BIG DATA ANALYTICS AND COMPETITIVE ADVANTAGE OF COMMERCIAL BANKS AND INSURANCE COMPANIES IN NAIROBI, KENYA

BY

DAVIS NDAMBO

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF MASTER OF BUSINESS ADMINISTRATION DEGREE, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

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DECLARATION

This research project is my original work and has not been presented for any academic award in any other university.

Signed ..... Date .....

DAVIS NDAMBO

D61/61046/2013

This research project has been submitted for examination with my approval as the university supervisor.

Signed ..... Date .....

MR. JOEL LELEI

Department of Management Science

University of Nairobi.

DEDICATION

This project would not have come to fruition were it not for the support and guidance of several individuals. To my dear parents Mr. and Mrs. Mutua who encouraged me throughout life's challenges, I thank you.

To my wife Rose for staying up until the wee hours of the night, offering suggestions and critiquing my work as I struggled to complete each chapter of this project, thank you; you are my pillar and source of great inspiration. To my daughter who had to sacrifice her precious play time in order to allow me to complete this project, I thank you.

To my supervisor Mr. Joel Lelei, thank you for challenging my mind set, teaching me to think outside the box, inspiring creativity and offering constructive criticism to this project. You are a well spring of knowledge; may you continue to illuminate the minds of those who come to you for guidance.

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LIST OF ABBREVIATIONS

BD	Big Data
CBK	Central Bank of Kenya
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IDG	International Data Group
IRA	Insurance Regulatory Authority

ABSTRACT

This study focussed on big data and competitive advantage in commercial banks and insurance companies in Nairobi, Kenya and was dependent on the following objectives: To establish the extent of application of big data analytics in commercial banks and insurance companies in Nairobi; to determine the relationship between big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi; to establish the challenges of big data analytics in commercial banks and insurance companies in Nairobi. A descriptive survey was employed for the purpose of data collection for this research. The population targeted for this study was commercial banks and insurance companies in Nairobi, Kenya. There are 42 commercial banks and 49 insurance companies in Nairobi. A sample of 20 commercial banks and 25 insurance companies was undertaken due to the limited time allocated for data collection and analysis. The sample was selected based on a judgmental basis taking into account the companies' use of big data analytics. This research used primary data collected using structured questionnaires. The respondents were managers dealing with company strategies and/ or information and technology managers in the selected companies. The data was analyzed using frequencies, percentages, mean, and standard deviation and regression techniques. The study found that companies in the financial industry specifically commercial banks and insurance firms have invested in data storage facilities and advanced tools in the area of business intelligence for reporting and analysing consumer/ client behaviour. These tools allow the companies to anticipate consumer needs more effectively, in addition to optimizing their operations. The addition of big data analytics systems in the companies' daily routines enables them to gain higher levels of insight in the big data environment thus enabling more effective decision making. There are challenges in management of big data that if addressed can help organizations appreciate the full potential of big data tools and various analytics especially in aspects of competitive advantage. This study, through a thorough analysis of its findings concludes that the big data revolution has found a place in the commercial banking and insurance industry in Nairobi, and that the trend is on the rise as these companies continue to discover the valuable data with tremendous potential they have had in their storage for decades.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The first documented instance that the phrase 'Big Data' was used was in 2005. This was when Roger Mougalas, a pioneer at O'Reilly Media referred to it as a large/ huge set of data that is quite difficult to handle/ manage by use of traditional/ less automated business intelligence tools (van Rijmenan, 2015). Since then, big data analytics have become necessary tools across a lot of organizations such that they create business value and competitive advantage (Jones, 2016).

The concept of big data is defined by the three Vs; Velocity, Variety and Volume. Velocity of big data refers to the speed that data is produced and requires processing. The volume of big data refers to the large amount of data and variety is a representation of the different data sets that are available (Fosso, Wamba, et al., 2015). The three Vs if used wisely can be an asset to a company to gain an edge over other companies in the same industry. The concept of competitive advantage comprises 'differentiation', 'focus' and 'cost leadership' strategies (Porter, 1998). These are the tools that aid an organization to perform better than its rivals in a shared competitive environment.

