A Critical Analysis into Big Data Analytics as a weapon for Competitive Advantage for Commercial Banks in Zimbabwe.

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This research study was conducted to finalise my Master of Business Administration Degree specialising in Strategic Leadership and Corporate Governance at the University of Zimbabwe. I have always been interested in technical problems and my goal is to make innovations more tangible, especially in the field of IT, turning these innovations into business opportunities. This journey could not have been completed without the contribution of several people.

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DEDICATION

I dedicate this project to my wife and kids, my entire family and my supervisor for their contributions, support and encouragement throughout the entire project.

ABSTRACT

This research focused on the analysis of Big Data and its Analytics and competitive advantage in the commercial banking sector of Zimbabwe, particularly in Harare and was based on the following objectives: the relationship between Big Data Analytics and the competitive performance of commercial banks in Zimbabwe, how Big Data Analytics create value for commercial banks through competitive advantage, the challenges of big data analytics in the commercial banking industry of Zimbabwe, the current status of commercial banks in Zimbabwe in terms of a data analytic culture and the extent to which the commercial banking industry is embracing the concept of Big Data and Analytics. A descriptive study was used to collect data for this survey. The target population for this study consisted of commercial banks in Zimbabwe, particularly in Harare. According to the RBZ, the total number of commercial banks registered in Zimbabwe is thirteen. A sample of ten (10) commercial banks was taken due to limited time for data collection and analysis. The sample was selected based on an evaluation, taking into account big data analytics usage by the bank. This research used primary data collected through structured questionnaires. Respondents were from IT and Business Intelligence departments, those dealing with organisational strategies, IT and business intelligence. Data were analysed using frequencies, percentages, means and techniques of standard deviation and regression. The study found that commercial banks have invested in data storage facilities and advanced intelligent tools to analyse and anticipate customers' behaviour. These tools enable firms to anticipate consumers' needs more effectively, as well as optimise their operations. Systems that incorporate big data analytics into daily business routines allows them to obtain higher levels of knowledge in the context of big data, enabling more effective decision-making. There are challenges in managing big data sets that, if addressed, can help organisations realise the full potential of big data tools and various analytics, especially in areas of competitive advantage. This study, through a complete review of its findings, concludes that the Big Data and its Analytics is driving competition at a tremendous rate. The banks are now discovering important data with great potential that they have had in their storage for decades.

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ABBREVIATIONS AND ACRONYMS

BDA – Big Data Analytics

OADC – Organisational Data Analytic Culture

ABDM – Analytic Based Decision Making

RBT – Resource Based Theory

BD – Big Data

IT – Information Technology

ICT - Information and Communication Technology

BI – Business Intelligence

IS – Information Systems

RBZ – Reserve Bank of Zimbabwe

Chapter 1 : INTRODUCTION

The emergence of Big Data today has taken the whole world by storm. The huge amounts of data emanate from various available digital sources has triggered companies to tap into the data that was considered to be of less value. The importance of data analytics is tremendously growing making today's companies knock the doors of the digital space to realise the greatest benefits from the unaccounted data considered of less importance. This is a disruptive technology that is a game changer in today's businesses and for firms to become data-driven is a cultural challenge, not just a technological one. Big data analytics is an emerging BD technology, and has become a mainstream market adopted broadly across industries, organisations, and geographic regions and among individuals to facilitate data-driven decision making for business and individual's hedonism (Shen et al., 2015).

The banking industry for the long time had access to data which provides an understanding into how their customers live the way they live. This data has been accumulating for so many years thanks to the multimedia systems dependent on smartphones and several social media tools. For commercial banks, this could indicate an increasing number of so many new opportunities to create linkages with customers and gain a valuable understanding that would improve engagement with end customers thereby creating more value to them. BD tools and techniques help banks to detect the occurrence of fraudulences by highlighting the exact area, reduces the risk factors of the organisation and to segment customers based on the dimensions of products and services (Bhuvana, Thirumagal and Vasantha, 2016). The problem has been that while the data accessible and available to banks about their customers is growing, it has been extremely difficult to appropriately dig and extract the exact worth and insights that can be highly considered. The banking industry is strategically positioned to make use of big data analytic tools so as to gain a competitive edge through improving customer experience and operational efficiency.

This study focuses on commercial banks of Zimbabwe on how they can tap into the BDA to create a data-driven culture to improve customer experience and operational efficiency. The Reserve Bank of Zimbabwe (RBZ) is the central monetary authority of the Zimbabwe. Founded in 1964, the RBZ supervises all financial institutions, building societies, and all other banks in Zimbabwe. It is responsible for formulating and implementing monetary policy, maintaining price stability, and promoting a stable financial system in the economy. Amongst the commercial banks in Zimbabwe, CBZ, NMB, Steward Bank, Ecobank, MBCA, Stanbic, Standard Chartered and Barclays Bank are few examples available.

1.1 BACKGROUND OF THE STUDY

The “Big Data” term, as coined by Roger Mougalas from O'Reilly Media in 2005, has been applied to data sets that persistently grow large to the extent that they become difficult to work with using available traditional methods. The data sets sizes are big enough beyond the ability of commonly used technological tools and storage systems for capturing, storage, management, as well as processing the data within an acceptable time.

In the commercial banking sector of Zimbabwe, under the big banner of BD, there are two common sources of data that these entities can rely on. Firstly, we have data obtained within banks through automation and shared access. This can include data from emails, computer servers, automated systems, business process events and client databases. Secondly, we have data obtained from outside the corporate network and this has been the centre of attraction for many corporations in today’s businesses as there is a lot more data that can be obtained from outside the organisation. Some of this data is available publicly freely and some through paid subscriptions. This data is available on social media platforms/sites, literatures distributed by competitors, customer complaints posted on the bank websites, and from the Internet sites.

Big Data concept is defined by four “Vs” which are; Volume, Velocity, Variety and Veracity. Big data are enormous in terms Volume, high speed in terms of Velocity, perceive truthfulness in terms of Veracity and high variety information assets require new ways of processing to enable enhance decision making, obtain new discoveries and process optimisation (Kubina, Varmus and Kubinova, 2015). Big Data is characterised by high volumes of data, which has seen most corporations struggling with the increasing sizes of the databases. Velocity represents the throughput of data, which is the speed at which data is transferred from one point to another as well other representing latency. Variety represents different types of data formats, a variety of applications as well as overwhelming sources of data. Finally, veracity represents the credibility of sources of data source and its truthfulness.

This research focuses on BD and advanced analytics as they are at the centre of how commercial banks in Zimbabwe can equip themselves to deliver better value to their end customers, and at the same time decreasing the operating costs, mitigating credit and operational risks, to gain competitive advantage.

1.2 RESEARCH PROBLEM

The commercial banking industry in Zimbabwe is lacking a data-driven culture therefore triggering a miss of opportunities available on the benefit of applying the concept of BDA in their operations. Commercial banks provide financial solutions to end customers through a number of different

platforms, such as online banking, mobile banking, walk-in services and many more others. One of their corporate ambition is to; capture more data, data storage, analyse data as well as to increase the organisational performance by making well informed decisions based on the collected data, so as gain a competitive advantage. Therefore, to realise this ambition, these banks need to create departments for all the BD issues as well as specific data analytics. The increase in information level and the associated tools has created a new breed of sophisticated consumers. These consumers are far more analytic, far savvier at using statistics, and far more connected, using social media to rapidly collect and collate opinion from others (Sathi, 2012).

Right now, the commercial banking industry in Zimbabwe is experiencing few drawbacks to have a more data-driven culture. The employees of these firms view BD as a jargon and a catch phrase. The culture within the corporations is that they still rely on experience, gut feelings and intuition for making day-to-day decisions. Therefore, the banks are struggling to instil a data-driven culture and to increase the organisational performance by making informed decisions based on data. This would add on to the banks to have a competitive edge. To conclude this, commercial banks in Zimbabwe need a good practical tactical approach to start with BDA to optimise the current BI processes, in order to create a data-driven culture.

1.3 RESEARCH OBJECTIVES

The main aim of this research is to establish the extent to which commercial banks in Zimbabwe utilise big data analytic tools as a weapon to gain a competitive advantage. Therefore, this research will examine how these banks can start with big data and analytics to optimise the current business transaction processes and gain a competitive advantage. This research will be guided by the following objectives:

- To investigate the relationship which is there between the BDA and competitive position of commercial banks in Zimbabwe.
- To examine how big data and its analytics create value for businesses through competitive performance.
- To determine the challenges of BDA in the commercial banking industry of Zimbabwe.
- To determine the current status of commercial banks in Zimbabwe in terms of a data-driven culture.
- To establish the extent to which the commercial banking industry is embracing the concept of Big Data and Analytics (Capabilities).

1.4 RESEARCH QUESTIONS

This study seeks to answer the following research questions:

1. How commercial banks in Zimbabwe can start with Big Data and Analytics to get more value out of the BD and create a data-driven culture to optimise the BI processes in a way to gain competitive advantage?
2. How BDA is used and perceived in commercial banking industry to affect competitive performance.
3. How can data analytics through a data-driven culture influence competitive advantage?
4. To what extend does a match between BD, employees' capability, data analytic tools and tasks influence an organisation's competitive advantage?
5. What instruments drive data analytic corporates to achieve competitive advantage?

1.5 HYPOTHESIS/PROPOSITION

Can Big Data Analytics create competitive advantage, and if so, what mechanisms drive analytic organisations to achieve competitive advantage.

H_1: Big Data and its Analytics has a positive effect on competitive performance.

H_2: There is a positive relationship between Big Data and a data-driven culture.

H_3: Big Data and its Analytics leads to competitive advantage through analytics-based decision-making.

H_4: Organisational data analytic culture has a positive indirect effect on competitive advantage through Big Data and its Analytics.

1.6 SCOPE OF RESEARCH

This study is restricted to a sample of banks, which has been selected from a population of available commercial banks in Zimbabwe. The research is going to focus on the commercial banks in Zimbabwe located in the capital city Harare.

1.7 JUSTIFICATION

The banking and the financial sector in Zimbabwe will benefit a great deal from this research, as it will provide resourceful information to them with all the avenues of making accurate decisions, based on BDA. Through a research on data analytics, several methods to avoid poorly calculated risks can be identified. With the introduction of data analytics approach, commercial banks and related firms fosters their chances of remaining significant in their respective fields. This research

will help identify hidden patterns of data that were considered of less importance, make it available to the firms and realise their great importance.

The study will contribute to the various business entities by making the concept of BDA understandable. Big data involves large amounts of data measured in terabytes and even more, that flows through various technological devices such as mobile smart phones and computers. Any organisation could drive all that large amount of data to increase its business value by using the right solutions. Today's big data analytic tools and technologies can transform any corporation especially the financial service sectors like these banking industry. Lack of abundant data is the major cause to manage risk in an organisation like banking industry (Bhuvana, Thirumagal and Vasantha, 2016).

The findings of this study will be of use to the academic fraternity including ICT practitioners, who would use BDA tools and technologies for the prevention of errors as well as crimes that are committed through fraudulent.

Other areas of applying the BDA tools can be identified, as there are so many areas available to apply the concept of BD. It is expected that this study will aid in identification of further research based on this subject.

1.8 DISSERTATION OUTLINE

This dissertation consists of five (5) chapters. Following this Introduction, first chapter, is the literature review on the second chapter. Literature review involves a critical thinking on the research problem, and this will include tapping into some underpinning theories relevant to this study, identifying the research gaps and extract the value of study to the different fraternities. This chapter is concluded by bringing together the findings from the literature review and design a theoretical and conceptual framework that would represent the real model of this study.

The third chapter is the research methodology and data collection phase. In this chapter, I present the methodology and data collection tools for this research. I will establish the research approach, philosophy, research strategy, and research sampling. I will present the data sources and methods applied for data collection and analysis techniques.

The fourth chapter will contain data analysis and presentation. Here, the results of the study are presented; a data-driven culture through BDA is delineated. The advantages of a more data-driven culture through BD in banks are defined as well as the challenges associated with BD. The acquired results are analysed and compared to the existing literature. The theoretical framework is remodelled to match the revised version of the framework.

The fifth chapter, which is the final chapter, the study is concluded. A summary of the findings is provided. Limitations of the study, recommendations and the values of the research are explored.

1.9 CHAPTER SUMMARY

This first chapter has provided a synopsis of the study by looking into the concept of BDA in improving competitive performance for organisations particularly commercial banks in Zimbabwe. In doing so, the chapter has identified the research questions and objectives of this study as the propositions that need answers from this research. Finally, the chapter has reflected on how this study will contribute to the application of BDA in the commercial banking industry of Zimbabwe and how these entities can identify hidden patterns in data through a data-driven culture. The next chapter attends to the literature review.

Chapter 2 : LITERATURE REVIEW

2.0 INTRODUCTION.

BDA have been discussed in various literature particularly in areas of IS and Business disciplines. There are publications on the benefits obtained from BDA and one of the acclaimed benefits of BDA is that it creates a competitive advantage through improved managerial decision making (Tiel, Gorp and Price, 2017).

In this chapter, in form of evidence, descriptions, summaries and critical evaluation will be given on information and knowledge available in different literatures on the relationship between BDA and competitive performance. This chapter has various section that looks at the narrative on the subject matter in discussion. It will provide an explanation on the search strategies for the literature used in this research, definitions relating to BDA terminology, major theoretical frameworks and models, value and importance of the subject in discussion, the conceptual framework and the discussion of the key variables.

2.1 LITERATURE SEARCH STRATEGY.

The process of developing search strategies for a research involves continual assessment and refinement of the literature, that is, it is an iterative process. Searching for evidence sometimes is deemed to be more of an art rather than a science. When beginning to search for the evidence, few small searches must be conducted to test for both various combinations of terms and search terms. The search strategies for this research are both specific and sensitive as the sensitive search pinpoints the relevant studies while specific search may ignore irrelevant studies.

The purpose of this literature review is to assess the contributions of the existing narratives to the subject under discussion, which is the relationship between BDA and competitive performance. This will allow the identification of new relevant information streamlining it from the existing knowledge. Gaps in the research will be identified thereby providing a rationale for analysis of this research. A systematic literature review is conducted which provides for a well-defined search strategy identifying some of the available research data relevant to BD and competitive advantage. The systematic review that includes both published and unpublished studies evaluates, synthesises and appraises the data by use of a clear methodology gathering data from various individual sources.

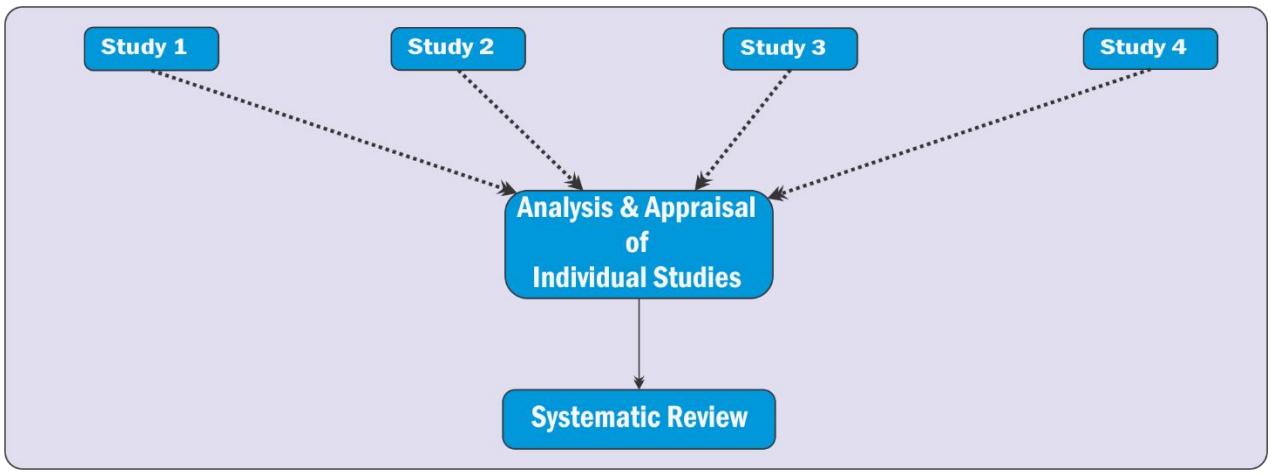

Figure 2.1: Literature Search Process

Systematic review process in BDA and competitive performance literature summarises the existing knowledge on the topic very effectively. Findings can be replicated and peer reviewed protocol to establish the search strategy and the selection criteria for the available resources to be included and excluded.

The following search strategies were used in literature gathering for this research:

1. **Keyword searching-:** The first formal step in all searches is to determine any alternative terms or synonyms for the identified concepts in the logic grid (Aromataris and Riitano, 2014). Keyword searching involves the use of natural language to describe the topic in discussion. The database checks keywords anywhere in the record for the resource such as the author, title, subject headings and so forth. Keyword searching is very flexible strategy for searching as different terms can be combined in different ways to yield better results. However, the negative side of it is that, it provides a huge amount of results, which may yield irrelevant results, which may prove it difficult to extract the relevant data.

