviewees indicated that they know the data mining technology.

### 6.7 Adoption of Data Mining

#### 6.7.1 Data Mining tools

Figure 26: Data Mining tools



From the survey, it is surprising that almost 36% of respondents indicated no data mining use within their AIS. When respondents were asked if their department used data mining tools, 50% were unaware, while just 14% said they did. This is consistent with the little understanding individuals seem to have about using analytical tools for AIS and their confusion over the department's use of data mining. However, it supports the notion that data mining is being used sparingly now.

**Table 12: Readiness/Preparedness to Adopt Data Mining**

| S/n | Readiness parameters | N | Min. | Max. | Mean |
|---|---|---|---|---|---|
| 1 | 18.2. Products and services that use the newest technologies are much more convenient. | 129 | 2 | 10 | 6.72 |
| 2 | 18.4. Technology makes me more efficient in my occupation. | 129 | 1 | 10 | 6.36 |
| 3 | 18.8. It is easy to learn how to use technology. | 129 | 1 | 10 | 6.22 |
| 4 | 18.10. I think it would be very good to use data mining technology for analysing accounting data in addition to current methods. | 129 | 2 | 10 | 6.20 |
| 5 | 18.7. I am always open to learning about new and different technologies. | 129 | 1 | 10 | 6.18 |
| 6 | 18.6. I find myself having fewer problems than other people in making technology work for me | 129 | 1 | 10 | 6.16 |
| 7 | 18.5. I keep up with the latest technological developments in my areas of interest. | 129 | 1 | 10 | 6.11 |
| 8 | 18.9. Overall, I find technology useful for any task I need to accomplish. | 129 | 1 | 9 | 6.05 |
| 9 | 18.3. I prefer to use the most advanced technology available. | 129 | 2 | 10 | 5.81 |
| 10 | 18.1. Technology gives me greater control over my daily work activities | 129 | 1 | 10 | 5.12 |

From the result shown in the table above, the mean score for the readiness parameters ranged from 5.12 to 6.72. Therefore, the results show a consensus on the level of agreement between the respondents. Next, the convenience of use is the most agreed with, followed by the efficiency of work, then, learning easily.

### 6.7.2 Years of Use and Expertise in Data Mining Technology

**Figure 27: Years of Use and Expertise in Data Mining Technology**

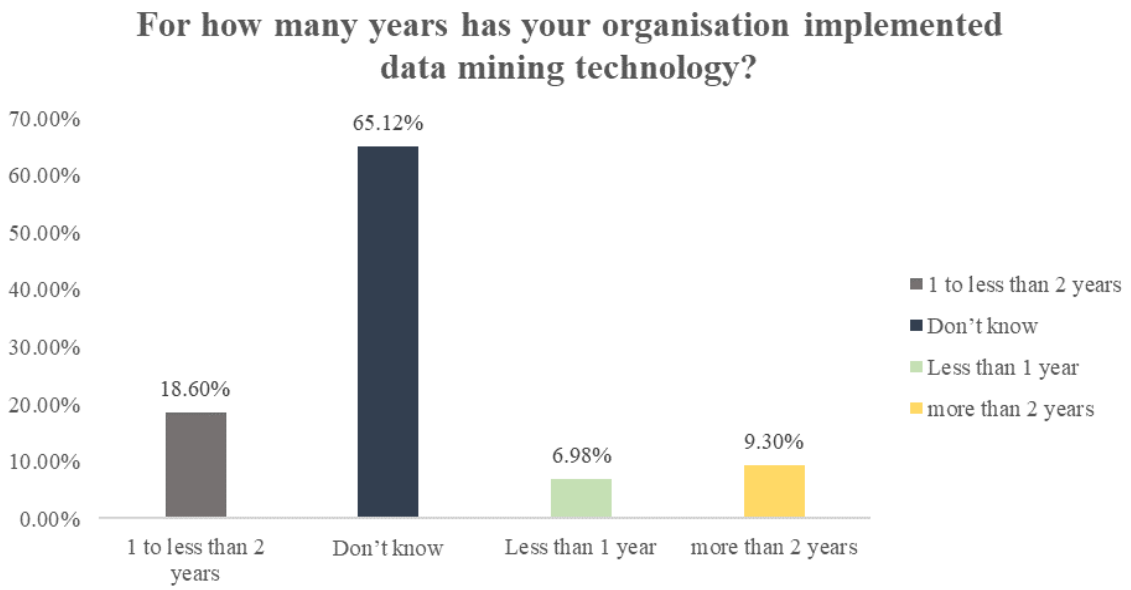



Figure 27 above depicts the level of expertise of the respondent in data mining technology. However, only about 35 per cent have relevant years of data mining technology experience. This further supports the notion that data mining is used sparingly within the Nigerian public sector.

### 6.7.3 Factors Influencing an Organisation's Decision to Employ Data Mining

Though there were variations in the responses as expected, the respondents who made a claim or stated that their departments employ data mining tools were questioned on the reason for their choice.

From the responses generated, technical, organizational, human resource-related, and external were the four highlighted problems. Table 6.7 summarizes the responses. The responses to the technical problems were mostly favourable, with over 80% of respondents deeming the highlighted issues. Technical support, software compatibility, and a department with an adequate ICT infrastructure are all likely to play a role in any choice to use data mining. Respondents agreed on organizational problems, stating that it was critical to have top management support and sufficient financial resources to implement data mining technologies. Human resource concerns such as training adequacy and employees with technological capabilities were significant. External factors such as shifting management trends in the private sector and political influence

do not seem to significantly impact the choice to use data mining since a sizable proportion of respondents expressed a neutral opinion on these topics. On the other hand, efforts to ensure public accountability were ranked highly as a possible influence.

**Table 13: Factors Influencing Organisation Decision to Adopt Data Mining**

| S/n | Decision Factors | N | 1 = Strongly Disagree | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 = Strongly Agree | RII | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 21.2. Compatibility of software with existing operating systems | 129 | 1 | 6 | 7 | 5 | 23 | 30 | 27 | 20 | 8 | 2 | 0.61 | 1st |
| 2 | 21.5. Technology savvy staff | 129 | 2 | 7 | 1 | 12 | 25 | 39 | 16 | 24 | 3 | 0 | 0.59 | 2nd |
| 3 | 21.3. Full support from top management | 129 | 3 | 5 | 7 | 12 | 23 | 36 | 20 | 14 | 9 | 0 | 0.58 | 3rd |
| 4 | 21.7. Changes in management trend within private sector | 129 | 0 | 9 | 8 | 11 | 30 | 20 | 28 | 15 | 8 | 0 | 0.58 | 3rd |
| 5 | 21.8. Directives from politicians. | 129 | 0 | 6 | 6 | 11 | 30 | 40 | 23 | 8 | 5 | 0 | 0.57 | 4th |
| 6 | 21.10. A sufficient financial resource | 129 | 4 | 1 | 6 | 16 | 30 | 31 | 24 | 10 | 7 | 0 | 0.57 | 4th |
| 7 | 21.6. Up-to-date ICT infrastructure | 129 | 1 | 7 | 8 | 15 | 36 | 28 | 19 | 11 | 4 | 0 | 0.55 | 5th |
| 8 | 21.9. An attempt to ensure public accountability | 129 | 0 | 6 | 20 | 10 | 24 | 26 | 21 | 18 | 4 | 0 | 0.55 | 5th |
| 9 | 21.4. Effective and adequate training for staff | 129 | 2 | 8 | 13 | 21 | 19 | 30 | 17 | 14 | 5 | 0 | 0.54 | 6th |
| 10 | 21.1. Adequate technical support from vendors | 129 | 10 | 19 | 13 | 4 | 17 | 36 | 14 | 11 | 5 | 0 | 0.49 | 7th |

From the result, it can be observed that the respondents rank the Compatibility of the data mining software with existing and Technology-savvy staff as the top two influencing factors, which are both technically related—having RII of 0.61 and 0,59, respectively. At the same time, the bottom two factors are Effective and adequate training for staff and Adequate technical support from vendors having RII of 0.54 and 0.49, respectively.

### 6.7.4 Reasons for Non-Implementation of Data mining Technology by the public sector

Respondents who indicated that their departments were not adopting data mining technology indicated reasons that could be classified as technological, organisational, or human resource issues. The Nine (9) issues were listed, and the respondents were presented with a 10-point Likert scale ranging from 1 as strongly disagree to 10 as strongly agree. The resulting analyses are shown in the table below:

**Table 14: Reasons for not utilising data mining**

| S/n | Issues | N | Min. | Max. | Mean |
|---|---|---|---|---|---|
| 1 | 22.2. Lack of expertise in implementing data mining | 129 | 2 | 9 | 5.98 |
| 2 | 22.5. Lack of top management support | 129 | 1 | 9 | 5.98 |
| 3 | 22.8. Lack of management policies | 129 | 1 | 9 | 5.79 |
| 4 | 22.9. Having more pressing problems | 129 | 2 | 9 | 5.72 |
| 5 | 22.6. Difficult to select appropriate software | 129 | 2 | 9 | 5.70 |
| 6 | 22.4. Costly to implement new technology | 129 | 1 | 9 | 5.62 |
| 7 | 22.3. Lack of awareness about data mining | 129 | 1 | 9 | 5.58 |
| 8 | 22.7. Too complex and time-consuming | 129 | 1 | 9 | 5.51 |
| 9 | 22.1. Satisfied with current analysis method | 129 | 1 | 9 | 5.33 |

These issues and obstacles preventing non-adopters from adopting data mining technologies seem moderate, as can be seen in the mean value ranging only between 5.33 and 5.98 out of 10.

### 6.7.5 Organisation Attitude towards Adoption of Data Mining Technology

**Table 15: Attitude towards Data Mining**

| S/n | Attitude towards Data Mining | Categories | Count | Percentages |
|---|---|---|---|---|
| 1 | Willingness to adopt and use data mining technology (Does your organization intend to adopt data mining?) | Definite intend to adopt | 16 | 12.4% |
| | | Don't know | 32 | 24.8% |
| | | Little intent to adopt | 35 | 27.1% |
| | | Moderate intent to adopt | 39 | 30.2% |
| | | No intent to adopt | 7 | 5.4% |
| | | | | |
| 2 | If your organization intends to adopt data mining, how soon will it be operationally implemented? | 12 to 18 months | 32 | 25% |
| | | 18 to 24 months | 24 | 19% |
| | | Less than 12 months | 13 | 10% |
| | | More than 24 months | 22 | 17% |
| | | No plans to adopt | 38 | 29% |

The researcher found out from quantitative data, as presented in Table 5.9 above, that Data Mining implementation seeks to improve how data is analysed and used for the organisation's greater good. However, these results depict that only a minority, about 12 per cent, are certain of their intention to adopt data mining technology. Furthermore, only 10 per cent of this group believe the implementation will be as soon as in less than 12 months. This generally summarises the attitude of the Nigerian public sector towards data mining adoption/ implementation.

### 6.8 Impact of Data Mining Technology

To investigate the potential impact of data mining on organisation, the researcher presents the below-listed impact parameter to the respondent and ask that they indicate their level of agreement with the statement. The Eight (8) statements were listed, and the respondents were presented with a 10-point Likert scale ranging from 1 as strongly disagree to 10 as strongly agree. The resulting analyses are shown in the table below:

**Table 16: Impact of Data Mining Usage**

| S/n | Impacts | N | Min. | Max. | Mean |
|---|---|---|---|---|---|
| 1 | 24.6. Fulfil information needed for the decision making | 129 | 1 | 10 | 5.73 |
| 2 | 24.2. Increase the quality of information derived from AIS. | 129 | 1 | 9 | 5.64 |
| 3 | 24.4. Improve the quality of the transaction | 129 | 1 | 9 | 5.58 |
| 4 | 24.8. Contributes to the speed of my decision making | 129 | 1 | 9 | 5.40 |
| 5 | 24.7. Provides decision support in supporting my decision-making process | 129 | 1 | 10 | 5.38 |
| 6 | 24.3. Increase overall AIS performance | 129 | 2 | 9 | 5.20 |
| 7 | 24.5. Reduce the cycle time of my organization | 129 | 2 | 9 | 5.16 |
| 8 | 24.1. Lower down transaction cost | 129 | 1 | 9 | 4.67 |

From table 16 above, it can be deduced that the respondents perceive data mining to have the greatest impact on Organisation's decision-making process by providing relevant information. Next on the list is the impact on AIS data quality. The least on the list is the impact on the cost by lowering transaction costs. The respondents do not think data mining technology will decrease an organization's operational costs.

**MODEL TESTING**

Model A: This research wishes to investigate what factors influence the satisfaction of staff with organisation's accounting information system. Relevant predictors include Years of experience in the AIS, Use of analysis software, Use of data mining technology.

To test the above model, ordinal logistic regression analysis was used having satisfaction with AIS as the dependent variable and years of experience in the AIS, use of analysis software, use of data mining technology as the covariances (independent variable), results are as presented below.

**Table 17: Model Fit**

| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
|---|---|---|---|---|
| Intercept Only | 156.927 | | | |
| Final | 144.489 | 12.438 | 3 | .006 |

The result shows that the inclusion of full set the predictors (Years of experience in the AIS, Use of analysis software, Use of data mining technology) represents significant improvement in fit of the final model relative to a null model with Chi-square value 12.438 and significance of .006.

**Table 18: Goodness of Fit**

| | Chi-Square | df | Sig. |
|---|---|---|---|
| Pearson | 105.930 | 66 | .001 |
| Deviance | 90.897 | 66 | .023 |

The "Goodness of Fit" helps to determine whether the model exhibits good fit for the data. In this model, we see that both the Pearson chi-square and the deviance test were both significant. These results suggest that the model does not have good fit.

**Table 19: Regression parameter estimates**

| | | Estimate | Std. Error | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|---|
| **Threshold** | [Satisfaction with AIS = 1] | -1.602 | .558 | 8.249 | 1 | .004 | .201 |
| | [Satisfaction with AIS = 2] | .307 | .470 | .426 | 1 | .514 | 1.359 |
| | [Satisfaction with AIS = 3] | 2.463 | .522 | 22.261 | 1 | .000 | 11.743 |
| **Location** | Years of experience in AIS | .611 | .256 | 5.700 | 1 | .017 | 1.842 |
| | Use of analysis software | .361 | .209 | 2.975 | 1 | .085 | 1.435 |
| | Use of data mining technology | -.263 | .241 | 1.188 | 1 | .276 | .769 |

Table 19 above presents the regression coefficient and significance tests of the independent variables in the model. The positive estimate value of .611 and .361 gotten for years of experience in AIS and use of analysis software respectively, reveals that for every unit increase in these predictors, the satisfaction with organisation's AIS (dependent variable) has a likelihood of increase of .611 and .361 respectively. This general, this indicates that an increase in these two predictors results in an increase of the probability of having a higher level of satisfaction with AIS. It is necessary to note that however, years of experience in

AIS has significant influence on satisfaction with AIS, while the influence of use analysis software is insignificant.

On the other hand, the negative estimate value of -.263 derived for "use of DM technology" predicts that for every increase in the use of DM technology, the level of satisfaction with AIS has a likelihood of decrease toward lower level. This indicates that an increase in the use of DM results to a decrease in the level of satisfaction with organisation's AIS, however this influence is relatively insignificant as show in table 19.

Additional information from the Exp(B) column shows that years of experience in AIS and use of analysis software have odds ratio >1 suggesting an increasing probability of having a higher level of satisfaction with AIS as these independent variables increase, and that the use of DM technology have odds ratio <1 suggesting otherwise.

**Table 20: Test of proportional odds**

| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
|---|---|---|---|---|
| Null Hypothesis | 144.489 | | | |
| General | 133.952 | 10.537 | 6 | .104 |

There is an assumption in regression analysis that the relationships between the independent variables are the same across all possible comparison. The results from this analysis as shown in table 8.4 indicates that this assumption is satisfied as p= .104 (insignificant).

In conclusion, years of experience in AIS was a significant positive predictor of level of satisfaction with AIS. For every one unit increase on years of experience in accounting information system, there is a predicted increase of .611 in the log of odds of staff being in a higher category of satisfaction with their organisation accounting information system.

Use of software to aid analysis in the AIS was an insignificant positive predictor of level of satisfaction with AIS. For every one unit increase on use of analysis software, there is a predicted increase of .361 in the log of odds of staff being in a higher category of satisfaction with their organisation accounting information system.