In Africa, the most visible cases of big data use have been in Kenya, where the number of bank accounts opened between 2007 and 2012 has grown four-fold, and this has largely been as a result of mobile money banking (Stefanski, 2012). The result is that more and more data is being churned out. The International Data Group (IDG) conducted a research that concluded that Kenya is definitely moving towards the big data revolution through the inception of big data projects and partnerships with major multi-national companies with similar interests (Tredger, 2013).

1.1.1 Big Data Analytics

Big data refers to groups of data sets that have been combined such that their volume, variability and velocity (growth rate) make them difficult to be captured, stored and processed for analysis by conventional/ traditional technologies within a specific time-frame (Slack, 2012). Big data is characterised as being too big, moves with too much speed or does not fit into traditional database architecture structures (Dumbill, 2012). Big data in business has a variety of uses that make it fundamental in ensuring that financial institutions remain relevant in today's competitive arena.

Big data analytics is the process of examining large sets of data over a period of time for the purpose of uncovering hidden patterns and trends that are useful to a business in terms of new revenue opportunities, improved customer service and competitive advantage among other benefits (Rouse, n.d.). 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 (Rouse, n.d.). Risk assessment of projects and corrective action are critical areas that big data analytics can be of use. Firms depend on insights from data they collect in order to make better informed decisions (The Economist, 2014).

1.1.2 Competitive Advantage of Big Data Analytics

Competitive advantage refers to an organization's ability to perform better than its rivals in the same industry (Kotler, 2000). At the core of the success or failure of a firm is competition (Porter, 1998). The indicators of competitive advantage of a company are 'Cost Leadership', 'Differentiation' and 'Focus' (Porter, 1998).

The cost leadership strategy involves ensuring that your firm has the lowest cost in the industry. Profits are increased by reducing costs incurred but still ensuring that industry – averaged prices are charged (Malburg, 2000). The Differentiation strategy involves taking steps to ensure that products or services are different by ensuring that they are of high quality thus noticeably different from those of competitors (Porter, 1998). A study carried out on sixty – four American companies revealed that the performance of companies that utilized the differentiation strategy was superior in relation to companies that did not employ it (Hall & Saias, 1980).

The focus strategy works when firms concentrate on a particular niche market instead of generally targeting the market (Porter, 1998). In a study carried out on three-hundred and thirty companies in North America, it was found that the companies that invest in big data analytics tools for their value chain experience 5-6% higher success levels than their rivals in the same industry (McAfee & Brynjolfsson, 2012).

Focus strategies involve achieving one of the two strategies of differentiation or cost leadership but applied in a niche market (Porter, 1998). Promotional activities are undertaken by firms to focus on alerting consumers who are interested in a product or service of its availability (Markgraf, 2014). This ensures loyalty from consumers, which is a valuable weapon against other brands in the same industry.

1.1.3 Banks and Insurance Companies

A bank is an institution of finance that accepts money from the public that is deposited and paid back, at the end of a time-frame that is fixed. Banks also use funds held after being deposited or part of the amount by investing, lending it out, or using

it for a variety of alternative legal ways for purposes of the account, at the risk of the person making use of the money (Central Bank of Kenya, 2013). An Insurance company is an entity that covers an individual or company in the form of compensation due to loss, damage of property or injury of persons in exchange for premium payments.

There are different types of banks in the industry. These include community banks, commercial banks, credit unions, community development banks, savings banks, land development banks, offshore and postal savings banks. This paper focuses on commercial banks which are banks that offer various services that are primarily receiving deposits, safeguarding of money, investing the funds in securities in return for profits and lending it to the general public and various companies (CBK, 2013).