2. **Cited Reference Searching**-: this involves finding particular sources on BD, data analytics and competitive advantage that have cited a certain author or source. Cited references are a common feature in the Academic search complete of Language Literature and Communication's (LLC) collection of EBSCO host databases and catalogues. Citing references has an advantage of tracing how influential research findings have been discussed. It is very useful for identifying sources that are out of print or those that are difficult to access. However, it requires consideration of misrepresentation from the identified sources as it is second hand.

3. **Controlled Vocabulary-**: this refers to a set of predefined words assigned to describe the content of resources in a database (Wetzel, Kotula and Grantham O 'brien, 2013). The most common are the subject headings in the content of a resource; they act as access references assisting users to locate sources. Resources grouped under BDA and competitive performance subject heading can be accessed quickly once that subject heading for the terms has been identified.

4. **Bibliography Mining-**: this is a process of reviewing references at the end of the book, article or a journal and mining further relevant resources that are of interest to the subject in discussion. Online bibliographic databases contain abundant information about research publications in different fields and each such database forms a gigantic information network, connecting in complex ways research papers, authors, conferences/journals, and possibly citation information as well (Sun, 2015). This allows tracing the history and evolution of a BD, data analytics and competitive advantage.

There is no prescriptive approach of conducting comprehensive search on BD, analytics and competitive advantage. Literature searching is an art rather than science, which can be cultured and practiced. It involves different processes, like developing search strings, bibliography mining on citation databases that index the relationship between BD, data analytics and competitive advantage, looking for unpublished narratives and hand searching.

2.2. DEFINITIONS.

2.1.1 Data

Data are symbols (Ackoff, 1989). It is raw, it simply exists and has no significance beyond its existence; it can exist in any form either usable or not and it does not have meaning of itself (Bellinger, Castro, and Mills, 2004). Data is pretty different from information as information is data that has been given meaning by way of relational connection and this "meaning" can be useful, but does not have to be (Bellinger, Castro, and Mills, 2004).

Data can be structured (standard) or unstructured within an organisation. Structured data is the data organised in a standard form by codes or classification that a computer can read. Unstructured data is non-standard data not organised into tables and cannot neither interpreted by databases tools nor natively used by applications. Unstructured and semi structured data share almost similar properties. In other words, unstructured data has no identifiable structure and is, therefore, not so easily usable (Ohlhorst, 2012). The data is collected so to be analysed to identify hidden patterns and correlations that may be of importance in making business decisions.

2.1.2 Organisational Data Analytic Culture

A data-driven culture means that organisational staff at all levels use data either structured on unstructured data to inform and guide decisions either clinical, operational or financial decisions (Heartbeat and Care, 2016). They understand the differences between structured and unstructured data, qualitative and quantitative data and the role that each plays in decision-making. Leaders and staff members in organisations that are data-centric embrace the data as a gift of learning rather than a tool of criticism (Heartbeat and Care, 2016).

"For culture to transform, someone must transform data into information and institutional learning through examination and translation. Developing such culture requires supported exertion over an extensive period of time at different organisational levels. In any case, someone needs to lead the pack; to advocate for, and keep up spotlight on this method of reasoning and practice.". (Leimer, 2012).

2.1.3 Big Data

Big data refers to datasets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyse (McKinsey Global Institute, 2011). Big in BD refers to the big **size**, big **complexity** rather than big volume; it can be small and not all large datasets are BD and size matters, but so does the **accessibility, interoperability** and **reusability** (Belloum, 2013). The Data is too big, moves too fast, or doesn't fit the structures of database architectures (Dumbill, 2012). It is the three characteristics of BD; volume, velocity and variety which can capture the true meaning of BD (Krishnan, 2013). Some literatures refer to these three characteristics as three V's volume, velocity and variety.

Volume simply refers to the aggregation that used to be measured in terabytes (TB), petabytes (PB) and now in Zettabytes (ZB), all the transactions, records, tables and files. Big Data is characterised by high volume sizes that are beyond the ability of traditional software tools. Data volume can be measured by the sheer quantity of transactions, events, or amount of history that creates the data volume, but the volume is often further exacerbated by the attributes, dimensions, or predictive variables (Michael, Michele and Ambiga, 2013). High volume data for the commercial banks in Zimbabwe arise from many years of customer records and transactions. Huge amounts of data collected are a result of advancement of technology, which has triggered the costs of data environments to come down, and companies now start to collect transactional data.

Data variety is the assortment of data (Michael, Michele and Ambiga, 2013). Sometimes the data is not even in the traditional format as we assume, it may be in the form of video, SMS, pdf or

something we might have not thought about it (Anuradha, 2018). It is now the duty of the organisation to arrange it and make it meaningful. Traditionally, most data is structured as it is put into a database based on the data type, that is, character, numeric, floating point and so forth. However, with time data is increasingly becoming unstructured, with some data being semi-structured, as the data sources have flourished beyond operational applications.

Data velocity is about the speed at which data is created, accumulated, ingested, and processed (Michael, Michele and Ambiga, 2013). Velocity is another dimension concerns the definition of BD, specifically referring to the time-sensitive nature of the BD, as the speed of data creation and use is often real-time. With the uprising velocity in which data is growing it faces limitation such as storage, technologies capacity of acquirement and process, lack of places to store this information, the difficulty of its manipulation and the fast and constant growth that overcomes the technologies that process it (Porter, 1985). The increasing speed in technology advancement is forcing businesses to process data and information either in a real-time or in near real-time responses but preferably in real-time responses. This means that data has to be processed live while streaming in order to make quick, real-time decisions and to make more timely decisions.

Big data now represents a technological trend leading to new approaches of understanding the world and make better decisions. Better decisions made from the structured, unstructured and complex data obtained from various sources such as social media platforms; Tweeter, Facebook, YouTube and so forth, and also data obtained from commercial transactions which traditional database tools and application find it difficult to process. Big data appears in two forms, one being in movement and another at rest. Data in movement such as Tweets/Retweets, Facebook comments, YouTube videos, Stock Market Data, sensors and so on. Data at rest represents the collection data that has been streamed, emails, weblogs and data from the disparate systems.

2.1.4 Big Data Analytics

Big Data Analytics refers to a technology and framework for quickly storing, converting, transferring and analysing massive amounts of constantly updated, huge, varied, structured and unstructured data for commercial gain (Russom, 2011). Big data has a variety of uses including identification of potential problems after collection of sufficient customer data, recommendation of new products to consumers after studying/ analysing buying behaviour and formulation of better strategies in order to avoid repeat problems (Russom, 2011). If users cannot understand the analysis of BD, then data analytics becomes of limited value. Provided with the results of data analysis, a

decision-maker must be able to interpret the results based on the assumptions made and reviewing the data analysis.

2.1.5 Competitive advantage

Competitive advantage is a favourable position over competitors gained by offering clients and customers more value, either by offering lower prices or by giving extra benefits that legitimise comparative or perhaps higher prices. (Ehmke, 2008). This occurs when a firm has the ability to provide the same benefits as other competitors but at a very lower cost (cost advantage), or bring benefits that surpass those of rivals (differentiation advantage) (Wen-Cheng, Chien-Hung and Ying-Chien, 2011).

At the core of the success or failure of a firm is competition (Porter, 1998). According to Porter (1998), the three indicators of a company's competitive advantage are; Cost Leadership, Differentiation and Focus. The cost leadership is a strategy that involves ensuring firm's lowest cost in the industry. Reducing costs incurred to increase profits while ensuring industry averaged prices. Differentiation strategy simply involves taking steps to provide goods and services that are of high quality different from those of competitors. The findings of a study carried out on 64 American companies showed that performance of firms that utilised the differentiation strategy was more superior as compared to those that were reluctant to utilise it (Hall and Saias, 1998). Focused strategy is an integrated set of actions taken to produce goods and services that serve the needs of a particular competitive segment. Firms use a focus strategy when they utilise their core competence to serve the needs of a particular industry segment or niche to the exclusion of others. Examples of specific market segments that can be targeted by a focus strategy include a particular group, for instance, youths or senior citizens, a different segment of a product line, for example, products for professional painters or a different geographic market. There are various specific customer needs that firms can serve by using a focus strategy, for example, the Empower Bank of Zimbabwe which is a registered deposit taking Micro Bank formed with the purpose of providing social and financial solutions to the financially excluded population with greater focus on the youth (*Empower Bank*, 2018).

The above literature implies that competitive advantage is the ability to stay ahead of competitors, present or potential competitors' thus ensuring market leadership through competitive advantage. This also provides an understanding that firm's resources and the business strategy have a profound impact on gaining competitive advantage.

2.1.6 Bank

Bank is referred to as a financial institution that is licensed to receive deposits and extend loans, both short term and long term (*Commercial Banks*, 2018). There are different types of banks, some are commercial/retail banks and some are investment banks where by in most countries these all banks are regulated by central bank or a national government bank. In Zimbabwe, all the banks are regulated by the Reserve Bank of Zimbabwe (RBZ). A commercial bank accepts deposits and valuables from its customers for safekeeping with the main aim of making profit, and they provide services such as deposits, extending loans and offer basic investment products such as providing insurances.

The type of bank, the country it operates from and where it originated from, determines the service offerings. Some banks target individuals and some target businesses, but it most cases they target both individuals and businesses, offering services such as opening and maintaining accounts, both savings and current accounts, cash withdrawals, taking deposits from customers, providing financial advisory, giving/extending loans, issuing debit and credit cards, effecting money transfer transactions, selling insurance, travelling cheques, investments in securities, and foreign exchange among others (*Financial Intermediary*, 2018).

Banks fully operating on collected data either structured or non-structured. The rapid growth of unstructured/nonstandard data is causing some issues for the banks. The government regulations on banks subject them to certain requirements, guidelines and restrictions. These regulatory structures are there to create transparency between these financial institutions, the individuals and businesses with whom they do business with (*Financial Intermediary*, 2018). The regulations and compliance issues have put a strain on data management platforms because they require the delivery of high volumes of data, with low latency and banks must now meet a more stringent fiduciary responsibility to provide correct data to regulatory agencies.

2.3 THEORETICAL FRAMEWORKS AND MODELS.

Theory is as necessary as it is unavoidable (Wise and Shaffer, 2015). Without it, it would be impossible to learn or to act in a consistent fashion; without generalisations and abstractions, the world would exist for us only as a chaotic patchwork of discrete, disconnected experiences and sensory impressions (Brittain-Catlin, 2001). According to the vocabulary dictionary online, a theory refers to a set of accepted beliefs or organised principles that seeks to explain and guide analysis of a phenomenon. A theory can be referred to as a set of accepted beliefs or organised principles that seeks to explain and guide analysis of a phenomenon. According Wise and Shaffer (2015), a theory is defined in the context of it being different from practice, when certain principles are being tested.

The theories that are relevant to this study are; Competitive Advantage theory by Michael E. Porter, the Schumpeterian theory of innovation, the Transactional Costs Economic theory by Ronald Coase and the Resource Based Theory (RBT) by Jay Barney.

2.3.1 Competitive Advantage Theory

Competitive advantage is highly regarded as a heart of a business's performance in competitive markets (Porter, 2008). Firms nowadays are losing the sight of competitive advantage in their quest for growth and pursuit of greatness. The importance of competitive advantage in today's businesses is much greater than in yesterday's competitive markets. Competitive advantage emanates from value firms are able to create from its customers.

Competition in industries, determines the appropriateness of a firm's activities that contribute to its performance in terms of innovations, a data culture, and good implementation (Porter, 2008). A firm should establish a competitive strategy that can position it at a profitable and sustainable position within a competitive market against all the forces of industry competition. Porter (2008 identified two basic types of competitive advantage which are; cost leadership and differentiation. The cost leadership applies mainly to production firms where a firm is the low-cost producer in its industry. The sources of cost advantage may include the pursuit of economies of scale, preferential access to raw materials, proprietary technologies among others. However, a cost leader may not ignore the basis of differentiation, the product or service must be perceived as above average in terms of quality relative to its competitors. The difference must be highly noticeable.

From this evidence, Porter argues that for a firm to remain relevant in a competitive market, it must employ a competitive strategy that would differentiate it from its competitors. Firms that apply a data-driven culture through BDA can highly differentiate them from their competitors by extracting the benefits from the hidden data that was considered to be of less value, which competitors are failing to realise.

2.3.2 Schumpeterian Theory of Innovation

Schumpeterian innovation theory states that innovation is the source of value creation. It emphasises the importance of technology research & development (R&D). According to the theory, value can be created by innovative ways of introducing new goods, new markets, new production methods, new supply sources and the reorganisation of industries through technical innovation resulting in economic development (Amit and Zott, 2001).

New products and services can be created by remodelling the existing products, services and technologies through new innovative technologies. This gives a rise of complete new products, services and technologies and hence creative destruction also referred to as the Schumpeter's gale, which is, destroying the old markets by creating new markets. The important aspect of Schumpeterian theory of innovation is the explanation of how new products, services and technologies are created from combining the existing products, services and technologies.

Innovation can occur in different areas, depending on how the underlying resources of a business are configured and combined. It can occur in areas such as the business processes known as process innovation, strategic position of the firm, marketing strategies among others. Through innovative ways, resources of firm can be reconfigured to create new products and services and these resources are categorised in to two, knowledge-based resources and input resources. Knowledge-based resources are intangible resources needed to reconfigure and combine resources productively creating value. Knowledge-based (Big Data Analytics) resources provide a specialised understanding of different inputs and how these inputs are combined together to provide value to the firm (Galunic and Rodan, 1998). Input resources are the tangible resources such as the equipment, capital, property rights and people among other things. Schumpeter argues that in order for firms to make profits, they have to innovate. Existing products, services and technologies must be innovated or remodelled to create new products and services valuable to the firm. The commercial banks in Zimbabwe can innovate their existing products and services through data analytics to create new services that can position them to take charge in the stiff competitive market.

2.3.3 Transactional Costs Economic Theory

The transactional cost economics theory states that in order for firms to create value, they need to increase their efficiency in terms of production and provisioning of services and at the same time reducing its costs (Amit and Zott, 2001). The theory mainly focuses on efficiency enhancement, cost and effort reduction. Value creation and profitability for firms occur when increasing transaction efficiency and reducing costs. Research carried out on different firms show results that firms that use Transaction Economic theory performed much better in terms of efficiency and profitability than those that do not use the theory (Canabal and White, 2008). Transaction efficiency is contributed by many factors such as reputation, transactional experience, and trust with suppliers and service providers among others.

2.3.4 Resource-based View Theory

The resource based view theory takes the business resources owned by the firm as the core determinants of gaining a competitive advantage position and good performance. The performance of the business is mainly affected by the available resources and capabilities (Barney, 2001). This entails that all the resources owned by the firm gives it the ability to improve its efficiency and effectiveness through strategy implementation. Businesses must identify their strengths and weaknesses in order to develop strategies to fight competition and outperform competitors with bundles of resources available and capabilities. In the theory resources refer to a firm's assets, firm attributes, capabilities, data, organisational processes, information and knowledge (Big Data Analytics) amongst others, managed by the business that enable the it to implement strategies that expand its efficiency and effectiveness (Barney, 1991). Strategic utilisation of valuable resources helps business organisations to seize opportunities and neutralise threats in competitive markets. A business attains competitive advantage using this resource-based view when its competitors are neither able to imitate nor duplicate its levels of performance. Data is one of the value resource of firm and when BDA, a new technique in today's businesses, is incorporated in the strategic plans of a firm, it brings the uniqueness of products and services that are difficult to imitate, and there cannot be equivalent substitutes to that.

2.4 IMPORTANCE OF THE SUBJECT.

The greatest importance of this study is that it was never done before in Zimbabwe, so it is worthwhile to conduct this research to identify to what extent BD management and analytics contributes to the firm's competitiveness particularly firms in the banking industry. Similar studies were conducted elsewhere in this continent of Africa so; this research will borrow some ideas from those studies and understand if BD management and analytics is applicable to the commercial Zimbabwean Banking industry.

Data as a resource can significantly create value for the entire economy through enhancing productivity, increasing competitiveness of firms and creating economic surplus for the consumers (Lehdonvirta and Ernkvist, 2001). This basically shows the importance of this study as BD may help to create value to the banking industry by managing down huge costs of large-scale data management, and also driving the business effectively.

The management of BD for financial service firms is quite a big challenge, the huge amounts of data storage capacities required strains the ICT infrastructure of a firm. Big data has appeared to overwhelm management capabilities and there are insufficient data management practises. So,

embracing the BDA and management initiatives can help banks to acquire a competitive advantage and identify strategic opportunities (Ohlhorst, 2012).