Use of data mining in the AIS was an insignificant negative predictor of level of satisfaction with AIS. For every one unit increase on use of data mining technology, there is a predicted decrease of .263 in the log of

odds of staff being in a higher category of satisfaction with their organisation accounting information system.

In general, this model of level of satisfaction with an organisation accounting information system does satisfy the assumption of proportional odds between the independent variables and but a have a week "Goodness of Fit". Thus, this model is considerable for this study.

Model B: This study is interested in what factors influence organisation intention/willingness to adopt DM in AIS. Potential predictors include Level of education, Years of experience in the AIS, Satisfaction with current AIS, Awareness of DM, and Experience in DM.

To test the above model, ordinal logistic regression analysis was used having Intention/willingness to adopt DM as the dependent variable and Level of education, Years of experience in the AIS, Satisfaction with current AIS, Awareness of DM, and Experience in DM as the covariances (independent variable), results are as presented below.

**Table 21: Model Fit**

| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
|---|---|---|---|---|
| Intercept Only | 311.928 | | | |
| Final | 284.768 | 27.159 | 5 | .000 |

The result shows that the inclusion of full set the predictors (Level of education, Years of experience in the AIS, Satisfaction with current AIS, Awareness of DM, and Experience in DM) represents significant improvement in fit of the final model relative to a null model with Chi-square value 27.159 and significance of .000.

**Table 22: Goodness of Fit**

| | Chi-Square | df | Sig. |
|---|---|---|---|
| Pearson | 336.547 | 259 | .001 |
| Deviance | 246.888 | 259 | .695 |

The "Goodness of Fit" helps to determine whether the model exhibits good fit for the data. In this model, we see that both the Pearson chi-square test was significant while the deviance test was insignificant. These results suggest good model fit.

**Table 23: Regression parameter estimates**

| | | Estimate | Std. Error | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|---|
| **Threshold** | [Intention/willingness to adopt DM = 0] | .974 | .768 | 1.608 | 1 | .205 | 2.648 |
| | [Intention/willingness to adopt DM = 1] | 1.307 | .771 | 2.876 | 1 | .090 | 3.696 |
| | [Intention/willingness to adopt DM = 2] | 2.642 | .796 | 11.030 | 1 | .001 | 14.045 |
| | [Intention/willingness to adopt DM = 3] | 4.463 | .854 | 27.313 | 1 | .000 | 86.772 |
| **Location** | Level of education | .500 | .198 | 6.391 | 1 | .011 | 1.487 |
| | Years of experience in the AIS | .397 | .234 | 2.877 | 1 | .090 | 1.648 |
| | Satisfaction with current AIS | -.100 | .203 | .242 | 1 | .623 | .905 |
| | Awareness of DM | .085 | .202 | .178 | 1 | .673 | 1.089 |
| | Experience in DM | .591 | .158 | 14.014 | 1 | .000 | 1.805 |

Table 23 above presents the regression coefficient and significance tests of the independent variables in the model. The positive estimate value derived for Level of education, Years of experience in the AIS, Awareness of DM, and Experience in DM, reveals that for every unit increase in these predictors, there is likelihood of increase in "Willingness to adopt DM" by the value in the estimate column of the above table. This general, this indicates that an increase in these predictors results in an increase of the probability of having a higher degree of intention to adopt DM. On the other hand, the negative estimate value of -.100 derived for "Satisfaction with current AIS" predicts that for every increase in the level of satisfaction with current AIS, there is a likelihood of decrease in the intention to adopt DM. Also, of all these predictors only Level of education and Experience in DM shows a significant effect on the decision or intention to adopt DM.

Additional information from the Exp(B) column shows that satisfaction with current AIS have odds ratio <1 suggesting a decreasing probability of having a higher degree of willingness to adopt DM. Other predictors have odds ratio >1 suggesting an increasing probability of having a higher degree of willingness to adopt DM as these independent variables increase.

### Table 24: Test of proportional odds

| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
|---|---|---|---|---|
| Null Hypothesis | 284.768 | | | |
| General | 266.393 | 18.375 | 15 | .243 |

There is an assumption in regression analysis that the relationships between the independent variables are the same across all possible comparison. The results from this analysis as shown in table 8.8 indicates that this assumption is met as p= .243 (insignificant).

In conclusion, level of education and experience in DM were significant positive predictors of decision to adopt data mining in AIS. For every one unit increase on staff level of education and experience in DM, there is a predicted increase of .500 and .591 respectively, in the log of odds of staff being in a higher category of willingness to embrace DM.

Years of experience in AIS and awareness of DM were insignificant positive predictors of decision to adopt data mining in AIS. For every one unit increase on staff level of education and experience in DM, there is a predicted increase of .397 and .085 respectively, in the log of odds of staff being in a higher category of willingness to embrace DM.

Level of satisfaction with current AIS was an insignificant negative predictor of the decision to adopt data mining in AIS. For every one unit increase on level of satisfaction with AIS, there is a predicted decrease of .100 in the log of odds of staff being in a higher category of willingness to embrace DM.

In general, this model of intention/willingness to adopt data mining in the accounting information system satisfies the assumption of proportional odds between the independent variables and have a strong "Goodness of Fit". Thus, this model is considerable for this study.

Model C: This study investigates the variables influencing the data mining adoption group, organisations staff were asked if they currently adopt or not adopt or not aware of data mining technology. Possible predictors in this study include Level of education, Years of experience in the AIS, Satisfaction with current AIS, Awareness of DM, and Experience in DM.

To test the above model, multinominal logistic regression analysis was used by comparing the Not aware and Adopter groups relative to the "non-adopter" group, using a set of parameters (independent variable) including Level of education, Years of experience in the AIS, Satisfaction with current AIS, Awareness of DM, and Experience in DM.

### Table 25:Model Fit

| Model | -2 Log Likelihood | Chi-Square | df | Sig. |
|---|---|---|---|---|
| Intercept Only | 230.869 | | | |
| Final | 148.098 | 82.771 | 10 | .000 |

The result shows that the inclusion of full set the parameters (Level of education, Years of experience in the AIS, Satisfaction with current AIS, Awareness of DM, and Experience in DM) represents significant improvement in fit of the final model relative to a null model with Chi-square value 82.771 and significance of .000.

### Table 26: Goodness of Fit

| | Chi-Square | df | Sig. |
|---|---|---|---|
| Pearson | 231.615 | 122 | .000 |
| Deviance | 134.015 | 122 | .215 |

The "Goodness of Fit" helps to determine whether the model exhibits good fit for the data. In this model, we see that both the Pearson chi-square test was significant while the deviance test was insignificant. These results suggest good model fit.

### Table 27: Regression parameter estimates

| Data Mining Adoption Group | | B | Std. Error | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|---|
| **Not Aware** | Intercept | 1.603 | 1.096 | 2.138 | 1 | .144 | |
| | Level of education | .454 | .265 | 2.936 | 1 | .087 | 1.574 |
| | Years of experience in the AIS | -.910 | .347 | 6.881 | 1 | .009 | .402 |
| | Satisfaction with current AIS | .247 | .290 | .728 | 1 | .394 | 1.280 |
| | Awareness of DM | -1.025 | .290 | 12.531 | 1 | .000 | .359 |
| | Experience in DM | -.681 | .236 | 8.305 | 1 | .004 | .506 |
| **Adopter** | Intercept | -5.914 | 2.136 | 7.667 | 1 | .006 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Level of education | -.007 | .387 | .000 | 1 | .985 | .993 |
| | Years of experience in the AIS | .399 | .482 | .684 | 1 | .408 | 1.490 |
| | Satisfaction with current AIS | -.145 | .445 | .107 | 1 | .744 | .865 |
| | Awareness of DM | 1.481 | .659 | 5.046 | 1 | .025 | 4.396 |
| | Experience in DM | 1.425 | .400 | 12.722 | 1 | .000 | 4.158 |

a. The reference category is non-Adopter.

Table 27 above presents a comparison of each category to the "non-Adopter" group, showing a set of parameter estimates for its comparison. The regression coefficient represents predicted change in log odds of membership in the target group. For the Adopter group, the negative estimate value B for level of education and satisfaction with current AIS depicts that staff with high level of education and high level of satisfaction with the current AIS of the organisation have a decreased likelihood of falling Adopter group relative to the Non-adopter group, while the positive estimate value seen in years of experience in the AIS, awareness of DM and experience in DM indicates that an increase in the log odds predicts an increase in the probability of staff falling in the Adopter group relative to the Non-adopter group. Also, out of these predictors only Awareness of DM and Experience in DM have significant influence on staff identifying as adopter of data mining.

Additional, information from the Exp(B) column shows that years of experience in the AIS, awareness of DM and experience in DM have odds ratio >1 suggesting an increasing probability of staff falling under the Adopter category relative to non-adopter. Other predictors including level of education and satisfaction with current AIS have odds ratio <1 suggesting a decreasing probability of staff falling under the Adopter category relative to non-adopter.

In conclusion, level of education was insignificant and having almost zero effect on predicting whether a staff falls under the Adopter category relative to non-adopter. For every one unit increase on staff level of education, there is a predicted decrease of -.007 in the log of odds of staff being an adopter of DM, in essence this shows that level of education has no influence on the staff being an adopter of data mining technology.

Years of experience in AIS was insignificant positive predictors of staff falling under the Adopter category relative to non-adopter. For every one unit increase on staff level of the Adopter category relative to non-adopter, there is a predicted increase of .399 in the log of odds of staff being an adopter of data mining technology.

Satisfaction with current AIS was insignificant negative predictors of staff falling under the Adopter category relative to non-adopter. For every one unit increase on staff level of the Adopter category relative to non-adopter, there is a predicted decrease of .145 in the log of odds of staff being an adopter of data mining technology. This implies that there is a bigger chance of staff with high level of satisfaction with their organisation current AIS to identify as Non-adopter of DM.

Awareness of DM and experience in DM were a significant positive predictor of staff falling under the Adopter category relative to non-adopter. For every one unit increase on staff Awareness of DM and experience in DM, there is a predicted increase of 1.481 and 1.425 respectively, in the log of odds of staff identifying an adopter of data mining technology. These two predictors indicated to be the most influencing in this model.

In general, this model of data mining adoption group has good model fit and describes the influence of the independent variable accurately. Thus, this model is considerable for this study.

### 6.9 Data Analysis of Research Questions

A series of questions were asked to examine knowledge of intention toward, and implementation of DM technologies to elicit information on managerial qualities thought important in using technologies. The first question was as follows:

**Research question one: What management styles are most prevalent in Nigeria's public sector?**

Factor analysis was used to evaluate management styles in the Nigerian public sector. Thirty questions were included in the survey to ascertain each firm's management style. In addition, the Kaiser-Meyer-Olkin (KMO) and Bartlett's sphericity tests were employed to determine the suitability of component analysis. Both tests show that factor analysis is acceptable for analysing management style components, KMO 0.856 and Sig = 0.000, respectively (see Table 17).

**Table 28: KMO and Bartlett's Test**

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .856 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 3223.343 |
| | df | 595 |
| | Sig. | .000 |

To better understand the management style predominant in the public sector of Nigeria, respondents were asked to rate their level of agreement with 30 statements relating to management style. The Thirty (30) statements were listed, and the respondents were presented with a 10-point Likert scale ranging from 1 as strongly disagree to 10 as strongly agree. The resulting analyses are shown in the table below:

**Table 29: Mean Analysis of Management Style**

| S/n | Management style | N | Min. | Max. | Mean |
|---|---|---|---|---|---|
| 1 | 10.20. I allow my staff to determine what needs to be done and how to do it. | 129 | 1 | 10 | 6.62 |
| 2 | 10.27. I tell the staff what must be done and how to do it. | 129 | 2 | 10 | 6.58 |
| 3 | 10.8. My source of power is based on organizational rules and procedures. | 129 | 2 | 10 | 6.53 |
| 4 | 10.25. When making decisions, I obtain the information I need, consider it, and personally make a firm and quick decision. | 129 | 2 | 10 | 6.50 |
| 5 | 10.16. I listen to staff opinions about work and take them into consideration. | 129 | 1 | 10 | 6.46 |
| 6 | 10.28. Forward planning begins at the department level. | 129 | 2 | 10 | 6.39 |
| 7 | 10.30. My responsibility to the needs of my subordinates is equally as important as working as a team. | 129 | 2 | 10 | 6.34 |
| 8 | 10.23. I have a rigid commitment to my opinion. | 129 | 1 | 10 | 6.33 |
| 9 | 10.2. I always make the final decision and instruct staff to implement that decision. | 129 | 1 | 10 | 6.33 |
| 10 | 10.26. In deciding, I devote large amounts of time to persuading staff to accept my point of view. | 129 | 2 | 10 | 6.26 |
| 11 | 10.19. I believe in extensive consultation with staff prior to making management decisions but always reserve the right to make decisions unilaterally. | 129 | 2 | 10 | 6.26 |
| 12 | 10.12. I am happy to let staff assume responsibility for important decisions within their job descriptions. | 129 | 1 | 10 | 6.22 |

| | | | | | |
|---|---|---|---|---|---|
| 13 | 10.18. I believe that staff members should be encouraged to respond creatively to challenging situations. | 129 | 1 | 10 | 6.21 |
| 14 | 10.24. I actively encourage teamwork. | 129 | 2 | 10 | 6.19 |
| 15 | 10.11. I seek to work in harmony with my staff. | 129 | 1 | 10 | 6.17 |
| 16 | 10.7. I feel upset if I cannot convince the staff that the decisions, I make are the best ones. | 129 | 1 | 10 | 6.17 |
| 17 | 10.13. This company has many rules and procedures that must be followed when making decisions. | 129 | 1 | 10 | 6.16 |
| 18 | 10.21. Even if the staff disagrees with my position on an issue, I impose my own view rather than negotiate a compromise solution. | 129 | 1 | 10 | 6.13 |
| 19 | 10.29. My responsibility for the needs of my subordinates is equally as important as getting the job done. | 129 | 1 | 10 | 6.13 |
| 20 | 10.10. I try to capture the allegiance and respect of my staff using my work skills and knowledge. | 129 | 1 | 10 | 6.12 |
| 21 | 10.5. I believe that innovation and unconventional approaches to problem-solving should be rewarded. | 129 | 1 | 10 | 6.09 |
| 22 | 10.4. I set tasks and schedules and make sure that the staff meets them even if this causes me to be unpopular. | 129 | 2 | 10 | 6.08 |
| 23 | 10.17. I believe that this company can quickly alter its administrative procedures, reallocate its resources and undertake new activities to meet changes in our operating environment. | 129 | 1 | 10 | 6.07 |
| 24 | 10.14. When something new occurs, I discuss with senior staff how this will have an impact on the firm and the work undertaken. | 129 | 1 | 10 | 6.06 |
| 25 | 10.15. I am prepared to delegate tasks to implement a new procedure or process. | 129 | 2 | 10 | 6.04 |
| 26 | 10.22. I accept disagreement and try to create a debate about the issues in seeking a resolution. | 129 | 1 | 9 | 5.95 |
| 27 | 10.3. I like to share my leadership power with my subordinates. | 129 | 1 | 10 | 5.94 |

| | | | | | |
|---|---|---|---|---|---|
| 28 | 10.9. My source of power is based on my knowledge of organizational work and activities. | 129 | 1 | 10 | 5.92 |
| 29 | 10.6. I believe that staff and management should work on a cooperative basis to achieve organizational aims. | 129 | 1 | 10 | 5.86 |
| 30 | 10.1. In this sector, management decisions are made based on agreement and consensus between staff and management. | 129 | 1 | 10 | 5.07 |

From table 18 above, the three topmost statements represent three distinguished management styles. This conflicting result shows that no single management style is predominately practised in the Nigerian public sector. The respondents show a wide range of different perspectives on this section. A careful look at the results also depicts that all the statements were above average, indicating that the respondents agreed with most management-style statements.

**Research Question two: Is there a discernible correlation between managers; attitude about IT and DM and their management styles?**

For continuous data, bivariate analysis or correlation analysis determines the strength of the linear connections between two pairs of variables. This study used bivariate analysis using SPSS to determine the relationships between the five demographic factors and attitudes toward IT and DM. Given that gender is categorised into two distinct categories (male and female), it is necessary to analyse the differences, not the correlations, between these groups and their views toward IT and DM. As such, the Mann-Whitney U Test was utilised.

