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BIG DATA AND ANALYTICS ADOPTION AND ITS IMPACT ON ORGANIZATIONS: THE CASE OF GHANAIAN BANKS

BY

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DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS

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A THESIS SUBMITTED TO

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DECLARATION

I do declare that this thesis is the result of my own research undertaken under supervision and has not been presented by anyone for any academic award in this or any institution. All references used in this research are fully acknowledged.

I bear any responsibility for any shortcomings.

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ABSTRACT

The emergence of the concept of Big Data (BD) has created significant value expectations for organizations with massive data collections. Banks, like all other organizations, understand the value potential of big data. Finance professionals view big data analytics as a powerful tool for improving risk analysis, improving fraud detection and prevention, and shifting the trade and investment paradigm from "of no moment" settlement to "real-time" settlement. Big data analytics is increasingly recognized as an essential component of agile organizations' decision-making processes, with the potential to yield impressive results across various industries. However, despite its growing importance, studies on big data analytics remain limited and inconsistent, particularly within the banking industry. Furthermore, practitioners are only beginning to embrace big data analytics, indicating a need for further research to understand the challenges associated with the adoption of big data technology in the banking sector. The purpose of this study is to investigate the adoption and impact of Big Data and Analytics (BDA) on Ghanaian banks. In addition, the study seeks to investigate the enablers and constraints of BDA adoption in Ghanaian banks and examine time as a moderating factor in the impact of big data and analytics in Ghanaian banks.

The study uses qualitative research methodology and is exploratory. It uses a theoretical framework that is based on the integrative IS success model developed by Delone and Mclean, which is a popular method for evaluating IT adoption. To gather information, semi-structured interviews were used. The final respondents for the study were chosen using purposeful sampling. Based on the impact, adoption, and duration of use of the platform, a total of 10 respondents were used for the study.

According to the study's findings based on the banks that participated, some foreign banks in Ghana have adopted BDA more than both local and private banks. BDA has been operational in some banking sectors for the last five (5) years, with most banks using the platform more frequently. Finally, the findings revealed a relationship between BDA Information Quality, BDA System Use, and BDA User Satisfaction. Furthermore, BDA Service Quality influenced BDA System Use and BDA User Satisfaction. Furthermore, BDA Time had a moderating effect on the relationship between BDA System Use and Net Benefits, as well as BDA User Satisfaction and Net Benefits. Net Benefits were directly affected by BDA System Use and BDA User Satisfaction.

This study fills a gap in the body of knowledge regarding Big Data and Analytics, their application, and their impact on Ghanaian banks in the context of a developing economy. Although the Delone and Mclean success model is typically used in quantitative studies to access technology adoption, the study's originality lies in the researcher's adoption of it to qualitatively explore the study. The relevance of this study to Ghana can assist bank managers in their use and implementation of BDA as well as policy makers in using it to develop policies for BDA adoption. Also, the study offers a solid foundation for academics and students who desire to conduct research in the field not just in Ghana but also elsewhere in the globe, especially in other developing nations.

DEDICATION

To the Almighty God who has seen me through this entire work, in memory of my late dad Mr. Joseph Obiri Taylor. To the one who inspires me academically and professionally, Doctor Nathaniel Nana Kojo Taylor, to my siblings especially Wilhemina Taylor, and my supportive mum, Hannah Afodzi Taylor. For your endless love, support, and encouragement. I shall forever remain grateful to you all.

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Glory be to the Almighty God who has been my strength and provider. Though only my name appears in this covered thesis, countless people have contributed to its success. I owe my gratitude to all these people who have made this thesis possible, and to whom my graduate experience has been one that will far longer be embedded in my memory.

Foremost, I would like to express my sincere gratitude to my supervisors Dr. Acheampong Owusu and Dr. Emmanuel Kolog Awuni for their continuous support of my study and research, for their patience, motivation, enthusiasm, and immense knowledge. Their guidance helped me in all the time of research and writing of this thesis. I could not have imagined having better advisors and mentors for my MPhil study. My profound gratitude goes to them.

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LIST OF ABBREVIATION

BD	-	Big Data
BDA	-	Big Data and Analytics
NASA	-	National Aeronautics and Space Administration
IEEE	-	Institute of Electrical and Electronic Engineers
3Vs	-	Volume, Velocity, and Variety
FSPs	-	Financial Service Provider
TOE	-	Technology Organization Environment
TAM	-	Technology Accepted Model
CR	-	Critical Realism
HDFS	-	Hadoop Distributed File System
BCPS	-	Government Basel Committee on Bankers Supervision
IS	-	Information System
BDA	-	Big data analytics adoption
B2C	-	Business-to-Consumer

CHAPTER ONE

INTRODUCTION

Research Background

1.1 The emergence of the Big Data (BD) concept has significantly increased value expectations. For organizations possessing substantial data collections, banks, like any other businesses, recognize the potential benefits of big data (Hong & Ping, 2020). The idea of big data, or vast collections of digital data, has existed since the beginning of computing even though the term "Big Data" is relatively new (Katin, Kazimianec, & Zilinskas, 2018). Big data analytics is viewed by financial professionals as a potent tool for enhancing risk analysis, enhancing fraud detection and prevention, and changing the trade and investment paradigm from "of no moment" to "real-time" settlement (Altaf, 2021). Raw facts that reflect an entity's or event's characteristics are referred to as "data" (Fosso Wamba, Akter, Edwards, Choeim, & Gnanzou, 2015). Businesses have started using big data, which has been dubbed the "new oil" for today's digital economy because information contains so much priceless insight (Mikalef, Pappas, Krogstie, & Ginannakos, 2018). The six main "Vs" have also been used to describe big data. It should be noted that while velocity describes the rate and frequency at which data is created, processed, and analyzed, variety refers to the various types of data that are collected (Ghasemaghaei & Calic, 2019). One of the six characteristics, veracity, refers to the data quality, relevance, uncertainty, reliability, and predictive value and is a coherent analysis that should be useful to the banking industry. Variation is the consistency of the data over time, whereas volume is the amount of data (Ghasemaghaei & Calic, 2019). Big data is a resource that businesses are relying on more and more because it can help them gain business insights. The adoption of big data analytics (BDA) has skyrocketed in recent years (Choi, Chan, & Yue, 2017).

To enhance decision-making, procedures that boost customer loyalty, or the creation of business value, many companies have started to invest heavily in developing and implementing a variety of tools and applications that provide a deeper understanding of data values buried within sizable unstructured datasets (Osman, 2019). "Large volumes of high velocity, complex, and variable data that require advanced techniques to capture, store, distribute, manage, and analyse" is how big data (BD) is defined (Aboelmaged & Mouakket, 2020.pg 25; Edu & Agozie, 2020. pg 45). Big data analytics combines predictive and prescriptive analytics to forecast future events and the routes they will take. It is a significant turning point in data use and a key engine for growth and profitability (Madhlangobe, 2018). "Big Data science is fascinating, but what makes it, so alluring is its value" (Zaman et al., 2021, p. 45). It is impossible to overstate the value of data for most organizations across a wide range of industries. For an organization to remain relevant and, if necessary, grow profitably, the relevant information is essential. A strategic decision cannot be made without the necessary information to support and shape that decision (Qi et al., 2018; Saleem et al., 2020). This is what Big Data brings to the table: the ability to use any type of data available, not just some aspects of available data (Chaurasia & Verma, 2020).

The research of Ghasemaghaei, Calic, and Maroufkhani (2019) indicates that big data and its analytical techniques represent recently emerging opportunities for businesses to analyse available data to learn more about the state of their business in the market and, as a result, make wise decisions to remain competitive and increase their market share. Big data analytics have been used in a variety of fields and industries, including e-government, healthcare, and e-commerce (Aboagye-Otchere et al., 2021; Archenaa & Anita, 2015; Edu & Agozie, 2020; Harerimana et al., 2018; Ristevski & Chen, 2018; Wang & Wang, 2020).

According to reports, big data analytics can boost a company's effectiveness and efficiency by allowing it to develop effective strategies based on data (Lei, Zhime 2021; Tang & Chaveesuk, 2021). Big data analytics is now an essential component of agile organizations' decision-making processes, and it is said to produce impressive results in a variety of industries (Agyapong, 2020). Notably, studies on big data analytics are still scarce and inconsistent, particularly in the banking industry (Tiwari et al., 2018). Furthermore, practitioners are only now starting to use big data analytics. According to the situation, more research is needed to understand the issues associated with the adoption of big data technology in the banking sector (Chaurasia & Verma, 2020). According to Loh and Teoh (2021) and Pourzolfaghar et al. (2018), big data technology adoption refers to enterprise users' adoption behavior and selection decisions of big data technology, data-based applications, and services that facilitate effective banking prediction and decision-making, allowing the banking sector to gain competitive advantages and create enterprise value (Lin & Kunnathur, 2019). A variety of analytics tools have also been used by companies in Ghana and other nations to aid in the organization, storage, and utilization of information that is available both internally and externally (Papadopoulos et al., 2017). Thus, examining the impact and adoption of BDA on Ghanaian banks provides us with insights into which BDA tools have been implemented and how BDA has been used to improve the effectiveness and efficiency of the bank's operations.

1.2

Research Problem

Existing studies have primarily focused on big data analytics, specifically modelling the relationships between big data analytics capabilities, IT-enabled transformation practices, benefit dimensions, and business values (Ristevski & Chen, 2018; Yichuan Wang, Kung, Wang, et al.,

2018). However, to understand how big data analytics capabilities can change organizational practices while also producing potential benefits, Hausladen and Schosser (2020), Inamdar, Nakhede, and Sagnak (2020), and Osman (2020) examined big data implementation cases in a healthcare setting (2019). Even though big data characteristics provide a very suitable foundation for developing applications that can handle big data in medicine and healthcare using promising software platforms, this was overlooked.

Big data in government was investigated by AboagyeOtchere, Agyenim-Boateng, Enusah, and Aryee (2021). The primary goal of the research was to conduct a thorough literature review to assess the current state of accounting research on big data analytics and identify potential areas for future research.

According to the study, personal income taxes, capital gains taxes, and value-added taxes are more likely to discourage people from engaging in future-oriented behavior. According to the findings, corporate income taxes can have a positive impact on a society's future orientation. Inamdar et al. (2020) and Jha et al. (2020) explored and provided insights into Big Data Analytics (BDA) studies in various sectors, with a primary focus on supply chain management, with a focus on India and France. The competitive environment and intra-firm power dynamics, in addition to technical capacity, are important factors in developing BDA capability and implementing BDA technologies. The benefits of implementing BDA, as well as a lack of adequate research in the field, motivated this study. Maroufkhani and Nourani (2019) investigated big data in firm performance to categorize the different types of performance that big data analytics can address and to identify the factors that may influence big data analytics adoption in different parts of an organization. Kreyenberg (2020) applied resource-based and institutional theory to big data and the supply chain. Furthermore, according to his paper, assimilation is a three-step process that

includes acceptance, utilization, and assimilation. The student used his discoveries to gain competitive advantage in the automotive industry through data-driven decision-making.

Furthermore, Edu and Agozie (2020), Razzak et al. (2020), and Ristevski and Chen (2020) consider big data in healthcare settings. Weng (2018) and Aldholay et al. (2018) systematic review of 25 articles revealed nine important factors that influenced healthcare institutions to adopt BDA. Among the factors influencing BDA adoption that received high marks were patient management, quality decision-making, disease management, data management, and promoting healthcare efficiencies. Future research, according to Al-Dmour et al (2021), should focus on the significant benefit of conducting similar studies that deal with other environments and contexts and investigate variables other than those studied in this research, investigating the factors influencing the practices of big data analytics applications by commercial banks operating in Jordan and their bank performance.

Existing research on the impact and adoption of big data and analytics preferences in the African banking sector is limited. Studies in France (Khan et al., 2017), America (Hu & Vasilakos, 2016; Mikalef et al., 2020; Mtsweni et al., 2020; Pourzolfaghar et al., 2018; Razzak et al., 2020), Malaysia (Loh & Teoh, 2021; Ristevski & Chen, 2018) and Korean (Lee et al., 2017) contexts have researched on the impact and adoption of big data and analytics in the banking sector. However, in the context of a developing economy, big data has been investigated in Ghana with a focus on accounting (Boakye & Ayerki Lamptey, 2020), government (AboagyeOtchere et al., 2021), and healthcare (Yeboah-Boateng & Fhea, 2018). As a result, this study provides a valuable study on the impact of big data and analytics on banking organizations, as well as their adoption.

DeLone and McLean's framework of system quality, information quality, service quality, system use, user satisfaction, and net benefits was adopted after a review of the IS evaluation literature

(Delone & Mclean, 2014b). This model is well established in the literature and serves as a solid starting point for defining success criteria and recognizing the multidimensional nature of information system success (Owusu, 2020). This model focuses on factors that contribute to success at various levels rather than variables that cause success (Bharati & Bharati, 2016). The model can also be used to explain how individuals, groups, and organizations move from awareness of technological innovation to adoption, acceptance, and, finally, "success" (Owusu, 2017) It demonstrates how early individual acceptance correlates with later organizational-level outcomes (Rouse, 2007). Furthermore, the use of time as a moderating factor in this paper demonstrates another application of the successful IS model developed by Delone and Mclean.

As a result of the preceding, one can conclude that the impact and adoption of big data and analytics in the banking sector in developing economies, particularly Ghana, are still in their early stages. There is a need for additional research in this emerging field due to the numerous possibilities. Currently, only a few studies on the impact and adoption of big data and analytics in Africa's banking sector, specifically Ghana's banking sector, have been conducted (Aboagye-Otchere et al., 2021; Hong & Ping, 2020; Inamdar et al., 2020). It is therefore critical to respond to this call by leveraging the Delone and Mclean IS Success Modelsuccess model (Abdurrahaman et al., 2019) for additional analysis of the phenomenon as described in the literature to contribute to the body of knowledge.

1.3

Research Purpose

The purpose of this study is to investigate the adoption and impact of big data and analytics (BDA) on Ghanaian banks. In addition, the study seeks to examine time as moderating factor in the impact and adoption of BDA on Ghanaian banks.

Research Objective

The specific objectives of the study are:

1. To examine the current state of BDA in the Ghanaian banking sector
2. To investigate the enablers and constraints of BDA adoption in Ghanaian banks
3. To examine the impact of BDA on Ghanaian banks

1.4

Research Questions

1.5 This study interned to answer these questions:

1. What is the current state of BDA in the Ghanaian banking sector?
2. What are the constraints and enablers of BDA adoption in Ghanaian banks?
3. What is the impact of BDA on Ghanaian banks?

1.6

Research Significance

This thesis will significantly contribute to the development of the relatively new BDA literature and will stimulate academic research interest in the field of information systems by adding to the growing body of literature on the impact and adoption of BDA specifically within the context of Ghanaian banks. As a result, the study's design and findings will be transferable to other countries with comparable contexts. This study's theory and model broaden the application and impact of BDA in Ghanaian bank literature. Future studies will incorporate this model and consider how to conduct more discerning research in the field. Moreover, it is expected to exert a moderating influence over time, unveiling novel behavioral patterns in the impact and adoption of BDA within Ghanaian banks. By examining the impact of BDA on Ghanaian banks, this study aims to learn

more and contribute to the body of knowledge. This is significant because little is known about how BDA has affected Ghanaian banks.

The practical goal of the study is to provide recommendations for better decision-making based on the results of BDA preferences for Ghanaian banks in emerging markets. The Delone and Mclean IS Success Model success model conclusions would serve as a framework or blueprint for organizations actively involved in the BDA on banks in Ghana.

Chapter Synopsis

1.7 The dissertation is written in seven chapters with a brief description of each chapter as below:

Chapter One: Introduction; the research area is outlined in this chapter. A problem statement is discussed to provide a clear picture of the study, and this discussion leads to the discussion of the research's purpose, objectives, questions, significance, and organizational structure.

Chapter Two: Literature Review: To complement the perspectives of other researchers on Big Data and Analytics Adoption and Its Impact on Organizations and to identify research gaps, this chapter reviews pertinent and recent literature on Big Data and Analytics Adoption and Its Impact on Organizations: The Case of Ghanaian Banks.

Chapter Three: Research framework; the research framework chapter presents the framework which guides the study, the justification for the use of the model, and its limitations.

Chapter Four: Methodology; in this chapter, the philosophical premises supporting this study are covered. It also explains how the research strategy connects to philosophical presumptions. It will act as a guide for the data analysis and discussions as well as the research design, data collection techniques, and tools.

Chapter Five: Research Analysis and Findings: this chapter provides an overview of Big Data and Analytics Adoption and Its Impact on Organizations in developing countries (Ghana), the profile of some selected banks as well as the presentation of findings.

Chapter Six: Discussions and Findings; in this chapter, the study's results are analyzed to identify key themes that emerged from the data and are further discussed to address the research questions.

Chapter Seven: Summary, Conclusion, and Recommendations; this chapter provides a summary of the entire body of research, along with implications, conclusions, and recommendations for future research directions. The following are study sources and appendices.

CHAPTER TWO

LITERATURE REVIEW

Chapter Overview

2.1 The existing literature on Big Data and Analytics aims to identify current knowledge gaps for future research, as well as its impact and adoption among Ghanaian bankers. It also goes into detail about the various characteristics of big data and discusses the benefits and drawbacks of using big data and analytics in the banking industry.

Big Data

2.2 At the IEEE 8th International Conference on Visualization in 1997, NASA researchers Michael Cox and David Ellsworth coined the term "big data" (Maroufkhani, Wagner, Ismail, Baroto & Nourani, 2019). They stated that visualization posed a challenge to computer systems because memory, local disks, or even remote disks could not handle large amounts of data (AboagyeOtchere et al., 2021). Big data is quickly becoming a popular topic in computer and information sciences, management, and social sciences (Mikalef, Pappas, Krogstie & Wetering, 2018). This phenomenon is largely caused by the widespread use of social media, mobile devices, and sensors, integrated IS, and Internet of Things artifacts. To date, several definitions of big data have been put forth to set the phenomenon apart from conventional data-driven or business analytics methods (Iqbal et al., 2020). Some researchers emphasize the various methods by which data is collected, highlighting the sources of the data, including healthcare, enterprise information systems (IS), customer transactions, business performance, small and medium-sized enterprises (SMEs), disaster management, and supply chain management (Chiang et al., 2017). As a starting point, Dubey (2019); Elgendy and Elragal (2016); and Kreyenberg (2020) provided an overview

of how big data has been defined in previous studies, as well as what attributes are essential to the concept.

Table 2.1: Definitions of Big Data

Study	Definitions
Elgendy and Elragal (2016)	The term big data applies to a database that grows so large that they become awkward to work with using a traditional data management system.
Yichuan Wang, Kung, and Byrd (2018)	Big data was first defined in terms of its volume, velocity, and variety (3Vs), after which it became possible to develop more sophisticated software to fulfill the needs of handling information explosions accordingly.
Tang and Chaveesuk (2021)	Big data involves more than simply the ability to handle large volumes of data; instead, it represents a wide range of new analytical technologies and business possibilities.
Fosso Wamba et al. (2015)	'Big Data' in terms of 3Vs: 'Volume' or a large amount of data that consumes huge. Storage entails many recorded data. Big data focuses on three main characteristics:

Pourzolfaghar et al. (2018)	Big data focuses on three main characteristics: the data itself, the analytics of the data, and the presentation of the results of the analytics that allow the creation of business value in terms of new products or services.
Altaf (2021)	Big data refers to voluminously large datasets, analytics refers to using these datasets to reveal patterns, trends, and associations that can be applied as a solution to various complex problems.