Big data analytics help the top management in the commercial banking industry of Zimbabwe to make informed decisions on how to analyse data, deliver more targeted, and give effective offers to their customers. Big analytics helps these managers to predict customer preferences and provide them with a solid background on how interact with their customers. The top management will be able to deliver an improved actionable insight during the interactions between their customers and their contact centres. Big data analytics may provide the Fraud Investigation Division of the bank with a cost effective platform, which is scalable, integrated and secure, to quickly prevent, mitigate and detect internal and external frauds within the banking environment. Big data plays an important role of managing enterprise risk and fraud detection. It does so simply because the digital information offers a window to the managers, to see an array of risks being faced by their organisation.

Big data management technologies enable analytics to be conducted in real time basis. The popularity of the electronic trading in Zimbabwe means that Capital markets now need to capture the time-series data, especially from the period when the country started to embrace electronic transactions, and merge this data with real-time processing systems. The data management techniques now make it possible to leverage huge amounts of electronic data for supporting real-time decisions and risk management.

Apart from the financial service firms, BD can be of great help to the politicians. Taking for example the presidential elections of 2012 in the USA, BD helped Barack Obama to be successfully re-elected in to presidency against his opponent Mitt Romney. President Barack Obama had already a huge database of 13 million email listings from his 2008 campaign, Mitt Romney had to, from scratch to build a social media campaign because his party did not engage social media during the year 2008. The BD that President Obama had, helped him to tap those 13 million people who supported him in 2008 through social media platforms like Facebook, Twitter and emails among others.

Big Data brings transparency, to the work of government agencies. Through the potentials of BD, government agencies can operate more efficiently and make informed decisions. The data that accumulates over the years within government agencies can offer new opportunities for the agencies to extract insights and identify specific needs of a nation. The economy of Zimbabwe has been hit by cash crisis, manipulation of foreign exchanges by the parallel market referred to as the black

market. The central bank can make use of the BD management to identify unscrupulous activities on the parallel markets; they can identify hidden patterns of what is happening in the economy and identify the contributing factors to the cash crisis. Electronic transactions now make it easy for the financial institutions to collect data about their customers; they can identify customer needs to purchasing behaviour, and try to reach to their customer needs. Through BD management, financial institutions and government agencies have the ability to better understand consumers, impeccably matching offers to a customer's needs, and this would allow the financial institution to optimise the management of a long-term customer relationships. A similar research was done in Kenya by Davis Ndamo in 2016, in his thesis for the University of Nairobi, when he specifically looked at how BDA can drive competition of commercial banks and financial institutions in Kenya. The results of his study were that BD found a niche in the commercial banking and insurance industries of Nairobi. Therefore, similar research is worth to be conducted in Zimbabwean commercial banking industry to identify to what extend does it contribute to bank's competitiveness.

2.5 EXISTING MODELS/FRAMEWORKS AND KEY CONCEPTS.

For the past years, we have been witnessing an incredible growth within the volume and accessibility of data. This is a result of the emergence of a large number of sources, like computers, mobile devices, sensors and social networks that are constantly producing structured and unstructured data.

We have supported a paradigm shift from hard cover books to sophisticated databases that are continuously being populated every second at a very fast rate. Internet especially social media has contributed to the worsening of the situation (Mayer-Schönberger and Cukier, 2014). To take Facebook, as an example, it has over 5 billion pieces of content being shared among friends on daily basis (Noyes, 2015). Traditional Database Management Systems and Data Warehouses) are intended to handle certain amount of data, normally structured data, which is very different from the reality that we are facing today. Business is producing vast quantities of data, too big to be handled and analysed by our traditional databases and data warehouses, which are struggling to meet the requirements in terms of performance and scalability.

Therefore, recently a new tactic that aims to alleviate these limitations has been developed. Companies like Google, Facebook, Amazon and Yahoo, to name a few, are the pioneers in developing solutions to deal with "Big Data" circumstances, through technologies like Hadoop (Shvachko *et al.*, 2010) and (White, 2012) and MapReduce (Dean and Ghemawat, 2008). Big Data is a general term referring to enormous as well as complex datasets, made of a variety of data

structures either structured, unstructured data from a large number of sources (Hurwitz *et al.*, 2013). As stated earlier, Big Data is characterised basically by three Vs, and an additional fourth V; volume is the amount of data, velocity is the in and out speed of the data and lastly variety which bundles all the classes of data types as well as sources (Beyer and Laney, 2012). The other additional V is the veracity, which represents the truthfulness and authenticity of data (Duncan, 2014).

Implementing Big Data tools and technologies not only alleviates the above presented problems, but also opens up new avenues which allow value mining from BD. Big Data tools and technologies have been applied successfully in multiple environments like in marketing and electronic commerce, where count clicks that crowds do on Internet allow trend identification to improve campaigns, assess personal user profiles, so that the content shown is that the one he or she likes; (Noyes, 2015) public health and government consenting to the detection and stalking of disease outbreaks through social media; (Shvachko *et al.*, 2010) transport industry and surveillance, with concurrent improved projected times of arrival and smart resources usage.

2.6 KEY VARIABLES/DIMENSIONS.

A competitive advantage is a set of attributes that allow a business to outperform its competitors (Porter, 1998). Big data analytics is an answer to firms seeking to gain competitive advantage over their rivals in the same industry. The competitive advantage is made possible by the use of differentiation, focus and cost leadership strategies (Porter, 1998).

The Differentiation strategy involves taking necessary steps to ensure that the products and, or services of a firm are different from those of rival firms. Firms that use BDA in their operations lead in their various industries.

The Focus strategy works best when companies concentrate on a niche market instead of targeting the general market. In a study on sustainable competitive advantage of insurance companies in Kenya by Mbaluka (2013), the dominant finding was that constant evaluation of strategies employed especially in a crowded market enabled firms to remain leaders in their respective industries (Ilovi, 2011). The evaluation of these strategies calls for analysis of already collected data in order to understand and take advantage of it.

Fraud detection software applications are now in use by a number of financial institutions (Gadd, Karstedt and Messner, 2011). The financial institutions that are able to purchase and adapt to the new breed of software place themselves in a competitive position compared to their rivals (Zikopoulos *et al.*, 2011). Data analysis applications such as ‘Qubole’ have been adopted in some

banks across America. This has disadvantaged other banks without the finances to purchase the software (Wayner, 2012).

2.7 LITERATURE SYNTHESIS & CONCEPTUAL FRAMEWORK/MODEL.

Big data analytics in the commercial banking of Zimbabwe is a research area that has not been explored here Zimbabwe. Ndambo (2016), conducted a research on BDA on financial institutions in Kenya. His findings are that, companies in the financial industry specifically commercial banks and insurance firms, typically have data warehouses and BI tools for reporting on and analysing customer behaviour to better anticipate their needs, and optimise operations. There are challenges in the management of BDA that if addressed, can help organisations capture the full potential of the availability and use of BD. His study established that commercial banks and insurance companies already have hands-on experience with BD handling techniques and tools. The commercial banks and insurance firms under serious planning bracket represented those that are close to or on the verge of signing contracts for BD management.

Organisations with a data-oriented culture recognise analytics as a strategic asset, have strong leadership support for analytics and make insights from data widely available within the organisation (Kiron *et al.*, 2011).

Big Data can create competitive advantage by providing insights into consumer behavior patterns and improving process efficiencies for profitability that was previously not possible (Vinod, 2012). Big Data paradigm is taking hold of the strategies for future development of all global industrial players, and it is not unrealistic to assume that it will become commonplace in the short-term. **Appendix I** contains a list of all reviewed articles and findings for the purposes of the literature review, while **Appendix II**, is a table with research gaps established within this study.

In the financial sector of the Zimbabwean economy, a research on the effects of BD on Competitive advantage has never been conducted. Therefore, this research is going to fill-in the gaps of lacking data analytics in the financial sector of Zimbabwe particularly banks and insurance companies. However, this study is mainly focusing on commercial banks of Zimbabwe. Big data has the potential to add value by providing transparency with immediate performance feedback, experimentation with quick results, more segmentation that is precise, more objective decision-making and new products, thereby adding to the firm's competitive advantage.

2.7.1 Contradictions in the Research Area.

Big data term has become universal. Owing to common origin between the academia domain, the industry and additionally the media there is no a unified definition, and diverse stakeholders provide numerous and sometimes contradictory definitions. The lack of a reliable definition presents vagueness and creels discourse concerning BD and its overall effects to the business. From the point in time, it is clear that BD is tangled with wide technical and socio-technical problems however, a precise definition is unclear. Early literature that have used the BD term has come from a different number of fields. This joint attribution has led to different, ambiguous and very contradictory meanings. Therefore, to further the research goals and reduce ambiguity, a solid definition is needed.

Amongst the most cited definitions is that included in a Meta (now Gartner) report from 2001 (Douglas, 2001). The Gartner report makes no mention of the phrase "big data" and predates the current trend. However, the report has since been co-opted as a key definition. Gartner proposed a threefold definition encompassing the "three Vs": Volume, Velocity, and Variety. This is a definition rooted in magnitude. This definition has since been reiterated to include an additional V, which is Veracity, to make them four "Vs'. Veracity includes aspects of trust and as well as uncertainty regarding the data and the outcome of analysis of that data.

Early literature using the term, Big Data, has come from numerous fields. The importance of BDA has been viewed in different ways. To acquire business value from BDA, requires investments into BDA capabilities (Gupta and George, 2016). Big Data Analytics Capability has been defined as an organisation's ability to exploit the combination of data and its ICT components with the goal of achieving competitiveness (Garmaki, Boughzala and Wamba, 2016). In recent years, several researchers have focused their attention on systematically sorting and understanding these capabilities.

2.7.2 Conceptual Framework

To ensure the quality of the model, I developed a model that leverages prior research both empirical and theoretical, so that all the elements of the model are extensions of the established principles. This model seeks to visualise a set of derived hypothesis.

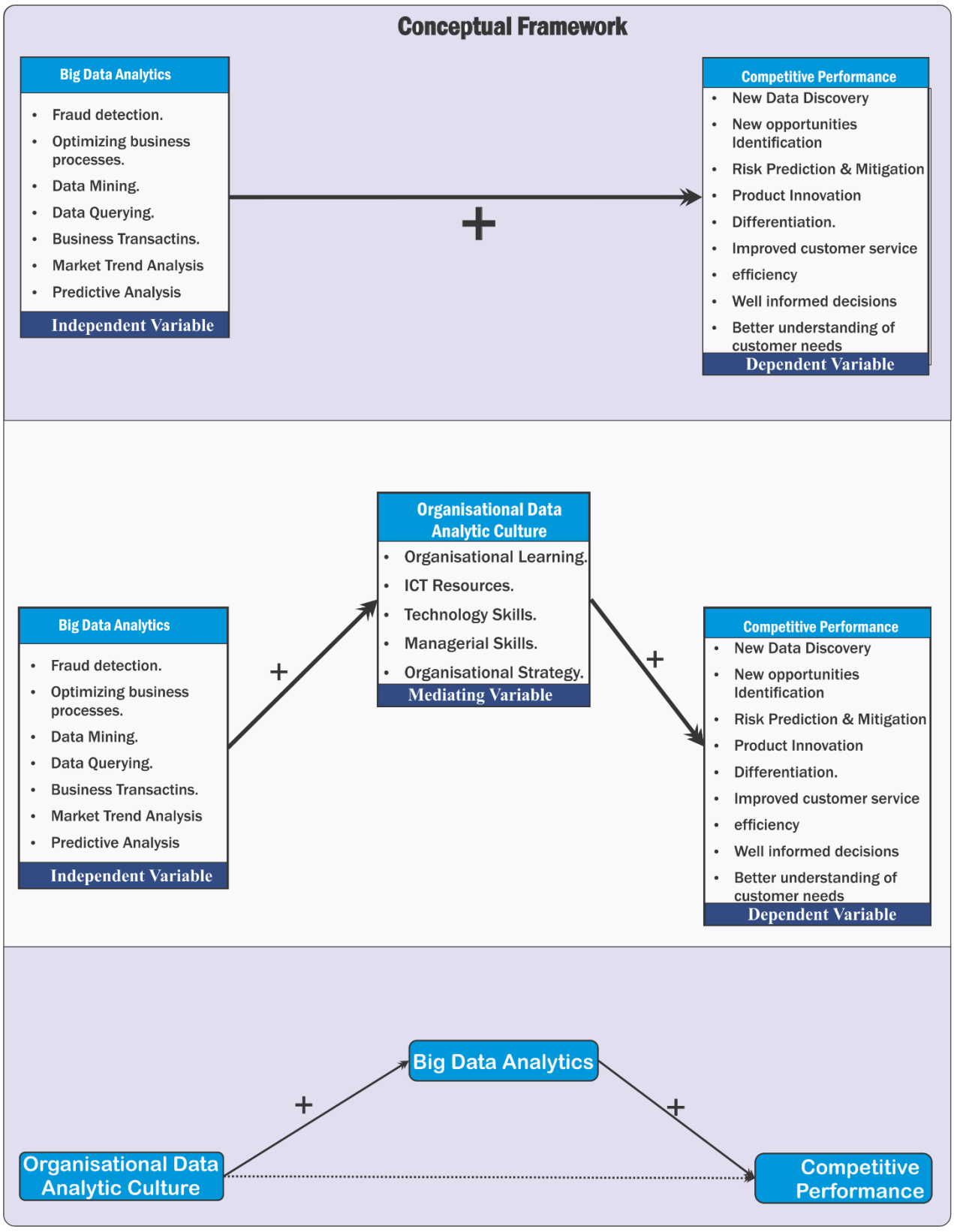

Figure 2.2 : Conceptual Framework

Conceptual frameworks are a network, or "a plane," of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena (Jabareen, 2009)**.** The conceptual framework in **Figure 2.2** above shows a relationship between the applications of BDA and

competitive performance through Organisational Data Analytic Culture (ODAC). The first section of the conceptual takes on hypothesis **H_1**, which says there is a positive relationship between BDA and competitive performance. Section 2 of the conceptual framework seeks to identify mediating variables for competitive performance with BDA (**H_2** and **H_3**), while the last section indicates an indirect positive relationship between ODAC and competitive performance through BDA **(H_4).**

2.7.3 Research Propositions/Hypotheses.

Big Data and its Analytics applies systematic procedures to answer problems formerly thought unbearable to resolve, as either the data or the data analytic tools do not exist. Big Data technology help business to create policies and strategies that are actionable by providing useful, extrapolative and real-time analytics, to obtain deeper understandings in to how best to address their business needs and strategies. BDA tools and techniques can analyse vast amounts of data types. I therefore predict as follows:

H_1: Big Data and its Analytics has a positive effect on competitive performance.

H_2: There is a positive relationship between Big Data and a data-driven culture.

H_3: Big Data and its Analytics leads to competitive advantage through analytics-based decision-making.

H_4: Organisational data analytic culture has a positive indirect effect on competitive advantage through Big Data and its Analytics.

2.7.4 Indications of Research Methodology

The method used in this research is a quantitative approach. It involves the generation of data in quantitative form, which can be subjected to rigorous quantitative analysis in a formal and rigid fashion. With the incorporation of data analytics into the culture of the commercial banks in Zimbabwe, I have identified independent variables, mediating variables and dependent variables, which will be numerically analysed to come up with solid conclusions. Quantitative measurements will be collected and analysed to examine the truth contained in the established propositions. Research methodology is a systematic way to solve the research problem. It may be understood as a science of studying how research is done scientifically (Kothari, 2004). The process of designing a research involves various decisions such as the research approach, research philosophies, research strategies, data source, research sampling, data collection methods and the data analysis techniques.

2.8 CHAPTER SUMMARY

The literature review and the exploratory case study were conducted through a rigorous and systematic process. The results from these studies were used to develop the overarching research

model. The journals, articles and books that have been published in relation to BDA and competitive performance are numerous. The material used in this research study relates to the stated objectives but also highlights the need for the adoption of BDA in financial institutions in Zimbabwe, specifically the commercial banking industry. The next chapter attends to the methodologies used in this research study.

Chapter 3 : RESEARCH METHODOLGY

3.0 INTRODUCTION.

This chapter provides the research methodology that was used to achieve the aims and the main objective of this study. It also describes the research design, the technique of data collection, population and sampling techniques, data gathering, and analysis and data presentation methods, taking into consideration all the ethical issues.

3.1 RECAP OF RESEARCH AIM, MAIN OBJECTIVE, MAJOR QUESTION, HYPOTHESES.

The aim of this study is to dig down into the application of BDA in the commercial banks of Zimbabwe and establish the effects of BD on the competitive advantage of the banks. The study will examine how the commercial banking industry of Zimbabwe can start with BDA to optimise their current and existing BI processes in order to gain competitive advantage. The main objective of the study being to investigate the relationship, which is there between BDA and competitive performance of the commercial banks of Zimbabwe.

The major question to be answered by this research is that how are BDA used and perceived by commercial banks to affect their competitive advantage in the banking industry. The following propositions have been made:

H_1: There is a positive correlation between applications of BD and competitive performance.

H_2: There is a positive relationship between Big Data and a data-driven culture.

H_3: Data-driven organisational culture has a positive impact on competitive performance.

H_4: There is a positive relationship between BDA and business value.