Additionally, the bivariate analysis allowed for the investigation of interactions between the sums of management styles (task-centred and people-centred management styles) on the one hand and the sums of attitudes toward DM on the other (Table 19).

**Table 30: Correlation between managers' attitudes towards IT and DM and management styles**

| | | Attitudes towards IT and DM |
|---|---|---|
| Task-oriented management | Pearson Correlation | -.056 |
| | Sig. (2-tailed) | .457 |
| | N | 180 |
| | Pearson Correlation | .385** |

| | | |
|---|---|---|
| People-oriented management | Sig. (2-tailed) | .000 |
| | N | 180 |

Table 19 demonstrates strong positive statistical connections between managers' attitudes toward IT and DM and a people-centred management style. The term "statistical significance" refers to significantly different correlations from zero. The positive link shows that when a manager's people-centred approach improves, their score on the attitudes scale improves as well. The people-oriented management style positively correlates substantially with managers' attitudes toward IT and DM.

However, task-oriented management styles show no statistically significant association with managers' attitudes toward IT and DM. As a result, people-oriented managers often have a more favourable opinion of IT and DM than their task-oriented colleagues. Furthermore, managers who score well on the people-oriented management style are likelier to view IT and DM positively.

The partial correlation coefficient was used to determine if these associations seem to be impacted by the five demographic parameters (gender, age, organisational experience, educational level, and supervisory role). This allowed for evaluating the connections mentioned above while accounting for the influence of these demographic factors. According to the findings of this research (Table 20), the five demographic factors have no discernible effect on the links between management styles and attitudes toward IT and DM.

**Table 31: P-correlation coefficient**

| Control parameters | | | Attitude toward IT and DM |
|---|---|---|---|
| Gender, Age, level of experience, Education and years in a supervisory role | Attitude toward DM | Correlation | 1.000 |
| | | Significance (2-tailed) | . |
| | | df | 0 |
| | Task-oriented management | Correlation | -.080 |
| | | Significance (2-tailed) | .295 |
| | | df | 173 |

| | | | |
|---|---|---|---|
| | People-oriented management | Correlation | .374 |
| | | Significance (2-tailed) | .000 |
| | | df | 173 |

The findings are compatible with certain theoretical interpretations of previous research. For instance, Johannessen (1994) highlights managerial styles as a major innovation aspect essential for successfully deploying information technology inside an organisation. He outlines many essential innovation aspects in the context of information technology. In addition, he emphasises that an open management style, such as a people-oriented approach, employee autonomy, flexibility, and the establishment of an interactive learning environment, are the most critical characteristics linked with the success of IT adoption.

According to Pheng (1999), people's resistance to IT can be eliminated with top management support, employee-manager involvement, and open employees' resistance to a new system can be reduced. These factors are all closely related to the management style prevalent in the public sector, where a new system or change is being introduced. They seem more associated with people-oriented management approaches and managerial inventiveness (Islam et al. 2010). Most significantly, the findings in Table 6.13 offer empirical support for current theoretical assumptions and provide a more extensive study of the multidimensional links between management styles and various components of attitudes toward IT and DM.

**Research Question three: Do management and personnel in the Nigerian public sector grasp the concept of data mining and acknowledge the importance of data mining techniques in day-to-day accounting activities?**

The answer to this question will be examined in terms of their level of knowledge of data mining methods and their willingness to embrace and use data mining technologies.

**a) Awareness and familiarity with data mining methods**

On the awareness and data mining tools familiarity, there was a seeming dearth of knowledge on the subject matter (see Table below). For example, only 12% (15 respondents) stated that the phrase "data mining" was used in their organization. In comparison, over 66% (87 respondents) were unaware that the term was ever

used inside their departments, and over 42.4% (53) were unsure whether an alternative term with a similar meaning had been used.

The degree of expertise indicated by respondents about data mining methods is also displayed in Table 6.13. Around 8% of respondents (10) reported having excellent knowledge, nearly 42% of respondents (52) reported having average knowledge, 32% of respondents (44) reported having little information, and 18.4% of respondents (23) reported not knowing at all. Additionally, the chart demonstrates that none of the respondents had an extensive understanding of data mining.

**Table 32: Frequency of awareness of and knowledge of data mining**

| | Frequency | Percent |
|---|---|---|
| **Use of data mining term** | | |
| 1. Yes | 15 | 12.0 |
| 2. No | 27 | 21.6 |
| 3. Don't Know | 87 | 66.4 |
| **Other terms that mean data mining** | | |
| 1. Yes | 12 | 9.6 |
| 2. No | 64 | 48.0 |
| 3. Not Sure | 53 | 42.4 |
| **Knowledge about data mining** | | |
| 1. No knowledge | 23 | 18.4 |
| 2. Little knowledge | 44 | 32.0 |
| 3. Average knowledge | 52 | 41.6 |
| 4. Excellent knowledge | 10 | 8.0 |
| 5. Rich knowledge | 0 | 0 |

More than eighty percent (80%) of respondents stated through the questionnaires that the phrase "data mining" had either not been used or were unaware of its usage. Issues regarding understanding data mining and its familiarity popped up throughout the interview.

**B) Data Mining Readiness**

Optimism, perception regarding ease of use, usefulness and innovativeness were the components used in assessing how ready they were for data mining.

These answers are briefed in Table 22 below. The optimism component received favourable responses, with around eighty to ninety-five per cent of the respondents agreeing with such assertions. Numerous respondents indicated that technology would give them more control over their daily work (95%), that it will be more convenient to use (88%), that they prefer to use the most advanced technology available (75%), that it will increase their work and occupation efficiencies (82%), and that it is a good idea to have data mining technology (86 per cent).

According to the descriptive statistics in Table 22, all respondents agree with these assertions expressing their readiness for data mining. For each statement equivalent to the agreement, the mean was more than 3, the model was greater than 4, and the median was higher than 4. As stated in the table, all t-tests were positive and significant. Positive and substantial outcomes were discovered for all optimistic assertions.

**Table 33: Readiness toward data mining technology**

| Readiness parameters | N | Mode | Median | Mean | T-test | Sig. |
|---|---|---|---|---|---|---|
| Technology gives me greater control over my daily work | 129 | 4.35 | 4.35 | 5.12 | 21.47 | .000 |
| Products and services that use the newest technologies are much more convenient to use | 129 | 4.35 | 4.35 | 6.72 | 18.56 | .000 |
| I prefer to use the most advanced technology available | 129 | 4.35 | 4.35 | 5.81 | 17.83 | .000 |
| Technology makes me more efficient in my occupation | 129 | 4.35 | 4.35 | 6.36 | 22.35 | .000 |
| I think it would be very good to use data mining technology for analysing accounting data in addition to current methods | 129 | 4.35 | 4.35 | 6.20 | 19.83 | .000 |
| I keep up with the latest technological developments in my areas of interest | 129 | 4.35 | 4.35 | 6.11 | 13.28 | .000 |
| I find myself having fewer problems than other people in making technology work for me | 129 | 4.35 | 4.35 | 6.16 | 14.552 | .000 |
| I am always open to learning about new and different technologies | 129 | 4.35 | 4.35 | 6.18 | 21.85 | .000 |
| **Easy to Use** | 129 | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| It is easy to learn how to use technology | 129 | 4.35 | 4.35 | 6.22 | 15.75 | .000 |
| Overall, I find the technology useful for any task I need to accomplish | 129 | 4.35 | 4.35 | 6.05 | 23.115 | .000 |

Respondents had a favourable attitude toward technology acceptance. They thought that implementing new technologies was necessary and should be encouraged. However, any government initiative aimed at introducing new technology should be accompanied by adequate initiatives to guarantee that employees' attitudes support adoption, that workflow is acceptable, and that manuals and necessary infrastructure are produced. Additionally, employees and management must see technology as a tool that may assist them in their jobs.

**Research Question Four: How might, or does, data mining affect the efficiency of public sector decision-making in Nigeria?**

Data from accounting information systems are utilized to make decisions. According to Table 6.13, 15% of respondents (19) utilized accounting information data seldomly in decision making, 30% (37) frequently used accounting information data, and 12% (15) frequently used AIS data in decision-making.

**Table 34: Frequency of use of accounting data from AIS in decision-making**

| Frequency of use | n | % |
|---|---|---|
| Never | 19 | 15.2 |
| Occasionally | 21 | 16.8 |
| Fairly often | 33 | 26.4 |
| Often | 41 | 29.6 |
| Very Frequently | 15 | 12.0 |

The AIS data is critical in the decision-making process. Therefore, any use or utilization of technology inside the AIS, such as data mining, aids decision-making. Respondents were questioned about their perceptions of the effect of data mining on the performance of AIS and decision-making processes (Table 24).

**Table 35: Perceived impact of data mining**

| PARAMETERS | N | Mode | Median | Mean | T-test | Sig. |
|---|---|---|---|---|---|---|
| Lower transaction cost | 129 | 4.25 | 4.0300 | 3.7037 | 13.332 | .000 |
| Increase the quality of information derived from AIS | 129 | 4.25 | 4.0300 | 4.1111 | 22.551 | .000 |
| Increase AIS performance | 129 | 4.25 | 4.0300 | 4.0074 | 19.621 | .000 |
| Improve the quality of transaction data | 129 | 4.25 | 4.0300 | 3.9778 | 14.847 | .000 |
| Reduce cycle time of the department | 129 | 4.25 | 4.0300 | 3.9037 | 18.68 | .000 |
| Meet the information needs for the decision making | 129 | 4.25 | 4.0300 | 4.0519 | 15.376 | .000 |
| Provides decision support in decision making | 129 | 4.25 | 4.0300 | 4.0593 | 21.163 | .000 |
| Contributes to the speed of decision making | 129 | 4.25 | 4.0300 | 4.0222 | 15.550 | .000 |

According to descriptive statistics (Table 6.16), the mean value for each of the eight assertions or effects was higher than 3.00, with the mode and median being equal to 4. Respondents expressed widespread agreement on the expected effect of data mining on the Accounting Information System (AIS). Positive and significant findings for all items relating to the effect of data mining on AIS indicate that respondents had a high view of the advantages and utility of incorporating such technology into their accounting systems.

Data mining has the potential to have a large influence on the AIS and decision-making processes. Respondents stated that data mining technologies would aid in acquiring more accurate information and data for decision-making. Incorporating data mining technologies into the accounting information system would increase the department's accounting system's performance and the efficacy of government decision-making procedures. By using data mining, the overall performance of AIS will be improved by cutting transaction costs, boosting the quality of information, and decreasing the department's cycle time. It substantiates the recommendation made by several researchers (Debreceny et al., 1999; Weber, 2002; Burns, 2003) that data mining would ensure the production of a good financial statement by increasing the accuracy and reliability of accounting information, as well as effectively providing information to decision-makers and ensuring internal control. Data mining was also considered to enhance decision-making

processes in the public sector by addressing the demand for information, speeding up making an educated choice, and providing a support system for the whole decision-making process.

**Research Question 5: Is the capability to use data mining methods a critical criterion for evaluating the Accounting Information System's success in the Nigerian public sector?**

This research question is intended to investigate whether data mining utilisation is a major issue or an important criterion in assessing the performance of AIS. Apart from the four qualities of AIS, other important factors considered in evaluating the performance of AIS were suggested. These also include statements relating to the ability to utilise data mining. The first part of the questionnaire asked respondents to indicate their agreement on the importance of each factor reflected in the evaluation of the Accounting Information System (AIS) performance. Table 6.17 summarises the result of the analysis; respondents (129) agreed that the simplicity of use of the system was a critical element in evaluating the system's success (this factor ranked number 1). In addition, the ability to automatically validate data ranked 1st, having adequate documentation ranked 3rd, being easy to modify and upgrade ranked 3rd, the ability to implement new data analysis tools (such as data mining) also ranked 3rd and having an effective data management strategy through a centralised database and data warehouse ranked 2nd. The above statements were all regarded as critical variables in assessing AIS success.

**Table 36: RII Analysis of AIS Performance Evaluation Criteria**

| Parameters | N | RII | Rank |
|---|---|---|---|
| The systems are easy to use | 129 | 0.61 | 1st |
| The systems can automatically validate the data | 129 | 0.61 | 1st |
| The systems have adequate documentation for employees to follow | 129 | 0.57 | 3rd |
| The system is easy to modify and upgrade | 129 | 0.57 | 3rd |
| The systems implement new data analysis tools (such as data mining) | 129 | 0.57 | 3rd |
| The systems have an effective data management approach such as, centralised database and data warehouses | 129 | 0.60 | 2nd |

The following statements were used to address the fifth research question: *(The systems implement new data analysis tools (such as data mining)) and (The systems have an effective data management approach such as centralised database and data warehouses).* These statements illustrated the capacity to use data mining inside the Accounting Information System (AIS). The result indicates that respondents agree that implementing new data analysis tools and managing data effectively via a central data warehouse is critical in evaluating their Accounting Information Systems in the public sector (see Table 26 below).

**Table 37: Factors representing the ability to utilise Data Mining**

| Factor | Descriptive Statistics | | | t-tests (Two-tailed =3) | |
|---|---|---|---|---|---|
| | Mode | Median | Mean | T value | Sig |
| The systems implement new data analysis tools (such as data mining) | 4.00 | 5.000 | 4.234 | 16.417 | .000 |
| The systems have an effective data management approach, such as centralised database and data warehouses | 4.00 | 5.000 | 4.534 | 21.626 | .000 |

Generally, a good accounting system is considered helpful, has fewer difficulties, is simple to use, comprehend, and user-friendly, generates current, timely, and accurate reports, and enables effective internal control. In addition, the replies indicate that the capacity to use data mining was a statistically important component, and the interviews elicited difficulties. As a result, it can be argued that the capacity to leverage data mining methods is a critical criterion for evaluating the success of Accounting Information Systems in the public sector.

**Research Question 6: To ascertain which model would enable the Nigerian public sector to execute more effective data mining techniques for the purpose of preserving high-quality knowledge inside the accounting information system.**

This question aims to develop a feasible paradigm for adoption in the Nigerian public sector to effectively deploy data mining technologies. This model would need to integrate the working culture and procedures of the public sector and emphasize the critical role of financial data in decision-making processes.

The initial step of model creation is integrating existing public sector systems. However, according to Abu Bakar et al. (2016), systems integration in the public sector is not a recent development in the Nigerian Public sector. Therefore, the integration of E-Government initiatives, state government accounting departments, and self-accounting departments with Accountant General Headquarters was proposed in this research to consolidate financial and accounting data into a single data warehouse for ease of access. That is, all systems from all e-government projects and data from statement government systems and the self-accounting department would have frameworks that enabled them to interact.

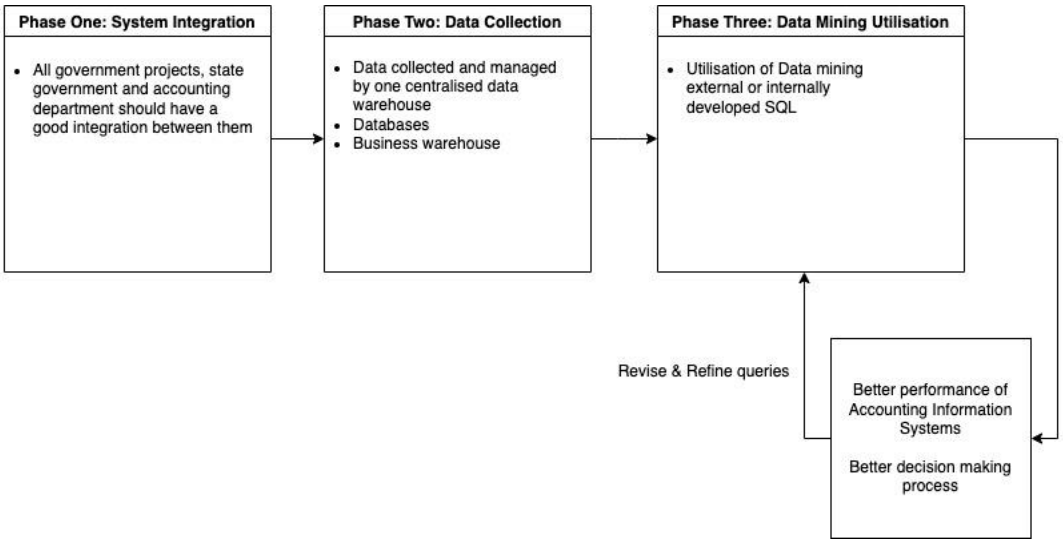
### 6.10 Proposed Data Mining Model

This project aims to establish a model that may guide the most effective way to integrate data mining technologies into the accounting information system in the Nigerian public sector. Fundamental to this approach is the need for the establishment of a warehouse capable of properly managing data, given the large number of public sector agencies that employ data, frequently of the same kind. A centralised data composite would seem to be the most practicable solution. The Francine Accounting and Financial Management System (FAFMS)' is a novel system that allows the deployment of a master database through a Business Warehouse (BW) and data marts. The incorporation of data mining technology into this system would seem to be reasonable. Using and deploying additional data mining methods with this data warehouse would be simpler. Adopting this new accounting system has laid a solid platform for data mining technology.