Source: From Literature

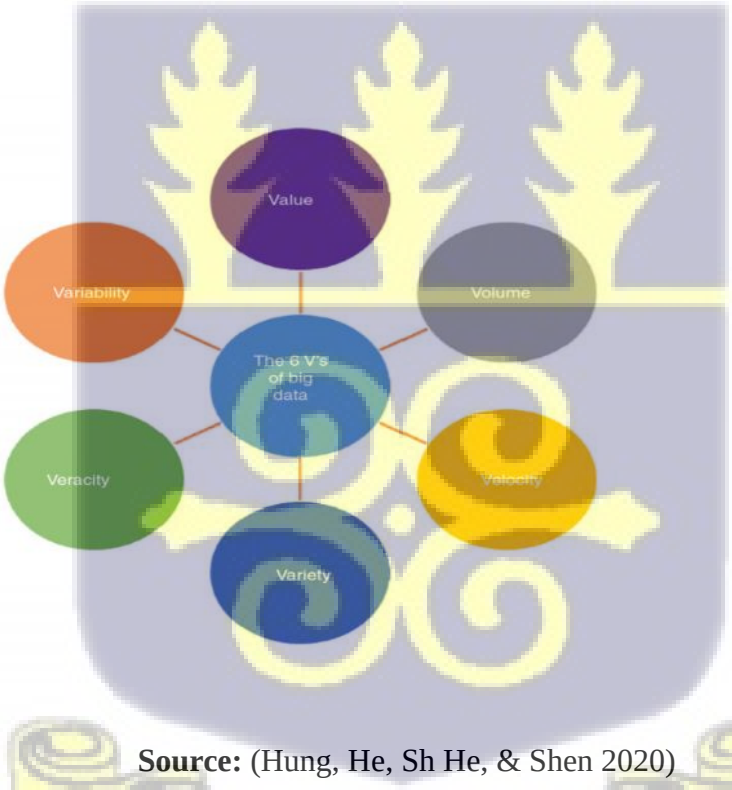
Table 2.1 according to Elgendy and Elragal (2016) define big data as a database that grows so large that it becomes difficult to work with using a traditional data management system. On the other hand, Yichuan Wang, Kung and Byrd (2018); Tang and Chaveesuk (2021); and Fosso Wamba et al. (2015) viewed big data in terms of its 3Vs (volume, velocity, and variety), to handle information explosions as needed. Altaf (2021) examined big data in terms of its massive datasets. Based on the definition of big data in table 2.1, all definitions of BDA focus solely on the data and their defining characteristics, including the analytical procedures, tools, and techniques that are used.

Big Data Characteristics

BDA properties are also being debated in academia and industry. Laney (2017) proposed the three Vs (Volume, Velocity, and Variety). As technology advances, the features of big data become more numerous. Several V modes are still used to infer big data characteristics. Gandomi and Haider (2016) added veracity to the previous three Vs to define big data (Tang & Chaveesuk, 2021). The six "Vs" that define big data, according to many academics, are volume, velocity, variety, value, variability, and veracity (Ghasemaghaei & Calic, 2019).

2.3

Figure 2.1: The six Vs of Big Data



Source: (Hung, He, Sh He, & Shen 2020)

The term "volume" refers to the overall size of the dataset, which is the result of the collection of numerous variables and many observations for each variable (Govindan, Cheng, Mishra, & Shukla, 2018). Furthermore, many definitions emphasize the increasing rate of data growth, which is commonly expressed in petabytes or Exabytes and is used by decision-makers to aid strategic

decisions. The velocity of these data reflects how quickly they are collected, updated, and analyzed, as well as how quickly their value becomes obsolete (Qi et al., 2018). When it comes to improving business agility and enabling real-time actions and intraday decision-making, the 'newness' of data that decision-makers can collect, as well as the ability to analyze these data streams, is an important factor (Boakye & Ayerki Lamptey, 2020; Mtsweni et al., 2020). Text, audio, images, video, networks, and graphics are examples of structured and unstructured data sources. The veracity of big data refers to how much it can be trusted, authenticated, and protected from unauthorized access and modification (Jha et al., 2020). High-quality and trustworthy data analysis is critical for enabling management to make informed decisions and derive business value. As a result, before being analyzed, big data used for business decisions should be authenticated and subjected to stringent quality-control procedures (Khan, Babar, Ahneh, Shah, & Han, 2017; Srinivasan & Arunasalam, 2013). This massive amount of data, it is argued, is a key enabler in the creation of value for organizations. Oracle pioneered the concept of value as a distinct quality of data. Big data, according to Oracle (2012), is frequently characterized by low-value density, which means that the value of the processed data is proportionately low in comparison to its volume. Variability and visualization are two additional dimensions added to the definition of big data by Seddon and Currie (2017). While visualization is concerned with the meaningful representation of data using artificial intelligence methods that generate models, variability refers to the dynamic opportunities made available by interpreting big data (Seddon & Currie, 2017).

2.4 Big Data Analytics

The process of analyzing massive datasets to discover patterns, unknown correlations, market trends, user preferences, and other valuable information that could not previously be analyzed

using traditional tools is referred to as big data analytics (Amakobe, 2015). Others go on to describe the impact that Big Data Analytics and presentation can have in terms of business value, whereas some definitions of big data focus solely on the data and its distinguishing features, such as the analytical procedures, tools, and techniques used. Big data analytics, according to the literature, are "a new generation of technologies and architectures designed to economically extract value from very large volumes of a wide variety of data, by enabling high-velocity capture, discovery, and/or analysis" (Dremel, 2017, p. 47). This point is made abundantly clear by Gantz and Reinsel (2012), who state that BDA revolves around three main characteristics: the data itself, the analytics applied to the data, and the presentation of results in a way that allows the creation of business value. This definition describes the process of data analysis without reference to any tangible or intangible business outcome.

2.5 Adoption Enablers and Constraints

With a few exceptions, the BDA literature has been largely quantitative and has focused on the relationship between contingency variables (Cornelli et al., 2022). In contrast, qualitative research concentrated on the specifics of both constraints and enablers. The work of Stornelli et al work's (2021) demonstrated how implementation can fail when managers fail to recognize the significance of specific BDA skills.

Previous research has looked at the technological and organizational enablers of BDA implementation (Wibisono et al., 2019). Identifying enablers for BDA implementation, on the other hand, is insufficient. It is critical to investigate interconnected, interdependent, and holistic sets of BDA enablers that can provide a more comprehensive understanding of BDA adoption (Chen et al., 2020).

2.5.1.1 Enablers in Big Data and Analysis

Enablers are factors that contribute to the successful implementation and effectiveness of big data analytics Aboelmaged, M and Mouakket (2018. Examples of enablers include:

1. Adequate system capabilities, which enable organizations to handle large volumes of data and perform complex analyses.
2. Established a culture of collaboration, fostering teamwork and knowledge sharing among different departments and stakeholders.
3. Good working attitude, characterized by a willingness to learn and adapt to new technologies and methodologies.
4. Technological advancements, such as high-dimensional statistics, matrix analysis, and convex optimization, support big data analytics.

2.5.1.2 Constraints in Big Data and Analysis

Constraints are factors that hinder the successful implementation and effectiveness of big data analytics Aboelmaged, M and Mouakket (2018). Examples of constraints include:

1. Poor data quality, which can lead to inaccurate or unreliable analyses.
2. Lack of data understanding, making it difficult for organizations to extract valuable insights from their data.
3. Data silos, which limit the sharing and accessibility of data across the organization.
4. Lack of time, as organizations may struggle to allocate sufficient resources and time to manage and analyze their data.
5. Lack of cost-benefit analysis, making it difficult for organizations to evaluate the potential returns on investing in big data analytics.

6. Lack of top management support, which can hinder the adoption and implementation of big data analytics initiatives.
7. Lack of technical skills, as organizations may struggle to find and retain skilled professionals to manage and analyze their data.

2.6 Big Data and Business Value

Big data is becoming a hot topic in information science, computer, and information sciences, management, and social sciences (Mikalef et al., 2018). The growing interest in big data is reflected in the academic literature, which spans multiple disciplinary domains (Abdullateef Omitogun, 2019). While each epistemological domain provides a unique perspective on big data, their definitions and key concepts differ significantly (Fossa Wamba et al., 2015). In the process of conducting a systematic literature review, the initial step involves identifying key concepts and formulating comprehensive definitions for each. Therefore, it is imperative to define the meaning of these concepts and delineate the various aspects they encompass.

2.6.1 Value of Big Data and Identifying Literature Gaps

Big data has become an increasingly important aspect of modern organizations, offering numerous opportunities for businesses to analyze large volumes of data and gain valuable insights (Zemre & Kabadurmus, 2020). This has led to the development of big data analytics, a methodology for analyzing massive datasets to uncover pertinent information using advanced techniques. However, despite its growing significance, identifying literature gaps in big data analytics is crucial for understanding the current state of research and informing future studies (Diniz, Luvizan & Hino, 2018).

Some studies have focused on specific industries, such as healthcare and supply chain management, while others have debated the realization of value from big data in various contexts. These studies have identified research gaps and potential future research directions, highlighting the importance of identifying literature gaps in big data analytics. For example, a systematic literature review on big data stream analysis found that scalability, privacy, and load balancing issues, as well as empirical analysis of big data streams and technologies, are still open for further research efforts (Hung, He & Shen, 2020). Additionally, the study found that although significant research efforts have been directed towards real-time analysis of big data streams, not much attention has been given to the preprocessing stage of big data streams (Naik, 2017).

2.7 BDA Applications in Banking Industry

Big data is a cutting-edge technology that has recently caught the attention of researchers, academics, business leaders, and government officials all over the world. Big data is the "new petroleum that will power the future information economy," according to some experts (Sharma & Al-muharrami, 2018). Banks use big data primarily to enhance customer service, risk assessment, decision-making support, evaluation and assessment of new profit opportunities, investment in new markets, reduce the time needed to enter the market, and investment in blockchain projects, according to PwC (2013). (Katin et al., 2018). Businesses gather and examine big data to better their decision-making, understand their markets and competitive environments, and implement more strategic initiatives (Zemre & Kabadurmus, 2020). Banks currently must deal with many demanding customers who demand constant communication and transacting in new

and varied ways anywhere and at any time due to competitive forces (Diniz, Luvizan & Hino, 2018). By accessing and analyzing vast amounts of data to satisfy rising customer expectations, banks anticipate that BDA will add value to the entire customer journey. BDA can be used by bank executive managers, operational managers, and customer service teams to forecast sales, forecast market movements, and offer their clients better and superior services. Due to the widespread use of cloud computing and mobile Internet technologies, businesses, especially financial service providers (FSPs), are exposed to several risks, including financial risks of varying severity. BDA is a tool that banks can use to create robust risk management frameworks, improve decision-making, and enhance corporate governance (Chen et al., 2012). Even though most banks provide comparable financial products and services, they are changing their strategies from a product to a consumer orientation to compete. According to Altaf (2021), there has been an explosion in data because of the adoption of open-source data technologies across almost all business domains.

2.8 Financial Services (Banking)

There is compelling evidence that business has finally recognized how data is reshaping the global economy. In a recent survey of more than 600 global business leaders conducted by Capgemini and the Economist (2020), three-quarters stated that their organizations were data-driven, and 90% stated that information was the fourth factor in production, alongside land, labor, and capital (Seddon & Currie, 2017). The aim of this study is to establish the role of Big Data Analytics (BDA) in defining or measuring organizational performance. However, the literature review conducted so far has not adequately addressed the role of BDA in organizational performance. To address this gap, a review of the literature on BDA and its impact on organizational performance is necessary.

According to Owusu (2017), organizational performance was defined in the late 1960s and early 1970s as "an organization's ability to exploit its environment for accessing and using limited resources." It is now defined as "the extent to which organizations, when viewed as a social system, achieved their objectives," and it is measured by organizational structure, work, and people. Furthermore, performance was defined as an organization's ability to achieve its goals (effectiveness) while using the fewest resources (efficiency).

Several studies have examined the relationship between BDA capability and organizational performance. For example, a study by Fosso Wamba et al. (2015) defined BDA as "a holistic approach to manage, process and analyze the '5 Vs' data-related dimensions (i.e., volume, variety, velocity, veracity and value) in order to create actionable insights for sustained value delivery, measuring performance and establishing competitive advantages". Another study by Mikalef et al. (2020) found that BDA capability has a positive impact on organizational performance, and that the mechanisms for realizing operational performance gains from BDA investments are unclear.

2.9

Challenges of Big Data in Banking

There are numerous big data challenges in banking, but we will only look at a few of them (Altaf, 2021). According to Madhlangobe (2018), some challenges include:

1. Legacy systems are struggling to keep up.
2. The more data there is, the greater the risk; where there is data, there is a risk.
3. Big data is becoming unmanageable.

To begin with, legacy systems struggle to keep up. The banking industry has always been relatively slow to innovate, but there are still banks that rely on IBM mainframes in their operations (Altaf, 2021). Traditional financial institutions have no chance against customer-centric and agile

startups. However, when it comes to big data, things get even worse: most legacy systems are incapable of handling the increasing workload (Lin & Kunnathur, 2019). Attempting to collect, store, and analyze the required amounts of data using an outdated infrastructure can jeopardize the overall system's stability. As a result, organizations must either increase their processing capacity or completely rebuild their systems to meet the challenge (Boldosova & Luoto, 2020).

Second, the more data there is, the greater the risk; where there is data, there is a risk (especially considering the legacy problem we have mentioned above). Banking providers must ensure that the user data they collect, and the process are always secure (Gupta & George, 2016).

Finally, big data is becoming too large; with so many different types of data and their total volume, it's no surprise that businesses are struggling to keep up (Chaurasia & Verma, 2020). This becomes even clearer when attempting to separate valuable data from useless data. Furthermore, while the proportion of potentially useful data is increasing, there is still far too much irrelevant data to sort through. This means that businesses must prepare and strengthen their methods for analyzing even more data, and, if possible, find a new application for data that has previously been deemed irrelevant (Kambatla et al., 2014).

2.10

Benefits of Big Data in Banking

Banks can complete customer segmentation, understand their income, and expense structures, comprehend their transaction channels, gather customer feedback from reviews, evaluate potential risks, and stop fraud using the technology mentioned above (Paper & Weng, 2020).

First, look at the clients' earnings and outgoings; banks have access to a wealth of data on clients' earnings and outgoings (Dicuonzo, Galeone, Zappimbulso & Atti, 2019). This information relates

to their earnings and the money that entered their accounts during a particular period (Song, Cen, Zheng, Fisher, Liang, Wang, & Huisingh, 2017). A financial institution can use this information to analyze the client's transactions and determine whether their salary has increased or decreased, which sources of income have been more consistent, how much they spent, and what channels they used (Hong & Ping, 2020). Banks compare data, evaluate risks, and consider whether the customer is looking for benefits or investments when extending credit (Paper & Weng, 2020).

After conducting an initial analysis of the income-expenditure structure, the bank divides its customers into several segments based on specific indicators. When offering clients, the right services in the future, this information will be helpful (Katin et al., 2018). Additionally, financial institution employees can more effectively sell ancillary goods and draw clients through tailored offers that allow the bank to calculate the clients' anticipated monthly income and expenses and develop intricate plans to guarantee a net profit and increase revenue (Sedkaoui & Khelfaoui, 2018).

Thirdly, this aids in risk assessment and fraud prevention because the bank can spot problems earlier by knowing the typical patterns of people's financial behavior. For instance, it might be a sign that a card has been stolen and used by fraudsters if a "cautious investor" tries to withdraw their entire account balance (Silva, Khan, & Han 2020). The bank will get in touch with the customer to explain the situation. However, the likelihood of fraud is significantly decreased by scrutinizing different kinds of transactions. For instance, data science in banking can be used to evaluate risks when trading stocks or judging a loan applicant's creditworthiness. Banks can benefit from using Big Data Analytics for procedures like compliance auditing and reporting. This reduces overhead costs and streamlines operations (Wally, 2021).

Finally, there's the matter of lying. In almost every sector, including banking and finance, detection is a major concern and is also very expensive. Technological developments have made it possible for cybercriminals to carry out these scams (Dicuonzo et al., 2019).

Review of Related Literature and Gaps

2.11 It is critical to conduct a review when conducting research. This is so that a thorough analysis of the research topic from the body of literature, the gaps needed to support the research, criticism, and solutions to the research problem can be provided by an effective literature review (Kambatla et al., 2014). Most big data analyses have yielded similar results, particularly when considering the impact and adoption of big data in the banking sector (Das & Mohan Kumar, 2013). According to the most recent literature, research on the impact and adoption of Big Data Analytics in the banking sector has received relatively minor attention (Al-Dmour & Zaman, 2021). Given the factors that have hampered or influenced banking acceptance, the literature on Big Data Analytics on the subject was reviewed. This is done to gain a better understanding of the forces driving Big Data Analytics, as well as how it affects and is used in banking. Table 2.2 summarizes various research papers on the factors that encourage or discourage the use of big data and analytics, as well as their effects and adoption by Ghanaian banks. The papers were also divided into groups based on their relevance to developing countries. The findings of the studies differ in terms of the factors that support or hinder bank customers' acceptance of Big Data Analytics, as shown in the table. These underlying assumptions will aid our comprehension of the study, particularly the one on obstructive factors.