3.2 RESEARCH DESIGN.

This section describes research design and methodology in terms of research philosophies, approach and the strategy used, all of which will be utilised in order to answer the research questions and achieve the set objectives. The design of this study is based on a descriptive survey research in which data is collected for the objectives of the study. The choice of descriptive survey research as opposed to other research designs was motivated by the fact that it provides for a suitable instrument for collecting a large amount of data, it provides a practical framework for collecting a large sample of composing groups, and thirdly, survey studies have strong data reliability.

3.2.1 Research Philosophy.

Finding an adequate philosophical basis proved strenuous. Are the notions of BD and competitive advantage all social realities that exist independent of social actors, or is it something that human beings have invented? Can the phenomena be explained in a value-free way (Remenyi et al., 1998), in the sense that the researcher is independent of, and neither affects nor is affected by, the subject of BD and competitive advantage? On one hand, arriving at a conclusion that could prove true, independent of human thoughts and beliefs, would arguably be a major theoretical contribution to further developing the notion of, for example, competitive advantage within the context of BD. This paradigm is rooted in phenomenology, which asserts that views the thesis' subject as a social phenomenon, and is thus concerned with generating meanings and drawing insights into what this phenomenon constitutes (Saunders, Lewis and Thornhill, 2008). Having presented this underlying research paradigm, this section now turns to elaborating on the ontological, epistemological, and axiological considerations.

3.2.1.1 Ontology

Having outlined that BD and competitive advantage are created from the perceptions and actions of social actors, this research asserts a subjectivist view in relation to the nature of reality. Hence, BD and competitive advantage are social phenomena under a current state of revision, and therefore holds no universal truth. Various definitions of the concept thus far in both academic and professional circles are all true to some degree, insofar as how its constructors view and subsequently apply it in their particular contexts. Remenyi et al., (1998) stress the importance of studying the details of importance, and to understand the reality or perhaps the reality working behind them (Remenyi et al., 1998). In other words, it is necessary to explore the subjective meanings motivating the actions of social actors, in order for the researcher to fully understand these actions. This is encapsulated in the term social constructivism, and implies that people's practice of BD and competitive advantage is considerably different across various contexts, as they all carry different assumptions and interpretation of what the concept means.

3.2.1.2 Epistemology

How we perceive the world around us in turn leads us to consider what one should regard as "acceptable knowledge" in regards to understanding BD and competitive advantage. Saunders et al (2008) suggest two different epistemological types through the "resources" researcher, and the 7 "feelings" researcher (Saunders, Lewis and Thornhill, 2008). The former is argued to be utilised by natural scientists, who are confident with the collection and analysis of "facts", since they view objects as independent of human thought. This would imply that data collected on BD and competitive advantage would be unbiased and thus "objective" constructs to reality. The later by

contrast would be more concerned with the feelings and attitudes placed behind the data, which would be entirely dismissed by the "resources" type, since such data cannot be measured or modified. Nevertheless, in line with the interpretivist paradigm, the thesis' epistemology will be more devoted to understanding the underlying drivers behind any quantitative data, which constitutes "acceptable knowledge".

3.2.1.3 Axiology

Given the view that world reality is a social construct, the role of values in research also becomes a significant aspect to cover. Heron (1996) argues that values are the guiding reason for human action. The axiological ability of the researcher is in turn demonstrated by articulating his or her values, as the basis for making judgments about the research conducted, and how the researcher plans to do so (Heron, 1996). Hence, the choice of the interpretivist approach also reflects the values of this researcher, as well as the data collection choices. In the case of BD and competitive advantage, this entails that the researcher places more value on personal interactions with those questioned for the project, rather than acquiring data from anonymous interviews. This is not to discredit the absolute validity of such data collection choices, but given the epistemological and ontological considerations above, personal interactions probably provide a better understanding of how a social actor perceives reality, which is the closest one can come to the truth (Saunders, Lewis and Thornhill, 2008).

3.2.1.4 Research Approach.

To answer the formulated research question, it was considered appropriate to use a quantitative approach with an extensive research strategy where the relationship between the BDA and competitive performance is examined. It will involve the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion (Kothari, 2004). With the incorporation of data analytics into the culture of the commercial banks in Zimbabwe, we identify independent variables, moderating variables and dependent variables, which will numerically, analysed to come up with solid conclusions. Quantitative measurements will be collected and analysed to examine the truth contained in these hypotheses. This is a deductive study where the hypotheses are based on theoretical knowledge from the literature. This approach fits the requirements for collecting empirical evidence that can be used to evaluate the hypotheses and thus enlighten research question.

3.2.2 Research Strategy.

In this study, a survey was used as a strategic approach to answer the research question. The survey aims to obtain the same kind of data from a larger group of people in a systematic manner, thereby looks for statistical patterns, and ultimately generalises the results for a larger population (McDonald, Seonaidh and Oates, 2006). As my topic of interest covers both technical and business aspects, the idea was to retrieve data from banks' representatives that could have insight into both aspects. The survey was therefore primarily directed to the executives with roles such as Chief Information Officers (CIO), Chief Technology Officers (CTO), IT Administrators, and IT Managers, Heads of Technology, Heads of BDA and the BI department. A model was developed with four hypotheses to investigate the relationship between BDA and competitive performance through the mediating concept of a data driven culture.

3.3 METHODS OF DATA COLLECTION.

The method of data collection used in this research was quantitative as opposed to qualitative. Data collection was through a descriptive survey using the questionnaire method and the questions were formulated in an easy-to-understand manner so that the needed data could be generated to test the stated hypotheses and answer the research questions.

A way to define and measure BDA in the commercial banking sector of Zimbabwe was established, and to do this, the existing literature on BDA capabilities was collected and reviewed same with competitive performance. With the help of previous literature and case studies, a survey was created.

The survey was appropriate for the study because it provided specific information that was necessary for the analysis that is detrimental to obtaining findings and conclusions for the research. The choice of descriptive survey research as opposed to other research designs was motivated by the fact that it provides for a suitable instrument for collecting a large amount of data, it provides a practical framework for collecting a large sample of composing groups, and thirdly, survey studies have strong data reliability.

3.4 RESEARCH INSTRUMENT.

This section explains how the research instrument, the survey questionnaire was designed, how the concepts are defined and operationalised and how the pilot study was conducted.

3.4.1 Questionnaire Development.

As there was only one opportunity with the respondents, a lot of effort was put in preparation for the survey. With the help of my supervisor, it was very crucial to ensure that the constructs were

properly measured and that the questions were formulated in an easy-to-understand manner so I could generate the data needed to test the hypotheses and answer the research question.

Each variable specified in the hypotheses is latent which is intangible and cannot be directly observed or quantified (Molloy et al., 2011). Constructing proper measurements/indicators for latent constructs, which provide an indirect measurement of the original unobservable concepts be, required (Borsboom, Mellenbergh and Van Heerden, 2003). A questionnaire was designed and constructed to capture the latent variables specified in the research model such as BDA, competitive performance, analytic based decision making and ODAC. The operationalisation of the constructs was based on prior academic literature but where required, practitioner literature was also consulted.

In designing the questionnaire, special consideration was given to the fact that there are several potential sources of common method bias. Data collected from a questionnaire can be influenced by the wording used as well as characteristics of respondents (Nelson and Skinner, 2013). Common method bias can be either random or systematic and can arise from four potential sources, which are common source or common rater, item characteristics, item context, and measurement context (Podsakoff et al., 2003). Necessary procedural remedies were applied to control for and minimise the impact from these common method biases.

A questionnaire was developed to use Likert scales to measure the extent of agreement or disagreement on a symmetric scale using a set of indicator statements Items should be designed based on the principle of symmetry and balance, and presented in plain English. The scales translate respondents' views on subjective dimensions into quantitative values.

A draft questionnaire was developed, designed to be concise and simple in order to increase the likelihood of participation. The face and content validity, as well as the appropriateness of Likert scale endpoints of the survey instrument, were assessed. Experts in survey research, data managers, were asked to evaluate the draft research instrument and were asked for suggestions to improve it.

The online survey tool was developed using the software tool called SurveyGizmo. The survey was designed so that respondents were first met with an introductory text about the context of the study, who supervised the study and an assurance that the data would be treated anonymously. To add validity to the survey, the logo from the University of Zimbabwe was used on the questionnaire. In addition to the questions related to the variables, a few introductory questions were provided. These were included to collect demographic information and support the analysis. The respondents were asked if their institution (bank) makes use of BDA. It was important to note that the banks that

participated in the survey did use or not use BD solutions, in order to examine the relationship between BDA and competitive performance for those banks with BD solutions and the competitive performance for those banks without BD solutions.

The questionnaire was developed with three main sections, which are the administrative section, demographic section and the main body section. The questionnaire contained no questions, which would require the respondents to reveal sensitive information about him/herself. As far as the organisations are concerned, no sensitive, information was asked for.

The revised questionnaire was then distributed to a few number of experts for review and piloting. The pilot test included an invitation email explaining the objective of the survey. The assessors' feedback and any issues, which arose during the piloting, were taken into consideration.

3.4.2 Pilot testing.

The pilot phase of the study was conducted on four (4) commercial banking industry of Zimbabwe, sending out eight (8) questionnaires per bank to give a total of thirty-two (32) questionnaires for the pilot study. The results from the pilot study indicate that the instrument needs to be edited to incorporate the Business Intelligence (BI) unit, which had been left out. Professionals within the BI unit deals with data analytics everyday more as compared to those in the ICT unit. The banks used in the pilot study were taken from Harare Central Business District due to ease of access in terms of transport and communication. The response was a total of twenty-eight (28) participants who took part in the pilot study to give a response rate of 87.5%. The sample was selected based on convenience sampling, however extra care was taken so that the participants selected were to represent the numerous dimensions important to the study in terms of age brackets, and gender dimensions, professional area, qualifications, as well as geographical location.

Preliminary hypotheses that had been developed based on the literature for the research were refined as an outcome of the evidence and insight obtained during the pilot study. The instrument was modified to capture useful data for the results of this study. Judging from the response rate, the pilot test confirmed that measurement problems in the instrument will be not seriously disabling, however minor changes were incorporated to improve the instrument.

The instrument was firstly tested for reliability using Cronbach alpha as indicated in **Table 3.1**

Table 3.1 : Reliability Statistics

Cronbach's Alpha	N of Items
.823	35

A commonly used rule of the thumb indicates that both coefficients should be above .70 to show good internal consistency. In this case, the Cronbach Alpha has a value of .823 suggesting a high degree of consistency with our tool.

3.5 POPULATION AND SAMPLING TECHNIQUES.

This section describes research design and methodology in terms of population, sample sizes and sampling methods all of which were utilised in order to answer the research questions and achieve the set objectives.

3.5.1 Population.

According to Gravetter and Wallnau (2007), a population is defined as the set of all the individuals of interest in a particular study (Gravetter and Wallnau, 2007). According to the RBZ, the total number of registered banks is twenty-one (21), divided into five (5) clusters as follows; commercial bank cluster has thirteen (13) institutions, building societies has four (4) institutions, development institutions are two (2), Savings and Merchant Banks have got one (1) institution each. These 21 registered institutions formed the population of the study where questionnaires were distributed to the IT and BI departments. This is because they maintain IT strategies, implementing, maintaining an organisation's technology infrastructure, organisation evaluation in terms of technology and overall BI processes. Appendix III contains a list of all available commercial banks in Zimbabwe.

3.5.2 Sample size.

A sample of ten (10) commercial banks was undertaken due to the limited time for data collection and analysis. The sample was selected based on the following:

i. Simple Random Sampling taking into account the institution’s usage of BDA.
ii. Cluster Sampling, only the commercial banks and building societies clusters were selected, as they are a best fit for the research.

3.5.3 Sampling method.

The sampling method used for this research is cluster sampling which is a probability sampling method. This method is based on the intention or purpose of the study whereby elements are selected from the population, which best suits, the purpose of the study. In this case we have banks in Zimbabwe, in five (5) clusters, so for the purpose of the study, only one (1) cluster was considered, which is the commercial banks cluster, as it is best fit the purpose of the study.

3.6 QUESTIONNAIRE ADMINISTRATION.

The questionnaires for this study were self-administered either in electronic form or in paper form. The electronic questionnaire was developed using the Google Forms and they represent a true picture of the paper-based questionnaire. The majority of the questionnaires were paper based and they were distributed in person, whereby the researcher would drop off the questionnaire to all the respondents. However, some respondents preferred to use the electronic questionnaires, so the researcher had to collect electronic email addresses for the respondents and send them a link with the questionnaire to complete.

3.7 DATA GATHERING, PROCESSING AND ANALYSIS.

The research questionnaire was distributed to a sample of ten (10) commercial banks. From these banks, the targeted respondents were those members in the IT and the BI departments. Questionnaires were distributed to one hundred and sixty-eight (168) respondents. It took a period of more than two (2) weeks to distribute all these questionnaires to the respondents and collect the completed questionnaires for data processing and analysis.

Access to the respondents for data gathering was mainly through using existing contacts and by providing a clear account of purpose and type of access required. The researcher indicated possible benefits, which can be realised from the research study. Completed electronic questionnaires were printed out and the collected data was analysed processed by using the Statistical Package for Social Sciences (SPSS).

After receiving the questionnaires from the respondents, the data was checked and verified to ensure consistency and accuracy. The data demographics were analysed using frequencies and percentages. The extent of BDA use and challenges of BDA use was taken through analysis using mean and standard deviation. The relationship between BDA and competitive performance was analysed using the regression technique shown below:

$$\mathbf{Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + Ɛ, \text{ whereby;}}$$

Y = Competitive Performance	X4 = Fraud Detection
β0 = Constant	X5 = Business Process Optimisation
X1 = Predictive Analysis	X6 = Market Trend Prediction
X2 = Data Mining	X7 = Business Transactions
X3 = Data Querying	Ɛ = Error

At this stage, the collected data was computed and the following analysis were conducted.

a) Descriptive Analysis

The research method used here was a quantitative method rather than a qualitative. Data collection was through a survey questionnaire, which will be numerically analysed. Descriptive analysis was conducted to describe the nature of the population and the sample. It was performed to come up with the response rate, which is the relationship between the received questionnaires against the distributed questionnaires. Descriptive analysis was used in this research to present quantitative descriptions in a manageable form. It was conducted to come up with statistics on respondents based on sex as well as defined age groups.

b) Reliability tests.

Big Data is relatively new and its meaning is also subjective and sometimes unclear, therefore it could lead to reliability problems. Therefore, reliability tests were conducted to estimate the reliability or consistency of a set of variables in this study also to assess how well a set of questions in this research survey, each of which is designed to illicit information about the same characteristic, give consistent results. For the pilot study, reliability test was conducted, using the Cronbach's Alpha, to determine if the instrument was best fit for the purpose. The following **Table 3.2** shows the results of the reliability test.

Table 3.2: Reliability Statistics

Cronbach's Alpha	N of Items
.823	35

The alpha coefficient for the thirty-five (35) items is .823, suggesting that the items have relatively high internal consistency. A reliability coefficient of .70 or higher is considered acceptable.

Reliability is all about consistency or stability of a measurement, such that we can determine if the measure or other form of observation were confirmed by further measurements or observations and if we measure the same thing would we get the same score.

c) Correlation and regression tests.

Correlation as another way of assessing the relationship between variables was tested using the SPSS. To be more precise, correlation measures the extent of correspondence between the ordering of two random variables, in a data set. Correlation analysis was done to determine the extent of relationships between variables stated in the hypothesis, that is, to determine whether there is a positive or negative relationship between the variables. Basically, to establish how strong is the relationship between BDA and competitive position. The Pearson's correlation coefficient was used

to express the strength of the relationship. This coefficient is best fit for variables that are of quantitative nature, that is, ratio or interval scale variables.

In the hypothesis, independent variables and dependent variables were defined. Now regression analysis was conducted to identify and evaluate the relationships between these variables, which are also termed as predictor and explanatory variables. Using SPSS, regression was calculated to explain variability in dependent variable by means of one or more of independent variables and to analyse relationships amongst the variables to answer; the question of how much dependent variable changes with changes in each of the independent's variables, and to forecast or predict the value of dependent variable based on the values of the independent's variables.

In addition, ANOVA was used to examine the statistical significance of our study and the correlation of the tested independent variables to identify the factor that improves the competitive position through BDA.

3.8 RESEARCH LIMITATIONS.

Banking and financial institutions do not easily share their data due to the nature of its sensitivity. As such, there were difficulties in getting the required information that was adequate for the success of the research. The time allocated for the data collection was a limiting factor. Understandably, the respondents did not have an air of urgency and more often that the researcher had to visit a particular branch on several occasions in order to check whether a questionnaire had been completed. Lack of focus from some of the respondents was also a limiting factor as this meant that they took more time to respond.

Lastly, the challenge faced by the researcher was that there was lack of control over the data collection; some of the respondents gave out incomplete questionnaires while others failed completely to attempt the questionnaires. It was also observed that most of the respondents agreed to participate on condition that the information was going to be used for academic purposes only and hence would not be divulged to a third party.