The suggested model is divided into system integration, data collection, and analysis (data mining) operations (See Figure 29 below). While trying to implement data mining technology, it is critical to ensure that all public sector accounting systems communicate well. As indicated by the interview results, resolving a system integration issue is the first component that must be addressed before moving on to further data analysis tasks.

This suggests that challenges of accounting system integration are critical in ensuring that data obtained is comprehensive, accurate, current, and consistent. Strong integration of disparate systems enables data to be exchanged across departments with fewer format and timeliness difficulties. A well-integrated system will give timely data from its sources while preserving and protecting data ownership. Additionally, it eliminates the risk of data conflicts across different authorities and departments.

**Figure 28: The proposed data Mining utilisation model for public sector**




The Nigerian public sector's accounting information system is currently focused on using Branch Accounting Systems, Payroll Systems, Investment and Loan Systems, and Subsidiary Ledger Accounting Systems. The Primary Information System is a central data store for all subsequent actions with these technologies. It generates reports for the statistics department, the self-accounting department, the programme monitoring system, and the treasury. In addition, several departments use other systems to manage budgets and expenditures and are connected to the Accountant General's Department's headquarters.

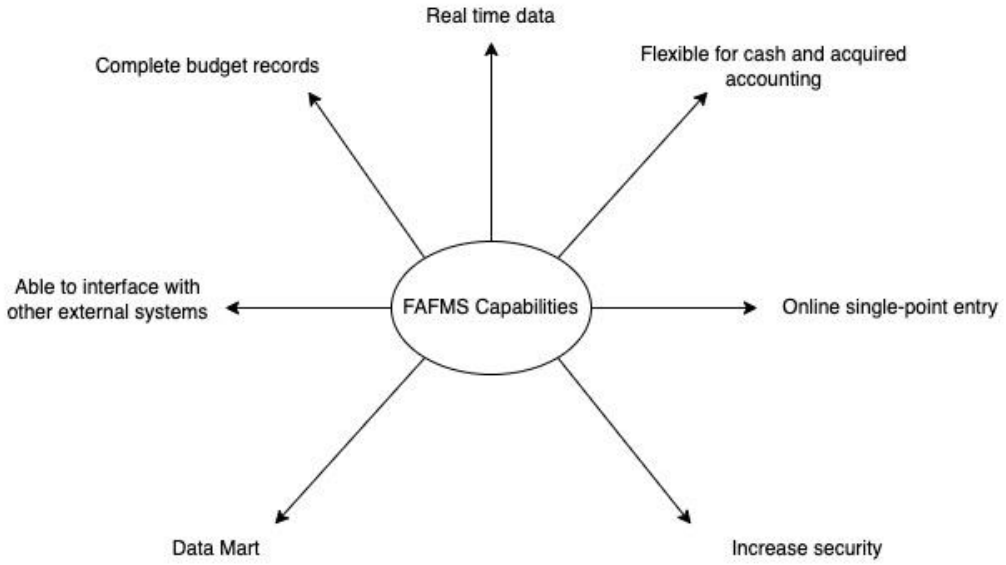
In all decision-making processes inside a public sector organisation, statistics and reports are crucial. Data mining efforts will aid in the production of high-quality reports. The results of this thesis corroborate this position, indicating that the deployment of such tools would enhance the capacity of public sector employees to provide better reports, which should lead to improved decision making. Graphs, charts, projections, and fraud detection reports may be included into reports to increase the likelihood of successful decision making inside government agencies.

Currently, for those who have adopted data mining technologies, the data to be mined are obtained from the accounting department, saved on the PCs of the data miners, and then data mining operations are carried out locally. Using the approach outlined in this thesis and the new FAMAS system, a central data warehouse is created, and data mining activities are conducted from this central data warehouse, providing accessibility for all departments and integrating PCs throughout the public sector with this data warehouse and enabling the execution of data mining activities. However, the accounting department would have to adopt a policy

about access to the data warehouse. According to the findings of this research, a dedicated government department or agency should be designated with complete access to and responsibility for all data mining operations. For instance, the Auditor General's Office and the Economic Planning Unit may have complete access to this data repository. There are possible privacy problems and information abuse threats that must be addressed. Depending on the data requirements of each department, access limitations would need to be established, and this should help reduce privacy and information abuse threats. With these rules and procedures in place, departments' security, dependability, and accountability should be increased.

As this survey discovered, 45% of respondents recognised the need for system reform. Therefore, the researcher proposes that the Nigerian public sector adopt the Francine Accounting and Financial Management System (FAFMS). The transition to a new Accounting and Financial Management System will be considered a step toward government and system improvement. This new system establishes a data warehouse formerly known as Business Warehouse. This data warehouse serves as the core data repository for the Accountant General's Departments of the public sector accounting systems. The endeavour to transition from an outdated system to a new FAFMS aims to enhance accounting and financial management in government agencies and departments. Simultaneously, this shift will be seen as an effort to improve the quality of data generated and the performance of accounting systems. This makes it easier for the government to provide the public with the right and accurate accountability.

**Figure 29: Francine Accounting and Financial Management System (FAFMS).**




As seen in the Figure above, FAFMS enables online single-point input, hence increasing security, real-time data, and the completeness of budget records. It supports both cash and accrual accounting. Additionally,

it can interact with other systems and has developed its data mart. This is where data mining tools may be used to analyse, interrogate, or mine the data in response to a request for data access. Data mining has several potential applications in public sector accounting, including administering government payments to suppliers and government spending on assets, such as monitoring and identifying any improper payments on assets. It would strengthen the efficiency and efficacy of a department's operations, as well as its accountability.

### 6.11 Conclusion

This chapter discussed the descriptive, statistical, and interview data collected throughout this study. According to the descriptive data, most respondents acquired AIS experience while working in government. Many respondents were unfamiliar with data mining or the proper use of data analysis tools. Respondents indicated influential factors for and against data mining and we analysed each of the main research topics. The next chapter tests and discusses hypotheses relating to those research topics.

# CHAPTER SEVEN
# QUALITATIVE ANALYSIS

## 7.1 Introduction

Fifteen participants were interviewed to elicit information on data mining practices in the Nigerian public sector. The participants cut across different departments from two ministries in the country. The analysis was done using a thematic analysis. Qualitative coding was done by systematically categorizing excerpts in the data collected in order to find the themes and patterns.

### Data Analysis

**Table 38: Demographic data of the respondent**

| Interviewee | Organisation | Role | Department | Experience | Function in AIS |
|---|---|---|---|---|---|
| Interviewee A | Ministry of Education | Finance Manager | Accounting | More than 10 years | Decision-making using information generated |
| Interviewee B | Ministry of Education | Accountant | Accounting | 5 years | Use accounting information in tasks |
| Interviewee C | Ministry of Education | Auditor | Audit | 8 years | Gather accounting information |
| Interviewee D | Ministry of Youths and sports development | IT manager | Budgeting and finance, | less than 5 years.' | visualise financial trends to facilitate decision making |
| Interviewee E | Ministry of Youths and sports development | Accountant | Accounting | 6 years | Aid data collection and analysis |
| Interviewee F | Ministry of Youths and sports development | Auditor | Accounting | over 15 years | Decision making |
| Interviewee G | Ministry of education | IT Assistant | IT | about 5 years | Give IT support to the AIS |
| Interviewee H | Ministry of Education | Accountant Manager | Accounting | 12 years | Decision making |
| Interviewee I | Ministry of Youths and sports development. | Accountant | Accounting | about 5 years | Carry out day-to-day accounting tasks |
| Interviewee J | Ministry of Education | Accountant | Accounting | Over 10 years | Decision making |

| | | | | | |
|---|---|---|---|---|---|
| Interviewee K | Ministry of Youths and sports development | Accountant | Accounting | Over 5 years | Decision-making using information generated |
| Interviewee L | Ministry of Education | Senior Auditor | Accounting | 15 years | Facilitate accurate and proper reporting |
| Interviewee M | Ministry of Youths and sport development | IT manager | IT | More than 10 years | Give Tech related support to the entire ministry |
| Interviewee N | Ministry of Youths and sport development | Accountant | Accounting | 12 years + | Manage staff within the AIS |
| Interviewee O | Ministry of Education | Auditor | Accounting | 15 years | Decision making |

The interview continued by asking about respondents' AIS and data mining knowledge. Finally, the interviewer probed further to find out their organisations' attitudes and level of adoption of data mining. Below is an analysis of the responses of each interviewee:

**Research Question three: Do management and personnel in the Nigerian public sector grasp the concept of data mining and acknowledge the importance of data mining techniques in day-to-day accounting activities?**

**a) Awareness and familiarity with data mining methods**

The following quotes were extracted from the interviewees

> *'Prior to this, we utilized mainframe. There is no such thing as data mining. None exist. We just generate standard reports. Thus, with the new technology, we will have a data warehouse and associated data analytic operations. We do data analysis, but not with any tools.*
>
> Interviewee A: Finance Manager

Furthermore, Interviewee B said that she had never heard of the phrase and thought it was synonymous with the Knowledge Management (KM) idea. However, in another interview, Interviewee C stated that she had heard of the phrase but was unsure what data mining was:

> *'I've heard this term but am not sure what it is, what it means, and what I can imagine is that if you're not involved in it, you tend to ignore it.*
>
> Interviewee C: Auditor

In an interview, Interviewee D said that she had heard the word data mining used in her studies but was unfamiliar with it. She proposed that awareness campaigns be launched immediately rather than later.

> *'If we look to the future, data mining should be employed immediately; awareness should be instilled immediately since this cannot be accomplished in a split second; exposure to all workers must occur immediately so that the transition may go smoothly.'*
>
> Interviewee D: IT Manager

As interviewee E stated,

> *'The language is computer jargon, and it was not widely used here. However, we have used this software for a long period of time but referred to it as bookkeeping, which I believe is also data mining... for example, I will show you the guidelines for the system and software application on how to use it; because it is a fully automated transaction, from voucher preparation to auditing, there are elements of control, fraud detection, and others that I consider to be data mining as well. It really depends on how inventive we are while using this programme to do the analysis.'*
>
> Interviewee E: Accountant

Another respondent (Interviewee F) believed data mining was a component of the Management Information Systems (MIS) she was using. The MIS was used to generate financial reports, management trial balances, contractor analysis, and supplier analysis per project. However, she acknowledged that the MIS lacks forecasting capabilities comparable to data mining.

> *'The one I am aware of is MIS, which assesses and analyses both current and historical data. It does not, include predictions...'*
>
> Interviewee F: Auditor

In summary, the phrase "data mining" was unfamiliar to interviewees. They may have heard the word but were unfamiliar with its use. Additionally, interviews indicate that job scope plays a role in staff understanding, as Interviewee G recalled:

> *'Staff are aware of it, but completely using the software is dependent on your job scope; thus, if your work does not contain these things, you do not utilise it. However, if the environment changes, such as an increase in automation, all stages become totally*

*automated, and you are forced to employ it. It depends on the specific scenario; when applicable, they will utilise it...in general, employees are aware of it, and some of them are even capable of using it...'*

Interviewee G: IT assistant

Most respondents agreed that exposure via public awareness campaigns would be good.

**B) Data Mining Readiness**

The interview results indicated that respondents were receptive to data mining technology because they were optimistic, and inventive, and positively assessed the ease and use of such technology in their work setting.

Interviewee B said positively that all public sector employees and management should be engaged in technology. As she stated,

*'...every one of us must be involved.... because our government is heading toward technology, I'm not sure why we should continue with a manual approach that we know is time-consuming and inconvenient...'*

Interviewee B: Accountant

Another respondent expressed optimism about the need for software such as data mining, stating that

*'It surely can assist us since, without it, we would struggle to obtain the information we needed when we needed it. Occasionally, we are required to work extra to complete the project; if we have excellent software, this will assist us in doing our duties'.*

Interviewee I: Accountant

The features of innovativeness were established via interviews with respondents who had a favourable attitude toward technology and an eagerness to learn new and diverse technologies such as data mining. However, one interviewee said, as progress is achieved, skills must be sharpened:

*'...I mean, if you ask me personally, I'll admit that before entering this office, I had very little understanding of computers, software, and all that, but we have no option because otherwise, you'd have no place in this atmosphere, so we must learn even if it's not always pleasant, you know.' Changes in systems necessitated departments holding mandatory seminars and training. '...You must possess the abilities appropriate to your level.'*

Interviewee K: Accountant

According to several respondents, obtaining a professional credential in technology and pursuing formal education in technology should be considered standard practise. According to one interviewee,

> *'In addition to my accounting experience, I have a degree in information technology and management information systems, which I earned after completing a one-year study at the University of Lagos (UNILAG).* The respondents expressed a readiness to learn, stating, *'we're eager to learn, we're ready to change and learn.'*
>
> Interviewee L: Senior Auditor

One interviewee said that she embraces the move and believes that the ability to utilise computer technology is a must for accountants today. Additionally, she felt more secure in her profession when she used computer technology.

Additionally, interviewees revealed a high assessment of the simplicity of use and utility of data mining technologies.

> *'If you obtain instruction and have a positive attitude, individuals who are proficient with computers may do the work immediately after training.'*
>
> Interviewee M: IT Manager

Another respondent concurred, stating that:

> *'a basic training, which we provide here, in-house training, the programme is generally straightforward to use.'* In terms of the technology's use, respondents had a favourable perspective.'
>
> Interviewee H: Accountant Manager

as one interviewee said,

> *'So, with this data mining, it really simplifies our job, and we can get the answers we want very instantly; I couldn't fathom doing this manually...'*
>
> Interviewee N: Accountant

Respondents had a favourable attitude toward technology acceptance. They thought that implementing new technologies was necessary and should be encouraged. However, any government initiative aimed at introducing new technology should be accompanied by adequate initiatives to guarantee that employees'

attitudes support adoption, that workflow is acceptable, and that manuals and necessary infrastructure are produced. Additionally, employees and management must see technology as a tool that may assist them in their jobs.

**Research Question Four: How might, or does, data mining affect the efficiency of public sector decision-making in Nigeria?**

In response to the ability of data mining software to enhance the capability of the accounting system, interviewee O stated,

> *'Increase the capability of the system...yes, because with this, data are properly stored, records are properly stored, and when they are properly stored, they are accurate and timely, which enhances the accounting record, the entire system in government'*.
>
> Interviewee O: Auditor

Additionally, he said that data mining would enable rapid and accurate analysis.

> *'We can provide rapid and accurate assessments to assist the ministry in resolving issues such as revenue, how much revenue they collected, how much government collected, and an analysis of why this occurred and the probability of fraud and all that'*.
>
> Interviewee O: Auditor

It would also contribute to the improvement of the government's financial management.

Another respondent concurred with this assessment of data mining's influence on the AIS.

> *'Yes, without a doubt. Through data mining, we will be able to determine its performance, the source of any difficulties, the amount of data, and why it is occasionally late. We can track how long it takes them to do any duties; we can even trace back any steps taken...its time; if there is any late work, we will be notified. All the while, it's difficult to keep track of everything'*.
>
> Interviewee J: Accountant

According to one respondent, data mining would lessen the likelihood of overlooking critical facts:

> *'So, if we had reports with percentage analysis, charts, and others, we might notice more...excellent.'*
>
> Interviewee F: Auditor

Most respondents to the survey agreed that data mining would influence decision-making, and interviewees confirmed this view. Interviewees believed that incorporating more technologies, such as data mining tools, into their job would aid them in identifying the data necessary to make whatever choice. One respondent said,

> *'By using the software, we can make a conclusion more swiftly and efficiently,'* which will enhance his decision-making skill. Another respondent stated, *'I feel that after enough of us have utilised it, our choice will be valuable. It unquestionably aids in our decision-making. With these criteria in hand, we may draw conclusions about the systems we audit, their flaws, and the danger they pose, whether low or high...'*
>
> Interviewee H: Accountant Manager

Additionally, he urged that all departments use similar technology.