There are 42 registered commercial banks and 49 registered insurance companies in Kenya (CBK, 2013). Commercial banks and insurance companies undergo a series of challenges due to the nature of their business – handling large sums of money (Zikopoulos et al., 2011). Government regulations provide a challenge to commercial banks and insurance companies. The Republic of Kenya's banking industry is governed by the Companies Act, the Central Bank of Kenya Act and the Banking Act Laws of Kenya Chapter 488 (Government of Kenya, 2011). Insurance companies are governed and regulated by the Insurance Regulatory Authority (IRA).

The bill capping interest rates in Kenya that was signed by the president dealt a major blow to commercial banks across the country. The high interest rates that commercial banks used to charge have been scrapped resulting in less income for them and obviously slower growth in terms of their asset base (Daily Nation, 2016). Fraud is a

major challenge that hampers progress in the industry. Big data analytics would be of great benefit in building fraud models to curb this menace (Zikopoulos et al., 2011). The non-detection of the fraud itself, lack of sharing the data with other banking and insurance companies as well as not sharing information about fraud with the general public are some of the reasons that allow criminals to get away scot-free and become repeat offenders (Wahito, 2015).

1.2 Research Problem

Big data can be categorised as big data in movement (facebook comments, tweeter and instagram comments) or big data at rest (emails, weblogs) and big data that has already been streamed (Mohanty et al., 2013). Due to the speed at which the generation of large volumes of big data has skyrocketed in the past decade, a new breed of better technologies has emerged (Marz, 2015). These technologies include big data analytics tools.

A study on big data analytics indicates that 91% of fortune 1,000 companies in the world have invested heavily on big data analytics in order to ensure that they remain ahead of the competition (Kiron et al., 2014). The Common Wealth Bank of Australia uses big data analytics for customer risk assessment by looking at the cash flow performance of its clients, allowing them to offer advice on the best way to mitigate their risks (Eyers, 2014). Chinese ecommerce company, 'Alibaba' realized that added security measures were required after carrying out big data analytics on user accounts that had been hacked. The company introduced five verification stages that an online customer has to pass in order to be allowed to proceed with their purchase (Kaushik, 2016). These studies show the importance of big data analytics. Even then, they were done outside the Kenyan context.

However, how much is known about big data analytics in Kenya? Big data analytics would benefit Kenya in numerous ways as data sets are becoming more available (Milller & Nyauncho, 2015). The Kenyan commercial banking and insurance industry has suffered a lot due to numerous challenges. Theft, lack of trust from customers, competition from mobile money and changing consumer preferences are some of the challenges (Miller & Nyauncho, 2015). Further, implementation of big data analytics is an issue in that it requires training of personnel on the use of big data analytics tools or hiring of new staff. In addition, big data analytics tools would require purchase and this is an added expense to the company but one that would be of benefit. These cases clearly show the necessity for understanding big data analytics in Kenya and how it can aid in solving these problems and providing them with a competitive edge/ advantage.

IBM conducted a study on big data analytics use in Kenya and found that although some companies have started to use big data analytics tools, a lot of them are still in the experimental phase. The study was motivated by the company's need to know how many major corporations in Kenya actually use IBM systems (IBM, n.d). Further, in a study carried out on methods of fraud detection in the Kenyan public sector, a researcher concluded that sampling of big data using big data analytics tools was in use. This means that not all the valuable data captured is used and that this should not be the case. The researcher concluded that sampling does not provide accurate findings but instead gives an estimate and this makes it more difficult to prevent future fraud (Karuitha, 2016).

This study would be useful to the Kenyan commercial banking and insurance industry by establishing the limiting factors and extent of big data analytics application in the

two industries and if they use the tools to gain competitive advantage. Examples of big data analytics tools already in use today in various financial institutions include 'Hadoop' and 'Cloudera' for data storage; for data cleaning there is 'Openrefine' and 'data cleaner' and for data mining there is 'RapidMiner' (Zikopoulos, 2011).

1.3 Objectives of the Study

This study was guided by the following objectives:

(i) To establish the extent of application of big data analytics in commercial banks and insurance companies in Nairobi, Kenya.