3.9 VALIDITY AND RELIABILITY.

Big Data is relatively new and its meaning is also subjective and sometimes unclear, therefore it could lead to reliability and validity problems. This is the reason why it is very important to ask every participant of the interviews to define Big Data. This will increase the reliability and it will also make it easier to reproduce the results. This research is only limited to the financial institutions,

particularly banks, because this was the only information available for the researcher. Therefore, this could be a thread to the reliability and validity of the gathered data for this thesis.

The validity of this study can be influenced by several factors. The most important include the willingness from interviewees to cooperate, provision of limited information due to reasons of secrecy and the application of some relative concepts, such as the notion of competitive advantage. The last factor that can limit the research validity will be tried to be eliminated by defining all concepts within the context, for the purposes of the research, and making sure that they coincide with the ones perceived, and used by the interviewees during the selection of data. Another limitation is the existence of bias, since the research is concentrated on how the interviewees perceive a given situation and that can differ within different people, different organisations or different industries. To receive reliable and valid data and get a better understanding regarding the points mentioned in the methodology section, the interview framework was conducted with the help of theory.

3.10 ETHICAL CONSIDERATIONS.

For this study, a lot of information was obtained from a good number of informants through filling out questionnaires. The information commercial banks share with the researcher is largely mediated by benevolence. To safeguard participants' values, it was important that, as a researcher act in a way that is "correct" and ethical. Violation of ethical guidelines would not only damage my reputation as a researcher, but also weaken the trust of the whole research community I belong to at the Graduate School of Management of the University of Zimbabwe. Rebuilding such trust may take long time and could thus prevent other researchers from doing their work. With this in mind, it has been highly prioritised to act morally trustworthy as a researcher.

Throughout the study, I made sure that all involved participants had made an informed consent to participate. An informed consent implies that participants first understand the purpose of the research and then voluntarily agree to participate (Israel and Hay, 2006). All the contacted commercial banks were informed about the nature of the research and that all collected data would be handled anonymously, at both the individual level and company level.

With respect for other researchers and their works, we have done our outmost to avoid plagiarism. In this context, we have been very careful to credit other researchers' work by referencing according to the Harvard Referencing style.

3.11 CHAPTER SUMMARY.

The design of this study was based on a descriptive survey research in which data was collected for the objectives of the study. The research determined the extent to which banks are utilising the BD technology in order to boost competitiveness. The choice of descriptive survey research as opposed to other research designs was motivated by the fact that it provides for a suitable instrument for collecting a large amount of data, it provides a practical framework for collecting a large sample of composing groups, and thirdly, survey studies have strong data reliability. The next chapter focuses on data analysis and findings.

Chapter 4 : DATA ANALYSIS, FINDINGS AND DISCUSSION

4.0 INTRODUCTION.

This chapter of the research study presents the analysis and findings made by the researcher. The findings documented are of the relationship between BDA and competitive advantage of the commercial banks of Zimbabwe. It provides the analysed data, interpretation and findings as per the main objective of the study, which was to determine the extent of BDA as a weapon for competitive advantage. This chapter also discusses the findings in comparison with relevant theory and literature as established by other authors in the same field of study.

4.1 DISCUSSION OF THE RESPONSE RATE.

Response rate refers to the degree to which the final data set comprises all the members sampled. It is derived by calculating the number of people who successfully completed the interview divided by the total number of people in the entire sample. This is inclusive of the respondents who declined participation and those that were not available. The research involved one hundred and sixty-four (164) respondents dealing with institution ICT strategy and/or business processes strategy, in the selected banks, as they understand the BDA and competitive advantage of their sector. The questionnaire rate of return findings are in the **Table 4.1**

Table 4.1: Response Rate

Issued Questionnaires	Returned Questionnaires	Usable Questionnaires	Response Rate
164	148	133	81.1%

One hundred and forty-eight (148) questionnaires were returned, however only one hundred and thirty-three (133) questionnaires obtained from the commercial banks where the research was conducted were usable, which accounts to 81.1% response rate. According to Mugenda and Mugenda (1999), a 50% rate of response is considered ‘adequate’, 60% is ‘good’, while 70% and above is rated to be ‘very good’ (Mugenda and Mugenda, 1999). This is in agreement with Bailey’s (1985) assertion that a response rate of 50% is ‘adequate’ and one that is greater than 70% is considered ‘very good’ (Bailey, 1985). Based on this assertion, the resultant response rate of 81.1% was ‘very good.’ This was a valid and reliable representation of the targeted population hence adequate for the study analysis. From the foregoing, the response rate provides adequate data to proceed with the analysis.

4.2 DESCRIPTIVE ANALYSIS.

This section of the study seeks to provide information such as the demography of all the respondents working in commercial banks in Zimbabwe. An analysis of the demographic data was carried out to have a clear understanding of the socio-demographic characteristics for the sample used. Other factors, such as the benefits of using BDA, challenges faced when faced when using BDA, competitive advantage as result of using BDA, and other factors were considered in this section relating to the defined hypothesis of the study. Variables were taken into account, both independent and dependent variables of the study.

4.2.1 Sex of the Respondents

Fig. 4.1 is a graphic representation of the sex respondents.

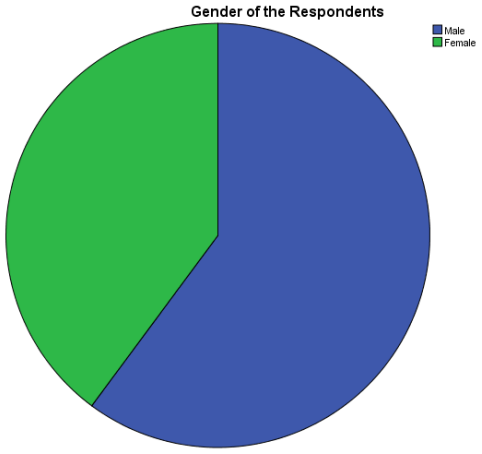

Figure 4.1: Sex of the Respondents

Majority (60.2%) of the responses were obtained from the male respondents, while 39.8% of them were female personnel working in these institutions. This indicates that these institutions have both female and male staff. It is fundamentally important to notice that the number of male staff is more than that of female staff members. The findings strongly imply that the views expressed in the researcher's findings are gender sensitive; they are an accurate and unbiased representation of the opinions of female and male respondents.

4.2.2 Age Brackets of the Respondents

Fig. 4.2 displays age groups of the respondents.

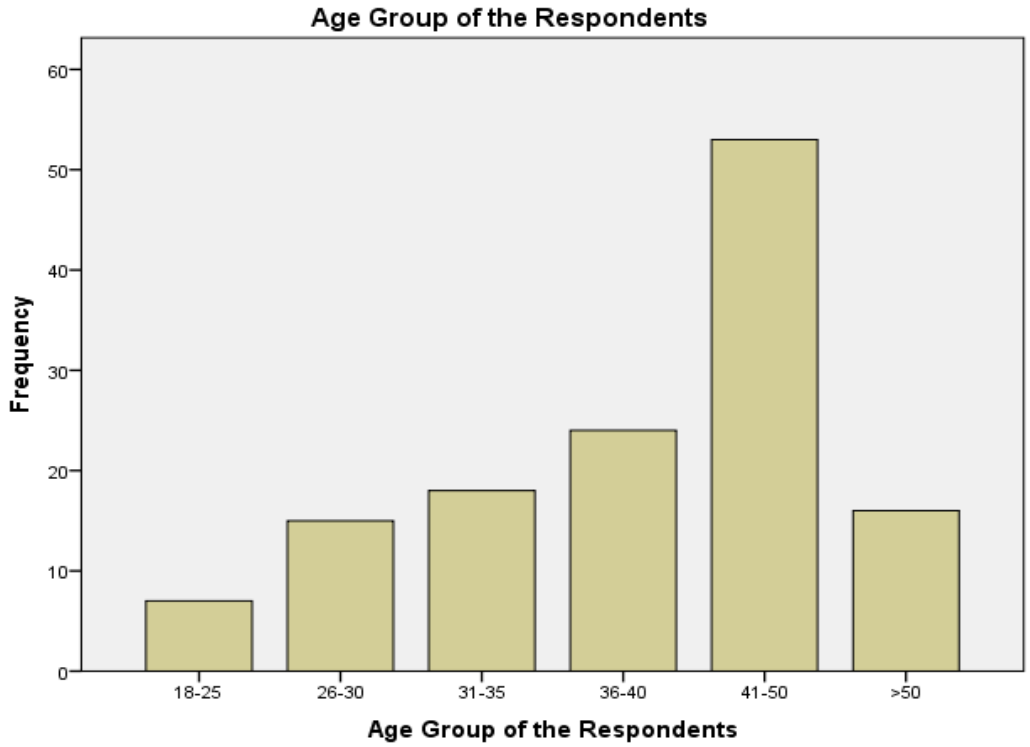

Figure 4.2: Age group of Respondents

From the sample, it is being observed that the age group of between 41 and 50 takes the majority (50%) of the sample followed by 36-40. This is mainly for the reason that the age group of 36 to 50 years are the more experienced personnel in this sector. Therefore, they have an idea of how BDA function within their respective institutions. This was aimed at understanding how the respondents were distributed across the various age groups and consequently their opinions on the topic of study. The results also indicate that the respondents were aware of technological advancements and productivity levels of their companies and can constructively contribute to these areas.

4.2.3 Functional Areas of the Respondents

Table 4.2 contains a summary of the functional areas of the institution where the respondents belong.

Table 4.2: Functional Area of IT or BI

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Database Administration	8	6.0	6.0	6.0
	IT Security	10	7.5	7.5	13.5
	Operations and Support	22	16.5	16.5	30.1
	Systems Administration	11	8.3	8.3	38.3
	Network Administration	8	6.0	6.0	44.4
	BI Training	21	15.8	15.8	60.2

	Contracts Management	9	6.8	6.8	66.9
	Data Mining	7	5.3	5.3	72.2
	Analytical Processing	29	21.8	21.8	94.0
	BI Reporting	8	6.0	6.0	100.0
	Total	**133**	**100.0**	**100.0**	

As you would most certainly suspect, most of the respondents reported that they performed data analytical processing and formed 21.8%. 16.5% were in IT Operations and support, 15.8% were from the BI training, while the least with 6% were from database administration, network administration and BI reporting.

4.2.4 Duration of Bank in the Market

Table 4.3 presents a summary of data relating to the number of years the bank has been in operation, while **Fig 4.3** is a graphical representation.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<10 Years	11	8.3	8.3	8.3
	10-20 Years	13	9.8	9.8	18.0
	21-30 Years	44	33.1	33.1	51.1
	>30 Years	65	48.9	48.9	100.0
	Total	133	100.0	100.0	

Table 4.3: Duration of Bank in the Market

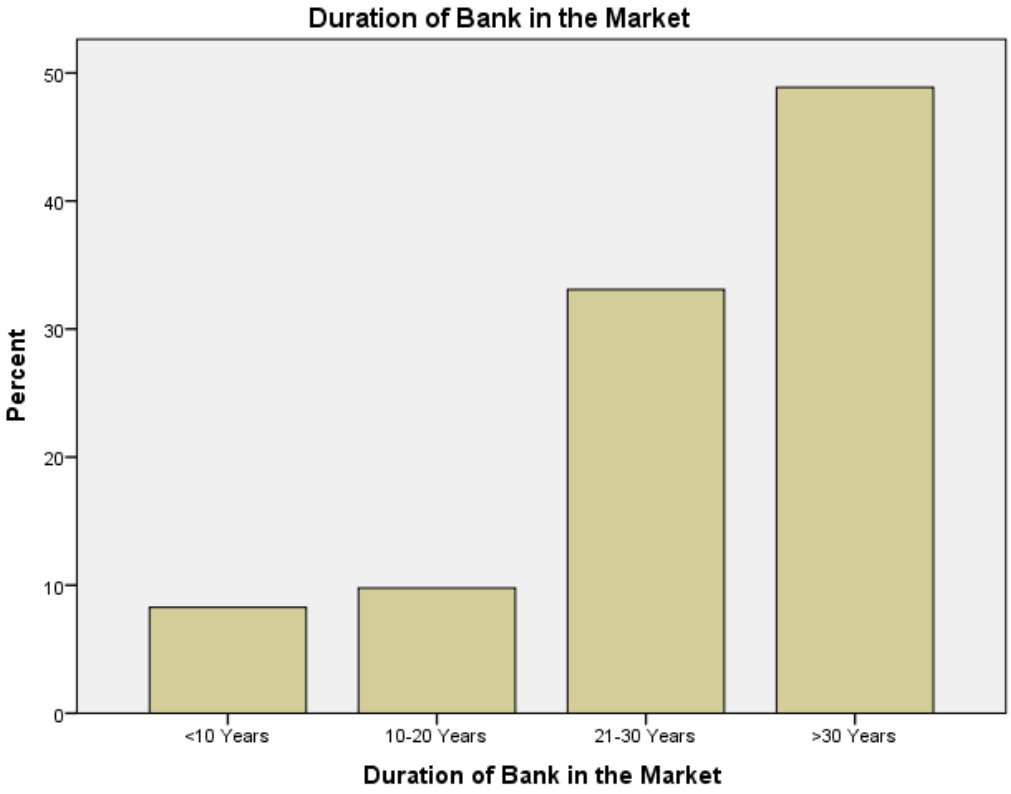

Figure 4.3: Duration of the Banks in the Market

Commercial banks in Zimbabwe have been in operation for more than 30 years as most of the banks became operational after the independence in 1980. As for the duration of the bank in the market, 48.9% of the sample have been in operation for more than 30, 33.1% have been there for a period of between 21 to 30 years, 9.8% have been in the market between 10 to 20 years while the likes of Steward bank have in the market for period less than 10 years.

4.2.5 Big Data Analytics Initiative in the Organisation

Table 4.4 shows the stages of BDA initiative in the banks, while **Fig 4.4** is graphical representation.

Table 4.4: Big Data Initiatives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, initiatives in process	52	39.1	39.1	39.1
	Serious Planning	36	27.1	27.1	66.2
	No initiatives underway	45	33.8	33.8	100.0
	Total	**133**	**100.0**	**100.0**	

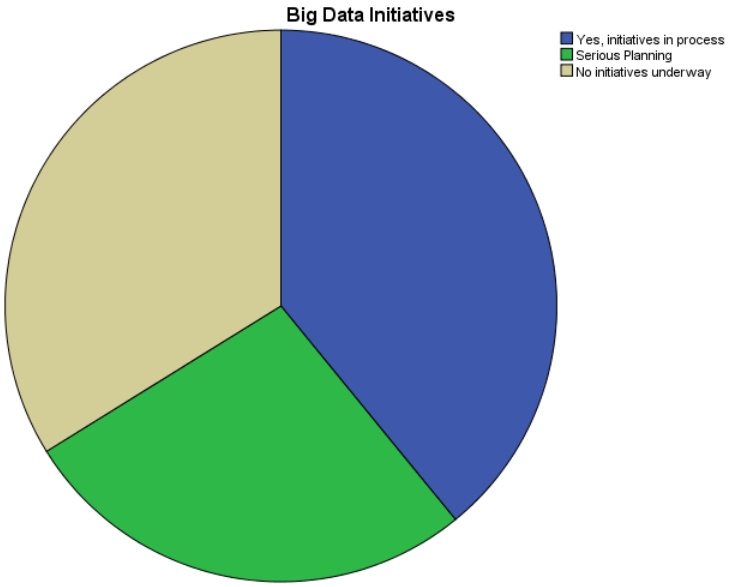

Figure 4.4: Big Data Analytic Initiatives

The **Table 4.4** above shows that, 39.1% of the respondents already have ongoing big data analytic initiatives or have implemented the initiative on some scale. 27.1% of correspondent banks have BDA initiatives under serious planning while the remaining 33.8% have no BD initiatives underway.

4.2.6 Level of Awareness of Big Data Products.

Table 4.5 shows the level of awareness of BDA and the visibility of these products in the Zimbabwean commercial bank market

Table 4.5: Awareness and Visibility of Big Data Products

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Slightly aware	14	10.5	10.5	10.5
	Neutral	29	21.8	21.8	32.3
	Aware	90	67.7	67.7	100.0
	Total	**133**	**100.0**	**100.0**	

The results show that 10.5% of the correspondents felt that their awareness and visibility of BD products on the market was low, while 67.7% thought that they were fully aware of BD management and its products on the market. 21.8% fairly rated the awareness and visibility of BDA in the market.

4.2.7 Current Big Data Analytics Capability.

Table 4.6 shows how the current BDA capabilities in the various banks look like, while **Fig 4.5** is a graphical representation.