> *'I believe that this type of software should be used in every department, including non-accounting departments, because when an organisation decides, any steps taken are ostensibly based on facts, and these facts came from analysis, and in conducting this analysis...we have the information, the data; it's unfortunate that we do not use the data. In terms of operations, it is true that the first phase involves the generation of data. For the public sector, that phase has been completed; the next step is to use those data, which implies that we are now entering an age of data utilisation....'*
>
> Interviewee H: Accountant Manager

This is because he thought that most public sector decision-making was not based on facts.

> *'Facts based on data, possibly one day...we tried in our department, we introduced the procedures, in some ways introducing this software and manner of work, so we are establishing it as a custom, with the hope that it would spread to other departments and ministries...'*
>
> Interviewee H: Accountant Manager

Another interviewee agrees on the critical nature of data mining in the decision-making process:

> *'I am very optimistic about it because it will undoubtedly assist us in making the best decision possible; with that data, we can decide...it is true that our decisions are entirely dependent on us, but with good data, they will be even better.'*

Interviewee L: Senior Auditor

Data mining has the potential to have a large influence on the AIS and decision-making processes. Respondents stated that data mining technologies would aid in acquiring more accurate information and data for use in decision-making processes. Incorporating data mining technologies into the accounting information system would increase the department's accounting system's performance and the efficacy of government decision-making procedures. By using data mining, the overall performance of AIS will be improved by cutting transaction costs, boosting the quality of information, and decreasing the department's cycle time. It substantiates the recommendation made by several researchers (Debreceny et al., 1999; Weber, 2002; Burns, 2003) that data mining would ensure the production of a good financial statement by increasing the accuracy and reliability of accounting information, as well as effectively providing information to decision-makers and ensuring internal control. Data mining was also considered to enhance decision-making processes in the public sector by addressing the demand for information, speeding up making an educated choice, and providing a support system for the whole decision-making process.

**Research Question 5: Is the capability to use data mining methods a critical criterion for evaluating the Accounting Information System's success in the Nigerian public sector?**

Interviews revealed that data mining was critical since it allowed the department to acquire trustworthy and up-to-date data. According to interviewees, reliable data that is rapid, timely, and current data and available online data were all critical considerations in evaluating the AIS's success. The capacity to use data mining for forecasting, for example, ‘simplifies our job significantly'.

However, interviewees were more likely to discuss the importance of fundamental requirements such as the ability to generate reports periodically, data control, ease of access, flexible reports, integration with other systems, real-time data, security features, strong internal control, and audit trail-generating systems. In addition, the system must have intuitive interfaces, be simple to comprehend and use, and provide comprehensive reporting.

> *'...as a user, I like how user-friendly the programme is, how current the data is, and how, in terms of reporting, it provides a variety of capabilities upon request based on our requirements. That is all we want.'*
>
> Interviewee A: Finance Manager

A fundamental demand was for technology to be less problematic in the workplace.

'A good accounting system is one that is *trouble-free...whatever you enter, it will properly record it, swiftly, and with a positive effect on pleased users. For instance, when they pay, we may obtain all the data, all the receipts, and provide rapid feedback to the taxpayer. Additionally, we document as accurately as possible everything we acquire. That is for income. We simply need to enter the payment information once, and the payment is sent directly to the payee's bank, allowing them to get the funds more quickly and with no upkeep.*'

Interviewee H: Accountant Manager

Internal control was another critical criterion or element. As one interviewee put it,

*'a good system... internal control is critical; when it was designed, every conceivable loophole was examined. It is essential to consider the possibility of mistakes, malfeasance, or fraud. We do not want any systemic errors. Typically, issues arise when a developer develops something only for the purpose of completion. For instance, if the purpose was to make a payment, it is acceptable if the system can make the payment. However, when it comes to payments, there must be a check system in place to determine if the payment is authentic, whether the permission came from the correct person, whether there are any supporting papers or allocations for that payment.'*

Interviewee M: IT manager

Generally, a good accounting system is considered helpful, has fewer difficulties, is simple to use, comprehend, and user-friendly, generates current, timely, and accurate reports, and enables effective internal control. In addition, the replies indicate that the capacity to use data mining was a statistically important component, and the interviews elicited difficulties. As a result, it can be argued that the capacity to leverage data mining methods is a critical criterion for evaluating the success of Accounting Information Systems in the public sector.

**Research Question 6: To ascertain which model would enable the Nigerian public sector to execute more effective data mining techniques for the purpose of preserving high-quality knowledge inside the accounting information system.**

This question aims to develop a feasible paradigm for adoption in the Nigerian public sector to effectively deploy data mining technologies. According to the discussions that resulted from the interviews, a suitable model (Figure 6.6) for the public sector would be an integrated system with a centralized data warehouse. In addition, this model would need to integrate the working culture and procedures of the public sector and emphasize the critical role of financial data in decision-making processes.

The initial step of model creation is integrating existing public sector systems. According to Abu Bakar et al. (2001), systems integration in the public sector is not a recent development in the Nigerian Public sector. Therefore, the integration of E-Government initiatives, state government accounting departments, and self-accounting departments with Accountant General Headquarters was proposed in this research to consolidate financial and accounting data into a single data warehouse for ease of access. That is, all systems from all electronic government projects and data from statement government systems and the self-accounting department would have frameworks that enabled them to interact.

One positive feedback from an interviewee that the researcher noted was that his department is prepared to play an important role in collecting all this data for data mining inside the government's accounting systems.

> *'In finance, I believe we already have a framework for financial information; we can gather all data from all sources. Thus, others will be able to connect directly to our department's data warehouse.' This is the primary department that gathers financial data for the government, but in terms of the model, how we will do it for financial data, we already have it. This is because our department will be responsible for all financial issues. The whole government department will return to us since we have all the information.' Concurrently with the master database, problems such as monitoring, and data security are needed to guarantee the data's dependability and correctness. Given various departments often need access to "the same data," the government should establish a centralized data warehouse for accounting and financial data.*
>
> Interviewee A: Accountant

Once the integration problem is resolved, and a centralized data warehouse is created, and controlled by a single department, in this instance, the Accountant General Office, any further data mining operations, analysis, and inspection of data becomes available for authorized employees and users. Data mining operations should use the same data from this master database to aid in decision-making, either via third-party software such as ACL or by development inside the databases.

However, interviewees indicated that a policy governing access to the master database should be established. One respondent even proposed that data mining operations should be carried out by a single department, such as the economics department or a unit inside the ministry, which would then provide the analysis's findings rather than each unit.

> '*For analysis, we create a part, maybe in the economic area, provide data for analysis, and restrict access to a specific level; this is a decent method. We do not need everything here, which means that if we want to submit payment receipts for analysis, there will be no difficulty in obtaining access to that analysis. That is the system I want. We do not need to be experts in everything, but we must know where to get knowledge. There is no sense in having a lot of data that we cannot use, that is worthless, that cannot be analysed; we should have limits...different levels of decision-making...which information is useful...according to the level...'*
>
> Interviewee I: Accountant

Another critical problem pertains to the decision-making process's culture. Because the culture of decision-making based on financial facts was not widespread in Nigeria's public sector, one respondent observed that:

> 'Using the accountant general's office as an example, they have access to all financial information and should make full use of it in their decision-making. Thus, as of today, that information was not completely used, which means that the numbers generated in summaries were not fully utilized in decision-making activities; maybe the information is available, but it is not yet part of our culture...'
>
> Interviewee N: Accountant

Thus, to ensure the success of data mining, senior management should establish and sustain a culture of using data and the outcomes produced by data mining operations.

An ideal architecture would include effectively administrating data warehouses through a centralised data warehouse to enable the public sector to use data mining methods effectively. Furthermore, data mining applications and access to data warehouses would be hierarchical according to the management level and kind of access needed to execute the job function. In terms of data mining software, this may be created in-

house or purchased from a more general source. However, it must be able to be used for various purposes at various levels, be simple to use and comprehend, be upgradeable, and be cost-efficient.

### 7.2 Conclusion

This chapter discussed the interview data collected throughout this study. Many respondents were unfamiliar with data mining or the proper use of data analysis tools. Respondents indicated influential factors for and against data mining. We analysed each of the main research topics. The next chapter tests and discusses hypotheses relating to those research topics. The analysis discovered that very little of the employees of the ministries are aware of data mining. They are optimistic and opened to accepting such technology as long as it is easy to use and help reduce their workload.

# CHAPTER EIGHT

## Results, Findings and Hypotheses Testing

### 8.1 Introduction

The previous chapter tackled the descriptive and quantitative results concerning the interview responses or remarks. Although knowledge about data mining technology was limited, it was discovered that there is a willingness to accept it. The findings showed that there are generally favourable attitudes about the potential effect of data mining technologies on the performance of Accounting Information Systems (AIS) and decision making. The capacity to mine data was a critical characteristic of a successful accounting system. This chapter analyses the study's hypotheses.

### 8.2 Influencing Issues in the Intention to Implement and Utilise Data Mining

***Hypothesis one: There is a significant gender difference in the readiness to implement and utilise data mining technology.***

In the past, gender inequalities and disparities have been determined and examined concerning individual adoption and continued use of technology in the workplace (Venkatesh & Morris, 2000, Zin et al., 2000, Kay, 2006). However, the findings of investigations have been inconsistent. For example, males have been found to have greater skill levels in operating systems, database software, web page design, and programming than females (Kay, 2006). Dahlan et al. (2002) also discovered that male workers seem more receptive to data mining technology than female employees. However, Ventakesh and Morris (2000) realized the tendency for females to be affected by the perceived ease of use when deciding to embrace new technologies. This indicates that, contrary to Busch's findings, views about computers are not gender-dependent (1995). Therefore, it is hypothesized that there would be variations in attitudes and preparedness toward technology (in this instance, data mining) between genders in Nigerian public sector departments.

| **Willingness to adopt and use data mining** | **Chi-Square** | **df** | ***p*** | **Remark** | **Decision** |
|---|---|---|---|---|---|
| Does your company intend to adopt data mining? | 7.867 | 3 | .049 | Significant | Ho Accepted |

**Note:** Significant at $p$<or= 0.05

The above table presents the Kruskal Wallis H Test result for the test of difference in the level of willingness of the two genders of respondents (Male and Female) towards adopting data mining technologies. Respondent gender was the grouping(independent) variable, while the intention to adopt data mining technologies served as the (dependent) data in the analysis process. The result shows a statistically significant difference amongst the gender groups in their intention to adopt data mining technology. This implies that the attitude of the respondents towards data mining adoption is dependent on the respondents' gender.

***Hypothesis two: Technological, organizational, human resource and external issues all have a major impact on the choice to adopt and use data mining technologies.***

This part of the study examines the hypotheses about the factors contributing to adopting data mining technology in public sector departments. These four points reflect variables recognized as important in the public sector's choice to embrace technology. Table 6.1 summarizes the responses. Though responses vary, responses about the technical issues were favourable, with more than 80% of respondents agreeing with the highlighted issues. Technical support, software compatibility, and a department with an adequate ICT infrastructure are all likely to play a role in any choice to use data mining. In addition, over 90% of respondents agreed on organizational problems, stating that it was critical to have top management support and sufficient financial resources to implement data mining technologies.

**Table 39: Factors influencing decision to utilise data mining - % of agreement**

| Factors | Value | df | $\chi$ | Remark | Decision |
|---|---|---|---|---|---|
| 21.2. Compatibility of software with existing operating systems | 46.775[a] | 36 | .108 | Not Significant | Ho Rejected |
| 21.5. Technology savvy staff | 66.471[a] | 32 | .001 | Significant | Ho Accepted |
| 21.3. Full support from top management | 49.805[a] | 32 | .023 | Significant | Ho Accepted |
| 21.7. Changes in management trends within the private sector | 66.361[a] | 28 | .001 | Significant | Ho Accepted |
| 21.8. Directives from politicians. | 67.507[a] | 28 | .001 | Significant | Ho Accepted |
| 21.10. A sufficient financial resource | 72.833[a] | 32 | .001 | Significant | Ho Accepted |

| | | | | | |
|---|---|---|---|---|---|
| 21.6. Up-to-date ICT infrastructure | 36.386[a] | 32 | .272 | Not Significant | Ho Rejected |
| 21.9. An attempt to ensure public accountability | 47.378[a] | 28 | .012 | Significant | Ho Accepted |
| 21.4. Effective and adequate training for staff | 59.992[a] | 32 | .002 | Significant | Ho Accepted |
| 21.1. Adequate technical support from vendors | 56.553[a] | 32 | .005 | Significant | Ho Accepted |

**Note: $\chi \leq 0.05$ implies a significant relationship**

To establish the relationship between the respondents' attitude toward adopting data mining and their perception of the factors influencing the decision to adopt it, the researcher conducted a Chi-square test of the relationship. As presented in the table above, the results show that most factors are significantly related to the intention to adopt data mining. This implies that the factors influencing the decision to adopt data mining significantly impact the attitude or intention to adopt data mining. From the results also, we can see that Organizational, Human resources and External factors all give $\chi \leq 0.05$ implies a significant relationship, while all technical factors listed indicated a statistically insignificant relationship.

***Hypothesis three: Technological, organisational, and human resource problems, as well as external factors, all contribute to the choice not to adopt and use data mining.***

Respondents who said their departments did not use data mining cited technical, organisational, and human resource concerns. Table below shows the results.

| Reason for non-adoption | Value | df | $\chi$ | Remark | Decision |
|---|---|---|---|---|---|
| 22.2. Lack of expertise in implementing data mining | 53.606[a] | 24 | .001 | Significant | Ho Accepted |
| 22.5. Lack of top management support | 59.209[a] | 32 | .002 | Significant | Ho Accepted |
| 22.8. Lack of management policies | 55.982[a] | 32 | .005 | Significant | Ho Accepted |
| 22.9. Having more pressing problems | 75.653[a] | 28 | .001 | Significant | Ho Accepted |
| 22.6. Difficult to select appropriate software | 72.842[a] | 28 | .001 | Significant | Ho Accepted |
| 22.4. Costly to implement new technology | 76.336[a] | 32 | .001 | Significant | Ho Accepted |

| | | | | | |
|---|---|---|---|---|---|
| 22.3. Lack of awareness about data mining | 68.521[a] | 32 | .001 | Significant | Ho Accepted |
| 22.7. Too complex and time-consuming | 93.787[a] | 32 | .001 | Significant | Ho Accepted |
| 22.1. Satisfied with current analysis method | 105.028[a] | 32 | .001 | Significant | Ho Accepted |

**Note: $\chi \leq 0.05$ implies a significant relationship**

The researcher also wishes to show a connection between the reasons for the non-adoption of data mining and the choice not to adopt data mining. To test this relationship, a Chi-square test was conducted. As presented in the table above, all the reasons or issues for non-adoption have a statistically significant relationship with the choice of not adopting data mining. This implies that respondents who have no intention to adopt data mining all have consensus reasons not to do so. These reasons are as listed in the table.

***Hypothesis four: There is a correlation between data mining expertise and the desire to adopt and use data mining technologies.***

**Table 7.4: Bivariate Correlation Analysis between Data mining expertise and Desire to adopt and use data mining technologies**

| | | | Data mining expertise | Desire to adopt and use data mining technologies |
|---|---|---|---|---|
| Pearson's *r* | Data mining expertise | Pearson Correlation | 1 | .161 |
| | | Sig. (2-tailed) | | .069 |
| | | N | 129 | 129 |
| | Desire to adopt and use data mining technologies | Pearson Correlation | .161 | 1 |
| | | Sig. (2-tailed) | .069 | |
| | | N | 129 | 129 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | |

| Coefficient Interval | Correlation |
|---|---|
| 0.00 – 0.199 | Very Weak |
| 0.20 – 0.399 | Weak |
| 0.40 – 0.599 | Medium |
| 0.60 – 0.799 | Strong |
| 0.80 – 1.000 | Very Strong |

***This description applies to both positive and negative relationships Adapted from (***(Dancey & Reidy, 2011)

From the table above, it can be observed that data mining expertise and the desire to adopt and use data mining technologies have a positive but very weak correlation of 0.161, tending towards zero. This implies that the relationship's strength is almost intangible. *p*-value of .069 depicts an insignificant relationship between data mining expertise and the desire to adopt and use data mining technologies.