Table 2.2: Related literature and gaps

Study	Research Purpose/ Objective	Context/ Perspective	Theory/ Methodology	Findings	Gaps
Al-Dmour et al. (2021)	This paper aims to examine factors influencing the practices of big data analytics applications by commercial banks operating in Jordan and their bank performance.	Jordan Bank performance	Technology–Environment–Organization (TOE) model. Quantitative Analysis	The extent to which commercial banks operating in Jordan use BDA applications is found to be significantly influenced by organizational factors, technological factors, and environmental factors, according to the findings.	Future research should emphasize the enormous advantages of carrying out comparable investigations that deal with different environments and contexts and investigate different variables than those examined in this study.
Zaman et al. (2021)	The foremost aim of this study is to investigate the antecedents of intention to adopt big data analytics in disaster management settings.	Pakistani Disaster management	Conceptual framework Cross-sectional study	The study findings provide significant evidence on the positive influence of attitudes, subjective norms, and behavioural control of disaster management officials on their intention to adopt BDA technologies.	Future researchers should incorporate the segmentation analysis in parallel to the SEM analysis to investigate which departments or individuals or most are mostly accepting of or resistant to the use of the big data approach in disaster management"

Study	Research Purpose/Objective	Context/ Perspective	Theory/ Methodology	Findings	Gaps
Aboagye-Otchere et al. (2021)	This study conducts a systematic literature review to determine the status of accounting research on big data analytics and provides avenues for further studies	Ghana Accounting	Conceptual framework Quantitative Analysis	The study reveals that personal income taxes, capital gains taxes, and value-added taxes are more likely to discourage future-oriented behaviour among individuals	Future studies may focus on the implications of big data on variables such as performance measurement, information governance, tax behaviour, curriculum design, and pedagogy
Loh and Teoh (202)	This study investigated the influence of technological factors on BDA adoption among Malaysian manufacturing Small and Medium Enterprises (SMEs)	Malaysia Small and Medium Enterprises (SMEs).	Technological Resource Competency Quantitative Analysis	The findings contribute to the Malaysian SMEs to strategize BDA adoption in today's dynamic business environment and can be a reference to ASEAN developing nations as well.	Future research may examine the results of manufacturing SMEs that adopted BDA in the contexts of different countries and conduct a cross-cultural based analysis of the outcomes.
Maroufkhani, Wagner, Ismail, Baroto, and Nourani (2019)	This study aims to provide a systematic review of contributions related to big data analytics and firm	Germany Firm Performance	Conceptual framework Qualitative Analysis	Findings were developed based on the objective that criteria for inclusion or exclusion of papers, the search strategy, the quality assessment, and	Future researchers are the study, of the factors influencing the adoption of big data analytics and the creation of business value for organizations

	performance.			the categorization of the	
Study	**Research Purpose/ Objective**	**Context/ Perspective**	**Theory/ Methodology**	**Findings**	**Gaps**
W. Y. C. Wang, and Wang (2020)	This paper, therefore, investigates the digital transformation enabled by big data analytics in the industrial markets and provides a conceptual framework.	United State Industrial markets	Conceptual framework Qualitative and Quantitative Approaches	Findings demonstrate that the use of customer big data significantly promotes sales growth and enhances customer relationship performance, with a stronger impact for businesses with a high level of analytics culture.	Building upon the previously discussed conceptual framework, particularly addressing the gaps identified in the connections among the elements outlined within the framework, there is a potential for further research to be conducted in of industrial marketing.
Inamdar et al. (2020)	The purpose of the study is to explore and provide insights into Big Data Analytics (BDA) studies in different sectors	Mumbai, India Supply chain	Conceptual framework	Findings reveals the benefits of adopting BDA, coupled with a lack of adequate research in the field, have motivated this study.	Future research may aim at using different keywords and objectives to obtain different results. In the future effect of BDA on supply chain risk and flexibility must be studied.
Ghasemaghaei and Calic (2019)	This study will investigate how big data's volume, velocity, variety, and veracity affect the	Canada Firm Innovation	Conceptual framework Quantitative Analysis	Findings offer a theoretical understanding of how big data affects business outcomes and give managers pointers on how to comprehend how each big data	Panel data from upcoming studies could be used to examine its stability. Future research could build on this study by gathering information from other nations to

	production of data-driven insights.			feature contributes to business insights.	see if country-level differences have an impact on the results.
Study	**Research Purpose/ Objective**	**Context/ Perspective**	**Theory/ Methodology**	**Findings**	**Gaps**
Yeboah-Boateng and Fhea (2018)	The study examines the utility of this technology and the use of Big Data techniques in Ghanaian private enterprises.	Ghana Organization (Private Sector)	Conceptual framework Qualitative Analysis	According to the study's interpretive findings, Ghanaian private organizations face environmental difficulties.	Future research exists, so leadership must be prepared to put in place intentional structures and a way of life that fosters a transformational mindset.
Miah et al. (2017)	This study aims to design and evaluate a 'big data analytics' method to support strategic decision-making in tourism destination management.	Australia Tourism destination management	DSR methodology Quantitative Analysis	Based on the findings of tourist's interests and locations, DMOs could develop targeted marketing materials that cover a wide range of locations of interests	In future studies, the researcher will continue to fine-tune the solution artifact in conjunction with real decision-makers, and more formally evaluate its usability and range of applicability.

Source: *Author's construction from literature*

As shown in table 2.2, there have been some BDA studies in recent years. Al-Dmo Bash and Al-Dmour, for example, conducted a study in 2021 that looked at the variables affecting the use of big data analytics applications by Jordanian commercial banks and the performance of those banks. To evaluate the current state of accounting research on big data analytics and to determine potential

future research directions, AboagyeOtchere et al. (2021) conducted a systematic literature review. Big data in the supply chain was discussed by Jha, Agi, and Ngai (2020), as well as Inam Narwane, Gardas, Narkhede, and Sagnak (2021). Nevertheless, Jha, Agi, and Ngai (2020) try to research by highlighting the elements that support or obstruct a company's efforts to enhance its BDA capability and maximize its benefits from BDA technologies. Even though the studies were carried out on various continents, it seems that developing nations still lag developed nations in terms of big data research and the examination of its effects and adoption on Ghanaian banks.

The review found that the US, Pakistan, and some regions of Jordan were the main contexts for big data and analysis. Regrettably, big data in Africa received less attention in the review. Aboagye-Otchere, Agyenim-Boateng, Enusah, and Aryee (2021) claim that the study offers opportunities for further research in Ghana and conducts a systematic literature review to ascertain the status of accounting research on big data analytics. The study's conclusions were crystal clear, even though it was only limited to big data in accounting. This suggests that future research should concentrate on the effects of big data on things like performance measurement, information governance, tax behavior, curriculum design, and pedagogy. There are both theoretical and empirical studies of Big Data Analytics. It was evident that the conceptual frameworks that were frequently applied were adoption-related because most of the studies were adoption-based. There was extensive use of theories like the (TOE) model, TAM, and TRC (Al-Dmour, N., Amin, & Al-Dmour, 2021; Verma & Chaurasia, 2018; Zaman, Zahid, Habibullah & Din, 2021). Furthermore, Wang and Wang's paper from 2020 was presumably the only one to examine big data adoption from the perspective of users' and organizations' expectations, as well as to empirically examine these influences. Their research shows that using big data from customers significantly boosts sales growth and enhances customer relationship performance; this effect is stronger in companies

with an advanced analytics culture. A systematic review of works on big data analytics and business performance was provided by Ghasemaghaei Calic (2019) and Maroufkhani (2020) in their discussion of big data. They also investigated how aspects of big data, such as velocity, variety, veracity, and volume, affect the generation of data-driven insights. As a result, according to this study, there is a need for a more practical approach to unraveling the choice of BDA being adopted and used in Ghana, as well as identifying variables that affect the performance of the adoption and its effects on Ghanaian banks.

Chapter summary

2.12 The literature related to the idea of big data and analysis, its impact and adoption in Ghanaian banks, overview, definitions, scope, types, benefits, and challenges are reviewed in this chapter. To reveal current knowledge and gaps in the field, a thorough review of the literature on Big Data Analytics, its effects, and its adoption in Ghanaian banks were conducted. The framework for this study will be introduced in general in the following chapter, and its constructs will be used to develop a conceptual framework for this study.

CHAPTER THREE

RESEARCH FRAMEWORK

Chapter Overviews

3.1 The primary objectives of the preceding chapter were to provide a clear definition and comprehensive discussion of the Big Data Analytics (BDA) concept. Additionally, the chapter aimed to conduct a literature review on BDA, with the specific goal of identifying any existing gaps in the field. This prompted the choice and defense of a gap for this study. However, the research framework that is thought to be appropriate to support the study's objectives is discussed in this chapter. Considering this, this chapter discusses pertinent literature that has a connection to the chosen research framework either directly or indirectly. The Delone and Mclean IS Success Model success model is the framework thought to be suitable for guiding this study to achieve its goals. This study does not attempt to develop a comprehensive theory on BDA; instead, it builds conceptual models. This study is exploratory because it primarily relies on qualitative data and may be one of the earliest pieces of evidence about BDA research. This chapter begins with a defense of the selection of the study's framework. Delone and Mclean's IS success model, justification, some application of the theory in previous research, limitations, a description of the constructs, and finally, a conceptualization of the framework come next. A summary of what has

3.2 been covered in the chapter follows its conclusion.

Theoretical Framework

The IS Success Model served as the foundation for this study. DeLone and McLean created the original version of the IS Success Model (1992). The IS success, Delone and McLean are used to gauging an information system's effectiveness (Trkman & Trkman, 2009). By identifying,

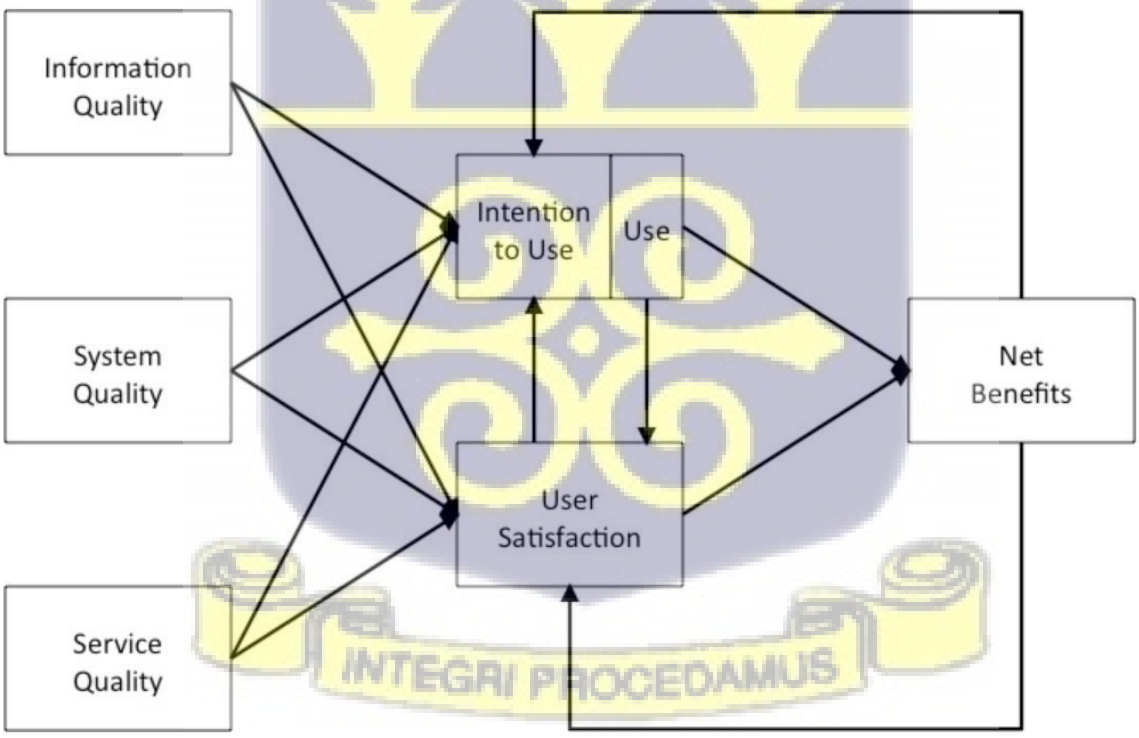
describing, and explaining the relationships between the six construct variables, which are the most dimensions for the success of evaluating an information system, this model aims to provide a thorough understanding of IS success (Mukred & Yusof, 2018). This theory was initially developed by William H. DeLone and Ephraim R. McLean in 1992, and it was later improved by the original author ten years later in response to input from other researchers working in the field (Wally, 2021). This IS success model is regarded as one of the most influential theories in current information systems research and has received an extensive citations in thousands of scientific papers (Owusu, 2017).

3.3 Delone and Mclean's model and framework

The IS-success model is one of the most widely cited (Delone & Mclean, 2014a). Based on the work of Almutairi et al.(2016), Delone and McLean proposed an IS-success model that reflects the systematic combination of previously reported individual measures (Bharati & Bharati, 2016). Motivated by Delone and Mclean's call for further development and validation of their model (Hwang & Mclean, 1996), many researchers have attempted to extend or re-specify the original model. Ten years after the publication of their first model based on the evaluation of many contributions to it, Delone and McLean proposed an updated IS success model (Delone & Mclean, 2002). The updated model consists of six interrelated dimensions of IS success: information, system and service quality, (intention to) use, user satisfaction and net benefits (Owusu, 2020). The Delone and Mclean IS Success Model Success Model (2003) posit that information quality, service quality and system quality of a given system will have a positive significant influence on the user's intention to use the system or actual system use, which can lead to user satisfaction (Abdurrahaman, Owusu, & Bakare, 2019). Likewise, the independent variables of a given system

will have a positive significant influence on user satisfaction, which can lead to the user's intention to use the system or actual system use (Owusu, 2017). As a result of using the system, certain benefits will be achieved (Licker, 2001). This model focuses on factors that are part of success at various levels, rather than variables that cause success. However, the causal aspect of the model recognizes that success at certain levels then causes success at other levels (Rouse, 2007). The net benefits will (positively) influence user satisfaction and further use of the information system (Delone & Mclean, 2014a). The model can also be used to explain the process of how individuals, groups and organizations move from awareness of technical innovation through adoption, acceptance and finally "success" (Owusu, 2017). It shows how acceptance at early individual levels can be linked to later organizational-level outcomes (Rouse, 2007).

Figure 1.1: Original Delone and Mclean IS Success Model Success Model



Source: Delone and Mclean (2002)

Constructs of the Delone and Mclean IS Success Model

The six constructs of Delone and Mclean define by (Delone & Mclean, 2014b), are briefly described in the sub-sections below:

3.4

3.4.1 Information Quality

Information quality is determined by how much a user considers the system under investigation's output to be "complete, accurate, well-formatted, and timely" (Delone & Mclean, 2002, 2014a; Jennex & Olfman, 2003; Owusu, 2020). The quality of the information has an impact on decision-making satisfaction. The performance of an information system determines how valuable it is. Gallagher (2017) used users' assessments of the system's utility (Paré et al., 2005) to evaluate the information quality. The metrics used to assess the quality of information include accuracy, completeness, relevance, information needs, timeliness, and information content needs (Mukred & Yusof, 2018).

3.4.2 System Quality

According to the definition of system quality, it is "the extent to which a user perceives that the system under scrutiny is easy to use, reliable, responds quickly, amicably, and flexibly."(Abdurrahaman et al., 2019; Delone & Mclean, 2002, 2014a; Jennex & Olfman, 2003).

3.4.3 Service Quality

The degree to which a user believes that needs like dependability, responsiveness, assurance, and empathy are met by system providers is referred to as service quality (Owusu, 2020; Delone & Mclean, 2002, 2014a; Jennex & Olfman, 2003). This characteristic is a result of the hardware and software in the system. System quality has been measured using perceived metrics such as usability, accessibility, system dependability, and adaptability in previously tested survey

instruments. These four metrics have been used in this study to assess the system quality construct (Bharati & Berg, 2005).

3.4.4 System Use

System use is an indicator of the degree 'to which the stakeholder believes that using a particular system has enhanced his or her job performance or his or her group's organization performance' (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Owusu, 2020). Several researchers have established that there is a positive significant relationship between system use and user satisfaction as well as between system use and net benefits (Abdurrahaman et al., 2019; Owusu, 2017, 2020).

3.4.5 User Satisfaction

User satisfaction refers to the degree to which an individual is satisfied with his or her overall use of the system under evaluation (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Rouibah et al., 2015). User satisfaction is a potent and crucial indicator of a system's success, according to findings from previous studies (Almutairi et al., 2016). One of the mediators in the relationship between the quality of the information, the service, the system, and the net benefits is user satisfaction (Owusu, 2020).

3.4.6 Net Benefits

The Net Benefit is 'the extent to which the user perceives benefits such as saving time and cost while using the system'(Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Owusu, 2020).

3.4.7 Moderating Variable

The impact of the six important constructs is moderated by one additional variable in addition to the ones mentioned above. (Acheampong & Moyaid, 2016; Bradford & Florin, 2003; Hou et al.,

2012; Owusu, 2017). The Moderating Variable for this study is Time since Adoption (Acheampong & Moyaid, 2016; Owusu, 2017).

Justification of Delone and Mclean IS Success Model

Prior research has indicated that the successful introduction of new technology is highly associated
3.5 with the depth of understanding of the factors affecting users' intention to adopt it (Kulkarni et al., 2014). As a first step toward successful Big Data integration, it is therefore important to examine potential drivers or impediments affecting employees' decisions to adopt Big Data. Therefore, Delone and Mclean (2002) IS success Model has been chosen as the underlying theoretical framework for this study, as it considers the factors and contingencies related to the prediction of technology acceptance and usage intention primarily in organizational contexts (Delone & Mclean, 2014a). To provide a general and comprehensive definition of IS success that covers different perspectives on evaluating information systems, Delone and McLean reviewed the existing definitions of IS success and their corresponding measures and classified them into six major categories(Information quality, system quality, service quality, system use, user satisfaction and net benefits) (Hu, 2002). The Delone and McLean success model is especially suitable for this study, as it helps managers to assess the level of Big Data acceptance within their organization before its initial introduction allowing them to proactively design interventions based on the results (Jennex & Olfman, 2003). Moreover, it has already been applied in several studies in different countries such as Australia (Americas, 2006), the USA, and the UK (Bharati & Chaudhury, 2004; Skok et al., 2001). Also in Ghana (Abdurrahaman et al., 2019; Owusu, 2017, 2020) and Malaysia (Mukred & Yusof, 2018) In addition, Trkman and Trkman, (2009) has been adopted in different technologies such as, Intranet, and electronic commerce (Licker, 2001).

Existing Research using Delone and McLean model and Framework.

Several approaches to understanding the impact of information systems in an organization have been taken. Previous investigations have employed various approaches to measure the
3.6 effectiveness of information systems. Examples of these approaches include cost-benefit analysis, system usage estimation, and user satisfaction, as demonstrated in studies such as Bharati and Berg (2006). Other domains, such as knowledge management systems (Jennex & Olfman, 2003), electronic commerce (Delone & Mclean, 2014a), health club management systems (Skok et al., 2001), and web-based decision support systems (Bharati & Chaudhury, 2004), have also contributed to the diverse methodologies used in assessing information system effectiveness. Further, the Delone and Mclean IS Success Model Success Model has been given attention from various technological innovation assessments. For example, The impact of audio – visual technologies on university teaching and learning in a developing economy (Owusu, 2020). The balanced scorecard approach (Owusu, 2017) and as well electronic records management system adoption in higher professional education institutions of Yemen (Mukred & Yusof, 2018).

In addition, the quality of the IS function has received a lot of attention in the recent IS literature (Kulkarni et al., 2014). Several studies on the quality of the service component of the IS function i.e. IS service quality have also been conducted (Hu, 2002).

3.7

Limitations of the Delone and Mclean model and framework

The Delone and McLean Information Systems Success Model is a widely used framework for evaluating the success of information systems (IS) within organizations (Wu & Wang, 2006). Wu and Wang (2006). The model posits that IS success is a multidimensional construct composed of six dimensions: system quality, information quality, use, user satisfaction, individual impact, and

organizational impact (Delone & Mclean, 2014b). While the model has been widely adopted in IS research and has been used to evaluate the success of a wide range of IS, including enterprise systems, healthcare systems, and e-commerce systems, it is not without its limitations (Scholar, 2008).

One of the key limitations of the Delone and McLean IS Success Model is its dependence on self-reported data. The model relies heavily on self-reported data, which can be subject to bias and may not accurately reflect the true state of the system. This can introduce a significant source of error into the evaluation of IS success and may limit the model's ability to provide an accurate assessment of IS performance (Wang Liao and Yi-shun 2008).

Another limitation of the model is the lack of a clear framework for determining the relative importance of the different dimensions of IS success or how to prioritize them. The model does not provide a clear framework for determining the relative importance of the different dimensions of IS success or how to prioritize them, which can make it difficult to use the model to guide decision-making or resource allocation (Wang Liao and Yi-shun 2008).

The model also does not consider the dynamic nature of IS, which can change over time. IS are constantly evolving, and the model does not consider the dynamic nature of IS or provide a framework for evaluating IS success in the context of changing technology or business environments.