Table 4.6: Big Data Management Capabilities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than adequate	93	69.9	69.9	69.9
	Adequate	7	5.3	5.3	75.2
	Don't know	33	24.8	24.8	100.0
	Total	**133**	**100.0**	**100.0**	

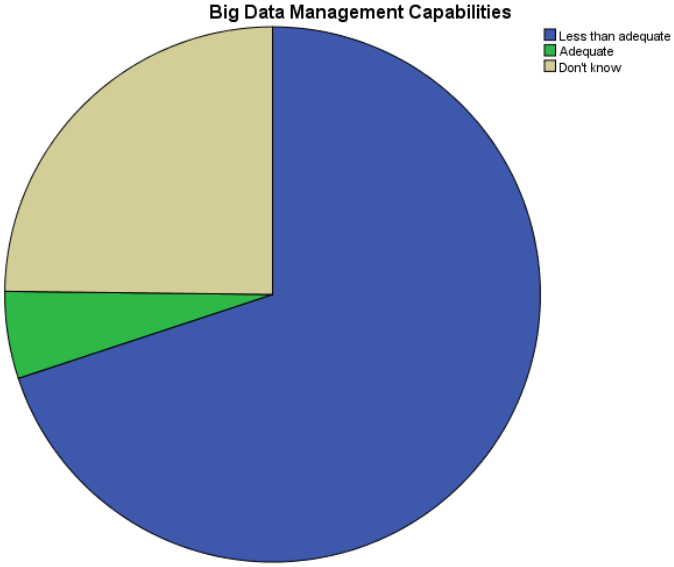

Figure 4.5: Big Data Management Capabilities

Only 5.3% of respondents ranked their analytical capabilities as adequate. 69.9% of respondents ranked their ability to use data and analytics to transform their business as less than adequate. 24.8% did not know how to rank their capabilities because they do not have any BD initiatives in operations or have not even thought about it.

4.2.8 The Extent to which Big Data Analytics is used for various purposes.

The extent to which BDA used for various purposes in the sampled institution is summarised in the **Table 4.7** below.

Table 4.7: Extent to Which Big Data Analytics is used for Various Purposes

	N	Minimum	Maximum	Mean	Std. Deviation
Statistics	133	1	5	3.46	.909
Predictive Analysis	133	2	5	3.59	.697
Data Querying	133	2	5	3.89	.714
Fraud Detection	133	2	5	3.86	.799
Data Mining	133	2	5	3.92	.675
Business Process Optimisation	133	2	5	3.79	.729
Strategy Implementation	133	2	5	3.85	.691

Processing Results of Online Surveys	133	2	5	3.77	.589
Market Trend Prediction	133	2	5	3.91	.701
Telephone Communication	133	2	5	3.77	.598
Business-Transactions/Processes	133	2	5	3.78	.595
Website Customisation	133	2	5	3.68	.556
Data Warehousing/Storage	133	2	5	3.75	.679
Risk Analysis	133	1	5	3.86	.757

From observing the study, the largest population of the respondents reiterated that commercial banks use BDA for data mining largely as shown by a mean score of 3.92 followed by market trend prediction with a mean of 3.91. Data querying is shown as having a mean of 3.89, fraud detection and risk analysis both scored a mean of 3.86, strategy implementation shown garnered a mean of 3.85. Business process optimisation to a large extent is indicated by a mean score of 3.79, followed by business transactions with a mean score of 3.3.78. Telephone communication and processing results of online surveys both scored a mean 3.77 while data warehousing scored a mean of 3.75.

In addition, the respondents recapped that their companies utilise BDA for website customisation, predictive analysis, and business statistics to moderate extents. Recorded mean scores of 3.68, 3.59 and 3.46 respectively exhibit this. For success in the digital strategy, there is need to pool resources with other players in the finance, economics and other business' ecosystem, irrespective of whether they share a partnership with each other or are competitors in the various industries.

4.2.9 Benefits of Using Big Data Analytics.

The study sought to find the various benefits that the harnessing of BD can bring to an organisation. **Table 4.8** presents a summary of the study findings concerning the various benefits attributed to BDA.

Table 4.8: Benefits of Using Big Data Analytics

	N	Range	Mean	Std. Deviation
Reduced Risk and Fraud	133	4	3.59	.827
Improved Customer Experience	133	2	3.87	.668
Real-Time Decisions Making	133	2	3.89	.540
New Product Innovations	133	3	4.05	.661
More Efficient Operations	133	4	4.11	.745
Competitive Advantage	133	2	4.13	.644

It is clear that most of the people felt that BDA has really led to a better competitive position ranking it top with a mean of 4.13. Others felt that it has helped them create more efficient operations, and that obtained a mean score of 4.11. New product innovations garnered 4.05 while a benefit of real time decision making scored a mean of 3.89. Improved customer experience and reduced risk and fraud obtained a mean score of 3.87 and 3.59 respectively.

4.2.10 Competitive Advantage as Result of Using of Big Data Analytics.

The main objective of this research study was to determine the relationship between BDA and competitive advantage of commercial banks in Zimbabwe. Accordingly, the respondents were required to select the most accurate option that indicated the level or the extent to which their organisations realised various advantages because of using BDA. The scale used for the questionnaire was represented as: (1) – No Extent, (2) – Little Extent, (3) –Moderate Extent, (4) – Large Extent, (5) – Very Large Extent. The scale for mean is understood as follows: <1.5 – no extent; 1.5 but < 2.5 – little extent; 2.5 but < 3.4 – moderate extent; 3.5 but < 4.0 – Large extent; 4.1 but < 4.5 – very large extent. For standard deviation, values that are less than 1.00 mean that responses were not far apart on the given scale. Values that are more than 1.00 indicate that responses were more dispersed on the given scale. Results are displayed in **Table 4.9.**

Table 4.9: Competitive Advantage as Result of Using of Big Data Analytics

	N	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Improved Customer Experience	133	3.89	.867	.151	.210
Better Informed Decisions	133	3.91	.468	-.306	.210
New Data Discovery	133	4.75	.434	-1.180	.210
More Customer Focused Strategies	133	3.88	.591	.032	.210
More Differentiation Compared to Others	133	3.91	.570	-.012	.210
More Products Innovation	133	4.67	.587	-1.602	.210
Segmentation of Customers	133	3.88	.603	.055	.210
Risk Mitigation and Prediction	133	3.36	.964	.042	.210
More Accurate Trading Decisions	133	3.83	.634	.157	.210

With reference to the results shown in **Table 4.9**, majority of the staff members who responded reiterated that their organisations realised more differentiation as compared to other organisations in the same sector, make better informed decisions, have increased ability to understand and respond to customer better, narrower segmentation of customers for better product offering, use of more customer focused strategies and realised more accurate trading decisions to a larger extent. Mean

scores of 3.91, 3.91, 3.89, 3.88, 3.88 and 3.83 respectively witness this. To a very large extent, some organisations suggested that they obtain new data discovery and have more products innovation as compared to others. Mean scores of 4.75 and 4.67 show this correspondingly. Risk mitigation and prediction has a mean value of 3.36 at a moderate extent. From these results, it is clear that BDA enable better communication, real-time decision-making, discovery of new data and new innovative ideas, hence improves the competitive position of a firm.

4.2.11 Challenges Faced with the Use of Big Data Analytics.

To establish the challenges of the use of BDA in commercial banks of Zimbabwe, the study requested the respondents to select the extent to which their firms face various challenges in BDA use.

The scale used for the questionnaire was divided into: (1) – No Extent, (2) – Little Extent, (3) – Moderate Extent, (4) – Large Extent, (5) – Very Large Extent. The scale for mean is understood as follows: <1.5 – no extent; 1.5 but < 2.5 – little extent; 2.5 but < 3.4 – moderate extent; 3.5 but < 4.0 – Large extent; 4.1 but < 4.5 – very large extent. For standard deviation, values that are less than 1.00 mean that responses were not far apart on the given scale. Values that are more than 1.00 indicate that responses were more dispersed on the given scale. The results of the section are exhibited in **Table 4.10**

Table 4.10: Challenges Faced with the Use of Big Data Analytics

	N	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Privacy and Security	133	3.67	.693	-.005	.210
Access and Information Sharing	133	3.78	.620	-.597	.210
Characteristics of Big Data	133	4.35	.718	-.626	.210
Data Sources Analytical Challenges	133	4.47	.634	-.957	.210

The majority of the respondents were of the idea that too much challenges emanate from analysing data from new data sources as this has mean score of 4.47. Following this, is the characteristics of BD that has a mean score 4.35, that is, the volume, velocity and variety of the BD pose challenges to a large extent. The staff members further recapped that the commercial banks in Zimbabwe experienced challenges with privacy and security, and access to information sharing to a moderate extent with mean scores of 3.67 and 3.78 respectively showed this.

Firms in the financial industry specifically banks have invested in data warehouses and tools designed for BI for report generation and analysis of customer behaviour patterns. These tools aid them to better understand and anticipate client needs that further enable them to optimise their business operations. The addition of BD systems in the daily running of company operations enables organisations to gain deeper insights into BD faster. The result is more often than not a clearer picture of the value of the data they have which in turn translates to a better-informed decision making criteria.

4.3 INFERENTIAL ANALYSIS

Inferential analysis has been conducted in this study for the purpose of determining the possibility of a relationship between an intervention and a resultant outcome. In addition, the level of strength of the relationship is also determined. The study conducted inferential analysis to establish the relationship between the independent variables and the dependent variable of which involved a coefficient of determination in addition to a multiple regression analysis. Coefficient of determination is defined as a measure of how well a statistical model is likely to predict the future outcome of a given set of data. The following sets of tests were conducted as part of inferential analysis.

4.3.1 Reliability Test.

Using the Cronbach's Alpha, reliability test was conducted to measure the internal consistency of the instrument used in this study, that is, consistent in producing the same results every time the measure is used. For data to be reliable, it must have a Cronbach's Alpha coefficient of greater than 0.6 for exploratory studies but otherwise the recommended threshold is Cronbach's Alpha coefficient of 0.7 (Hair *et al.*, 2006).

The instrument used in this study has sections from A to section E, so for reliability analysis, sections B to E were considered as they have the same scale. **Table 4.11** shows the reliability statistics of this instrument using the Cronbach's Alpha, while **Appendix IV** shows the reliability statistics if an item is deleted.

Table 4.11: Reliability Statistics

Cronbach's Alpha	N of Items
.772	37

The alpha coefficient for the thirty-seven (37) items is .772, suggesting that the items have relatively high internal consistency. A reliability coefficient of .70 or higher is considered acceptable. This

indicates that the instrument used in this research has internal consistency, in other words the tool produce stable and consistent results.

4.3.2 Test for Normality.

It is common that survey data using Likert scales is not normally distributed (Zeis *et al.*, 2001). In this study, test for normality was conducted on both indicator data and the latent constructs so as to determine suitable analysis and testing techniques. Skewness and kurtosis was analysed to confirm data distribution characteristics (West, Finch and Curran, 1995).

The sample consists of 133 respondents; therefore, Shapiro-Wilk test for normality was employed. The descriptive statistics of all indicators and constructs are presented in **Appendix V** while **Table 4.12** presents the results of the Shapiro Wilk test.

Table 4.12: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Competitive Advantage	.212	133	.000	.807	133	.000
More Differentiation Compared to Others	.352	133	.000	.741	133	.000

a. Lilliefors Significance Correction

The Shapiro-Wilk test results show that our dependent variables significantly deviate from a normal distribution as they have p-value of 0.000, which is less than 0.05. **Appendix V** shows that the variables are negatively skewed as they have p-values of -.089 and -.012 respectively.

4.3.3 Correlation Analysis.

Correlation analysis was performed to obtain a bivariate statistical data on the strength of a relationship BDA of a firm and the competitive advantage and to test all the hypothesis of this study. This was done in order to test hypothesis 1 of the study, which asserts that there is a positive relationship between BDA and firm's competitive performance. There a relationship was tested between BDA and competitive advantage. Pearson's correlation was used in this study to measure the degree of the linear relationship between the stated variables. By a linear relationship, we mean that the relationship can be well characterised by a straight line. Correlation ranges from -1.0 to +1.0 and Pearson correlation is given by the letter *r*. There can be three (3) types of relationships; positive relationship, negative relationship and there can be no a predictable relationship between the variables.

Hypothesis 1: Big Data and its Analytics has a positive effect on competitive performance.

Table 4.13 shows the results of the Pearson correlation analysis between BDA and competitive advantage.

Table 4.13: BDA and Competitive Advantage Correlation Test.

		Big Data Analytics Sophistication	Competitive Advantage
Big Data Analytics Sophistication	Pearson Correlation	1	.658**
	Sig. (2-tailed)		.000
	N	133	133
Competitive Advantage	Pearson Correlation	.658**	1
	Sig. (2-tailed)	.000	
	N	133	133

**. Correlation is significant at the 0.01 level (2-tailed).

The results from **Table 4.13** shows that there is a positive relationship between BDA sophistication and firm's competitive performance. The relationship is very strong, witnessed by r =0.658. Using $\alpha = 0.01$, in a 2-tailed test, the decision rule is that there is a significant relationship between BDA sophistication and competitive advantage as this is being witnessed by p-value of 0.00 which less than 0.01.

Hypothesis 2: There is a positive relationship between Big Data and a data-driven culture.

Table 4.14 displays the results of the Pearson correlation between BDA and OADC.

Table 4.14: BDA and OADC Correlation Test

		Big Data Analytics Sophistication	Organisational Data Analytic Culture
Big Data Analytics Sophistication	Pearson Correlation	1	.341**
	Sig. (2-tailed)		.000
	N	133	133
Organisational Data Analytic Culture	Pearson Correlation	.341**	1
	Sig. (2-tailed)	.000	
	N	133	133

**. Correlation is significant at the 0.01 level (2-tailed).

This hypothesis has a medium weight of r = 0.341. The decision rule is that there is a significant relationship between BDA sophistication and ODAC as this is being witnessed by p-value of 0.00 which is less than 0.01.Therefore, we can confirm that this hypothesis is supported.

Regression analysis was further conducted to test mediation and moderating effects of the stated variables. This was done to make further conclusions on the third and fourth propostions. It allows the examination of relationships between two or more variables of interest.

4.3.4 Regression Analysis.

A multiple regression analysis was required for the study in order to ascertain the relationship between the parameters of competitive performance of commercial banks in Zimbabwe based on established hypothesis. Both variables have been identified as follows:

Independent Variables – Predictive Analysis, Data Mining, Data Querying, Fraud Detection, Strategy Implementation, Business Process Optimisation, Market Trend Analysis and Business Transactions, all these have been identified in this study as independent variables, being part of the predictors. The dependent variable for this study is the competitive performance of the commercial banks in Zimbabwe. The regression equation for this has earlier on identified as;

$$\mathbf{Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + \text{Ɛ},}$$ whereby;

Y = Competitive Performance
β0 = Constant
X1 = Predictive Analysis
X2 = Data Mining
X3 = Data Querying
X4 = Fraud Detection
X5 = Business Process Optimisation
X6 = Market Trend Prediction
X7 = Business Transactions
Ɛ = Error

Taking into account the regression equation established, comprising all factors (predictive analysis, data mining, data querying, business process optimisation, prediction of market trend analysis, business processes and or transactions, competitive advantage of commercial banks in Zimbabwe would be 1.332 as shown by the following **Table 4.15**, coefficient of determination.

Table 4.15: Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.332	.399		3.342	.001
	Predictive Analysis	-1.004	.370	-1.774	-2.718	.008
	Data Querying	.873	.172	1.518	5.086	.000
	Fraud Detection	.237	.092	.247	2.564	.012
	Data Mining	.576	.176	.803	3.266	.001

	Business Process Optimisation	-.367	.158	-.560	-2.318	.022
	Market Trend Prediction	.279	.094	.453	2.982	.003
	Business-Transactions/Processes	.698	.237	.632	2.940	.004

a. Dependent Variable: Competitive Advantage

Data aided findings that have been analysed also show that when all other independent variables are taken from zero, a unit increase in predictive analysis will yield a negative increase in competitive advantage of commercial banks in Zimbabwe by 1.004; a unit increment in data querying leads to a 0.873 increment in competitive advantage of commercial banks in Zimbabwe, a significant unit increment in fraud detection leads to a 0.237 increase in competitive advantage of commercial banks in Zimbabwe and a unit increase in data mining leads to a 0.576 increment in the competitive advantage of commercial banks in Zimbabwe.

Further, a unit increment in business transactions will certainly lead to a 0.698 increment on the competitive advantage of commercial banks in Zimbabwe; there will be a decrease by 0.367 in competitive advantage of commercial banks in Zimbabwe, if there is a unit increment on business process optimisation. There will be a 0.279 increment in the competitive advantage of commercial banks in Zimbabwe if there is a unit increment in marketing trend analysis.