***Hypothesis five: There is a considerable variation in how prepared individuals at various levels of education are to use data mining technologies.***

| Preparedness Parameters | Chi-Square | df | *p* | Remark | Decision |
|---|---|---|---|---|---|
| Technology gives me greater control over my daily work activities | 6.465 | 3 | .091 | Not Significant | Ho Rejected |
| Products and services that use the newest technologies are much more convenient to use. | 12.418 | 3 | .006 | Significant | Ho Accepted |
| Prefer to use the most advanced technology available. | 7.361 | 3 | .061 | Not Significant | Ho Rejected |
| Technology makes me more efficient in my occupation. | 14.009 | 3 | .003 | Significant | Ho Accepted |
| I keep up with the latest technological developments in my areas of interest. | 3.617 | 3 | .306 | Not Significant | Ho Rejected |
| I find myself having fewer problems than other people in making technology work for me | 4.687 | 3 | .196 | Not Significant | Ho Rejected |
| I am always open to learning about new and different technologies. | 5.051 | 3 | .168 | Not Significant | Ho Rejected |

| | | | | | |
|---|---|---|---|---|---|
| It is easy to learn how to use technology. | 12.587 | 3 | .006 | Significant | Ho Accepted |
| Overall, I find technology useful for any task I need to accomplish. | 5.165 | 3 | .160 | Not Significant | Ho Rejected |
| I think it would be very good to use data mining technology for analysing accounting data in addition to current methods. | 8.555 | 3 | .036 | Significant | Ho Accepted |

**Note:** Significant at $p$<or= 0.05

The above table presents the Kruskal Wallis H Test result for the test of difference in the degree of preparedness of respondents to use data mining technologies at various levels of education. Respondent levels of education were the grouping(independent) variable, while the preparedness of respondents to use data mining technologies served as the dependent data in the analysis process.

The result shows both statistically insignificant and statistically significant differences in respondents' degree of preparedness to use data mining technologies at various levels of education, as presented in the table above. This implies that the preparedness of the respondents to use data mining technologies is dependent and independent of the respondents' level of education.

***Hypothesis six: There is a substantial disparity between respondents' various work functions and their willingness to embrace data mining technologies.***

Work function is another component of individual differences that this research examines. Work functions and job level have been shown to connect with cognitive style differences (Taylor, 2004). A cognitive style is one of the viewpoints on human characteristics that substantially impact the design and usage of information systems. Taylor (2004) asserts that cognitive styles vary according to job function and level, even within the same organization. According to Allinson and Hayes (1996), there are distinctions in cognitive style across occupational functions. As a cognitive style reflects an individual's method of thinking and reasoning, it was believed that it would also represent their perception. Individuals may also alter their attitudes, beliefs, and behaviours to conform to the group's consensus (Lembke & Wilson, 1998). All respondents' job functions in this research are related to accounting information systems, and they are primarily represented by three groups: accountants, auditors, and information technology workers. It is argued that these distinct roles vary in their cognitive style and attitude toward data mining technology acceptance.

| Willingness to adopt and use data mining | Chi-Square | df | *p* | Remark | Decision |
|---|---|---|---|---|---|
| Does your company intend to adopt data mining? | 11.920 | 3 | .008 | Significant | Ho Accepted |

The above table presents the Kruskal Wallis H Test result for the test of difference in the willingness of the respondents to embrace data mining based on their work function. The respondent role was the grouping(independent) variable, while the willingness to embrace data mining technologies served as the dependent data in the analysis process. The result shows a statistically significant difference in the willingness to embrace data mining technology amongst the respondents based on their work functions/roles. This implies that the respondents' willingness to embrace data mining depends on their job role. Since there is a disparity in the respondents' perception across the various job functions, respondents whose task is to work on accounting data will have a different level of willingness compared to those whose job is only to collect data.

***Hypothesis seven: There is a substantial difference between years of expertise with the AIS and willingness to embrace data mining.***

According to Ventakesh and Morris (2000), as people's direct experience with technology develops, they develop a more accurate evaluation of the advantages and costs connected with technology. Agarwal and Prasad (1999) discovered a favourable correlation between past familiarity with comparable technology and perceptions of ease of use. Additionally, they discovered that duration in employment did not influence perceptions or attitudes. However, this research recommended that personnel be exposed to information technology, such as computer-based accounting systems, throughout their stay in the AIS field. Additionally, the preceding chapter's interview responses suggest that computer technology's integration into the ordinary work environment is unavoidable. Continuous training sessions on information systems, for example, improve exposure to technological advancement within the department. Participating in training was positively related to a good assessment of the technology's utility (Agarwal & Prasad, 1999). This research hypothesised that the longer a respondent has worked in the Accounting Information System, the more information technology experience they have, and therefore the more favourable their attitude about embracing data mining technology would be.

| Factors | Value | df | *p* | Remark | Decision |
|---|---|---|---|---|---|
| Willingness to embrace data mining | 29.576[a] | 4 | .003 | Significant | Ho Accepted |

The above table presents the Kruskal Wallis H Test result for the test of difference in the willingness of the respondents to embrace data mining based on their years of experience with AIS. Respondent years of experience with AIS were the grouping(independent) variable, while the willingness to embrace data mining technologies served as the dependent data in the analysis process. The result shows a statistically significant difference in the willingness to embrace data mining technology amongst the respondents based on their expertise with AIS. Respondents with more years of expertise in the AIS will have a different level of willingness compared to those with less expertise.

***Hypothesis eight: There is a significant disparity in the preparedness of adopters, non-adopters, and do not know (not aware) groups to use data mining technologies.***

| Preparedness Parameters | Chi-Square | df | *p* | Remark | Decision |
|---|---|---|---|---|---|
| Technology gives me greater control over my daily work activities | 21.196 | 2 | .001 | Significant | Ho Accepted |
| Products and services that use the newest technologies are much more convenient to use. | 1.889 | 2 | .389 | Not Significant | Ho Rejected |
| I prefer to use the most advanced technology available. | 9.714 | 2 | .008 | Significant | Ho Accepted |
| Technology makes me more efficient in my occupation. | 11.914 | 2 | .003 | Significant | Ho Accepted |
| I keep up with the latest technological developments in my areas of interest. | 7.395 | 2 | .025 | Significant | Ho Accepted |
| I find myself having fewer problems than other people in making technology work for me | 10.668 | 2 | .005 | Significant | Ho Accepted |
| I am always open to learning about new and different technologies. | 10.594 | 2 | .005 | Significant | Ho Accepted |
| It is easy to learn how to use technology. | 9.943 | 2 | .007 | Significant | Ho Accepted |

| | | | | | |
|---|---|---|---|---|---|
| Overall, I find technology useful for any task I need to accomplish. | 16.500 | 2 | .001 | Significant | Ho Accepted |
| I think it would be very good to use data mining technology for analysing accounting data in addition to current methods. | 15.956 | 2 | .001 | Significant | Ho Accepted |

The above table presents the Kruskal Wallis H Test result for the test of difference in the degree of preparedness of respondents to use data mining technologies based on their adopter group (adopters, non-adopters, and unaware). The Adopters group was the grouping(independent) variable, while the preparedness of respondents to use data mining technologies served as the dependent data in the analysis process. The result shows that for most of the statements, there are statistically significant differences in the degree of preparedness to use data mining technologies by respondents within various adopter groups. However, there is no disparity in the respondents' perception of the statement, “Products and services that use the newest technologies are much more convenient to use”.

***Hypothesis 9a: Respondents with a greater knowledge of data mining technology have a more favourable view or anticipation of data mining's impact on the AIS than those with a lesser comprehension.***

| **Spearman's rho** | N = 129 | Knowledge/Expertise in data mining | Increase the quality of information derived from AIS | Increase overall AIS performance |
|---|---|---|---|---|
| Knowledge/Expertise in data mining | r | 1 | | |
| | *p* | | | |
| Increase the quality of information derived from AIS | r | 0.081 | 1 | |
| | *p* | 0.361 | | |
| Increase overall AIS performance | r | -0.07 | 0.007 | 1 |
| | *p* | 0.429 | 0.941 | |

From the table above, it can be observed that the data mining expertise/knowledge of the respondents and their perception of the impact of data mining on AIS have a negative but very weak correlation of -0.07,

tending towards zero. The negativity shows that as one variable increases, the other decreases, though the relationship is not tangible and monotonic. The p-value of .429 depicts an insignificant relationship between data mining expertise and the impact of data mining on AIS. Thus, the hypothesis is rejected.

***Hypothesis 9b: Respondents who are more aware of data mining technology have better knowledge or belief about the impact of data mining on decision-making than those who have less information.***

| **Spearman's rho** | **N = 129** | **Awareness of data mining technologies** | **Fulfil information needed for the decision making** | **Provides decision support in supporting my decision-making process** | **Contributes to the speed of my decision making** |
|---|---|---|---|---|---|
| Awareness of data mining technologies | r | 1.000 | | | |
| | *p* | | | | |
| Fulfil information needed for the decision making | r | .046 | 1.000 | | |
| | *p* | .602 | | | |
| Provides decision support in supporting my decision-making process | r | .047 | .151 | 1.000 | |
| | *p* | .597 | .088 | | |
| Contributes to the speed of my decision making | r | .206* | .049 | .019 | 1.000 |
| | *p* | .019 | .584 | .833 | |

From the table above, it can be observed that respondents' awareness of data mining technologies and their perception of the impact of data mining on decision-making only show a significant relationship in its "contribution to the speed of decision-making." At the same time, other areas remain, showing insignificant relationships. The relationship between awareness of data mining technologies and the impact of data mining on the speed of decision-making has a weak positive correlation of 0.206, and a p-value of .019 depicts a significant relationship. All this implies that as the respondents' awareness of data mining technologies increases, their perception of the impact of data mining on the speed of decision-making also increases. Thus, respondents who are more aware of data mining technology have better knowledge or

belief about the impact of data mining on the speed of decision-making than those with less information. Hypothesis accepted.

***Hypothesis 10: There is a correlation between the desire to use data analysis and the Accounting Information System's efficiency.***

The performance of AIS was determined by respondents' satisfaction with the systems and their opinion of their overall data quality. It encompasses the correctness, currency, completeness, and consistency of data. Apart from data quality, additional aspects critical for judging AIS's performance were examined in the questionnaires45. The questionnaire suggested that the capacity to use data mining technologies be one of the variables used to evaluate AIS performance.

| **Spearman's rho** | N = 129 | Satisfaction with AIS | Desire to use data mining |
|---|---|---|---|
| Satisfaction with AIS | r | 1.000 | |
| | *p* | | |
| Desire to use data mining | r | -.019 | 1.000 |
| | *p* | .833 | |

From the table above, it can be observed that respondents' desire to use data mining and their level of satisfaction with the existing AIS of their organisation have a negative but very weak correlation of -0.019, tending towards zero. A p-value of .833 depicts an insignificant relationship between the desire to use data analysis and the Accounting Information System's efficiency. Thus, the hypothesis is rejected.

**8.3 Conclusion**

This chapter presents the statistical findings for evaluating the study's hypotheses. When considering the variables that influenced the choice to use data mining, organisational, technical, and human resource concerns were significant and influenced the decision to use data mining technology. While those who do not use technology cite concerns about technical, organisational, and human resource constraints as reasons for their choice not to use it. The intention to use data mining technology was related to the respondent's understanding of it. There was no difference in willingness to embrace data mining technology in the future across gender, occupational functions, or groupings of adopters. However, it was shown that the amount of knowledge and expertise with Accounting Information Systems influenced willingness to adopt.

Knowledge of data mining influences expectations about the influence data mining may have on the Accounting Information System and decision making. Therefore, the Accounting Information System's performance is determined.

# CHAPTER NINE

## Summary, Conclusions and Recommendation

### 9.1 Introduction

This chapter presents a summary of the study and proceeds to outline conclusions on its key findings and impacts on the current views of data mining and accounting information concepts. It subsequently related the findings to the practical world by presenting its perceived implications, contribution to the existing body of knowledge and broad application. Finally, it suggested the main limitations of the research and recommended areas where further research is required. It also recommended a course of action to introduce the concepts and implement data mining technology in the Nigerian public sector.

### 9.2 Summary of the Research

The research proposed to assess the progress and challenges of implementing data mining in the accounting information system in public sectors in Nigeria through surveys and interviews of key practitioners in Nigerian ministries. To achieve this research aim, the approach used was to first study the state of practice of data mining and AIS, mainly in developed countries, as found in the literature. It was then followed by investigating the level of adoption of those concepts and practices in the Nigerian Ministry. This was achievable using mixed research methods. At the end of the study, two sets of results emerged, one from the survey, which sought to gather the respondents' perspective on determined variables and the other from the interview, which sought to obtain the true opinions of the respondent on the research question. In combination, they form a comparative perspective of the implementation of data mining technology in the AIS of Nigerian ministries. The study also yielded a means of validating the findings of one with the other. Finally, based on the two perspectives, inferences were made on relationships between the research variables.

The study brought about key contributions to knowledge, especially in the challenges of implementing data mining technology in developing countries. This study
proposes that the successful implementation of this concept and technology in the Nigerian public sectors will contribute in no small way to bringing about improvements in the decision-making process, quality of data derived and overall work performance of AIS in ministries and thereby contribute to public sector development in Nigeria.

### 9.3 Summary of Hypothesis

The study set out to examine a variety of research aims and objectives. The framework's use of data mining was key, suggesting that technical, organisational, human resource, and external factors all had a role in the choice to embrace or not use the technology. Readiness to embrace data mining technologies, as judged by optimism, innovativeness, perceived utility, and perceived simplicity of use, all contribute to a strong desire to do so. Individual variances in preparedness have resulted in a better knowledge of respondents' characteristics. Additionally, it was discovered that knowledge and awareness are associated with the willingness and intention to use such technology. Data mining was shown to have a substantial influence on increasing the performance of the accounting information system and on the decision-making process.

Technological, organisational, human resource and external variables significantly influenced the adoption and use of data mining. Technological, organisational, and human resource constraints were all identified as important barriers to data mining adoption. Additionally, qualitative research indicates that adequate infrastructure, ongoing training, workshops, and other awareness programmes aimed at growing human capital would aid in assuring the effective application of new technologies, including data mining technologies. It is challenging for the public sector to properly implement any new technology because it will involve several levels of implementation and many issues that need to be resolved, such as raising employee understanding and technical aptitude. Therefore, continuous programmes with interactive, hands-on training elements should be explored along with other strategies. Human capital is seen as the most critical aspect of applying any technology.

The research indicates that the public sector does have effective initiatives for integrating technology into departments via courses, hands-on training, and awareness activities. In addition, there was a correlation between awareness and understanding of such technologies and the desire to employ data mining technology. However, these initiatives must be implemented simultaneously with strong leadership, representing the belief that top management is critical in successfully implementing any technology. According to the poll and interviews, senior management largely supports technological advancements.

Although data mining technology has not been extensively embraced, the readiness and degree of desire to adopt indicate a significant preference for its adoption. The findings suggested a high degree of optimism, inventiveness, and views of data mining technology's ease of use and usefulness. Additionally, it verified that optimism and inventiveness are critical drivers of data mining preparedness, as Dahlan et al. discovered (2002). Further investigation of preparedness revealed no difference in the readiness of public sector department workers toward this technology based on gender, job function, or user group. However,

expertise in the Accounting Information System (AIS) and education level correlates with varying willingness to embrace data mining technologies.

Most responders responded that their departments lacked specialised data mining tools but were open to embracing and using them in the future: data mining knowledge and awareness help shape staff perceptions and behaviours. The research discovered that insufficient knowledge relates to lower expectations about the potential influence of data mining on their accounting systems and decision-making processes. Departments that use data mining technologies tend to have a greater understanding of accounting and are better equipped to make sound financial judgments. The research discovered that the capacity to mine data influences the performance of accounting information systems.

### 9.4 Conclusions

The research resulted in key findings that addressed the objectives set. Below describe those which addressed the objectives and emanated from the research process.