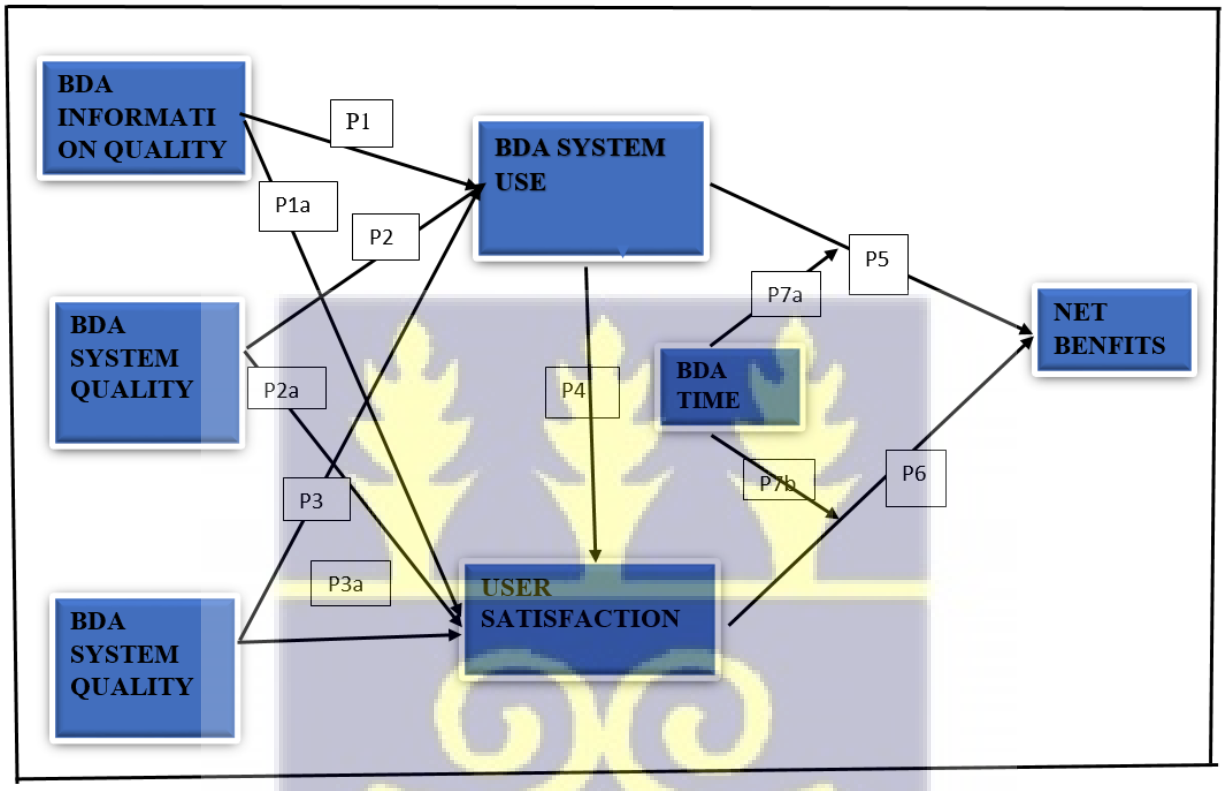
Finally, the model has mostly been tested in the context of IS in organizations and may not be generalizable to other settings or industries. The model has been primarily tested in the context of IS in organizations and may not be generalizable to other settings or industries, which limits its applicability in a broader context (Mclean & Delone, 2014b).

Conceptual Framework and Proposition Development

This study endeavors to enhance our comprehension of Big Data acceptance within organizations, steering away from mere replication of the Delone and McLean IS Success Model theory. The

3.8 Delone and McLean theory model has been slightly adapted to fit the context of Big Data.

Figure 2.2: Conceptual Model of the Delone and Mclean framework



3.9

Source: Author's constructs

Constructs Used in the Conceptual Framework

Big data and analytics should be influenced by the constructs discussed in this section. The model has been updated to include new constructs that relate to the adoption and its effect on Ghanaian banks while removing others that weren't thought to be relevant. The constructs used in the conceptual framework for this study are as follows.

3.9.1 BDA Information Quality

A thorough review of related literature indicates various information quality definitions. To begin with, Information quality is defined as 'the degree to which a user perceives that the information output' of the system under investigation is 'complete, accurate, well-formatted and timely (Delone & Mclean, 2002, 2014a; Jennex & Olfman, 2003; Owusu, 2020). Quality of information influences decision-making satisfaction. The performance estimates the value of an information system. Gallagher (2017) has used user perception of the value of the information system to determine the information quality of the system (Paré et al., 2005). Another study underscores the perceived importance and unstableness of information (Aldholay et al., 2018). In some studies, information quality has not been considered separately but as an integral part of user satisfaction or user information satisfaction (Amakobe, 2015). The measures that have been employed for information quality are information accuracy, information completeness, information relevance, information content needs and information timeliness (Mukred & Yusof, 2018). In the context of this study, information quality is renamed 'BDA Information Quality' and that is what is being examined. Several studies have established that there is a positive significant relationship between information quality and system use as well as between information quality and user satisfaction (Dickson et al., 2021; Owusu, 2017, 2020). Therefore, it is proposed that:

Proposition 1: *BDA Information Quality will positively influence BDA System Use.*

Proposition 1a: *BDA Information Quality will positively influence BDA User Satisfaction.*

3.9.2 BDA System Quality

System quality (SYS) is defined as 'the degree to which a user perceives that the system under scrutiny is easy to use, reliable, responds quickly, amicably and flexibly' (Abdurrahaman et al., 2019; Delone & Mclean, 2002, 2014a; Jennex & Olfman, 2003). Hence, the anticipated impact of

system quality on IS effectiveness is substantial, with system quality defined as the degree to which the information system successfully fulfills its intended purpose (Owusu, 2017). In the context of this study, system quality is renamed 'BDA System Quality' and that is what is being examined. Several studies have established that there is a positive significant relationship between system quality and system use as well as between system quality and user satisfaction (Almutairi et al., 2016; Owusu, 2020; Rouibah et al., 2015). Therefore, it is proposed that:

Proposition 2: *BDA System Quality will positively influence BDA System Use.*

Proposition 2a: *BDA System Quality will positively influence User Satisfaction.*

3.9.3 BDA Service Quality

Service quality is manifested in the system's overall performance, which can be measured by individual perceptions of this quality (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003). Service quality is defined as 'the extent to which a user perceives that needs such as reliability, responsiveness, assurance and empathy are satisfied by system providers' (Owusu, 2020). This quality is a manifestation of system hardware and software. Perceptual measures such as ease of use, the convenience of access, system reliability and flexibility have been used in previously tested survey instruments to measure system quality (Owusu, 2017). In this study, these four measures have been adopted for the system quality construct (Bharati & Berg, 2005). In the context of this study, service quality is renamed 'BDA Service Quality' and that is what is being examined. Several studies have found that the relationships between service quality and system use and between service quality and user satisfaction are positively significant (Abdurrahaman et al., 2019; Mukred & Yusof, 2018; Owusu, 2017) Therefore, it is proposed that:

Proposition 3: *BDA Service Quality will positively influence BDA System Use*

Proposition 3a: *BDA Service Quality will positively influence User Satisfaction.*

3.9.4 BDA System Use

System use is an indicator of the degree 'to which the stakeholder believes that using a particular system has enhanced his or her job performance, or his or her group's organization performance' (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Owusu, 2020). However, for this study, system use is renamed 'BDA System Use' and that is what is being examined. Several researchers have established that there is a positive significant relationship between system use and user satisfaction as well as a direct relationship between BDA system use and Net Benefits (Abdurrahaman et al., 2019; Owusu, 2017, 2020). Therefore, it is proposed that:

Proposition 4: *BDA System Use has a positive significant relationship with User Satisfaction.*

Proposition 5: *BDA System Use will have a direct relationship with Net Benefits.*

3.9.5 User Satisfaction

User satisfaction refers to the degree to which an individual is satisfied with his or her overall use of the system under evaluation (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Rouibah et al., 2015). User satisfaction is a potent and crucial indicator of a system's success, according to findings from previous studies (Almutairi et al., 2016). One of the mediators in the relationship between the quality of the information, the service, the system, and the net benefits is user satisfaction (Owusu, 2020). A high level of information quality, system quality and service quality are always a good omen to User Satisfaction. User (system) satisfaction has been extensively studied in IS research (Paré et al., 2005). A plethora of studies (Owusu, 2020) has also found a direct relationship between BDA User Satisfaction and Net Benefits (Acheampong & Moyaid, 2016; Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Rouibah et al., 2015)). Therefore, it is proposed that.

Proposition 6: *BDA User Satisfaction has a direct relationship with Net Benefits.*

3.9.6 BDA Time-since-implementation

This refers to the length of time the Bank deployed the BDA platform (Acheampong & Moyaid, 2016; Owusu, 2017). Acheampong and Moyaid (2016) argued that organizations tend to develop more expertise using the system more effectively after they have used it for a longer period, which in turn generates the most needed business benefits. They further explained that a lot of BDA benefits are likely to be derived as the system evolves following the advancement of BDA technologies used by the organization. In addition Bradford and Florin (2003) asserted that employees become more comfortable with the system as time elapses, which leads to greater satisfaction. In this study, Time since adoption is used as the moderating variable and is measured by the number of years since the implementation of the BDA System (Bradford & Florin, 2003; Hou et al., 2012). This is used to determine whether the banks that deployed BDA systems earlier have derived more benefits than those who are late adopters. However, for this study, time is renamed 'BDA Time' and that is what is being examined. Numerous studies (Acheampong & Moyaid, 2016) have identified a correlation between the adoption of Big Data Analytics (BDA) systems, the relationship between BDA time, and user satisfaction in the context of BDA. Therefore, it is proposed that:

Proposition 7a: *BDA Time will have a moderating effect on the relationship between BDA Systems Use and Net Benefits.*

Proposition 7b: *BDA Time will have a moderating effect on the relationship between BDA User Satisfaction and Net Benefits.*

3.9.7 Net Benefits

The success dimension net benefits show the degree to which IS helps different stakeholders succeed (Khand & Kalhoro, 2020). The construct combines the individual impact and organizational impact dimensions from the original Delone and Mclean IS Success Model with additional IS impact measures from other researchers like workgroup impacts and societal impacts to create a single success dimension (Delone & Mclean, 2002, 2014a; Rouibah et al., 2015). What impact should be measured depends on the system being evaluated, the study's purpose and the level of analysis. Although system use and user satisfaction are related to net benefits, there is still a need to directly measure net benefits (Scholar, 2008). Some researchers argue that benefits cannot be quantified due to intangible system impacts and intervening environmental variables (Aldholay et al., 2018; Khand & Kalhoro, 2020; Licker, 2001; Mukred & Yusof, 2018; Rouibah et al., 2015). The majority of studies that use the D and M IS Success Model assess the benefits of using an IS on both an individual and organizational level (Owusu, 2020).

3.10 Chapter Summary

The Delone and Mclean framework, which was chosen as the framework for the study, was discussed at the beginning of the chapter. A conceptual model for the study was developed using this framework. It's crucial to remember that the Delone and Maclean Model was developed by combining various technology adoption models (Jennex, 1998). It has a solid foundation and has become the theory. The various perceived elements that contribute to big data analysis, adoption, and the impact on Ghanaian banks were explained. These elements include BDA information quality, BDA system quality, BDA service quality, BDA system use, user satisfaction, and net benefits.

CHAPTER FOUR

RESEARCH METHODOLOGY

Chapter Overview

4.1 The research techniques and approaches used in the study are covered in this chapter. It begins by talking about research paradigms, in particular Critical realism. The sampling strategy, data collection, and analysis procedures used in the work are then thoroughly explained.

Research Paradigms

4.2 Every research project must have philosophical assumptions that are based on the researcher's perception or comprehension of reality (Mack, 2010; Turyasingura, 2011). A paradigm is "an integrated set of assumptions, beliefs, models of doing good, and techniques for gathering and analyzing data," according to Neuman and Robson (2004, p. 12). To shape the process, philosophical presuppositions are frequently used in many studies by researchers, including both scientific and social researchers. The following elements typically make up research paradigms: ontology, epistemology, and methodology (Lincoln et al., 2011). Ontology is the study of being, and epistemology is the study of the nature and forms of knowledge (Crotty, 1998; Cohen et al., 2007). Meanwhile, methodology describes the specific procedures and techniques employed to acquire knowledge of reality (Wahyuni, 2012). However, different types of methodological processes, such as qualitative, quantitative, or mixed methods, are employed in research. Keep in mind that each paradigm has its own ontological and epistemological tenets. The philosophical foundations of each paradigm cannot ever be empirically supported or refuted because all assumptions are conjectures (Fisher, 2010). Different ontological and epistemological stances are inherent to various paradigms. That is to say, various paradigms support their specific research approach with varying assumptions about reality and knowledge (Moser & Korstjens, 2018).

However, Myer and Avison (2002) discussed the positivist, interpretive, and critical realist research paradigms.

4.2.1 Positivist Paradigms

Studies using the positivist paradigm typically test the theory to improve our ability to predict phenomena (Myers & Avision, 2002). The deductive study aligns with the positivist paradigm, aiming to formulate and test hypotheses to draw conclusive results. Positivism is counted on the philosophical stance of natural scientists that are working with observable reality within society leading to the production of generalizations (Alharahsheh & Pius, 2020). Positivism relates to the importance of what is given in general, with a more strict focus to consider pure data as well as facts without being influenced by the interpretation of bias of humans First, the results of the same phenomenon or event may be allowed to "replicate for different groups or subgroups of the population in social contexts" with methodologies and methods of data collection and analysis based on evidence and statistics. (Awa Uduma & Sylva, 2015). As result, the researchers can save time and investments in using the findings of the specific study for future quantitative predictions (Lan, 2018). This paradigm still maintains some limitations. The first concern of using this paradigm in social research projects is that it could be impossible to measure phenomena related to the intention, attitudes, and thoughts of a human because these concepts profoundly may not explicitly be observed or measured with sense experience or without evidence (Hammersley, 2013, pp. 22- 23). For this reason, it causes some constraints in further exploring abstract conceptualization commonly developed around human relationships in educational contexts (Weber, 2016).

4.2.2 Interpretivism Paradigms

Interpretivism is the inclination that there are multiple realities (Fisher, 2010). The interpretive model of the study holds that multiple realities exist because it is a social construct (Fisher, 2010). The goal of the interpretive researcher is to evaluate social experiences beyond people's outward behaviors and consider the subjective meanings that people attach to those behaviors to recognize and understand the motivations behind those behaviors (Neuman, 2011). To avoid having a measurement-based truth, interpretivism adopts a relativist ontology in which a single phenomenon may have multiple interpretations. Virtually, with an interpretivism perspective, researchers tend to gain a deeper understanding of the phenomenon and its complexity in its unique context instead of trying to generalize the base of understanding for the whole population (Lan, 2018).

4.2.3 Critical Realism Paradigms

The critical realists, on the other hand, hold that there are differences between people's perceptions of reality and that there is elasticity in perception (Fisher, 2010) (Bisman, 2002). The objective of the critical realist is to identify the observable and non-observable structures that are separate from the events they produce. Critical realism helps IS researchers "go beyond the surface to understand and explain why things are as they are, to hypothesize the structures and mechanisms that shape observable events," according to Mingers (2004, p. 30). The study proposes to use a critical realism (CR) philosophical stance and qualitative methods to conduct this research to uncover the structures and mechanisms of big data capabilities and their accompanying benefits (Mingers et al., 2013). According to Bhaskar (2010), these elements are only discernible through the social sciences' empirical and theoretical work because they are not readily apparent in the pattern of events that can be observed. As a result, CR gives way to the intricate and thorough uncovering of

social reality's structural components, such as the skills required for big data adoption. Critical realism uses a retroduction research methodology to identify the components of big data capabilities (Bhaskar, 2010). Retroduction enables the CR researcher to identify the fundamental prerequisites for a phenomenon, such as the existence of big data capability. Consequently, big data capability won't exist without these prerequisites. Since it recognizes that there are various types of knowledge objects and that each type of object necessitates a different research approach to be discovered, CR is in favor of methodological pluralism, whether it be quantitative or qualitative data collection methods (Carter & New, 2004). The study aims to investigate how Big Data Analytics are being used and adopted in Ghana and to find out what factors affect the adoption's performance and how it affects Ghanaian banks.

4.3 Research Design

A research design provides a body of knowledge for gathering, analyzing, and studying data. The study design that was chosen for consideration reflects the importance placed on the following factors: the ability to extrapolate results beyond the actual participants, the ability to comprehend behavior and make sense of it in its specific social context, and, finally, the ability to appreciate social phenomena and how they interact. The research design is composed of the research strategy and approach.

4.4 Research Approach

The research methodology, according to Kilani and Kobziev (2016) p.g.54, is "a systematic and orderly approach taken towards the collection and analysis of data so that information can be obtained from those data." Researchers have proposed two main approaches for conducting a study. The quantitative and qualitative approaches are these. The quantitative approach is a highly structured research methodology that is used to test the plausibility of objective theories by looking

at the relationships between the variables underlying the phenomenon (Creswell,2013). The qualitative approach, on the other hand, consists of a set of methods that enable researchers to comprehend the immediate sociocultural context in which people live (Myers, 1997). A qualitative research methodology was used for this study. In CR, qualitative approaches play a more significant role because they are better able to describe phenomena, formulate hypotheses, and spot structured interactions between intricate mechanisms. Therefore, a qualitative research approach will be well suited for developing a deeper understanding of big data capabilities. To explore the interaction of structure, events, actions, and the context to identify and explicate causal mechanisms, several CR researchers have determined that the case study method is the best (Ackroyd, 2010; Easton, 2010; Miles, Huberman & Saldaa, 2013). To ascertain the effect of BDA on Ghanaian banks, the study will use a case study research design and qualitative research methodology.

4.5 Research Strategy

Methodology, according to Wedawatta et al. (2011), is the overall approach to a problem that can be used in a research process, from the theoretical underpinning to the collection and analysis of data. According to Johannesson and Perjons (2014), a research study's overall plan is referred to as the research strategy. Case studies, surveys, and experiments are just a few of the different research methods that have specific questions that need to be addressed. According to three conditions: the type of research question posed, the extent of control the investigator has over actual behavioral events, and the focus on contemporary as opposed to historical events, research designs may be influenced by these three factors (Kilani & Kobziev, 2016). When a variable is manipulated and tested in an experimental study, it is claimed that "causality suggests that a single

event (the "cause") always leads to another single event (the "effect")" (Boateng et al., 2010). In a survey research strategy, respondents are questioned using structured measurement techniques, such as questionnaires and/or interviews (Boateng et al., 2010). The fundamental inquiries that make up the research agenda are "who, where, what, how many, how, and much" (Kilani & Kobziev, 2016). On the other hand, among the various techniques for methodological inquiry, a case study is perhaps the most popular and well-known (Wedawatta et al., 2011).

Additionally, it is among the simplest methods for conducting qualitative research (Pack, 2015). According to Benbasat et al. (1987), the case study approach is preferable when gathering extensive knowledge about a problem, including the mechanisms in use and the specific problems at hand. Case studies are used to examine situations or phenomena that are complex and characterized by rapid change (Denzin, 2000). This is a perfect representation of Ghana's banking phenomenon. The analysis utilized the case study method. However, it's important to note that there are no fundamental laws that explicitly define the significant factors and relationships, nor do they specify the conditions under which these factors and relationships can be directly observed in a case study (Fidel, 1984).

4.5.1 Research Target Population

A large group to which one intends to apply an outcome is referred to as population (Draugalis & Plaza, 2009). However, Khalid et al. (2012) define the population as the entire set of components or participants from whom the researcher draws specific inferences. The entire group of people or things used to generalize the findings is referred to as the target population. Although there are currently as many banks as possible in Ghana, this study focuses on the banking industry in Accra. The study focuses on the bank's population.