On independent sample tests, there is no statistical significance between two variables that encompass the dependent variable and the independent variable because the t-test values are greater than 0.05, which is the significance level, except for predictive analysis and business process optimisation, which have t-test values of less than 0.05. Predictive analysis and business process optimisation can be taken off from the independent sample tests as they have t-values of less than 0.05, which indicates a statistical significance between two variables. On other independent variables with t-values of greater 0.05, the highest difference was registered in the data querying variable (t-value=5.086, $p< 0.05$) while the least variance was noted on fraud detection variable (t value= 2.564, $p< 0.05$). These results provide the inference that data querying is more of a contributor to the competitive advantage of commercial banks in Zimbabwe, followed by data mining, then market trend analysis, then business transactions, and fraud detection being the least contributor to competitive advantage of commercial banks in Zimbabwe.

4.3.5 ANOVA Test.

A one-way analysis of variance (ANOVA) that provided details on the variability levels within the model of regression and which formed a basis for the test of significance that was used. The ANOVA F-statistic used was for testing research questions for the regressor coefficients for each variable to be equal to zero. An

analytical study was undertaken to determine the combined influence of all the independent variables. **Table 4.16** shows the results of the ANOVA F-statistic.

Table 4.16: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.222	7	8.889	77.106	.000[b]
	Residual	14.410	125	.115		
	Total	76.632	132			

a. Dependent Variable: Competitive Advantage

b. Predictors: (Constant), Business-Transactions/Processes, Data Mining, Market Trend Prediction, Fraud Detection, Data Querying, Business Process Optimisation, Predictive Analysis

In this study, the ANOVA test was done at $\alpha = 0.05$. The overall model was statistically significant, $F(7,25)=77.11$, $p<0.05$, $R^2=0.81$.

4.3.6 Model Summary.

Table 4.17: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.901[a]	.812	.801	.340

a. Predictors: (Constant), Business-Transactions/Processes, Data Mining, Market Trend Prediction, Fraud Detection, Data Querying, Business Process Optimisation, Predictive Analysis

The coefficient of determination, r^2 is the square of the sample correlation coefficient between outcomes and predicted values. R^2 explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable that is explained by the seven independent variables, which are, business-transactions, data mining, market trend prediction, fraud detection, data querying, business process optimisation and predictive analysis. The seven independent variables that were studied revealed that there exist a strong relationship between BDA and competitive performance of commercial banks in Zimbabwe, which is represented by adjusted R^2. This is a clear indication that the seven independent variables contribute approximately 80.0% to the competitive performance of commercial banks in Zimbabwe while factors and aspects that have not been studied in this research contribute to 20.0% to the competitive performance of commercial banks in Zimbabwe.

4.4 DISCUSSION OF FINDINGS.

H_1 suggests that BD and its analytics generate competitive advantage, direct and total positive effect. The finding confirms previous anecdotal claims that BD and its analytics generate benefits

by enhancing organisational performance, thereby creating competitive advantage. New analytic tools and methods make it possible to analyse a greater amount and variety of data, thereby helping to explore and make sense of BD. Real-time or near real-time information enables organisations to be more agile than their competitors do. In some cases, BD and its analytics also directs and/or automates business processes and decision-making. This has been witnessed by the results obtained in this study.

The results obtained from this study supports **H_2**, which states that big data and its analytics can create a data-driven organisational culture through a direct positive relationship. This has been supported by the results in correlation analysis, which has indicated that increase in data analytics fosters an organisation to be more data driven. The findings also confirm a positive direct effect in **H_3** that is big data and its analytics can create incentives for managers to use analytic outputs to support their decisions, which in turn has a significant impact on competitive advantage. The findings support practitioners' claims that BD solutions help organisations create actionable strategies by providing timely and deeper insights so as to understand better, their customers and business entirety. When managers make more of their decisions based on high quality information, the quality of their decisions will be improved and therefore be more likely to create organisational competitive advantage.

Big Data alone does not strengthen its direct relationship competitive performance. The results suggest the presence of mediating rather than moderating effects. The findings from **H_4** indicate that organisational data analytic culture has the predicted effects big data and its analytics, thereby indirectly driving and sustaining competitive advantage. Organisations high on analytic culture achieve competitive advantage through higher levels of big data analytics. Managers in these organisations also tend to make their decisions based on analytics, rather than on intuition, leading to better decision quality and better performance. In summary, organisations with high levels of analytic culture generate competitive advantage through big data and its analytics. Organisational culture is still a factor that can sustain competitive advantage, even in this big data era.

Chapter 5 : CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter provides a summary of the findings, conclusions and recommendations with a strong basis on the objectives of the study. This section is dependent on background identification, the research problem itself and the objectives stated in the first chapter. In addition, the review of literature undertaken in chapter two and the methodology documented in chapter three used for data collection that was detrimental to the success of the study also appears in these findings. Further, the analysis of the collected data done in chapter four allows the researcher to present suggestions for further studies on the relationship between BDA and competitive advantage of commercial banks in Zimbabwe.

5.2 ACHIEVEMENT OF RESEARCH AIM AND OBJECTIVES

The main aim of the research was to establish the extent to which the commercial banking industry in Zimbabwe utilise BD analytic tools as a weapon to gain a competitive advantage. This aim goes along with the following set of objectives:

- To investigate the relationship which is there between the BDA and competitive position of commercial banks in Zimbabwe.
- To examine how big data and its analytics create value for businesses through competitive performance.
- To determine the challenges of BDA in the commercial banking industry of Zimbabwe.
- To determine the current status of commercial banks in Zimbabwe in terms of a data-driven culture.
- To establish the extent to which commercial banks are embracing the concept of Big Data and Analytics (Capabilities).

A set of four hypothesis was established in order to achieve this aim and set of objectives and to identify the direct and indirect relationships between BDA and competitive performance. The first hypothesis expects that a higher level of BD and its analytics sophistication lead to competitive advantage $\mathbf{H_1}$. The second hypothesis $\mathbf{H_2}$ anticipates a positive relationship between BD and its analytics and a data-driven organisational culture. The third hypothesis $\mathbf{H_3}$ adds a mechanism that is expected to explain the relationship in $\mathbf{H_1}$. To that effect, analytic-based decision-making is hypothesised to be a mediator in the relationship between BDA and competitive advantage. Then, the last hypothesis $\mathbf{H_4}$ is applied in an attempt to define the mechanisms that drive data analytic

organisations to achieve sustainable competitive advantage. It is hypothesised that organisational data analytic is one of the primary drivers for organisations competing in analytics.

The main aim was achieved by testing the proposition **H_1**, which suggests that big data and its analytics generate competitive advantage, direct and total positive effect. The finding confirms previous anecdotal claims that big data and its analytics generate benefits by enhancing organisational performance, thereby creating competitive advantage. New analytic tools and methods make it possible to analyse a greater amount and variety of data, thereby helping to explore and make sense of BD. Real-time or near real-time information enables organisations to be more agile than their competitors do. In some cases, big data and its analytics also directs and/or automates business processes and decision-making.

The study sought to find out the extent to which banks in Zimbabwe were managing BD and the current utilisation of BDA. Banks with BD management in operation shows that they already have hands-on experience with BD techniques and tools. The banks under serious planning bracket represented those that are close to or on the verge of signing contracts for BD management. Investigating banks represented those still looking at BD management requirements and technologies and are far from implement BD solutions. The category of banks without any BD management initiatives had some banks who were thinking of allocating exploratory budgets for investigation and the growth of BD. There is another category that did not have BD management initiatives in the pipeline but were still trying to figure out how the technology fits into their strategy. This is clear that Zimbabwean banks are at the early stages of deploying BD management initiatives. This can tell us that the one ones who have implemented are piloting and experimenting, the ones who are planning might be developing strategy or knowledge gathering about the initiative.

The responses from those in the IT department and BI, about their top BD challenges, we found that most were rated similarly in terms of their significance. This indicates that respondents face more than one challenge with BD. The influx of data presents many barriers to effectively analysing it and to the creation of business insight for most decision makers. There are challenges with BD and if they can be addressed can help organisations to capture the full potential of BD. The range of technology challenges and the priorities set for tackling them will differ depending on the data maturity of the institution. Data governance and security, large data volume, speed, flexibility of data deployment platforms, cloud based solutions, understanding and utilisation of BD, lack of sharing capacity and integration of a wider variety of data, lack of business support from top management are most of the challenges that kept on coming up from the survey.

On the part of BD and analytics capabilities of the bank, there were some exciting findings which helped to know if the bank has heavily invested on its technology or otherwise. Today's less expensive technologies have opened the door for a democratisation of innovation, allowing most firms to leverage BD and its opportunities at reasonably affordable rates. None of the respondents rated their BD management capabilities as world class because this is a new concept in the market and even those who have are already harnessing its potential are struggling to keep with the pace. Whether their current analytics capabilities are ranked as "Less than adequate" or as "world class," all respondents should look at BD to have a major impact on their business. Big data and analytics initiatives have brought with it a lot of benefits and values to the organisations that have put it into use.

5.3 CONCLUSION

Overall, the results show that the concept of big data analytics capability is transformed into competitive performance through organisational data analytic culture, which can be seen as a mediating factor. In addition, analytic based decision-making contributes to competitive performance through BDA.

The BD revolution has found a niche in the banking industry of Zimbabwe, considering the valuable data that they have had in storage for decades. Big data analytics assist firms to unlock secrets of money movements, prevent major disasters and thefts and understand consumer behaviour. Banks in Zimbabwe have been reaping the benefits of BDA as they can now extract valuable information in a quick and timely manner from their stored data to benefit themselves and their customers.

The study also concludes that banks in Zimbabwe are able to make strides in various ways through the utilisation of BDA tools that enable them to derive utility across various spheres of their platforms including sentiment analysis, financial crime management, and product cross selling, risk management, regulatory compliance management and much more. Banks are taking a business-driven and practical approach to BDA and this is exhibited in the manner in which they formulate company strategies. These firms massively extracting potential solutions to the problems they are currently experiencing and those that they foresee as potentials drawbacks. By redefining their BD technological strategies in addition to extending avenues for exploring sources of data capture, these companies have managed to improve on their infrastructures over time.

Clearly, the banking sector is beginning to build out road maps of where BD could deliver the most value within this broader set of technology investments, but many financial services firms are cautious about making broad-based investments in these new and relatively nascent BD

management initiatives. The effective use of BD has the potential to transform economies, delivering a new wave of productivity growth and consumer surplus. It is also expected that over the next five years, there will be notable and significant progress toward BD deployments within Zimbabwean banking sector.

Using BD will become a key basis of competition for existing firms, as this will create new competitors with the ability to attract a workforce with critical skills for BD world. The leaders in business units need to recognise available opportunities and strategic threats posed by BD and should evaluate and then fill ups the gaps between their present IT competencies and capabilities their organisational data strategy and what is essential to capture BD prospects relevant to their line entity. In this mission, the leaders will need to be very creative and active in shaping the pools of data that they can merge together to create value as well as to gain the access to those pools.

However, there are many challenges in the side of technical and organisational, described in this study, which must be tackled before the BD potential is realised fully. The productivity of BD will emerge through giving users in the organisation the power to work with a quite number of different types of datasets. Achieving the enormous potential of the BD requires a considerate and holistic approach to the management of data, data analysis as well as information intellect. Across the industries, the organisations that are ahead in terms of BD have the potential to create new operating efficiencies, create new revenue lines, a differentiated competitive advantage as well as entirely new models of business. The leaders in today's businesses need to start thinking strategically on how to prepare their business entities for the BD tools and technologies.

5.4 ANSWER TO RESEARCH QUESTIONS

This study explores the following research questions:

1. How commercial banks in Zimbabwe can start with Big Data and Analytics to get more value out of the BD and create a data-driven culture to optimise the BI processes in a way to gain competitive advantage?
2. How BDA is used and perceived in commercial banks of Zimbabwe to affect their competitive advantage.
3. How can data analytics through a data-driven culture influence competitive advantage?
4. To what extend does a match between BD, employees' capability, data analytic tools and tasks influence an organisation's competitive advantage?
5. What instruments drive data analytic corporates to achieve competitive advantage?

To answer these research questions, BDA is operationalised as a combination of analytic tools and methods. The model was developed using a set of four hypothesis to come up with answers to these research questions. The following paragraphs illustrate the answers to the research questions.

As per the research study's findings, firms in the financial industry specifically banking industry, typically have data warehouses and BI tools for reporting on and analysing customer behaviour to better anticipate their needs, and optimise operations. There are challenges with BDA that if addressed, can help organisations capture the full potential of the availability and use of BD. Since there are firms with different ranges of technological challenges, it is understood that the methods of tackling them will be different. In addition, the level of data maturity of the institution also determines its value. Data governance and security, large data volumes, speed, flexibility of data deployment platforms, cloud based solutions, understanding and utilisation of BD, lack of sharing capacity and integration of a wider variety of data plus lack of business support from top management are most of the challenges that kept coming up from the survey.

The study also ascertained that banks desire to differentiate themselves from their competitors through various methods such as developing, testing and delivering unique products and services to their clients. Big data technologies enable correlation of data from multiple sources to determine fraudulent incidences. Harnessing the value of BD entails being able to use it for fast, fact-based decisions that lead to the realisation of a company's business value. The demands on data are becoming increasingly complex as more and more people are relying on different types of data to run their businesses.

The findings confirm previous anecdotal claims that BD and its analytics generate benefits by enhancing organisational performance, thereby creating competitive advantage. New analytic tools and methods make it possible to analyse a greater amount and variety of data, thereby helping to explore and make sense of BD. Real-time or near real-time information enables organisations to be more agile than their competitors do. In some cases, big data and its analytics directs and/or automates business processes and decision-making.

5.5 CONTRIBUTION

This section seeks to provide the contributions made by this research study to different fraternities as indicated as follows:

5.5.1 Theoretical contribution

This study makes the following contributions to the existing academic literature in relation to BD, managerial decision-making, analytic culture, and competitive advantage.

The first contribution relates to the research model. Even though a substantial amount of literature has been speculating about the benefits of BDA, so far no largescale empirical study has been conducted to analyse how BDA can create competitive advantage. The research explains both the direct and indirect relationships between BDA and competitive advantage.

The second contribution is that very little is known about mechanisms contributing to the achievement of benefits from BDA, in particular whether managers actually use analytic outputs for decision-making. The findings demonstrate that managers in the BD era do listen to analytics. Furthermore, they validate the claims that IS can help to overcome the information overload problem as increase in BD lead to more analytic based decision making.

Lastly, the findings suggest that the impact of BDA investments is predominantly driven by culture and not the BDA investments themselves. In other words, organisations, which invest in BDA, for example, by employing advanced analytic professional, creating modern BD infrastructures and deploying BD analytic tools, may create an incentive for managers to listen more to what data analytic results recommend. However, in the absence of organisational data analytic culture, such impacts will remain very little.

5.5.2 Methodological contribution

The methodology employed in this research to understand of how BDA can be implemented within a bank in order to reach better performance and further gain a competitive advantage contributes to all other firms apart from the banking industry, which may need to incorporate data analytics in their operation. Firms interested in the use of BDA can better understand which factors are perceived to lead to competitive advantage.

The approach used in this research allows future research to be conducted based on this methodology used. The methodology helps understand the potential of the BD technology. The strategic potential of BDA is contingent upon the organisation's ability to relate those assets to other resources and therefore create strategic IT-enabled resources. Thus, it alerts management to consider the importance not only to the IT assets in which they invest but also mainly to the other resources in which those are implemented. Specifically, managers' interest should be focused on how to integrate BDA investments in the way the organisation functions and how to make them compatible with other organisational resources, since their importance in reaching a competitive

advantage is crucial. Managers are advised to acknowledge this importance, since it could help them exploit a higher business value of IT within their organisations.

5.5.3 Empirical contribution

The first contribution relates to the measurement model. This research first focuses on operationalising BDA. The operationalisation of the constructs is based on prior academic literature, but where required, practitioner literature is also consulted. This study is one of the earlier empirical research projects attempting to measure BDA in Zimbabwean banking industry.

The findings of this study broadly support the existing claims that BDA enhances organisational performance and creates competitive advantage. The findings of this study empirically confirm the unverified claims on the impact of BDA on managerial decision, behaviour and as far as extra advanced data analytics create an enticement for managers to support their decisions on data analytic insights. This research also confirms BDA as a second order construct, derived from two underlying dimensions: analytic tools and methods.

The results provide an insight in how to deal with BD in practise and utilise BDA effectively. Managers in organisations, which use sophisticated BDA tools and methods, tend to base their decisions on analytics than those in organisations with low BDA. However, the analytic culture in an organisation is a stronger predictor of analytic based decision making than the sophistication of BDA practices.

Lastly, despite some apparent shortage of data analytic skills in the job market, BDA resources can be sourced from markets in a relatively short time. Culture, on the other hand, is generally considered a valuable, rare, inimitable and non-substitutable resource, because it cannot be changed easily and quickly. Organisations with a strong analytic culture are therefore in a good position to compete on analytics, whereas those, which have a low analytic culture, are well advised to start developing such culture, rather than investing blindly into valuable, rare, inimitable and non-substitutable assets.