The preliminary findings from the study further reinforce the notion that there is no universally adopted management style in Nigerian ministries. The three predominant management styles are far different from one another. Furthermore, this study suggests that the management styles are perspective based, relying more on the manager's personality and not on the organization. Furthermore, it was revealed that managers with a people-oriented management style show a positive attitude towards IT and DM.

On data mining, the study suggests that the technology is not well known in Nigeria. However, its potential benefits are well understood by practitioners in the public sector. The problem seems to be the lack of awareness. The study also suggests that DM impacts the quality of data derived, AIS performance and the decision-making process; this supports existing notions in literature. IT-related issues were the key criteria for evaluating DM performance in AIS.

Sequel to the above key findings, the following conclusions can be drawn from this study which is as:

The main factors influencing an organization’s decision to adopt DM within AIS are technology-related, organizational, human resource, and external factors. All staff in an organization's accounting information system, from top managers to junior staff, need to be actively involved in the implementation process of DM with full commitment. Moreover, top management plays an important role in achieving the required and planned targets.

There is some form of rigidity in the AIS of the ministries; most indicated to be satisfied with the current situation of their AIS in respect of data management but utilizes outdated data analysis technique as old as manual computation. This reflects the poor state of DM implementation in the public sector.

The main reasons for the non-implementation of DM within AIS are corruption, lack of top management commitment, organizational culture and structure, lack of skilled staff, government intervention and financial resources. Organizational attitude toward adopting DM is influenced by prior knowledge of the technology and expertise. It can also be concluded that DM is impactful in improving an AIS's operations, both in the quality of work performance and in making management decisions.

### 9.5 Implications

#### Data mining provides better AIS Performance

The evidence from this finding suggests that, like in the developed world, DM in developing countries seeks to play a more active role in improving AIS. It implies that AIS has not always been satisfactory to practitioners in public sectors due to the absence of DM.

When the same questions were posed to practitioners, for rankings of the most important AIS performance evaluation criteria, they agreed more evenly on one out of six criteria, one of the least important ones: “The systems implement new data analysis tools (such as data mining)”. There also agreed in principle (not in terms of ranking) that effective management approaches (such as a centralised database) and automation of the data validation process are the topmost criteria. This could involve concepts other than data mining technology in the future.

#### The organization’s attitude to data mining is linked to the Knowledge of Top management of the concept

The results of the findings, especially about the factors influencing decisions to adopt DM and the reasons for the non-implementation of DM, showed that most of the problems associated with DM adoption are management related with the others relating to technological and human resources. This finding supports the idea that management-related problems or factors are the major challenges of DM implementation in the developed world. Furthermore, this position of top management support for DM is collaborated by their expertise in DM, factors related to their internal organization and those related to the external environment. These results suggest that the organization's attitude to DM is linked to management's prior knowledge of it.

**There is a need for Staff development**

It remains evidenced that staff within the Nigerian public sectors are less versatile in emerging technologies, particularly in the accounting field. This deficiency is rooted in their lack of know-how; you cannot give what you do not have. Top management must train staff in modern-day technologies to acquire competence and skills relevant to their field. Staff development policies and practices benefit individuals and organisations in fulfilling a career role and achieving organisational goals. Public sector organizations play very important roles in any society. In addition to employing significant proportions of the population, they are seen as both the regulator of public morality and an important yardstick for assessing bureaucracy and politics.

Public sector organizations cut across major sectors of the economy, fulfilling the government's obligations to the people in such areas as security, welfare, healthcare, education, social infrastructure, social justice, and an enabling regulatory or deregulatory framework for the economy. Having such importance and influence, it is only appropriate to invest in developing its employees to foster career management. Career management has been identified as an important determinant of career success and satisfaction. However, effective career management has proven to be challenging, particularly for Nigerian public sector employees, because factors such as inadequate funding, poor training, nepotism, sexism, tribalism & red-tapism have resulted in employees adopting lackadaisical or negative attitudes towards professional development. This challenge can be sufficiently mitigated by increasing employer support for staff development.

**IT Support is significantly low**

As previously established, up-to-date ICT infrastructure is one of the issues of implementation of DM in the AIS of Nigerian public sectors. Information Technology (IT) is the bedrock for national survival and development in a rapidly changing global environment. It challenges us to devise bold and courageous initiatives to address vital socio-economic issues such as reliable infrastructure, skilled human resources, open government, and other essential capacity-building issues. In addition, an Information Technology policy built on reliable human resources and infrastructure constitutes the fundamental tool for assessing, planning, managing development change and achieving true growth in all sectors. Therefore, IT support must be viewed differently to arrest AIS's dissatisfying state in the Nigerian public sector.

### 9.6 Contribution to existing knowledge of the research

The thesis contributes to knowledge in the following areas.

**Enhancing readers' understanding of DM and AIS literature and body of knowledge.**

The research has provided evidence that the different management style has no impact on the management attitude towards DM, eliminating the need always to consider the role of management style in DM implementation. The study also took appropriate steps toward enhancing understanding DM related to AIS in public sectors. It has shown that implementing DM requires a unique approach and diversified concepts. The conclusions from the literature and the study's findings have also contributed to the growing body of literature regarding the development DM implementation model. By working within the emerging data mining theory, the research has also contributed to the ongoing investigation in IT support for accounting information systems and the appropriate theoretical basis of accounting as a discipline.

Finally, the study has also shown that, like other disciplines, accounting sectors require a data management tool that identifies with each organization’s unique nature, its temporariness, and the type of data being generated in the sector.

**The general applicability of the method and findings**

The methods used in determining the progress and challenges of implementing DM in AIS of public sectors can most readily be used to determine the same for other sectors. Significantly, assessing the level of implementation of the concepts of the study may require improvement in some respects.

### 9.7 Limitations of the study

Several key limitations are identifiable within this study. The first one must do with the responses during the survey. It is not possible to ascertain that all the respondents

answered the questions with the same level of honesty and openness. In addition, we estimate that no matter how candid respondents may be, the quality of their responses is limited by their ability to recollect from experience and be influenced by their present conditions. The effect of these potential deficiencies, however, is minimised by the mixed research methods used in the investigations. Secondly, given that the entire investigation was carried out with a cross-sectional design, meaning responses were collected at a single point in time which does not take account of possible changes trend over time, it implied that overall developments would influence the trend of the responses. In other words, changes in respondent work conditions, together with its associated constraints, could affect the trend of the results, if not the content. Thirdly, even though it has been suggested in the literature that DM implementation is directly linked to IT

developments, the scope of this research did not include this aspect in its investigation. This leaves an information gap needed to derive further a better understanding of the challenges of DM implementation.

Another problem area is descriptions of factors influencing organisations' decision to implement DM. The literature found that different authors use different descriptions to define the same things. Those obtained from qualitative studies through interviews also followed a similar trend. This caused an endless list of factors, mostly expressing the same issues.

Finally, the research focused only on accounting information systems, leaving out other aspects of data-driven public sectors. These limitations, however, do not undermine the validity of the research and its main findings because, like every scientific research, it is purposed to contribute to the continuous quest of investigation, observation, measurement, and examination of some phenomenon for enhanced understanding and insights.

### 9.8 Recommendations for Further Research

This section presents recommended areas for further research. Firstly, to objectively assess the level of implementation of DM, it is necessary to develop an empirical approach to evaluating the extent of the adoption of data mining. A score allocation system seems to be a unique and more evidential means of appraising the DM implementation level. This will provide a clear measurement of progress made in implementing DM rather than just saying whether the concept is adopted or not.

Secondly, an extensive and comprehensive review of prevailing and potential DM software will be instrumental in categorising what technology falls under DM and what does not, rather than viewing all data analysis software as DM equals.

Another area that requires attention is the need to establish a data bank of factors influencing the implementation of DM, the data which will require regular updates. Additionally, the challenges of data mining implementation should be investigated to propose corrective actions. It is also recommended that further work be done to determine the relationships among the factors within the same factor groups and factor groups. In addition, the relationship between the factors and the challenges should be determined. These will enhance the understanding of the behaviour of key factors and provide the needed guidelines for research on the mitigation of the challenges of DM.

Lastly, independent research is required to determine the extent of IT support in the Nigerian public sector. It is not enough to solely measure the level of DM implementation in isolation; other IT aids must also be

investigated. Without the existence of some IT support, DM implementation will surely fail. In addition, there is a need for research and development of a model for the effective implementation of DM in public sectors. This will speed up the selection and implementation of suitable technologies for DM and ensure their applicability to various departments of the sectors.

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**APPENDIX**

## Appendix one: The study participant sheet and Online questionnaire


**PARTICIPANT INFORMATION SHEET**

**Study title:**

Ascertaining the progress and challenges of implementing data mining technology within the Accounting Information Systems of public sector functions in developing countries – the cases of the Nigerian ministries of Education, and Youth and Sports Development

**Invitation Paragraph**

You are invited to participate in a research study on the implementation of data mining technology (DM) within accounting information systems (AIS). This research investigates management styles within the context of technologically developing west African countries, including Nigeria, and provides empirical and theoretical insights into the changing and diverse nature of management styles. In addition, this study investigates managers' attitudes toward information technology (IT) and decision making (DM), as well as the relationship between certain demographic characteristics, such as age, gender, educational level, organisational experience, and span of control, and managers' attitudes toward IT and DM.

AYEBO BOLALE LAOUROU, doctoral researcher in accounting at Brunel Business School, Brunel University, is conducting the study. Under the guidance of:

Dr John Aston, Dr Grigorios Theodosopoulos and my RDA Dr Radha Shiwakoti.

**What is the purpose of the study?**

This study's objective is to examine the adoption and deployment of IT and DM technologies within AIS in Nigerian publicly traded enterprises. This study will explore the link between management styles prevalent in the Nigerian public sector and managers' views toward IT and DM.

**Why have I been invited to participate?**

You are asked to participate in this research because top managers in the finance/accounting field are the intended participants. You were selected as a target responder because it is considered that you represent a significant AIS stakeholder within your organisation, that you are aware of technology usage within your organisation, and that you have a solid grasp of the information concerns inside your sector.

**Do I have to take part?**

'As participation is entirely voluntary, it is up to you to decide whether to take part. If you do decide to take part, you will be given this information sheet to keep and you may be asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without having to give a reason.'

**What will happen to me if I take part?**

You would be needed for the research for just a couple of weeks (Maximum of 3 weeks), You would be needed to just fill in the questionnaire online and there is an interview on skype or zoom. The questionnaire takes less than an hour to be answered so it would not take much of your time. The questionnaire is not taking any personal information (E.g., Name) would not be asked.

**Are there any lifestyle restrictions?**

There are no restrictions in this study

**What are the possible disadvantages and risks of taking part?**

'There are no anticipated disadvantages or risks associated with taking part in this study.' You can ask me as many questions as you want while answering the questions.

**What are the possible benefits of taking part?**

This research is likely to aid senior management in accounting and audit departments as well as IT personnel within these departments in publicly traded companies in gaining a better understanding of the issues surrounding the implementation and use of Information technology and Data Mining technology in the accounting information system domain. In addition, scholars and practitioners are anticipated to gain from these contributions. Researchers can benefit from applying the conceptual model developed in this study to the conduct of similar research in organisational settings other than the public sector, as well as to the conduct of research extending the model and investigating its various aspects in more specific strategic contexts. Practitioners may profit by applying the findings of the research to their own accounting information system quality data choices, with an awareness of the relationship between those decisions and the strategic outcomes of the firm.

**What if something goes wrong?**

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have grounds for a legal action, but you may have to pay for it.' You can contact my supervisors: John.aston@brunel.ac.uk, Grigorios.Theodosopoulos@brunel.ac.uk or the Chair Committee of the Brunel Business school Ethics committee david.Gallear@brunel.ac.uk first, and they can advise you on what to do.

**Will my taking part in this study be kept confidential?**

'All the information that I will collect about you during the research will be kept strictly confidential. You will not be able to be identified in any ensuing reports or publications.'

**Will I be recorded, and how will the recording be used?**

You will not be recorded during the collection of Data for this study

**What will happen to the results of the research study?**

Since the Research is for educational purpose. The results from the study would be used for the conclusion of my thesis. After the grading of the dissertation, I would get back at you to inform you about the grading if it can be published. The dissertation won't be having any information concerning participants.

**Who is organising and funding the research?**

This is self-funded research by Ayebo Bolale Odjougbele Lynda Francine LAOUROU in conjunction with Brunel University London.

**What are the indemnity arrangements?**

Brunel University London provides appropriate insurance cover for research which has received ethical approval.

**Who has reviewed the study?**

Dr John Aston who is my Principal Supervisor, Dr Grigorios Theodosopulos who is my second supervisor and the College of Business, Arts and Social Sciences Research Ethics Committee.

**Research Integrity**

Brunel University London is committed to compliance with the Universities UK Research Integrity Concordat. You are entitled to expect the highest level of integrity from the researchers during this research.

**Contact for further information and complaints**

You can contact my supervisor: Dr John ASTON on his email: john.aston@brunel.ac.uk, Dr Grigorios Theodosopulos on his email: Grigorios.Theodosopoulos@brunel.ac.uk and the Chair Committee of the Brunel Business school Ethics committee Professor David GALLEAR on his email: David.Gallear@brunel.ac.uk.

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Dr John Aston

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Dr Grigorios Theodosopoulos

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**For complaints, Chair of the Research Ethics Committee:**
Professor David Gallear

EMAIL: David.Gallear@brunel.ac.uk.

## Appendix Two: Questionnaire

**Dear Sir/Madam**

I am pursuing a doctorate at Brunel University in London. You have been recognised as someone who can contribute to the study by completing the questionnaire. The questionnaire will take around 20 to 25 minutes to complete, and all responses are anonymous; a participant sheet is included to assist you in providing the relevant information. I guarantee you that all information you submit will be kept strictly secret and that your comments will only be used for the purposes of this study.

This questionnaire is divided into six questions: the first section requests basic information about your history in (your) industry. The second portion requests fundamental information about your management style, while the third piece requests fundamental information regarding your accounting systems and your evaluation of their performance. The fourth and fifth sections deal with data mining preparation and implementation, respectively. Section six focuses on the perspective of data mining's influence on your accounting system and decision-making process.

***To assist you in responding to this questionnaire several terms used are defined to ensure you understand how I am using these terms in this study.***

**Accounting Information System (AIS):** is the system that records and processes accounting transactions within functional modules such as payables, receivables, payroll, and trial balances.

**Data mining:** is the process of analysing data in a value-added manner to develop information and knowledge (patterns and linkages) to improve an organization's decision-making procedures. Exploring (summaries, comparisons, analyses, forecasts, estimates) the data using a range of methodologies and tools based on a current data analysis.

**Data Mining tools:** The software used to identify patterns and regularities in data sets (for example, Clementine, Enterprise Miner, Intelligent Miner, Darwin, Scenario, Knowledge SEEKER, Data mined Data Cruncher, Oracle9i Data MiningTM, etc).

**Data Mining adopters:** Organizations that have deployed or are adopting data mining techniques or technologies.

### Section ONE

1. Your age group (please tick one)

- ○ 18-29 years
- ○ 30-39 years
- ○ 40-49 years
- ○ 50-64 years
- ○ 65 years and more

2. Your gender (please tick one)

- Male
- Female
- Non-Binary
- Prefer not to say

3. What is your level of education?

- High School
- Undergraduate
- Postgraduate
- Prefer not to say

4. How long have you been working with this government department?

- Less than 5 year
- 5 – 10 years
- 10 – 15 years
- 15 - 20 years
- Above 20 years

5. How long have you been in a supervisory

- Less than 5
- year5 – 10
- years
- 10 – 15 years

6. How long have you had experience with Accounting Information System?

- Less than 1 year
- 1 – 5 years
- 5 – 10 years
- Above 10 years

7. Number of years in the division/unit?

- Less than 1 year
- 1 – 5 years
- 5 – 10 years
- Above 10 years

8. What is your Job function?

- ○ Accounting
- ○ Finance
- ○ Information management
- ○ Auditing
- ☐ Other

8.a. If you selected Other, please specify.