4.5.2 **Sample size**

Sampling is a statistical technique that involves choosing an objective or random subset of individual observations from among a population of observation (Etikan & Bala, 2017). It aims to provide some insight into the population under consideration, especially to make predictions using the sample frame (Creswell, 2009). A sample is a discrete portion of something that serves as an illustration of the whole. A sample size of 10 respondents was intended to represent a larger segment of the banking industry. The study is conducted in the context of Ghana, a developing nation where there are numerous obstacles to the adoption and application of Big Data Analytics in the banking industry, including fraud and service access insecurity (Wally, 2021).

4.5.3 **Sampling Technique**

To determine or confirm the realities or truths about a population, a sample is, according to Rabiee (2018), a smaller (but hopefully representative) collection of that population. The foundation of sampling techniques is probability as well as non-probability sampling. A participant must be chosen at random from the sampled population with an equal chance for them to be considered a probability sample. This makes it easier to draw valid statistical conclusions. Contrarily, non-probability sampling prevents the drawing of reliable population inferences (Moser & Korstjens, 2018). To administer the interview, this study used a purposive sampling technique. The purposeful selection of an informant based on the qualities the informant possesses is referred to as the purposive sampling technique, also known as judgment sampling (Creswell & Miller, 2000, p.55). Ten banks were selected based on their notable impact on Big Data Analytics (BDA), with a specific emphasis on a Ghanaian bank.

Data Collection Techniques

4.6 To gain a deeper understanding of the big data capabilities phenomenon under study, qualitative researchers use interviews, focus groups, and observations as data collection tools (Al Kilani & Kobziev, 2016; Etikan & Bala, 2017). Interviews and focus group discussions incorporated open-ended questions that delved into multiple facets of big data capability adoption within banking firms, as suggested by (Chism et al., 2010). Interviews are one of the most crucial ways to obtain answers to questions for case study research (Yin, 2003). By using interviews, the interviewer can make clear any points that the interviewee may not understand while also gaining a clear understanding of the interviewees' responses using follow-up questions (Al Kilani & Kobziev, 2016). Data collection in this study is aligned with the research questions and the study's perspective (Etikan & Bala, 2017). It is not merely about collecting data for subsequent analysis, as emphasized by (Chism et al., 2010). Therefore, information for the study will be gathered from Fidelity and Standbic bank. The Delone and McLean IS-success model will also be used to structure and direct the interview, which will include a variety of questions about the adoption of Big Data Analytics and its effects on Ghanaian banks. The constructs and the number of items used in this study are listed in Table 4.1.

Table 4.1: Constructs and the number of an item used in this study.

Constructs	Definitions	Questions	Adopted From
Information quality	is defined as 'the degree to which a user perceives that the information output' of the system under investigation is 'complete, accurate,	3	Owusu (2017); Dalle et al. (2020); Seta et al. (2018); Bossen et al. (2013); Tona et al. (2012).

	well-formatted, and timely (Owusu, 2020).		
System quality	is defined as 'the degree to which a user perceives that the system under scrutiny is easy to use, reliable, responds quickly, amicably, and flexibly' (Abdurrahaman et al., 2019).	3	Dalle et al. (2020); Seta et al. (2018); Owusu (2017); Owusu (2020); Mukred and Yusof (2018); Yi-shun Wang and Liao (2008).
Service quality	is defined as 'the extent to which a user perceives that needs such as reliability, responsiveness, assurance, and empathy are satisfied by system providers' (Owusu, 2020).	3	Owusu (2020); Mukred and Yusof (2018); Seta et al. (2018); Owusu (2017); Bossen et al. (2013); Yi-shun Wang and Liao (2008).
System use	is an indicator of the degree 'to which the stakeholder believes that using a particular system has enhanced his or her job performance, or his or her group's organization performance' (Owusu, 2020).	3	Owusu (2020); Mukred and Yusof (2018); Seta et al. (2018); Owusu (2017); and Bossen et al. (2013).
User satisfaction	refers to how satisfied a person is with their overall use of the system	2	Owusu (2020); Mukred and Yusof (2018); Seta et al.

	that is being evaluated. (Rouibah et al., 2015).		(2018); Owusu (2017); and Bossen et al. (2013).
Net Benefit	is 'the extent to which the user perceives benefits such as saving time and cost while using the system' (Owusu, 2020).	3	Owusu (2020); Mukred and Yusof (2018); Seta et al. (2018); Owusu (2017); Bossen et al. (2013); Tona et al. (2012); Yi-shun Wang and Liao (2008).
Time	This refers to the length of time the Bank deployed the BDA system (Acheampong & Moyaid, 2016; Owusu, 2017)	2	Acheampong and Moyaid (2016); Owusu (2017).

Source: Author's constructs

4.6.1 Data Analysis and Interpretations

For effective data analysis, the researcher must be able to develop and draw contrasts. Additionally, the researchers must be open-minded and consider alternative or opposing explanations for their findings. It is frequently both the most fascinating and challenging aspect of any research (Creswell & Miller, 2000). The research work's Appendix B contains the interview guide.

4.6.1.1 Thematic Analysis

Thematic analysis is a qualitative data analysis method that involves searching across a data set to identify, analyze, and report on repeated patterns (Kiger & Varpio, 2020). It is a data description

method, but it also involves interpretation in the processes of selecting codes and constructing themes (Wiltshire & Ronkainen, 2021). The flexibility of thematic analysis to be used within a wide range of theoretical and epistemological frameworks, as well as to be applied to a wide range of study questions, designs, and sample sizes, is a distinguishing feature Yin,2009. However, as with any research or analytic method, we would argue that thematic analysis should be chosen based on the research's goals rather than a desire to select an easy-to-follow method of analysis (Miles & Huberman, 1994). When attempting to understand a set of experiences, thoughts, or behaviors across a data set, thematic analysis is an appropriate and powerful method to employ (Kiger & Varpio, 2020). Interview data collected from respondents will be transcribed and carefully read over and over to take note of key views expressed by respondents and how they reflect on the key themes in the research questions. The data will be further categorized into patterns developed by the researcher based on the research questions. This made it easier to identify similarities and differences in responses.

4.7

Ethical Issues and Consideration

To obtain the consent of all interviewees who are participating, the research will be guided by ethical questions and considerations.

Ethical considerations played a crucial role in the thesis writing and research process, serving as a cornerstone for reliability, credibility, and the respectful treatment of all involved parties. Academic integrity stood out as a paramount ethical concern in thesis writing, posing dilemmas for students who sought external assistance and raising questions about the acceptable extent of such help. This was accomplished by obtaining a studentship letter of clearance from the University of Ghana Business School's Department of Operations and Management Information

Studies (OMIS) to conduct this research project. The letter is contained in Appendix A of the study.

It was imperative for students to comprehend the ethical boundaries surrounding academic support and recognize their own responsibilities in seeking assistance. The alignment of sought-after help with ethical standards was a key consideration. Fostering clear communication and transparency between students and service providers became pivotal in mitigating potential ethical dilemmas.

Authorship and co-authorship represented another ethical dimension in thesis writing. Collaborative efforts in writing introduced challenges in determining authorship attribution and order. Researchers had to ensure fair assignment of authorship, acknowledging all contributors appropriately to uphold ethical standards.

To instil and uphold ethical practices in the thesis writing assistance industry, collaborative efforts were essential. Educational institutions bore a responsibility to underscore the significance of academic integrity. They could achieve this by implementing educational programs or workshops aimed at enlightening students on ethical practices. Additionally, industry associations could contribute by establishing codes of conduct and standards, thereby regulating practices, and cultivating a culture of heightened ethical awareness and accountability.

4.8

Chapter Summary

This chapter's goal was to outline the study's research techniques. The critical realist paradigm was introduced as the study's paradigm in this chapter. This chapter also discusses the methodology to be applied in the study's execution and explains how the information will be gathered from the case firms and other respondents. The steps taken to analyze the data gathered are described in the chapter's conclusion.

CHAPTER FIVE

RESEARCH ANALYSIS AND FINDINGS

Chapter Overview

5.1 The previous chapter discussed the methodology that was used for the study. Further, this chapter presents the study's findings from the perspectives of the bankers who utilize the big data platform. It also provides an analysis of the data collected. The concluding section of the chapter is a summary of the findings.

Brief Profile of the Case Platform - Big Data and Analytics (Hadoop)

5.2 The big data platform is software that processes a lot of data by using distributed parallel computing power (Noh & Lee, 2015). Data collection, storage, processing, search, analysis, and virtualization are the technical components of it (Xu & Xiaoping Du, 2020). The big data platform implementation model also serves as a technical model to ensure the platform's scalability, dependability, and high performance, making it a crucial component for developing all different kinds of big data systems (Borkar et al., 2017). Large Web companies as well as non-traditional businesses now use Hadoop and HDFS as their primary platform for Big Data analytics (Borkar et al., 2017). Large Web companies as well as non-traditional businesses now use Hadoop and HDFS as their primary platform for Big Data analytics (Borkar et al., 2017). An open-source server and programming architecture is called Hadoop (Xu & Xiaoping Du, 2020), It is used in a clustered computing environment to store and analyze large data sets quickly with the aid of thousands of commodity servers (Verma et al., 2015). According to Dong et al. (2015), Verma et al. (2015), and Xu and Xiaoping Du (2020), the Hadoop Distributed File System (HDFS) is a distributed file system that provides high-throughput access to application data. Hadoop commonly comprises

four components that contribute to its proper functioning. Hadoop MapReduce is a YARN-based system for the parallel processing of large data sets, and Hadoop YARN manages scheduling and cluster resource management. It can replicate the data to ensure that there is no data loss in the event of a server or hardware failure (Cheng et al., 2015).

5.3 Operations of Big Data and Analytics in the Ghanaian Banking Sector

The Ghanaian government began implementing big data platforms in 2011 for businesses and organizations that are gathering an increasing amount of digital data from customers and staff (Borkar et al., 2017). These businesses and organizations include those that provide financial services (banks), healthcare, telecommunication, gas, and government agencies (Liu et al., 2018). But we concentrated on financial services (banks). The concept of financial science and technology has emerged as the new outlet for the development of the financial industry due to the widespread use of the Internet and the quick development of emerging technologies, offering the limitless potential for financial product innovation and service improvement (Yeboah-Boateng & Fhea, 2018). The banking sector, one of the key sectors in the financial sector, is deeply incorporated with new technologies like big data and is being propelled by the wave of financial science and technology. The law of large numbers serves as the cornerstone of banking, so it can be said that the banking sector and data are closely related (Khand & Kalhoro, 2020). The banking sector can put an end to its dated method of relying on customer speculation. It is now possible to keep track of customers' needs and financial health thanks to big data and analytics (Verma et al., 2015). However, banks now have access to big data and analytics to identify fraud, assess risk, and customize banking services (Xu & Xiaoping Du, 2020). The value of data will increase over time as more people produce and use it. As more banks adopt big data and analytics tools, not only will

the amount of information increase, but so will its profitability. Big data and analytics will also help the banking sector continue to identify new market trends and make informed decisions. The banking sector must use big data and analytics to keep up with customer demands because the internet has altered how people think and interact.

5.4 Demographic Representation of Respondents

Ilker Etikan and Sulaiman Abubakar Musa (2016) claim that because there are so many topics to research, it is impossible to cover them all. Table 5.1 presents an overview of the final respondents used in the study based on the traits or criteria for selecting the respondents rather than providing any kind of justification for a statistical selection.

Table 5.1: Demographics of Respondents

Demographic Variables		**Number of Participants**
Gender	Male	6
	Female	4
Education	Doctorate	1
	Masters	2
	Bachelor	6
	HND	1
Job description	Board of Director	1
	Manager	2
	IT Officers (Analytics, Programmers, Software	5

	Engineers, Data Analysts, and Coordinators) Executives Officers	2
Ownership Structure	Local Public Local Private Foreign	3 3 4
Length of time	Less than 1 year 1-3 years 4-5 years Over 5 years	 2 8

Source: Author's Construct

Table 5.1 provides a profile of respondents that was conducted between 10 bankers or participants where 6 of the respondents were males' whiles 4 were females. As indicated in the table above, the educational level of the participants ranged from Doctorate to HND, where doctorate consisted of only 1 of respondent, master's consist of 2 of respondents and the highest of the educational background falls within the bachelor's degree which consists of 6 which HND is 1. However, within the ownership structure, the local public bank, made up of 3 respondents whiles local private banks sum up to 3 of the sample and foreign banks consisted of 4. The majority of the respondents have over 5 years of experience with BDA in the banking sector, this constitutes 80.0% of total respondents whiles 2 of respondents having experienced BDA between 4 to 5 years.

5.4.1 The current state of the BDA platform in the banking Sector

The period a banker has been employed will determine how long their experience with the use of the platform. There are numbers of business operations and activities that require the high use of BDA in the banking sector, which helps them to understand the day-to-day activities in the bank and as well know the exact needs of customers and how to service them better. Again, most of them also indicated how often the bank uses BDA and whether it has been adopted in their banks. In response to the question regarding the current state of the BDA platform in the banking sector, one member of the board of directors said.

> *"I have been working with the bank for almost six years now. Since I started working with the bank in 2016 to date. The bank has adopted the BDA platform which is often used as far as the operations of the bank are concerned. The number of business operations and activities in the bank is five, which are transfer and monitoring of transactions, accounting, investment, insurance, and account opening. Even though I have worked with the bank for steven to eight, my experience with BDA is over five years".*

Similarly, An IT officer also said:

> *"I have been employed with the bank for about seven years to eight years and can say for a fact that within these periods, BDA has been adopted. The BDA platform is used daily from Monday to Friday and at times when we are not even working. About the business operation, I can say that it depends on the processes, but I can say five or six operations, which are Operations credit, HR customer services in finance, Accounting, Marketing, and Investment, and it has been over five years now I experience the use of BDA".*

One female manager also said:

> *"I have been working with this bank for like 15 years now and yes, BDA has been adopted with my bank and we use it on a daily basis for the affairs of the bank. My experience with the use of BDA is over 5 years and more now since I have been working in the banking sector for a long period. Customer Information and customer integration, affairs of the company, marketing, credit, and loan. So then, let's say five are the business operations of the bank".*

An executives Officer also said:

> *"With the business operation, I can give three that is account opening, loan recommendation, and monitoring customer transactions. Working in the banking sector for almost 5 years, I can say BDA has been adopted and is used on a daily basis for the operations of the bank. My experience with the BDA platform is 4-5 years since I started working not too long."*

The responses above illustrate that the BDA platform helps bankers to operate several business operations and activities such as account opening, marketing, etc. BDA also provides knowledge of the internal and external affairs of the banking sector. Therefore, bankers' experience with the platform and how long the BDA has been adopted and used in the banking sector give them the upper hand in what they are doing and how well they are abreast with the understanding and use of the platform.

In summary, the findings reveal the business operations and activities of the banking sector and the experience some bankers have with the use of the BDA platform.

5.4.2 Challenges faced using the BDA platform.

Findings reveal that some challenges affect the use of the BDA platform making it difficult for the bankers to operate the platform when and how needed. Some of the challenges are highlighted

below. Firstly, one of the challenges indicated by one of the programmers of the banks was the lack of source code to develop the analytics further. He indicated, *"Yes, once, or twice again, how to tweak the analytics to suit what you are looking for. "If I give you an example, looking at the bank, the banking software that gives you a trend of deposits so that we can look at the customers and the trend of deposits and how they are depositing money thus analyzing your customers". Then, you want to also look at probably specific to Ghana trend of deposits, same branch or thread of deposits using other branches. Therefore, now what I want to do now might not be easily done analytics, I am using my ability to do the analytics or the Oracle application that sits behind analytics, and my ability to write code to bring it determines how well I can use the platform".* This challenge is linked to BDA service quality which deals with the overall performance of the system.

Secondly, one of the challenges indicated by one of the IT coordinators of the banks was the lack of network connectivity, where she indicated "*The most common challenge we experience is network unavailability. When the network is down, it slows the working process of the bank and brings everything to a standstill, which affects the working performance for that day".* This challenge is linked to BDA service quality and BDA system quality, which deals with the overall performance of the system.

Finally, one of the challenges indicated by one of the software engineers of the banks was literacy. He indicated, *"This talk is about the instances where the knowledge is out there for everybody knowing data is a future and it must be monetized and apply to enhance profitability and understanding of the fundamentals and management of data. We can say data literacy is defined as the capacity to read, manipulate, analyze, and communicate data in a manner that empowers*

workers at all levels to raise the appropriate queries about data and machines, gain knowledge, make decisions, and convey meaning to others. Poor data literacy is a barrier to bank growth and transformation, and as data becomes more integrated into daily workflows, the need for increased data literacy will only grow. Maintaining a competitive advantage necessitates increased access to and understanding of data throughout the organization". This challenge is linked to BDA information quality which deals with the accuracy of the information and how well the information is understood.

5.4.3 Policy

The findings indicate that there is a policy governing the usage of the BDA platform that requires bankers to keep the information of client information private and not disclose it to a third party. Some of the policies are highlighted below.

Firstly, one of the policies indicated by one of the IT managers of the banks was Government Basel Committee on Bankers Supervision (BCPS 236). He indicated *"This is the principle for effective risk data aggregation and risk reporting, where its objective is to strengthen, banks' risk data aggregation capabilities and internal risk reporting practices to enhance the risk management and decision-making processes at the banks". This policy is linked to the BDA system used to enhance the decision-making and risk management of banks.*

Lastly, one of the policies indicated by one of the board of directors of the banks was the company's policy governing privacy. *"This is to help inform bankers on what you can do with the customer's data, how much of it you can process, and to what extent you can process it. However, before you process information beyond the level to which you have collected it, you need the consent of the owner of the information, or better still, you should notify the*

customer". This policy is linked to the BDA information quality where it deals with information relevance and information content needs of the system.

5.4.4 Enablers that helped the bank to successfully use BDA.

Findings reveal that some enablers have helped the bank to successfully use the BDA platform. Some of the policies are highlighted below,

Firstly, one of the enablers indicated by one of the data analysts of the banks stated, *"Excel also serves as an enabler, which has helped in the successful use of BDA"*. This enabler is linked to BDA service quality which measures the ease of use and convenience of access to the platform.

Secondly, *one of the software engineers from the banks indicated an enabler, stating, "The quality of the banking application has helped in the successful use of BDA"*. This enabler is linked to BDA system use which deals with the beliefs stakeholders have in using a particular system to enhance job performance.

Thirdly, one of the programmers from the banks indicated a particular enabler, stating "Nebula has helped banks to successfully use big data to enable the operations and cost management system of the banks". This enabler is linked to the net benefits since it looks at the overall operations of the bank and how cost-effective affect the banking sector.

Finally, one of the IT managers from the banks indicated a particular enabler, stating *"I am not going to say is successful yet since it is a journey when you look at the data analytics maturity profile, there is a niche everybody is striving towards, which is to become the Googles and Amazons of the world, but I am not sure we are there yet. However, I probably say the status of all these journeys is what is called Data maturity assessment, just to gauge the level of data literacy quality of data across the organizational level, which will help in assessing the work ahead of time"*. This enabler is linked to BDA user satisfaction where an individual is satisfied with his or

her overall use of the system under evaluation. Also, BDA service quality measures the ease of use and convenience of access to the platform.

Findings from the Case Platform

The purpose of this qualitative case study was to explore Big Data and Analytics, its impact and adoption on Ghanaian banks within the 7 constructs of the Delone and Mclean IS Success Model success model. The subsections presented under this section present the overview of the case used for the study and the findings made. The study further looks at the time since the implementation of big data and analytics in Ghanaian Banks.

5.5

5.5.1 BDA Information Quality

The accuracy with which most bankers found the use of the platform is because the stated value of what they input into the system reflected all the supporting facts. Further, understanding of the platform would be attributed to how sufficient information it gives to the bankers. Again, most of them asserted that the platform is very timely since most of the information input into the system produces an early result.