5.6 POLICY RECOMMENDATIONS

The study recommends that banks in Zimbabwe should prioritise on technology investments and use a test-and-learn mentality to determine how fast and deep-to go when it comes to BD management initiatives. In policymaking, the banks should understand the immediate and strategic information needs of the organisation, which will help them in understanding why they are interested in BDA and if they require assistance with the existing investments in data platforms they

are currently utilising. They should develop reliable and detailed organisational policies with vision and seek guidance from other firms that have grown after embracing BDA. In addition, these firms need to know the right technologies to invest in based on current business strategies that complement overall company goals and investments.

5.7 MANAGERIAL RECOMMENDATIONS

As for the managerial recommendations, the study recommends that it is vital for the banks in Zimbabwe to ensure that their strategies are in line with other firms that could potentially affect their way of business. To get these banks on the path to greater success in the area of BD management initiatives, there should be more emphasis on understanding where a company really is, where it needs to be and how to start in order to improve on its business value and competitive performance. As there are many ways of finding business value from data that firms already have, the processes of auditing and leveraging of the information from corporate data sources would prove to be a big help as it would create better understanding of existing data assets.

The study also recommends that banks should lead in the social revolution by looking for new data sources. That is the reason why these firms need to reinvent their current architectures and software capabilities in order to satisfy the ever-increasing demands of BD and the rise of increasingly more complex scenarios.

5.8 GENERALISATION OF FINDINGS

The findings established in this research can be generalised so as to fit other business fraternities apart from the financial sector of the economy. The retail sector can consider big data and its analytics in order to improve their competitive performance. The medical industry can use as well the same findings to incorporate big data analytic tools in their operations.

Big data management initiatives help banks to become more proactive in their methods of making decisions and less reactive, to be able to deal with issues of importance such as risk, fraud, gaining more consumer insights, compliance, improving on their operations, benefitting from competitive advantage, increasing company efficiency by using BD to reduce costs and developing new products or product features and business models using additional insight gleaned from BDA. All this, is not upon the banking sector only, but to the entire financial industry.

Due to the nature of this study and the points mentioned above, the results are generalisable for many industries. Organisations could tweak the set of recommendations and findings of this research and will therefore benefit from the research study.

5.9 RESEARCH LIMITATIONS.

The findings should be interpreted with caution. While the analysis provides some interesting findings, it should be pointed out that there are a number of limitations to this study. The predominant limitation relates to the survey method and the responses. Despite the fact that several procedural and statistical remedies were deployed to avoid biases, survey-based research is not completely, immune to biases.

Typically, financial institutions do not easily share their data due to the nature of its sensitivity. As such, there were difficulties in getting the required information that was adequate for the success of the research. The time allocated for the data collection was a limiting factor. Understandably, the respondents did not have an air of urgency and more often that the researcher had to visit a particular branch on several occasions in order to check whether a questionnaire had been completed. Lack of focus from some of the respondents was also a limiting factor as this meant that they took more time to respond.

Lastly, the challenge faced by the researcher was that there was lack of control over the data collection; some of the respondents gave out incomplete questionnaires while others failed completely the questionnaires. It was also observed that most of the respondents agreed to participate on condition that the information was going to be used for academic purposes only and hence would not be divulged to a third party.

5.10 AREAS OF FURTHER RESEARCH

Further studies identified as potentially beneficial in relation to this study include carrying out a similar study on other sectors in the finance industry. In addition, further research should be carried out to find out how BDA adoption in operations management can contribute to a companies' financial performance and how this can be measured.

By studying more cases, the results will likely be more generic, hence could improve the validity of the results. Another way to improve the level of generalisation is by focusing on other markets such as health care. This is particularly valuable for organisations working in that specific market. As BDA is considered new and relatively unexplored, the same study should be done in a few years to see how banks are currently struggling with conceptualisation and implementation, have succeeded or not in turning their BD chaos into BD opportunities.

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APPENDICES

Appendix I: Reviewed Articles

Year	Article	Findings / Contribution
2011	Big Data, Analytics and the Path from Insights to Value	Analytics driven opportunities are central to growth and success.
2011	Knowledge resources and competitive advantage.	Strategic resources and capabilities that help determine the extent of competitive advantage is knowledge (data).
2012	Four strategies to capture and create value from BD.	Companies that effectively create and implement BD strategies stand to gain a competitive advantage.
2012	Why BD Is the New Competitive Advantage.	Improved performance, better risk management, and the ability to unearth insights that would otherwise remain hidden.
2013	Big data: Friend or foe of digital advertising?	Digital BD generated by the Internet now are providing consumers with pricing transparency across many product categories, allowing them to easily and quickly find the lowest price for any product.
2013	Content analysis in an era of BD: A hybrid approach to computational and manual methods.	Computational methods using BD combined with manual methods help provide advantage.
2014	Big Data solutions on a small scale: Evaluating accessible high performance computing for social research	Big Data solutions can also enable robust, deep, and fruitful research outcomes.
2014	Big data and competitive advantage at Nielsen	Big Data helped regain competitive advantage that had eroded.
2014	Using 'Big Data' to deliver a competitive advantage.	Leveraging BD helps managers understand how to operate their business.
2014	Using BD to improve customer experience and business performance.	Big Data can create sustainable competitive advantage for customer service.

2014	BDA in healthcare: promise and potential	BDA has the potential to transform the way healthcare providers use sophisticated technologies to gain insight from their clinical and other data repositories and make informed decisions.
2014	BI and BDA: An Overview	Schools are filling the knowledge gap by providing programs about data analytics.
2014	Big data and the government agency	Managers must be aware that BD holds major benefits for their customers.
2014	Study on the Implementation of Budget Performance Evaluation from the Perspective of Big Data	Big data thinking and techniques helped improve budget performance.
2015	Leveraging Big-Data for Business Process Analytics	Big Data solutions produced remarkable results in two real functional environments.
2015	Big data, bigger dilemmas: A critical review	There is a competitive advantage for institutions and corporations that can afford the computing infrastructure necessary to analyse BD.
2016	Social media and the social sciences: How researchers employ BDA	There is a big need for critical data analysis using BD.

Appendix II: Research Gaps

Researchers	Topic	Major Findings	Knowledge Gaps
Hall & Saias (1998)	A survey of competitive strategies by sixty-four American companies	The study found that companies following a differentiation strategy had a large market share than those who were reluctant to adapt differentiation strategies.	The study limited itself to one strategy alone; differentiation
Chan and Jamison (2001)	Competitive strategies adopted by banks in China from 1978 to1998 and performance	The findings revealed that most banks that adopted competitive strategies had a superior performance.	The study did not address issues of market share. The study focused on profitability
Irungu (2010)	the strategies used by Safaricom in responding to the competitive environment	The study found that the responses adopted by Safaricom led to financial strategies, innovation, invention, strategies, research and development ventures and investment in technology strategies	The study did not address matters pertaining the market share
Njuguna (2012)	Competitive strategies adopted by Safaricom Kenya limited to tackle competition.	The results revealed that the most popular strategies were as follows: differentiation, cost leadership strategy, focus strategy, product choice, and market penetration strategy and pricing strategy.	The study limited itself to competitive strategies
Ong‟ong‟a, (2014)	Effect of marketing strategies in gaining market share by insurance companies in Kenya.	The study found that marketing strategies led to improved market share.	The study did not address competitive strategies in the telecommunications firms.

Asiabugwa and Munyoki (2012)	The relationship between e-commerce strategy and performance of commercial banks in Kenya	The findings also indicated that the main factors which influenced the adoption of e-commerce strategy in banks to a larger extent are customer support service and the	The study did not address issues to do with the market share

Appendix III: List of Commercial Banks in Zimbabwe

1. Agricultural Development Bank of Zimbabwe
2. BancABC Zimbabwe
3. First Capital Bank Limited.
4. CBZ Bank Limited
5. Ecobank Zimbabwe Limited
6. FBC Bank Limited
7. Nedbank Zimbabwe Limited
8. Metbank
9. NMB Bank Limited
10. Stanbic Bank Zimbabwe Limited
11. Standard Chartered Bank Zimbabwe Limited
12. Steward Bank
13. ZB Bank Limited

Appendix IV: Reliability Statistics if an Item is Deleted.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Awareness and Visibility of Big Data Products	132.91	77.265	-.202	.786
Does your Institution do Big Data Analytics	135.48	75.312	.000	.773
Big Data Management Capabilities	134.44	68.475	.137	.792
Statistics	133.02	70.022	.293	.766
Predictive Analysis	132.89	69.571	.452	.759
Data Querying	132.59	68.895	.498	.757
Fraud Detection	132.62	68.676	.453	.758
Data Mining	132.56	70.884	.350	.764
Business Process Optimisation	132.69	71.109	.299	.766
Strategy Implementation	132.63	72.341	.212	.769
Processing Results of Online Surveys	132.71	70.297	.473	.760
Market Trend Prediction	132.57	69.035	.496	.757
Telephone Communication	132.71	71.179	.374	.763
Business-Transactions/Processes	132.70	69.985	.500	.759
Website Customisation	132.80	72.496	.265	.767
Data Warehousing/Storage	132.73	70.563	.376	.763
Risk Analysis	132.62	67.420	.589	.752
Reduced Risk and Fraud	132.89	70.398	.305	.765
Real-Time Decisions Making	132.59	71.032	.438	.762
New Product Innovations	132.44	68.051	.625	.752
More Efficient Operations	132.37	69.098	.457	.758
Competitive Advantage	132.35	70.988	.360	.763
Improved Customer Experience	132.61	70.301	.408	.761
Privacy and Security	132.81	71.487	.285	.766
Access and Information Sharing	132.70	71.651	.312	.765
Characteristics of Big Data	132.14	72.179	.215	.769
Data Sources Analytical Challenges	132.02	68.545	.606	.754
Improved Customer Experience	132.59	76.137	-.104	.786
Better Informed Decisions	132.57	75.004	.011	.775
New Data Discovery	131.73	75.169	-.006	.775
More Customer Focused Strategies	132.60	73.893	.105	.773
More Differentiation Compared to Others	132.57	72.747	.230	.769
More Products Innovation	131.81	75.139	-.017	.777
Segmentation of Customers	132.60	73.287	.161	.771
Risk Mitigation and Prediction	133.12	76.470	-.124	.789
More Accurate Trading Decisions	132.65	74.228	.062	.775
BDA Should be a Key Strategic Priority for ICT and BI	135.48	75.312	.000	.773

Appendix V: Kurtosis and Skewness – Normality Statistics

			Statistic	Std. Error
Competitive Advantage	Mean		4.05	.066
	95% Confidence Interval for Mean	Lower Bound	3.92	
		Upper Bound	4.18	
	5% Trimmed Mean		4.06	
	Median		4.00	
	Variance		.581	
	Std. Deviation		.762	
	Minimum		3	
	Maximum		5	
	Range		2	
	Interquartile Range		2	
	Skewness		-.089	.210
	Kurtosis		-1.263	.417
More Differentiation Compared to Others	Mean		3.91	.049
	95% Confidence Interval for Mean	Lower Bound	3.81	
		Upper Bound	4.01	
	5% Trimmed Mean		3.90	
	Median		4.00	
	Variance		.325	
	Std. Deviation		.570	
	Minimum		3	
	Maximum		5	
	Range		2	
	Interquartile Range		0	
	Skewness		-.012	.210
	Kurtosis		.065	.417

COVER LETTER

My name is Benito Mangwiro. I am currently studying towards a Master of Business Administration degree at the University of Zimbabwe, specialising in Strategic Leadership and Corporate Governance. I am undertaking a survey on 'Big Data Analytics and Competitive Advantage of Commercial Banks in Harare, Zimbabwe' that will lead to the production of my final masters' dissertation report.

I would be obliged if you volunteered a few moments of your time in order to give your consent and complete a questionnaire which covers certain aspects of the survey.

Any information you provide will be treated with utmost discretion and none of the participants of this survey will be individually identified in the resulting product.

Thank you in advance for your assistance.

Kind regards,

Benito Mangwiro.

RESEARCH QUESTIONNAIRE

This research questionnaire is part of an educational study on Master of Business Administration that is being carried out on the analysis of Big Data Analytics (BDA) technology as a weapon for competitive advantage for Zimbabwean commercial banks. Your bank has been selected for this study. The information obtained will be treated as confidential and will be used for the study and nothing else. Your cooperation and assistance will be highly appreciated. Thank you in advance for taking time to fill in the questionnaire.

Big data is the term for a collection of data sets so large and complex that it becomes difficult to process using traditional database management tools or traditional data processing applications.

SECTION A: ABOUT YOURSELF AND YOUR ORGANISATION

1. What is your gender?

□ Male □ Female

2. Which age group do you fall in?

□ 18 – 25 years □ 26 – 30 years □ 31 – 35 years □ 36 – 40 years

□ 41 – 50 years □ Above 50 years

3. What functional area of IT or Business Intelligence (BI) do you work in?

□ Database Administration □ BI Training

□ IT security □ Contracts Management

□ Operations and Support □ Data Mining

□ Systems Administration □ Analytical Processing

□ Network Administration □ BI Reporting

4. How long have you worked in your organisation (bank)?

□ Less than 1 year □ 1 – 5 years □ 6 – 10 years □ 11 – 15 years

□ 16 – 20 years □ More than 20 years

5. How many employees work in your organisation (bank)?

□ Less than 1000 □ 1000 – 3000 □ 3001 – 5000 □ More than 5000

6. How long has your organisation been in banking industry?

□ Less than 10 years □ 10 – 20 years □ 21 – 30 years □ More than 30 years

7. How many branches does the bank have in Zimbabwe?

□ Less than 10 □ 10 – 20 □ 21 – 30 □ More than 30

8. Is there any big data analytics initiative in your organisation?

□ Yes, initiatives in operations

□ Serious Planning

□ No initiatives underway

SECTION B: BIG DATA ANALYTICS APPLICATION IN YOUR ORGANISATION

9. On a scale of 1-5 how would you describe your awareness of and the visibility you have on big data products currently on the market? Kindly indicate with (✓) as appropriate.

□**1** Not aware at all □ **2** Slightly aware □**3** Neutral □**4** Aware □**5** Highly aware

10. Does your company do any Big Data analytics

□ Yes □No

If **Yes** answer questions 11 to 16, **Else** answer question 16 only

11. How would you rate your current organisation's big data analytics capabilities?

	Less than Adequate	**Adequate**	**More than Adequate**	**World class**	**Don't know**
Current big data analytics capabilities					

12. How would describe your Analytics Based Decision making in your organisation?

	No Extent	**Little Extent**	**Moderate Extent**	**Large Extent**	**Very Large Extent**
We base our decisions on data rather than on instinct					
We are willing to override our own intuition when data contradict our viewpoints					
We continuously coach our employees to make decisions based on data					

13. Kindly indicate the extent to which big data analytics is used in your organisation for each of the following purposes:

	No Extent	**Little Extent**	**Moderate Extent**	**Large Extent**	**Very Large Extent**
Statistics					
Predictive Analysis					
Data querying					
Fraud detection					
Data mining					
Business Process Optimisation					
Strategy Implementation					
Processing results of online surveys					
Market trend prediction					
Telephone communication					
Business-Transactions/ Processes					
Website customisation					
Data warehousing/ storage					
Risk analysis					

SECTION C: BENEFITS OF USING BIG DATA ANALYTICS IN YOUR ORGANISATION.

14. To what extend has big data analytics helped your organisation achieve the benefits below.

	No Extent at All	**Little Extent**	**Moderate Extent**	**Great Extent**	**Very Great Extent**
Reduced risk and fraud					
Real time decisions					
New product innovations					
More efficient operations					
Competitive advantage					
Improved customer experience					
Others (Please indicate)					

SECTION D: CHALLENGES FACED IN THE USE OF BIG DATA ANALYTICS IN YOUR ORGANISATION.

15. Please indicate the extent to which the below challenges inhibit the management of big data in your organisation.

	No Extent at All	**Little Extent**	**Moderate Extent**	**Great Extent**	**Very Great Extent**
Privacy and Security					
Access and information sharing					
Characteristics of big data (volume, variety, velocity)					
Analytical challenges of new data sources					
Others (Please indicate)					

SECTION E: COMPETITIVE ADVANTAGE AS A RESULT OF USE OF BIG DATA ANALYTICS IN YOUR ORGANISATION.

16. In a scale of 1-5, please rank how the below results of big data analytics has affected the organisation's competitive advantage. (1) – **No Extent**, (2) – **Little Extent**, (3) – **Moderate Extent**, (4) – **Large Extent**, (5) – **Very Large Extent**. Kindly indicate with (✓) as appropriate.

	1	**2**	**3**	**4**	**5**
Increased ability to understand and respond to customers better					

Better Informed decisions					
New Data Discovery					
Use of more customer focused strategies					
More differentiation compared to other companies					
More product innovations					
Narrower segmentation of customers thus better product offering					
Increased ability to predict and mitigate risks					
More accurate trading decisions					
Others (Please indicate)					

17. Do you agree that big data should be a key strategic priority for ICT and Business Intelligence in your organisation now and in 5 years?

□ Yes

□ No