9. What is the level of responsibility of your Job?

- ○ Top management
- ○ Middle management
- ○ None of the above

## Section TWO

Below are a series of statements. They are designed to allow you to indicate the extent to which you agree or disagree with the ideas expressed. Place a 'cross'(**x**) in the space under the label, which is closest to your agreement or disagreement with the statements.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| In this sector, management decisions are made based on agreement and consensus between staff and management. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I always make the final decision and instruct staff to implement that decision. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I like to share my leadership power with my subordinates. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| I set tasks and schedules and make sure that the staff meet them even if this causes meto be unpopular. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I believe that innovation and unconventional approaches to problem solving should be rewarded. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I believe that staff and management should work on a co-operative base to achieve organisational aims. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I feel upset if I cannot convince the staff that the decisions, I make are the best ones. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| My source of power is based on organisational rules and procedures. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| My source of power is based on my knowledge about organisational work and activities. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| I try to capture the allegiance and respect of my staff using my work skills and knowledge. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I seek to work in harmony with my staff. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I am happy to let staff assume responsibility for important decisions within their job descriptions. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| This company has many rules and procedures that must be followed when making decision. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| When something new occurs, I discuss with senior staff how this will have an impact on the firm and the work undertaken. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I am prepared to delegate tasks to implement a new procedure or process. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| I listen to staff opinions about work and take them in consideration. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I believe that this company can quickly alter its administrative procedures, reallocate its resources and undertake new activities to meet changes in our operating environment. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I believe that staff members should be encouraged to respond creatively to challenging situations. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## Section THREE

**Accounting Information System (AIS)** is a term which describes the financial recording system implemented by your organisation and consists of subsystems such as transaction processing system, general ledger/financial reporting system, fixed asset systems and management reporting system.

**1-** How satisfied are you with your current accounting information system?

- ○ Very satisfied, no improvement required
- ○ Reasonably satisfied, although some improvement may be required
- ○ Needs improvements, but still usable
- ○ Dissatisfied, system requires major improvement

**2-** Does your department use any software packages to assist in analysing an accounting data?

- ○ Yes
- ○ No
- ○ Don't know

**3-** Please indicate your agreement with the importance of each of the following influences on the performance of the organisation. **Where 1 represents Strongly Disagree and 10 represents Strongly Agree**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Accurate: the data recorded conforms to the actual value | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Complete: all relevance value for a certain variable is recorded | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Up to date (timeliness): the data recorded in your system is timely | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**4-** Please indicate how frequently you use the accounting data from AIS in each of the following areas **Where 1 stand for Very Frequently and 10 stands for Never**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Planning and Budgeting | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Decision Making | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Performance management | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Cost control | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**5-** If you are going to evaluate the performance of your AIS, are the following factors important? Where 1 stand for Strongly Disagree and 10 Strongly Agree

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| The systems are easy to use | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| The systems can automatically validate the data | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| The systems have an adequate and sufficient documentation for employeesto follow | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| The systems are easy to modify and upgrade | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| The systems implement new data analysis tools (such as data mining) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| The system has an effective data management approach such as, centralized database and data warehouse | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

## Section FOUR

Data mining is the act of examining data in a value-adding manner to develop information and knowledge (patterns and linkages) that improves the organization's decision-making processes. Exploring (summaries, comparisons, analyses, forecasts, estimates) the data using a range of methodologies and tools based on a current data analysis.

**6-** Is the term data mining used in your organisation?

- Yes
- No
- Do Not Know

**7-** Is there any other term used that means data mining?

Please select no more than 2 answer(s).

- Yes
- No
- Do Not Know
- If yes (Please Specify)

7.a. If you selected Other, please specify.

**8- Readiness toward technology** – ***these questions seek to gain an understanding of your readiness to adopt technology in particular data mining.*** Please indicate the degree to which you agree with the following statements:

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Technology gives me greater control over my daily workactivities | | | | | | | | | | |
| Products and services that use the newest technologies are much more convenient to use. | | | | | | | | | | |
| I prefer to use the most advanced technology available. | | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Technology makes me more efficient in my occupation. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I keep up with the latest technological developments in my areas of interest. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I find myself having fewer problems than other people in making technology work for me | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I am always open to learn about new and different technologies. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| It is easy to learn how to use technology. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Overall, I find the technology useful for any task I need to accomplish. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I think it would be very good to use data mining technology for analysing accounting data in addition to current | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| methods. | | | | | | | | | | |

## Section FIVE

**Adopters of Data Mining:** Organizations that have implemented data mining tools or currently implementing any data mining software.
**Data Mining tools:** Software, which used to find patterns and regularities in sets of data (for example, Clementine, Enterprise Miner, Intelligent Miner, Darwin, Scenario, Knowledge SEEKER, Oracle9*i* Data Mining™, etc).

**9-** Based on the definition, does your organisation utilise any data mining tools?

- ☐ Yes
- ☐ No, never used data mining tools
- ☐ Don't know

9.a. If you selected Yes, please specify.

**10-** For how many years has your organization implemented data mining technologies?

- ○ Less than 1 year
- ○ 1 to less than 2 years
- ○ more than 2 years
- ○ Don't know

**11-** How important are the following factors in influencing your organisation's decision to employ data mining? **Please tick (√) your answer according to the scale given Where 1 represents Strongly Disagree and 10 represents Strongly Agree**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Adequate technical support from vendors | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Compatibility of software with existing operating systems | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Full support from top management | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Effective and adequate training for staff | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Technology savvy staff | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Up-to-date ICT infrastructure | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Changes in management trend within private sector | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Directives from politicians. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| An attempt to ensure public accountability | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| A sufficient financial resource | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**12- If your organization is NOT implementing any data mining tools, please answer the following questions.** Please indicate the degree to which you agree with the following reasons for **NOT** implementing data mining in your organizations. **Where 1 stand for Strongly Disagree and 10 stands for Strongly Agree**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Satisfied with current analysis method | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lack of expertise to implement data mining | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lack of awareness about data mining | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Costly to implement new technology | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lack of top managemen t support | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Difficult to select appropriate software | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Too complex and time-consuming | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Lack of managemen t policies | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Having more pressing problems | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**13-** The following questions explore your organisation's attitude toward adopting data mining. It does not matter if your organisation has implemented data mining or not. The questions are about your organisation's INTENTION to adopt data mining technology.

| | No intent to adopt | Little intent to adopt | Moderate intent to adopt | Definite intend to adopt | Don't know |
|---|---|---|---|---|---|
| Does your company intendto adopt data mining? | ☐ | ☐ | ☐ | ☐ | ☐ |

**14-** Please indicate the option that suits your organisation

| | Less than 12 months | 12 to 18 months | 18 to 24 months | More than 24 months | No plans to adopt |
|---|---|---|---|---|---|
| If your company intends to adopt data mining, how soondo you anticipate that it will be operationally implemented? | ☐ | ☐ | ☐ | ☐ | ☐ |

## Section SIX

This section seeks information about the impact that data mining technologies could bring to your organisation in terms of AIS performance and decision-making process.

**15-** Please indicate the degree to which you agree with the following statements about impacts you expect data mining bring to your organisation Where 1 stands Strongly Disagree and 10 stands for Strongly Agree.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lower down transaction cost | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Increase the quality of information derived from AIS. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Increase overall AIS performance | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Improve the quality of transaction | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Reduce cycle time ofmy organization | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fulfil information needs for the decision making | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Provides decision support in supporting my decision-making process | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Contributes to the speedof my decision making | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**16-** If there is anything else that you would like to tell us about the implementation of data mining technologies in accounting information systems, please use the space provided below.

Your contribution to this research project is very greatly appreciated.

**Appendix Three: Interview Cover Letter**

Dear Participant,

My name is Ayebo Bolale Odjougbele Lynda Francine LAOUROU, and I am pursuing a Ph.D. in Accounting at Brunel University London under Dr. John Aston's supervision. I am doing research on the installation and use of Data Mining Technologies inside the Accounting Information System of the Nigerian Public Sector - A Country Study. The fundamental objective of this thesis is to examine and analyse the current degree of employment of this technology, as well as to investigate the feasibility of building a successful data mining model inside accounting information systems in the Nigerian public sector. Given the gaps in the literature and the lack of understanding about data mining technologies in the accounting information system environments of organisations in the public sector, this research is vital. It is necessary to discover evidence that indicates if this technology will assist the government sector to enhance its management credibility.

You may recall participating in a recent online poll about my doctoral dissertation in accounting at Brunel University, London. Many thanks for your assistance. As you may remember, I am doing research on Ascertaining the success and obstacles of adopting data mining technologies inside the Accounting information systems of the public sector in developing nations - the ministries of Nigeria.

You indicated in your online survey response that you would be willing to participate in an interview for research reasons. This interview is vital to my research and would strengthen the credibility of this study's results. Your suggestions and ideas will greatly benefit this study. Now, I would want to evaluate whether you may still join. Please see the reduced interview schedule attached. It is recommended that interviews take place in March 2021, that your availability be conveyed on August 20, 2021 at 10 a.m., or that you choose a convenient day and time. The interview is planned to be done online and last between forty and eighty minutes. It is expected that the interview will be audio recorded, and you will have the opportunity to review and edit all

materials, including any transcripts resulting from these recordings. The raw data for this study will be maintained securely at the Brunel Business School for five years. The data will be deleted at the completion of this five-year period. I'd be delighted to give you with a summary of my results. Simply write me an email and I will handle the situation.

Participation in this procedure is purely voluntary, as shown by the below signature on the consent form. Please be warned that you may withdraw without penalty or explanation if you fail to answer to any question. If you withdraw, you may opt to remove any previously submitted information.

Should you have any queries regarding the project or questionnaire, please feel free to contact me on 1800340@brunel.ac.uk and you can contact my Principal supervisor: Dr John ASTON john.aston@brunel.ac.uk or my second supervisor Dr GRIGORIOS THEODOSOPULOS Grigorios.Theodosopoulos@brunel.ac.uk and the Chair Committee of the Brunel Business school Ethics committee Professor David GALLEAR on his email: David.Gallear@brunel.ac.uk.

I look forward to hearing from you.

Your sincerely,
Francine LAOUROU Doctoral researcher
Student ID 1800340

## Appendix Four: Interview consent form

**Ascertaining the progress and challenges of implementing data mining technology within the Accounting information systems of public sector in developing countries- the cases of the Nigerian ministries.**

Ayebo Bolale Odjougbele Lynda Francine LAOUROU

APPROVAL HAS BEEN GRANTED FOR THIS STUDY TO BE CARRIED OUT BETWEEN Click here to enter a date. AND Click here to enter a date.

| **The participant (or their legal representative) should complete the whole of this sheet.** | | |
|---|---|---|
| | YES | NO |
| Have you read the Participant Information Sheet? | ☐ | ☐ |
| Have you had an opportunity to ask questions and discuss this study? (Via email/phone for electronic surveys) | ☐ | ☐ |
| Have you received satisfactory answers to all your questions? (Via email/phone for electronic surveys) | ☐ | ☐ |
| Who have you spoken to about the study? | | |
| Do you understand that you will not be referred to by name in any report concerning this study? | ☐ | ☐ |
| Do you understand that: | | |
| • You are free to withdraw from this study at any time | ☐ | ☐ |
| • You don't have to give any reason for withdrawing | ☐ | ☐ |
| • Choosing not to participate or withdrawing will not affect your Choose an item. | ☐ | ☐ |
| • You can withdraw your data any time up to Click here to enter a date. | ☐ | ☐ |

| | | |
|---|---|---|
| I agree to my interview being Choose an item. | ☐ | ☐ |
| I agree to the use of non-attributable quotes when the study is written up or published | ☐ | ☐ |
| The procedures regarding confidentiality have been explained to me | ☐ | ☐ |
| I agree that my anonymised data can be stored and shared with other researchers for use in future projects. | ☐ | ☐ |
| I agree to take part in this study. | ☐ | ☐ |

| | |
|---|---|
| Signature of research participant: | |
| Print name: | Date: |
| Witness Statement | |
| I am satisfied that the above-named has given informed consent. | |
| Witness signature: | |
| Print name: | Date: |

## Appendix Five: Interview question guide

**Ascertaining the progress and challenges of implementing data mining technology within the Accounting information systems of public sector in developing countries- the cases of the Nigerian ministries**

Organisation name:

Interviewee number:

Business profile:

Location:

Date:

Start time of the interview:

Finish time of the interview:

***Note for interviewer: The interviewer will briefly explain the meaning of data mining and examples of software available in the market.***

### Section 1: General Information (Demographic)

Please tell me about yourself.

1. Your background.
    1) Education, and working experience
    2) Your experience with accounting information systems
    3) Your role in the organisation, time in that role

2. Your organisation.
    1) Your department
        - Finance
        - Accounting
        - IT
        - Senior Executive

- Other

2) Your primary function in relation to accounting data. Do you principally:

- Collect accounting data
- Manage people who collect accounting data.
- Apply accounting data to tasks
- Manage those who apply accounting data to tasks
- Perform duties as an information system professional
- Supervise information system professionals.
- Use produced information in decision making

## Section 2: Accounting Information Systems (AIS)

Please tell me something about your organisation's accounting information systems (AIS)?

1. How extensive is the AIS? (Number of unique systems/packages, Number of personnel)
2. What kind of systems do you use for AIS? Please specify.
3. What is the age of the AIS? (The age and development of the system)
4. How does your function fit into the organisational framework of the AIS?
5. What is your overall assessment of the AIS's performance? Why do you hold this belief?
6. What factors do you examine while assessing the effectiveness of the AIS?
7. What aims do you suppose are implicit in your organization's utilisation of an AIS?

## Section 3. Data mining readiness

1. Do you have any knowledge with data analysis software? What do you think of the various options? What is your company currently utilising? Are you using the 'greatest software' for your organisation? What are your thoughts on the proliferation of data analysis software on the market?
2. Can you define the sort of person you are with regards to computer technology? Do you see technology to boost your work's efficiency? Or maybe you see it as a panacea? Do you like experimenting with cutting-edge technology?
3. Are you willing to attend a workshop or seminar that focuses on cutting-edge technology if the chance arises?
4. 4.I'm sure you use a computer at work; do you feel comfortable with all the tasks you do on it? If you use a computer, what functions do you use it for?
5. How do you feel about the fast growth of technology in general? And its implications for your professional field?

6. Are you familiar with data mining technology? What are your thoughts on this technology?

**SECTION 4**

1. Do you currently have data mining software installed in your AIS?

***Note to interviewer: If they do not have Data Mining installed, ask the following questions. If YES, go to questions 10 and beyond.***

2. What do you suppose are the primary causes for your company's lack of data mining software?
3. Has your department researched this sort of software and determined it to be inappropriate?
4. Does your organisation have a different term for identical tasks performed under data mining? What exactly is it?
5. Please describe how your accounting data is analysed prior to being provided to decision-makers.
6. What sort of analysis have you typically performed on this data?
7. Utilize any programme to assist in the analysis of this data? What exactly is it?
8. Have you established data analysis policies and a data analysis model? Can I have a copy after this interview?
9. Do you believe that your department will explore data mining software?
10. What are the primary reasons for your department's implementation of this technology?
11. Do you believe that technology has increased your decision-making capacity and capability? Do you believe this technology has enhanced your AIS performance?
12. Are you in agreement that the capacity of your departments to utilise the technology has enhanced your AIS functions?
13. I have identified several elements that may impact a department's decision to employ data mining technologies. Which of these do you believe are crucial and essential in the choice to use a new technology like data mining? Would you be able to rate each of these variables on a scale from 1 to 10, with 10 being the most significant and 1 being the least?

**A**. Adequate vendor technical support **B**. User-friendly interfaces **C**. Availability of high-quality data **D**. Capacity for problem-solving **E**. Commitment of top management **F**. Optimistic department **G**. Nature of the application (easy to use) **H**. clarify departmental policy regarding data analysis **I**. The organisational structure **J**. The organisational culture

**K**. Financial resource **L**. Skilled personnel **M**. Political factors **N**. Government involvement **O**. Private sector data analysis trend

Consider these elements to be appropriate? Why wouldn't we?

Exist more aspects that you believe may be significant but were omitted from this list?

**Conclusion:**

Is there anything I haven't asked you regarding data mining software, tools, and advancements in accounting information systems that you believe is pertinent?

Who else would you consider speaking with regarding this subject?

Would you want some input on the study's results from this report?

If you choose, I will provide you with a transcript of what I think you told me and how I perceived what you said, so you may correct the impressions I've formed from your responses.

**Thank you so much for your significant time and assistance!**