In a response to the question regarding BDA information quality, one of the programmers said:

> *"The information from the platform is very accurate to the extent that, whatever you input into the system turns to reflect the same thing on your supplementary records it can be trusted. Therefore, in terms of percentage, I will classify it to be 90%. In addition, the system provides sufficient information and is very timely as it provides information when needed".*

According to a data analyst, it was said that.

"I could say that being a data analyst of this bank the accuracy is very high because the platform is a cloud-based application that helps us the bankers to virtually use it. Rating the accuracy of the information given, I will say 80% because at times it fails due to internet connectivity since is virtual. The system provides sufficient information, yes, it does. You will be able to get on the system. The information obtained from the system is very timely".

Another response from an executive's officer said:

"In terms of accuracy, the platform provides very good accuracy since I have not been able to use the platform for a long period but with the little time have spent around the system, I would say the accuracy of information obtained is very good. It provides sufficient information when working on the platform and as well is very timely".

Another response from an IT analytics said:

"Yes, the platform provides accurate information and does not take forever thus the response time is quick and helps you to save time in doing other things".

Hence, the response above indicates that the accuracy of information obtained from the platform has to do with data consistency with reality, which is referred to as data correctness and serves as the fundamental benchmark for data quality (Scholar, 2008). Since greater conformance translates into greater accuracy, the accurate data must correspond to the information you need. This implies that the information has a trustworthy and consistent source and is devoid of errors. In addition, the platform's response time is very adequate, and much time is not spent when using the platform. In summary, the findings reveal that BDA information quality was a result of the accurate information received from the platform and how timely the platform responds to the bankers.

5.5.2 BDA System Quality

It is apparent that the ease with which most bankers found the use of the platform was because they understood how it works. Further, understanding the platform could be attributed to the understanding of how the features of the application work. Again, most of them asserted that learning to use the platform with them going through countless sections on how to use and as well received guidelines from the IT personnel and so they found the use of the platform to be very easy to use and user-friendly. In terms of response time, the application is very responsive since they use it daily. Some respondents are even able to teach others to use the platform. In response to the question regarding BDA system quality, one's response from an IT coordinator said:

> *"I think it is easy to understand because, when I heard the concept of big data and analytics platforms, right away I understood what it does and how they will work since am an IT analyst even though the technicalities behind it were quite intriguing. However, generally I understand how the platform works. Learning to use the app is easy and user-friendly since it is not complicated to use. There are even times when I have had to teach people to use the app. The application has a very good response time".*

Other responses from a programmer said:

> *"The platform is a secure front-end platform that can be easy to use. If you can write your SQL, you can have access to the platform and is so easy to use based on your technical skills* and *diligently depends on a metric in various settings sometimes, is back to just like a general system so sometimes slow because of what is happening in the general matrix. However, response times are largely dependent on the server you are operating. if it is very fast, then you will get your response time on a fast note. And the application is user-friendly".*

According to one executive officer:

> *"I understand how features on the platform work since it was easy at the initial stages. Knowing how to operate the application was always difficult and at some point, I was stressed out and did not know what to do until a colleague of mine gave me the manual to read and guided me through it since using the system has become very friendly and the response time is on point".*

Another response from a data analyst said:

> *"Okay, the system is easy to use, but the BDA platform sometimes requires expertise in using blockchain when using the platform. If data is entered, the response is produced at a faster rate. The response comes just when you need it. If you use a platform and issue a command the response comes in when you are working on it. It does not take that much time".*

Responses from the above findings indicate that the BDA platform is user-friendly because it helps to run the day-to-day activities of the banking sector. It is very easy to use because manuals are made available to refer to in case of difficulty and training sessions are being carried out to help those having issues with the platform and as well if you can write your SQL, you can have access to the platform since is based on your technical skills and diligently depends on a metric in various settings. The platform response quickly to queries entered the system dependent on the server being operated on for effective use.

However, some of the respondents mentioned the BDA platform sometimes requires expertise in using blockchain and learning to write my SQL can help to operate the platform. Also knowing how to operate the application was difficult at some point until the use of a manual which served as a guide.

In conclusion, the findings reveal that BDA system quality was a result of the easiness of using the platform as well as its being user-friendly and how quick response time it gives to the banking sector.

5.5.3 BDA Service Quality

This deals with the overall performance of the platform and the understanding bankers have in using the platform. However, in the use of every information system, the technical support, resources, and tools to operate the platform are important to help in the successful adoption by bankers. Inadequate resources and the lack of needed support in times of challenges will lead to obstruction and the lack of effectiveness whiles using the system (Rouibah et al., 2015). In this case the platform under study is big data and analytics that help bankers to understand the use of the platform by providing them with the necessary resources like manuals that can be referred to in case of difficulties. However, training sessions are then given to each banker to learn how to use the platform.

According to one response data analyst:

> *"The use of the platform prevents me from stressing myself. As I say, the stress you go through cracking your brain skull, searching through books with the help of the platform where everything is done on the internet and manual provided, you can get your first-hand information on what is needed. In addition, it is very easy to learn how to use the platform, because tutorials and manuals are in place when having any difficulty getting Moreover, is easy to use as well".*

According to one response from one board of directors:

"The big data platform is not something that you need to learn but rather is a platform that needs basic skills to be able to use. The platform is easy when you know exactly what you are doing and the expected outcome of it".

According to one response from an IT coordinator:

"It was intriguing at first when I had experience with using big data later, I'm like oh wow, that's really what the platform is all about. It baffles me a little but using big data is quite an easy way to use the platform".

According to one response from an IT analytics and a programmer:

"The platform is easy because I am an IT analytics and a programmer as well, so I do understand the bases of the platform in terms of the writing of codes and basic knowledge when using it. However, I found my learning of the platform very easy and as well as easy to use".

Hence from the responses given above, it could be said that the platform is quite easy due to the basic knowledge that some bankers have before their experiences with the use of the platform and making manuals available for them to refer to, in case of any challenges that may arise from using the platform.

In summary, the findings reveal that BDA service quality was a result of understanding the use of the platform, its easiness, and how to learn using the platform.

5.5.4 BDA System Use

The BDA system use deals with the decisions made by the stakeholders of the bank and how it helps to enhance the productivity of the organization. It also helps in assessing the daily performance of the bankers to enable them to up their game for an effective outcome of their work.

In addition, bankers or workers in the banking sector use the big data platform on daily bases since the platform is inter-connected between the bankers. According to one response from a software engineer,

> *"The platform helps in terms of investments but maybe someone also wants to invest in the company or the banking system. It helps the bank to decide to know whether the person investing is good, or the investment policies are okay for the person. Nevertheless, we use it daily when it comes to the banking sector. Our major tool is the big data platform because everything is on the internet and inter-connected in the office and getting information from the platform is easy. Also, we do not spend much time when using the system because it's fast and easy to use".*

Another response from a programmer said:

> *"It helps in providing trends and expectations forecasting in deciding to move in a different direction also helps in performance tracking to see who is performing to ensure that you list the right people so that they up their game. In terms of how often, we use it as often possible as it has been used in the banking sector. Moreover, the big data platform in general is what I use every day. So, if you say how much time I do not know. It is as if you work with Excel. So, every time you excel is open and you are working with the system".*

Another response from an IT analytics said:

> *"It helps the bank in so many ways. In terms of timing, doing transactions in terms of investment-wise, and then in terms of tracking information from our clients. I often use it daily and everything done is based on the BDA because without the internet we cannot work in the office. In conclusion, because I just have an hour's break. So, eight hours are being spent on the internet, you know, working so let's say roughly eight hours in the day".*

Another response from an IT coordinator said:

> *"The platform helps in decision-making by providing reports and insights of those who are typically ad hoc or every quarter where you provide business insight and direction of the business. The bank runs on big data, so you use it as often as possible".*

Hence, from the responses given above, it could be said that the big data platform enhances the decision-making of stakeholders and helps with the overall performance of the banking sector. Further, a major decision about a client and matters concerning the bank fall on the platform for assistance.

In summary, the findings reveal that BDA system use was a result of decision-making and how often the platform is used as well as the actual time spent when using the platform.

5.5.5 BDA User Satisfaction

User satisfaction is the mediator that serves both purposes (direct and indirect effects) between BDA information quality, BDA system quality, BDA service quality, and BDA system use. This is where bankers get to know how exactly they feel about the use of the platform and the expected outcome from using the platform. It helps the stakeholders to know the banker's response concerning the use of the platform. In addition, how to improve the system if there is a need for improvement. They tend to know those collective findings from bankers' suggestions on user satisfaction and the strong and critical manifestation of the success of the system. According to the data analysis, he said:

> *"The BDA is software which does not give problems by itself, I will say is more satisfactory. In addition, the BDA is a platform and sometimes has its downside so is not everything that you will get as a goal. So, the more people get to use it, the more people also bring suggestions and everything so that they can also improve".*

According to one Manager:

> *"I'm very satisfied with the use of the platform because it provides you with first hands information. With the interaction of network connectivity, I would say it makes jobs easier because it makes available any information needed from the platform".*

According to Software Engineer:

> *"The platform is very satisfactory. In terms of its expectation, I could say it does not meet expectations on an organizational level since it's still a working process and needs more room for improvement but on its own in isolation then it meets the expectation".*

According to an IT Coordinator:

> *"The platform has met expectations by making it easier for him to understand the basic features, and how to work with them without any struggle. Moreover, as well as satisfied with the use of the platform."*

"From the findings of the responses provided earlier, it can be concluded that the big data platform aids management in understanding the fundamental responses of bankers. It also highlights areas where the platform requires further enhancement and provides firsthand insights.

In summary, the findings indicate that BDA user satisfaction enables bankers to grasp the overall expectations of the platform individually. However, there is a need for significant improvements at the organizational level since there is ample room for enhancement. Nevertheless, bankers expressed satisfaction with the anticipated outcomes of the system."

5.5.6 BDA Time

This refers to the length of time the Bank deployed the BDA platform since companies tend to achieve more proficiency with the system after using it for a longer time. BDA Time is a

moderating variable between BDA System Use and Net Benefits and User Satisfaction and Net Benefit. This also helps them to know the significant benefit of using the BDA platform from the time of implementation of the BDA platform as well helps to enhances the working performances of the banking system. However, adopting BDA enables strategic agility so that the firm can react fast in the big data era. The application of BDA can facilitate efficient internal and external knowledge management. By fostering strategic agility inside the firm, BDA adoption will enhance Net Benefits. According to a data analyst said:

> "*I have been working in the banking sector for quite a long period such as, I could say we adopted the BDA platform 5-10 years. BDA platform of course has brought a lot of significance to the banking sector by helping in decision support and knowing the customer's behaviors and what they invest their money into*".

Another response from a programmer said:

> *"Yes, it has, because it has made or helped operations to become more effective."*

According to a software engineer:

> **"***Since the implementation, the BDA platform has brought significant impact on the Bank's performance and adoption time frame is within 2-5 years***".**

Nevertheless, from the findings of the responses given above, it could be said that the big data platform has helped bankers and stakeholders at best we can surmise from the responses that the BDA initiative has assisted in decision support and has brought a significant impact on the performance of the workers. In some bankers, BDA has been adopted even in the shortest possible time, it has helped impact their performance as well as enhance the operation of the bank to become more effective. In addition, most of the bank falls within 5-10 years, which is the infancy stage of adopting the BDA platform.

In summary, the findings reveal that BDA time has helped bankers to develop more expertise using the system more effectively for a period after which in turn generates the most needed business benefits. Also, it has helped in identifying the significant impact of the platform on bankers' performance as well as how long BDA has been implemented since its adoption.

5.5.7 BDA Net Benefits

The Net Benefit is 'the extent to which the user perceives benefits such as saving time and cost while using the system (Owusu, 2017). This also helps in knowing the outcome of the platform by achieving what is expected of it thus enhancing productivity. In addition, the platform makes bankers' work easier for them without stress and saves time. According to the Software engineer:

> *"Yeah, the BDA platform helps save time, because instead of you doing copy and pasting for many data, you easily use a SQL script to extract the data quickly and do whatever you have to do aiding in quick decision making. BDA helps enhance your productivity improving the processes and leading to better-operating margins. Then it helps in collecting very large amounts of information within the shortest possible time. Finally, using the system makes it very simple for you to use."*

According to one executive officer:

> *"It helps a lot because when it comes to documentation, it helps you better understand business processes. Moreover, the BDA platform enhances productivity based on the performance of the bankers and helps in determining the needs and state of the platform. In terms of the time spent or hours used when operating the system, its less time spent and helps in saving time to do other things. The BDA platform makes my joy easier for me because it does not matter whether I save the data or not, I always have access to the data when and how needed."*

According to one programmer:

> *"The BDA platform enhances productivity by being able to account for money spent within the year and how much profit they have made with the money invested into the company. In addition, it helps to regulate the cash flow within the banking sector and what is to be expected of the customers and workers of the bank.* However*, the BDA platform helps in saving time and making jobs easier for us since we spend less time in search of information".*

In addition, from the findings of the responses given above, it could be said that the big data platform has helped management and stakeholders to better understand the cash flow within the banking sector, it has also enhanced the operation of the bank to become more effective. In addition, it will help in relieving workload when dealing with huge sums of data.

In summary, the findings reveal that Net benefits implementation has helped in decision-making satisfaction, and it is directly and positively affected been affected by BDA information quality, BDA system quality, BDA service quality, BDA system use, BDA user satisfaction, and BDA time. In addition, implementation and use have enhanced their operations, things are being done quicker, and all stakeholders are happy with the system. Also, it has enhanced productivity, and performance among workers and makes the job easier as well as saves time when using the platform.

However, Table 5.2 indicates the constructs of Delone and Mclean, briefly describing their factors and what lessons were drawn from their findings.

Table 1.2: Lessons Learnt

Constructs	Factors	Lessons
BDA Information Quality	Accuracy of information	Bankers have full trust in the use of the BDA platform because it provides error-free data and reflects the exact thing they input into the system (Amakobe, 2015)
	Sufficient information	It provides them with sufficient information since you get what you input (Aldholay et al., 2018).
	Timely	The platform's response time is very adequate, and much time is not spent when using the platform (Delone & Mclean, 2014).
BDA System Quality	Ease of use	Bankers generally found the platform to be easy to use. The ease with which bankers found the use of the platform was because they understood how it works (Almutairi et al., 2016).
	User friendly	The platform is user-friendly to bankers because is easy to learn and not complicated in using (Mukred & Yusof, 2018).
	Response Time	The platform's response time is very adequate since it does not take a longer period in generating the responses needed (Delone & Mclean, 2014).
BDA Service Quality	Understanding of the Platform	Bankers generally understood how the platform works because they know about its features and functions (Rouibah et al., 2015).

	Ease of Use	Bankers generally found the platform to be easy to use. The ease with which bankers found the use of the platform was because they understood how it works (Hwang & Mclean, 1996).
	Ease of Learning	Bankers generally found the learning of the platform to be easy to use. For some of the bankers, their learning experience was facilitated by the initiators of the platform (Owusu, 2020).
Constructs	**Factors**	**Lessons**
BDA System Use	Decision Making	It helps the bank in so many ways. In terms of timing, doing transactions in terms of investment-wise, and then in terms of tracking information from our clients (Bharati & Berg, 2005).
	Often use of the Platform	The platform is used daily since that is the core use of everyday activities (Rouibah et al., 2015).
	Time is spent using the platform.	Since is used daily, bankers spend almost 8 time when using the platform (Abdurrahaman et al., 2019).
BDA User Satisfaction	Satisfaction with the platform	Bankers are very satisfied with the use of the platform because it provides you with hands-on information (Bharati & Berg, 2005).
	Expectation	BDA has met the expectation of bankers by making their jobs easier and as well helping them to know

		their customer's preferences **(**Delone & Mclean, 2014).
Constructs	**Factors**	**Lessons**
BDA Time	Significant impact on the Banks performance	The platform has helped bankers and stakeholders to make accurate decisions concerning the working performance of the bankers and customers and as well make the operations of the banking sectors very effective (Hou et al., 2012).
BDA Net Benefits	Makes Job Easier	BDA has helped bankers to make their jobs easier by providing them with an electronic way of handling huge sums of data (Rouibah et al., 2015).
	Saves Time	The platform helps bankers to save adequate time when it comes to documentation. It helps bankers to better understand the business process (Khand & Kalhoro, 2020).
	Enhance Productivity	The BDA platform has helped improve the processes, leading to better-operating margins. Moreover, helps in collecting very large amounts of information in the shortest possible time **(**Delone & Mclean, 2014).

5.6 Chapter Summary

The qualitative study results and discussions were presented in this chapter using the Delone and Mclean framework. Lessons were taken from each construct's factors, which were explained. Based on the study's goals, bankers' interview results were presented

CHAPTER SIX

DISCUSSIONS OF FINDINGS

6.1 Chapter Overview

The case findings from the previous chapter are examined in this chapter. The chapter aims to address the research questions and offer justification and supporting data for the research propositions.

Addressing the Research Questions

6.1 The study posed several research questions to achieve its goals. In the subsections below, these are explained and analyzed with the study's findings.

6.1.1 What is the Nature of the BDA platform in Ghana?

The researcher looks for solutions to the set of study questions in the section below.

1. What is the current state of BDA in the Ghanaian banking sector?
2. What are the constraints and enablers of BDA adoption in Ghanaian banks?
3. What is the impact of BDA on Ghanaian banks?

6.1.2 Current State of BDA Platform in the Banking Sector in Ghana

In this sub-question, the researcher seeks to answer question one of the research questions:

1. What is the current state of BDA in the Ghanaian banking sector?

The current state of BDA in the banking sector in Ghana describes the ownership structure, how long the banks have adopted the BDA platform, and how frequently they use the platform. According to the findings, it is apparent that foreign banks in Ghana have adopted BDA (40%)

compared to both local and private banks (30%). In addition, according to the findings, BDA in the banking sector has been operational over the last five (5) years with most banks using the planform more often. The findings show that majority of the banks are still in their infancy stages of adopting BI systems since the majority are under 5-10 years of adoption although none of the banks fall under the less than 1-year category. This is a good sign that Ghanaian banks are fully aware of the BDA platform and are using them for their operations. Indriasari et al. (2019), also in another study in Indonesia found that BDA is still in the early stage.

6.1.3 Constraints and Enablers of BDA Adoption in Ghanaian Banks

In this sub-question, the researcher seeks to answer question two of the research questions:

2. What are the constraints and enablers of BDA adoption in Ghanaian banks?

Table 2.1: Constraints and Enablers of BDA Adoption in Ghanaian Banks

Enablers and Constraints	Findings	Supporting Reference
Constraints	Lack of network connectivity Data literacy Lack of source code to develop the analytics further	Ardagna, Ceravolo and Damiani (2016); Chen, Lin, and Wu (2020).
Enablers	The quality of the banking data. Microsoft Excel	Behl, Dutta, Lessmann, Dwivedi, and Kar (2019); Hajiheydari, Delgosha, Wang, and Olya (2021).

Source: Author's Constructs based on findings

Constraints refer to any challenges that hinder the operation of the BDA platforms in Ghanaian banks (Ardagna et al., 2016). There are always constraints to technology adoption; however, how these constraints are managed or controlled determines how effective the system will be to the organization (Hajiheydari et al., 2021). From the findings, table 6.1 indicate that evident that banks in Ghana lack network connectivity, data literacy, and lack of source code to develop the analytics further. This confirms the findings of Chen, Lin, and Wu (2020), in a study about Big Data adoption in healthcare. They found human expertise, resource allocation, operational procedure, and laws and regulations as constraints to BDA adoption in healthcare. However, Ardagna, Ceravolo, and Damiani (2016) found the level of complexity and level of standardization as constraints to BDA adoption. This is inconsistent with the findings from this study.

Enablers on the other hand are the facilitators, of technological readiness or what necessitates the adoption of BDA in Ghanaian banks. Before the adoption of any technology, the users must possess some skills, resources, and financial resources to maintain using the system (Hajiheydari et al., 2021). From the findings, table 6.1 indicates that the quality of the banking data and Microsoft Excel are enablers of BDA adoption in the banking sectors. These findings are concurrent with studies by Behl, Dutta, Lessmann, Dwivedi, and Kar (2019); and Hajiheydari, Delgosha, Wang, and Olya (2021). For instance, Hajiheydari, Delgosha, Wang, and Olya (2021), in a study in Iran about "Exploring the paths to big data analytics implementation success in banking and financial service: an integrated approach" identified financial, infrastructure readiness, selecting appropriate big data technological and skilled workforce as enablers to BDA adoption. Also, Behl, Dutta, Lessmann, Dwivedi, and Kar (2019) in another study about BDA

adoption by e-commerce startups, identified access to relevant data technical skills of employees as enablers for these e-commerce startups.

6.1.4 Impact of Big Data and Analytics on Ghanaian banks

In this sub-question, the researcher seeks to answer question three of the research question:

3. What is the impact of BDA on Ghanaian banks?

6.1.5 Big Data and Analytics Information Quality

Table 6.2: BDA Information Quality

Factors	Bankers	Supporting Reference
Accuracy of information	✓	Owusu (2020); Mukred and Yusof (2018); Bharati and Berg (2005); Rouibah et al. (2015); and Delone and Mclean (2014).
Sufficient Information	✓	Owusu (2020); Mukred and Yusof (2018); Bharati and Berg (2005); Rouibah et al. (2015); and Delone and Mclean (2014).
Timely	✓	Owusu (2020); Mukred and Yusof (2018); Bharati and Berg (2005); Rouibah et al.

		(2015), and Delone and Mclean (2014).

Source: Author's Construct from Findings

Table 6.2 address BDA Information quality results from the summary of the responses. BDA Information quality is the degree to which a user believes the information output by the system under review is "complete, accurate, well-formatted, and timely (Delone & Mclean, 2014a). The accuracy with which most bankers found the use of the platform is because the stated value of what they input into the system reflected all the supporting facts. Further, understanding of the platform would be attributed to how sufficient information it gives to the bankers. Again, most of them asserted that the platform is very timely since most of the information input into the system produces an early result. The findings reveal that BDA information quality was a result of the accurate information received from the platform and how timely the platform responds to the bankers. This confirms the stand of Owusu (2020) in his study concerning the impact of audiovisual technologies on university teaching and learning in a developing economy, users of AV systems found accuracy, completeness, satisfaction, and how timely the system is when using it. Later his context of AV technologies revealed the relationship between information quality and system usage has a positively significant relationship. Moreover, the path relationship between information quality and user satisfaction was found to be positively significant. A similar confirmation is made by Mukred and Yusof (2018) that information quality has a positive significant relation to system use.

Existing studies have supported this relationship based on the association between the accuracy of information received from the platform and how satisfied bankers are with the information as well as the time consumption (Almutairi et al., 2016; Bharati & Berg, 2005; Rouibah et al., 2015). Hence, the accuracy of information obtained from the platform has to do with data consistency with reality, which is referred to as data correctness and serves as the fundamental benchmark for data quality. Since greater conformance translates into greater accuracy, the accurate data must correspond to the information you need. This implies that the information has a trustworthy and consistent source and is devoid of errors. In addition, the platform's response time is very adequate, and much time is not spent when using the platform. The first proposition is supported by the evidence discussed above, which suggests that:

Proposition 1: *BDA Information Quality will positively influence BDA System Use.*

Proposition 1a: *BDA Information Quality will positively influence BDA User Satisfaction.*

6.1.6 Big Data and Analytics System Quality

Table 6.3: BDA System Quality

Factors	Bankers	Supporting References
Ease of Use	✓	Rouibah et al. (2015); Kulkarni et al. (2014); Owusu (2020); and Delone and Mclean (2014).
User Friendly	✓	Rouibah et al. (2015); Kulkarni et al. (2014); Owusu (2020); and Delone and Mclean (2014).

Response Time	✓	Rouibah et al. (2015); Kulkarni et al. (2014); Owusu (2020), and Delone and Mclean (2014).

Source: Author's Construct from Findings

Table 6.3 addresses BDA System Quality results from the summary of the responses. BDA System quality is defined as 'the degree to which a user perceives that the system under scrutiny is easy to use, reliable, responds quickly, amicably, and flexibly' (Delone & Mclean, 2002, 2014; Kulkarni et al., 2014). It is apparent that the ease with which most bankers found the use of the platform was because they understood how it works. Further, understanding the platform could be attributed to the understanding of how the features of the application work. Again, most of them asserted that learning to use the platform deals with them going through countless sections on how to use and as well received guidelines from the IT personnel and so they found the use of the platform to be very easy to use and user-friendly. In terms of response time, the application is very responsive since they use it daily. Some respondents are even able to teach others to use the platform. The findings reveal that BDA system quality was a result of the easiness of using the platform as well as its being user-friendly and how quick response time it gives to the banking sector. Owusu (2020) asserted the fact that system quality had a positively significant.

relationship between system use and user satisfaction. Furthermore, the result also indicated that the relationships amongst service quality, system use, and user satisfaction were also found to be positively significant, thus supporting the hypothesis. Another researcher Kulkarni et al. (2014) also confirmed the claim that the system quality of a platform should be easy for those using the

system and have a quick response time and be user friendly according to his article on knowledge management success model. In addition, he later also confirmed the fact that system quality has a positive influence on system use and user satisfaction.

The existing literature broadly talks about how system quality affects the hardware and software of the system, in manifesting the overall performance of the system. The quality of the system usually has an impact on the services that the firm provides, albeit indirectly through employee IT performance. It is asserted that the system should be simple to use and quick to respond to commands when information is entered into the system to improve the flow of day-to-day activities and also the performance of workers (Abdurrahman et al., 2019; Mukred & Yusof, 2018; Noh & Lee, 2015; Rouibah et al., 2015; Skok et al., 2001).

Further, the BDA platform is user-friendly because it helps to run the day-to-day activities of the banking sector. It is well easy to use because manuals are made available to refer to in case of difficulty and training sessions are carried out to help those having issues with the platform. The platform responds quickly to queries entered the system for effective use. From the above discussion, there is evidence that is suggestive of the proposition that:

Proposition 2: *BDA System Quality will positively influence BDA System Use.*

Proposition 2a: *BDA System Quality will positively influence User Satisfaction.*

6.1.7 Big Data and Analytics Service Quality

Table 6.4: BDA Service Quality

Factors	Bankers	Supporting Reference
Understanding of the Platform	✓	Owusu (2020); Mukred and Yusof (2018); Owusu (2017); Rouibah et al. (2015).
Ease of Use	✓	Owusu (2020); Mukred and Yusof (2018); Owusu (2017); Rouibah et al. (2015); Hwang and Mclean (1996); Almutairi et al. (2016).
Ease of Learning	✓	Almutairi et al. (2016); Rouibah et al. (2015).

Source: Author's Construct from Findings

Table 6.4 addresses BDA Service Quality results from the summary of the responses. BDA Service quality is manifested in the system's overall performance, which can be measured by individual perceptions of this quality (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003). It also explains 'the extent to which a user perceives that needs such as reliability, responsiveness, assurance, and empathy are satisfied by system providers' (Owusu, 2020). Technologies that are easy to understand are more quickly adopted compared to those requiring users to acquire new knowledge and skills. They are also easier to use and learn. In this study, service quality is defined as the perceived ease of use of the platform after users have learned and

comprehended its operation. The findings suggest that BDA service quality is a result of understanding the platform, its ease of use, and the learning process associated with it. This confirms the stance of Rouibah et al. (2015) in their dimensions of business-to-consumer (B2C) systems success in Kuwait, that service quality is when consumers understand how to use the platform and how easy it is for them in using the platform. A similar confirmation made by Bharati and Berg (2005) has a significant impact on system use and user satisfaction in the case of service quality from the other side.

Existing studies have supported this relationship based on the association between the platform ease of use to use the platform and the intention to use the platform (Almutairi et al., 2016; Bharati & Berg, 2005; Mukred & Yusof, 2018; Owusu et al., 2017; Rouibah et al., 2015).

Additionally, the training provided by the platform's creators on how to use the platform is crucial to bankers' comprehension of the platform and its usability, as shown by the learning process for using the platform, which is notably obvious in the responses of bankers. This is consistent with the study by Rouibah et al. (2015) that self-efficacy could be increased by providing step-by-step guidance and training in using technology and further confirms Almutairi et al. (2016) study that bankers get more and more familiar with using electronic devices and applications when they undergo training.

Hence, it could be said that understanding the use of the platform is quite easy due to the basic knowledge that some bankers have before their experiences with the use of the platform and making manuals available for them to refer to, in case of any challenges that may arise from using the platform. From the above discussion, there is evidence that is suggestive of the proposition that:

Proposition 3: *BDA Service Quality will positively influence BDA System Use*

Proposition 3a: *BDA Service Quality will positively influence User Satisfaction.*

6.1.8 Big Data and Analytics System Use

Table 6.5: BDA System Use

Factors	Bankers	Supporting Reference
Make decision	✓	Elgendy and Elragal (2016); Mukred and Yusof (2018); Owusu (2020).
Often use of the platform	✓	Elgendy and Elragal (2016); Mukred and Yusof (2018).
Time Spent	✓	Mukred and Yusof (2018).

Source: Author's Construct from Findings

Table 6.5 addresses BDA System Use results from the summary of the responses. BDA System use is an indicator of the degree 'to which the stakeholder believes that using a particular system has enhanced his or her job performance, or his or her group's organization performance' (Delone & Mclean, 2002, 2014a; Hwang & Mclean, 1996; Mcgill, 2003; Owusu, 2020). The BDA system use helps in accessing the daily performance of the bankers to enable them to up their game for an effective outcome of their work. In addition, bankers or workers in the banking sector use the big data platform on daily bases since the platform is inter-connected between themselves. Findings reveal that BDA system use was a result of decision-making and how often the platform is used as well as the actual time spent when using the platform.

The impact of audiovisual technologies on university teaching and learning in a developing economy talks about the analysis that revealed that system quality had a positively significant relationship between system use and user satisfaction (Owusu, 2020). Elgendy and Elragal (2016) confirmed the fact that decision-makers need to be able to gain valuable insight to enhance the working performance of their employees.

Literature on the often use of the BDA platform allowed them to better get familiar with the platform (Mukred & Yusof, 2018).

Hence, the big data platform enhances the decision-making of stakeholders and helps with the overall performance of the banking sector. Further, a major decision about a client and matters concerning the bank fall on the platform for assistance. From the above discussion, there is evidence that is suggestive of the proposition that:

Proposition 4: *BDA System Use has a positive significant relationship with User Satisfaction.*

Proposition 5: *BDA System Use will have a direct relationship with Net Benefits.*

6.1.9 Big Data and Analytics User Satisfaction

Table 6.6: BDA User Satisfaction

Factors	Bankers	Supporting Reference
Satisfaction with the platform	✓	Jaafreh Bakhit (2017); Khand and Kalhoro (2020); Bharati and Bharati (2016); Owusu (2020); Almutairi et al. (2016).

Expectation	✓	Jaafreh Bakhit (2017); Khand and Kalhoro (2020); Bharati and Bharati (2016); Owusu (2020); Almutairi et al. (2016).

Source: Author's Construct from Findings

Table 6.6 addresses BDA User Satisfaction results from the summary of the responses. User satisfaction is an important part the of IS success model which is the most popular measure in studies of information systems satisfaction (Bharati & Bharati, 2016). The degree to which a user views the system's overall evaluation favorably is known as BDA Satisfaction (Owusu, 2020). One of the mediators in the interaction between the quality of the BDA's information, services, systems, and net benefits is user satisfaction. Bankers gain insights into their feelings about the platform's usage and the anticipated outcomes. This understanding assists stakeholders in comprehending the bankers' responses to platform use and provides guidance on potential system improvements. The findings indicate that BDA User satisfaction is instrumental in helping bankers understand the overall expectations of the platform and their satisfaction with the anticipated outcomes of the system. Jaafreh Bakhit (2017) confirmed the three metrics, which were taken from the User Information Satisfaction survey, will be used to gauge user satisfaction. Five criteria are used to assess the user constructs (intention to use): Use frequency, enjoyment, the volume of use, Number of reports produced or information requests for specific reports, as well as anticipated future use of an IS or its output and willingness to utilize (Mukred & Yusof, 2018).

Existing studies show that BDA user satisfaction has met the expectations of bankers and has a significant influence on BDA time. since the longer period spent with a platform will determine the satisfactory use of the platform and the expected outcome with the use of the platform (Acheampong & Moyaid, 2016; Bharati & Berg, 2005; Jaafreh Bakhit, 2017; Khand & Kalhoro, 2020; Rouibah et al., 2015).

Finally, the big data platform helps management in knowing the basic response of the bankers and how the platform needs more room for improvement as well as gives first hands information on the platform. From the above discussion, there is evidence that is suggestive of the proposition that:

Proposition 6: *BDA User Satisfaction will have a direct relationship with Net Benefits.*

6.1.10 Big Data and Analytics Time

Table 6.7: BDA Time

Factors	Bankers	Supporting Reference
Time since adoption	✓	Acheampong and Moyaid (2016); Owusu (2017).
Significant impact on the Banks performance	✓	Hong and Ping (2020); Acheampong and Moyaid (2016); Owusu (2017); Ghasemaghaei and Calic (2019).

Source: Author's Construct from Findings

Table 6.7 addresses BDA Time results from the summary of the responses. This is the amount of time the Bank has the BDA system deployed (Acheampong & Moyaid, 2016). Using the system for a longer period, Acheampong and Moyaid (2016) argued, tends to result in greater system proficiency, which generates the most essential economic benefits. BDA time helps bankers understand the major benefits of using the BDA platform from the time of BDA platform deployment, and it also improves the operational performance of the banking system. Adopting BDA enables strategic agility so that the firm can react fast in the big data era. The application of BDA can facilitate efficient internal and external knowledge management. The findings reveal that BDA time helps bankers to identify the significant impact of the platform on bankers' performance and how long BDA has been implemented the researchers investigated the extent of the adoption as well as its impact on the business performance of banks in terms of employees' Learning & Growth, Customers' management, improved internal Business Processes, and Financial gains dimensions using Time since Adoption as a Moderating variable. Owusu (2017) also confirmed the determination of whether the banks that deployed BI systems earlier have derived more benefits than those who are late adopters in this article.

Hong and Ping (2020) confirmed the fact that businesses may use data to examine and manage their strategies thanks to BDA. BDA is playing a bigger and bigger role in company decision-making processes, where employees monitor client purchasing patterns and forecast their future purchasing tendencies. Dickson et al. (2021); Ghasemaghaei and Calic (2019); Hong and Ping (2020), confirmed that time has a positive relationship with the outcome of the banking sector. Nevertheless, the big data platform has helped bankers and stakeholders in making good decisions, helped in improving the performance of workers, and enhance the operation of the bank to become more effective. In addition, the time since implementation has been a help to bankers who adopted

it at an early stage to enhance the working performance of their banking sector. From the above discussion, there is evidence that is suggestive of the proposition that:

Proposition 7a: *BDA Time will have a moderating effect on the relationship between BDA System Use and Net Benefits.*

Proposition 7b: *BDA Time will have a moderating effect on the relationship between BDA User Satisfaction and Net Benefits.*

6.1.11 Big Data and Analytics Net Benefits

Table 6.8: BDA Net Benefits

Factors	Bankers	Supporting Reference
Makes Jobs Easier	✓	Hong and Ping (2020); Mukred and Yusof (2018); Owusu (2020); Baig et al. (2019).
Saves time	✓	Hong and Ping (2020); Mukred and Yusof (2018); Owusu (2020), Baig et al. (2019); Rouibah et al. (2015).
Enhance productivity	✓	Hong and Ping (2020); Mukred and Yusof (2018); Owusu (2020); Baig et al. (2019).

Source: Author's Construct from Findings

Table 6.8 addresses BDA Net Benefits results from the summary of the responses. The Net Benefit is 'the extent to which the user perceives benefits such as saving time and cost while using the system'(Mukred & Yusof, 2018). BDA time is the moderating variable considered in IS success model, and it is directly and favorably impacted by the following variables: system quality, information quality, information presentation, and user satisfaction. The findings reveal that BDA net benefits help bankers to know the outcome of the BDA platform by enhancing productivity and making the job easier as well as saving time when using the platform. This confirms the instance of Owusu (2020) who established that there is a direct positive significant relationship between user satisfaction and net benefits. It can be said that the higher the level of user satisfaction, the higher the net benefits. This implies that the level of a user's expectation being met has a significant impact on the net benefit or the success of the IS.

Existing literature also confirmed how the BDA platform helps in making jobs easier and saves time for bankers to help enhance the productivity of the banking sectors and also senior management (Hong & Ping, 2020; Mukred & Yusof, 2018; Owusu, 2020; Rouibah et al., 2015). The big data platform has helped management and stakeholder to better understand the cash flow within the banking sector, it has also enhanced the operation of the bank to become more effective. In addition, it helps in relieving the workload when dealing with huge sums of data.

6.2

Chapter Summary

With the help of the conceptualized model created from the Delone and Mclean IS Success Model, this chapter set out to examine the case findings discovered in chapter 5 concerning the research questions and identified themes while considering the BDA information quality, BDA system quality, BDA service quality, BDA system use, BDA use satisfaction and Net benefits. The chapter

went on to explore the analysis of the findings in more detail and addressed the research questions about chapter 2's literature review, chapter 3's research framework, chapter 5's findings, and the analysis of the findings, which led to the suggestion of 10 propositions. Additionally, chapter 7 highlighted the study's findings by presenting an empirically tested and updated research framework.

CHAPTER SEVEN

SUMMARY, CONCLUSION, AND RECOMMENDATION

7.1 Chapter Overview

The preceding chapter's main goal was to discuss and evaluate the study's findings, particularly considering the literature covered in chapters 2 and 3. The summary of the study, discussion of the implications for future research, presentation of the research limitations, and general conclusion are the main topics of this chapter.

7.2 Summary

Big data and analytics were introduced in Chapter 1 of the report, along with its adoption on Ghanaian banks, numerous classifications, and categories for big data and analytics, and advantages were discussed. After doing so, the researcher set out to investigate the following research topics, which enabled the study's objectives to be met: The following research questions were derived from the objectives and the purpose of the study.

1. What is the current state of BDA in the Ghanaian banking sector?
2. What are the constraints and enablers of BDA adoption in Ghanaian banks?
3. What is the impact of BDA on Ghanaian banks?

The researcher recognized the current state of big data and analytics in the Ghanaian banking sectors to achieve the research's objectives and discover solutions to its open-ended queries. The researcher then conducted in-depth interviews with bankers to better understand the constraints

and enablers in the adoption of big data and analytics, as well as the impact on the banking sectors in Ghana.

Chapter Two Begins by providing a summary of the pertinent literature on the idea of big data and analytics, including its overview, definitions, types, characteristics, advantages, and difficulties. It also went on to provide a thorough analysis of the literature on big data and analytics by outlining the state of the field's existing understanding and its knowledge gaps. Finally, a summary and a list of research gaps are presented in the chapter's conclusion.

In **chapter three**, the study focuses on going over the research framework that is thought to be appropriate to help achieve the study objective. Considering this, chapter 3 reviews pertinent literature that has a connection to the chosen study framework either directly or indirectly. The Delone and Mclean success model is the framework that is thought to be appropriate for achieving the objectives of this study. Instead of developing a full-fledged theory on the relationship between big data and analytics, the chapter further conceptualized a model from the Delone and Mclean IS Success Model success. This chapter also discusses the benefits, some applications of the theory in current research, the rationale for the research framework selection, limits, and an explanation of the study's structures. A summary of the chapter's content is provided in the conclusion.

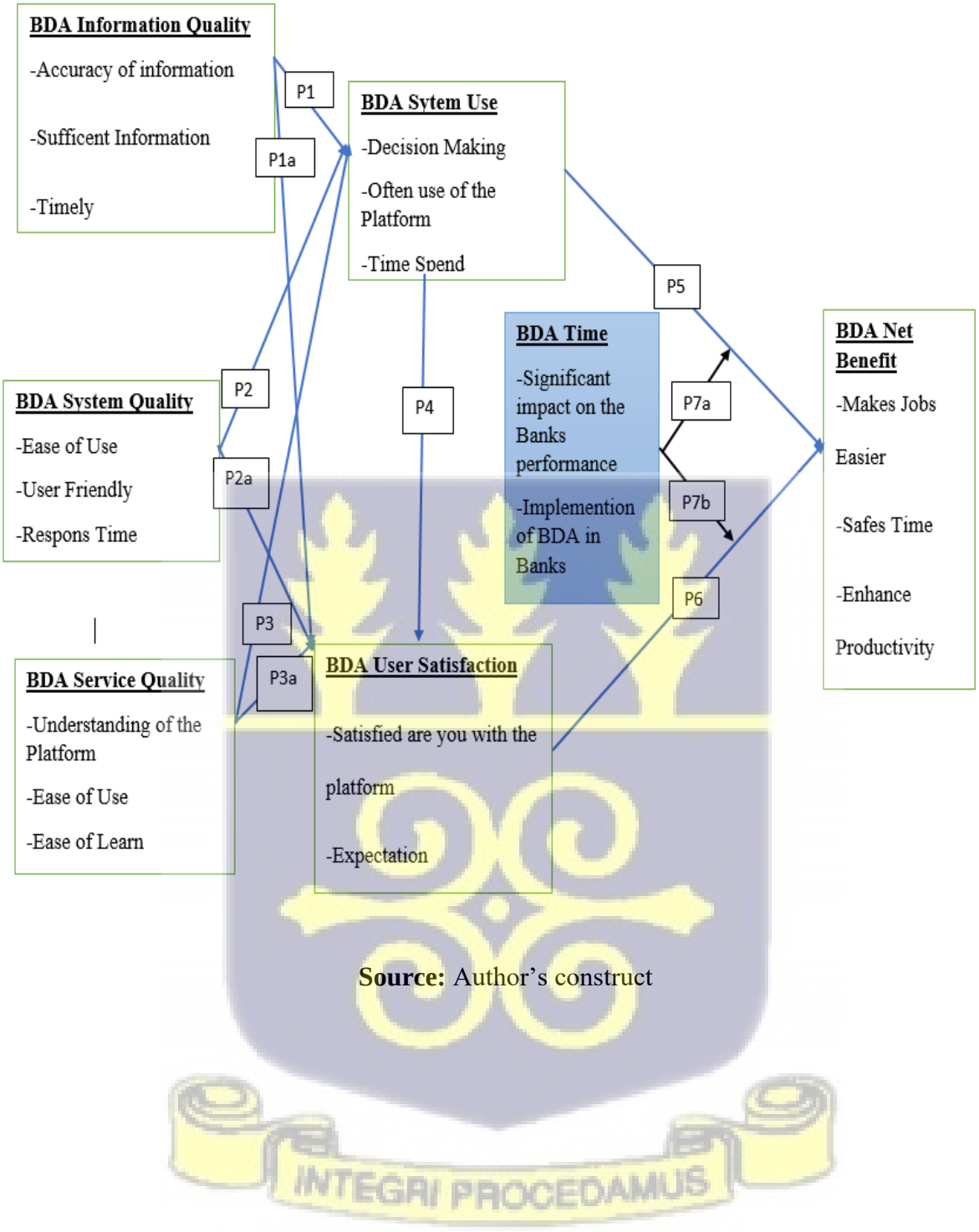
The researcher went on to detail the research methods used for this study in Chapter 4 despite using a theoretical lens and conceptualizing a model for it. The study goes into additional detail regarding the research paradigm used in the research design, technique, and data collection and analysis procedures. The chapter's final portion offers a synopsis of the entire work.

Chapter five provides the results of the information gathered from the responses given by the study's participants. The chapter based on the Delone and Mclean framework described how the quality of the BDA information, the quality of the BDA services, the quality of the BDA systems,

the use of the BDA systems, the satisfaction of the BDA users, the BDA time, and the anticipated net benefits affect each case participant.

Chapter 6 evaluated the case data from chapter 5 regarding the conceptualized model created using the Delone and Mclean framework and research questions. The chapter went on to discuss the analysis of the results and, in particular, how the research questions were to be compared to the literature reviewed in chapter two, the research framework in chapter three, and the results in chapter five, as well as the analysis of results, this led to the summary of the answers of research question from findings as (see, Table 7.1) also the findings led to confirmation of the seven propositions (see, Table 7.2). The conclusions also paved the way for the presentation of an updated and practically proven research framework (see, Figure 7.1).

Figure 7.1: Redefine Conceptual Framework Based on Findings from the BDA Platform



Source: Author's construct

Table 7.1 Summary of the Answers to Research Question from Findings

Research Purpose: The purpose of this study is to investigate the impact and adoption of BDA on Ghanaian banks. In addition, the study seeks to examine time as a moderating factor in the impact and adoption of BDA in Ghanaian banks			
Research Objective	**Research Findings**	**Extant Literature**	**Contribution, Implication, and Recommendation**
To examine the current state of BDA in the Ghanaian banking sector.	Findings from the study based on the banks that participated suggest that some foreign banks in Ghana have adopted BDA more) compared to both local and private banks. BDA in some banking sectors has been operational over the last five (5) years with most banks using the platform more often.	Al-Dmour, Saad, Amin, Al-Dmour, and Al-Dmour (2021); Bhuvana, Thirumagal, and Vasantha (2016); Wibisono, Ari, Widjanarti, Zulen, and Tissot (2019); Cornelli, Doerr, Gambacorta, and Tissot (2022).	The study contributes to the limited studies on BDA adoption in some of the banking sectors in Ghana. The findings provide an avenue for future studies to delve deep into how the BDA adoption makes these banks competitive among themselves. The Delone and Mclean success IS model is one of the few theories that have been used to study BDA adoption. Due to time constraints, the researcher was unable to explore more dynamics of BDA adoption in some Ghanaian banks.

Research Objective	**Research Findings**	**Extant Literature**	**Contribution, Implication, and Recommendation**
To investigate the enablers and constraints of BDA in Ghanaian banks.	From the findings, it was evident that some banks in Ghana lack network connectivity, data literacy, and lack of source code to develop the analytics further. From the findings, it was apparent that some banks in Ghana had Microsoft Excel skills and the quality of the data they generate serves as an enabler to BDA adoption	Behl, Dutta, Lessmann, Dwivedi, and Kar (2019); Hajiheydari, Delgosha, Wang, and Olya (2021).	The study provides enablers and constraints to BDA adoption in some Ghanaian banks. This will assist banks yet to adopt BDA on how to successfully adopt the system. The Delone and Mclean success IS is one of the few theories that have been used to study BDA adoption. Due to time constraints, the researcher was unable to explore more dynamics of BDA adoption in some Ghanaian banks. The findings can inform policy-making bodies and banks on how best to adopt BDA to help in their operations.

Research Objective	**Research Findings**	**Extant Literature**	**Contribution, Implication, and Recommendation**
To examine the impact of BDA on Ghanaian banks	Findings indicated that there was a positive influence between BDA Information Quality, BDA System Use, and BDA User Satisfaction. Also, BDA Service Quality had a positive influence on BDA System Use and BDA User Satisfaction. In addition, BDA System Quality had a positive influence on BDA System Use and BDA User Satisfaction.	Elgendy and Elragal (2016); Mukred and Yusof (2018); Owusu (2020); Jaafreh Bakhit (2017); Khand and Kalhoro (2020); Bharati and Bharati (2016); Owusu (2020); Almutairi et al. (2016); Acheampong and Moyaid (2016); Owusu (2017); Hong and Ping (2020); Mukred and Yusof	The study contributes to the existing BDA platform studies, by validating the updated Delone and Mclean IS Success Model Success Model, backed by an interview done with bankers, to examine the impact of the BDA platform in some Ghanaian banking sectors. In terms of practice, the findings revealed that although information quality was not found to have a significant effect on BDA system use, the relationship between BDA information quality and BDA user satisfaction was found to be strongly significant. The study recommends that systems designers make full use of the timeliness, usefulness, relevance, completeness, and accuracy of the information in the user

	However, BDA Time had a moderating effect on the relationship between BDA System Use and Net Benefits and BDA Time had a moderating effect on the relationship between BDA User Satisfaction and Net Benefits. BDA System Use and BDA User Satisfaction had a direct effect on Net Benefits	(2018); Owusu (2020); Baig et al. (2019); Rouibah et al. (2015).	manual to help increase user satisfaction with the BDA platform. Given this, the current study recommends that developers of the BDA platform should focus on developing systems that are visually appealing and provide help when necessary.

Source: Author's construct

Table 7.2 Propositions made from Discussions.

NO	Propositions	Bankers
1	*BDA Information Quality will positively influence BDA System Use.*	
1a	*BDA Information Quality will positively influence BDA User Satisfaction*	✓
		✓
2	. *BDA System Quality will positively influence BDA System Use.*	✓
2a	*BDA System Quality will positively influence User Satisfaction.*	✓
3	*BDA Service Quality will positively influence BDA System Use*	✓

3a	*BDA Service Quality will positively influence User Satisfaction.*	✓
4	*BDA System Use has a positive influence relationship with User Satisfaction.*	✓
5	*BDA System Use will have a direct relationship with Net Benefits*	✓
6	BDA User Satisfaction will have a direct relationship with Net Benefits	✓
7a	*BDA Time will have a moderating effect on the relationship between BDA System Use and Net Benefits.*	✓
7b		

	BDA Time will have a moderating effect on the relationship between BDA User Satisfaction and Net Benefits.	✓

Source: Author's construct

The correct symbol ✓ used in table 7.2 indicates how the seven constructs of the Delone and Mclean IS Success Model positively influence each other and BDA time as a moderating variable will have a direct relationship with BDA System Use, BDA User Satisfaction, and Net Benefits.

7.3 Implications to Research, Policy, and Practices

The study's significance can be examined from three angles: its implications for practice, research, and policy.

7.3.1 Implication to Research

In terms of the study's research implications, it contributes to the body of knowledge already known about big data and analytics, particularly in the setting of a developing economy. It also fills in research gaps given the dearth of academic or intellectual studies conducted in the setting of developing economies. Big data and analytics have been highlighted as a field with a bright future, and this research offers a solid foundation for academics and students who desire to conduct research in the field not just in Ghana but also elsewhere in the globe, especially in other developing nations.

Regarding the research's addition to knowledge, it conceived a framework that was based on the Delone and Mclean IS Success Model success model, which had been extensively employed quantitatively and qualitatively in subsequent studies. The Delone and Mclean approach had, however, been used qualitatively to explain BDA's impact on some Ghanaian banks. Therefore,

this study lays the groundwork for future studies that can quantitatively examine Delone and Mclean's IS success model on the impact and adoption of BDA on Ghanaian banks.

7.3.2 Implication to Practice

Concerning the implication to practice, this study reveals the key enabling and constraining factors confronting big data and analytics as well as the impact and adoption of big data and analytics not only from the literature but also by offering some sort of empirical proof from the field. The propositions of this study will further serve as strategic guidelines for all stakeholders in Ghana and other developing countries who use big data and analytics to comprehend its nature and that which constrains and enables some banks will use to make Ghana a hub for application development. Based on the findings, the study provides an avenue for managers to take note of the enablers and constraints of BDA adoption. Banks that are yet to adopt BDA can also take note of the constraints to successfully implementing BDA.

7.3.3 Implication to Policy

Concerning policy, this research calls on Government agencies responsible for communication, for instance, A While the National Communication Authority and Central Bank of Ghana have the authority to develop policies that support banks in adopting and using Big Data Analytics (BDA), there may be feasibility challenges associated with implementing such policies. Some potential challenges include:

Lack of resources and expertise: Implementing BDA policies may require significant investments in technology, data infrastructure, and skilled personnel. Banks in Ghana may face difficulties in allocating adequate resources and finding qualified professionals to manage and analyze the vast amounts of data generated by BDA systems.

Data privacy and security concerns: BDA systems often involve the collection, storage, and analysis of sensitive customer data. Banks in Ghana may need to establish robust data protection measures to ensure the privacy and security of customer information, which could add to the complexity and cost of implementing BDA policies.

Integration with existing systems: Integrating BDA technologies with existing banking systems and processes may pose challenges. Banks in Ghana may need to make significant adjustments to their existing infrastructure and processes to accommodate BDA, which could be time-consuming and costly.

Regulatory environment: The National Communication Authority and Central Bank of Ghana may need to develop new regulations or guidelines to govern the use of BDA in the banking sector. This process may involve coordinating with various stakeholders, such as the privacy commissioner and other data protection authorities, which could be a complex and time-consuming process.

Public acceptance: The adoption of BDA in the banking sector may also be influenced by public perception and acceptance. Banks in Ghana may need to invest in public relations and awareness campaigns to educate customers about the benefits and potential risks associated with BDA, which could be challenging given the relatively low levels of digital literacy and internet penetration in the country.

Finally, the Government agencies are responsible for the Data Protection Act for effective risk data aggregation and risk reporting, where its objective is to strengthen, banks' risk data aggregation capabilities and internal risk reporting practices to enhance the risk management and decision-making processes at the banks.

In conclusion, while the National Communication Authority and Central Bank of Ghana have the authority to develop policies that support banks in adopting and using BDA, they may face various feasibility challenges in implementing these policies. Banks in Ghana will need to address issues such as resource allocation, data privacy and security, system integration, regulatory environment, and public acceptance to successfully implement BDA policies.

7.3.4 Limitations and Suggestions for Future Research

Several restrictions and suggestions for future research were found as this study was being conducted. Some of these restrictions and suggestions are:

First, the challenges to big data and analytics adoption and their impact on Ghanaian banks were examined in this study using a qualitative methodology. Additionally, conducting this study quantitatively would yield different results. To provide some generalization in these areas, the researcher advises pursuing this analysis utilizing a quantitative and mixed approach.

Second, the scope of this research is limited because it was created from the perspective of some bankers without considering some banking clients. Therefore, pursuing a multi-perspective study that also involves banking customers would be imperative.

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APPENDIX A

UNIVERSITY OF GHANA
BUSINESS SCHOOL
DEPARTMENT OF OPERATIONS AND MANAGEMENT INFORMATION SYSTEMS

UGBS
University of Ghana Business School

Ref. No.:.....INTRO/OMIS/0422/05.....

19th August, 2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

LETTER OF INTRODUCTION – ERICA TAYLOR (10877258)

I write to kindly introduce to you the above-named second year MPhil student from the Operations and Management Information Systems department, University of Ghana Business School.

Erica is working on a dissertation titled '**Big Data and Analytics Adoption and its Impacts on Organizations: The Case of Ghanaian Banks'.**

The thesis is being supervised by Dr. Owusu Acheampong, a Lecturer in the department.

Erica intends to carry out data collection in your organization.

I should be very grateful if you could provide the necessary information and assistance for the successful completion of this thesis.

Thank you for your anticipated co-operation.

Yours faithfully,

Prof. Anthony Afful-Dadzie
Head of Department

INTEGRI PROCEDAMUS

APPENDIX B

University of Ghana Business School

INTERVIEW GUIDE

Introduction:

My name is Erica Ekua Obo Taylor an MPhil student of the Operations and Management Information Systems (OMIS) Department, University of Ghana Business School pursuing Management Information Systems. I am conducting a study on ***Big Data and Analytics Adoption and its Impact on Organizations: The Case of Ghanaian Banks.***

Overview of the Research:

Businesses in Ghana as well as in other countries have used various analytics tools to assist in the organization, storage, and use of the information available both externally and internally. This study, therefore, seeks to examine the impact of Big Data and Analytics (BDA) on the banks in Ghana, as it will provide insights into what BDA tools have been implemented, and how BDA has been used to improve the effectiveness and efficiency of the banks' operations, among others.

This research seeks to meet the following objectives:

1. To examine the current state of BDA in Ghanaian banking sector
2. To investigate the enablers and constraints of BDA in Ghanaian banks
3. To examine the impact of BDA on Ghanaian banks

You are however not under any obligation to answer the questions to which you feel uncomfortable with. Thank you in advance for your invaluable contribution. Your participation is vital to the

success of this research. Be rest assured that the information you will provide is intended solely for academic purposes and you can as well contact or email us on the information provided in case of any additional information. Thank You.

Erica Taylor

E-mail: etaylor002@st.ug.edu.gh

Contact: 0504706360

Dr. Acheampong Owusu

E-mail: aowusu@ug.edu.gh

PART A

A. Background of Respondent:

1. Please tell me about yourself.
2. What is your level of education?
3. What is your position in this Bank?
4. Describe the ownership structure of your Bank (Local Public, Local Private, Foreign).
5. How long have you been employed in this bank?
6. Has BDA been adopted in your bank?
7. How often does your bank use BDA?
8. What is the number of business operations and activities in the bank that requires high use of BDA?
9. Please indicate your experience with BDA (Less than 1 year, 1-3 years, 4-5 years, over 5 years).
10. What are some of the challenges faced using BDA?
11. Are there any policies that govern the use of BDA?
12. Do you have enough resources to operate BDA?

13. Which other enables has helped your bank successfully to use BDA?

PART B

B. Big Data and Analytics (BDA) Information Quality

14. What is the accuracy of information obtained from the system?
15. Does the system provide sufficient information?
16. How timely is the information obtained from the system?

C. Big Data and Analytics (BDA) System Quality

17. How easy is it to use BDA platform?
18. Is the BDA platform user friendly?
19. What is the response time when using the platform?

D. Big Data and Analytics (BDA) Service Quality

20. How do you find your understanding of using the platform?
21. How easy is it for you to use the platform?
22. How do you find learning to use the platform?

E. Big Data and Analytics (BDA) System Use

23. How does BDA help the bank to make decision?
24. How often do you use BDA?
25. How much time do you spend when using the system?

F. Big Data and Analytics (BDA) User Satisfaction

26. How satisfied are you with the output from the BDA platform?
27. Has BDA met your expectation?

G. Big Data and Analytics (BDA) Net Benefits

28. How does BDA make your job easier?
29. How does BDA help you save time?
30. Does BDA help enhance your productivity?

H. Time

31. How long has BDA been implemented in your Bank? (Less than 1 year, 2–5 years, 5-10years, over 10 years). Please indicate.
32. Since the implementation, has BDA brought a significant impact on the Banks performance?

Closing Remarks:

I have completed my questions. Do you have any additional inquiries or anything you would like to share that you may not have included earlier?

Are there any available documents (manuals, brochures, flyers) that can provide me with further information?

Thank you for your time and participation.