(ii) To determine the relationship between big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi, Kenya.

(iii) To establish the challenges of big data analytics in commercial banks and insurance companies in Nairobi, Kenya.

1.4 Value of the Study

Kenya's commercial banking and insurance sector would benefit a great deal from this research paper as the information will provide them with avenues for more accurate decisions and methods of avoiding poorly calculated risks. Through the introduction of new and improved products and services, firms improve their chances of remaining relevant in their respective industries (Ammit & Zott, 2001).

This study will also be of use to the academic fraternity as well as Information and Communications Technology (ICT) practitioners who can use big data analytics tools for prevention of errors and crimes committed by fraudsters rather than treatment of the same after the fact.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

A literature review is a documented account of evaluated information found in the literature related to the specific area the researcher has decided to study (CQ University, 2015). The books, journals and articles gathered for this research paper focus on the objectives previously highlighted in the study and how they relate to the day to day running of commercial banks and insurance companies in Nairobi, Kenya.

2.2 Theories Relating to Big Data Analytics

A theory is a set of assumptions, or facts that attempt to provide rational explanations of relationships among a group of phenomenon that have been observed (Business Dictionary, n.d). The theories that are relevant to this study are the 'Transaction Costs Economic Theory, 'Schumpeterian's Innovation Theory' and the 'Resource- Based Theory of Competitive Advantage.'

Schumpeterian's Innovation Theory states that innovation is the key to making a firm valuable in a particular industry. Through the introduction of new and improved products and services, a firm can remain relevant in a stiffly competitive market (Amit & Zott, 2001). According to the theory, consumer preferences are not spontaneous but are rather already innate. This means that irrespective of the economic changes that take place in a country, consumers already know what they want (Schumpeter, 1934).

The innovation theory is divided into five steps. The re-launch of an already known product or launch of a new one; the introduction of new production or sales methods (that have not been proven yet in the industry); the creation of previously non-existent

markets; the purchase/ acquisition of new sources of supplies of raw materials; implementing a new industry structure that becomes a monopoly or that destroys a current one (Schumpeter, 1934). Schumpeter argues that in order for one to make profit, they have to innovate.

The Transaction Cost Economic Theory states that in order for a firm to be profitable it needs to increase its efficiency while all the while reducing its costs (Amit & Zott, 2001). The Transaction cost theory has been the most studied for firms that desire to enter a new market (Canabal & white, 2008). Studies carried out on companies that used this theory conclude that they performed better than companies that do not use it in terms of improved profit margins and reduced costs (Brouthers, Brouthers & Warner, 2003).

The Resource – Based Theory of Competitive Advantage states that the resources owned by a firm include all information, assets, organizational processes, capabilities and knowledge (big data analytics) controlled by the firm that give it the ability to plan and improve its efficiency and effectiveness through implementation of this strategy (Rugman & Verbeke, 2002). A firm attains competitive advantage using this theory when its rivals are unable to duplicate its level of performance. In addition, the firm must have four attributes: it must be of some value that it exhibits by exploiting opportunities and neutralizing threats; it must be imperfectly imitable – worthy of imitation but difficult to imitate; it must be rare when compared to its competitors in terms of uniqueness of products offered and there can't be strategically equivalent substitutes for the resource (Rugman & Verbeke, 2002).

2.3 Big Data Analytics Applications

Applications of big data analytics are the tools that have been invented to carry out data analytics. For data analysis, the 'Qubole' application is a viable solution (import.io, n.d.). The application simplifies big data analytics workloads and scales them against stored data such that relationships are created. This is a useful tool during querying.

The 'BigML' application allows importation of data and produces predictions as the end product (Wayner, 2012). The application allows users to create scenarios based on the data collected thus allowing them to make more informed decisions while avoiding pitfalls. In order to give it a competitive advantage, the company that created the application has offered a free version of the product that allows testing of data that is less than 16 megabytes just to show its effectiveness (Wayner, 2012).

'Infotracker' is an application recently developed that is triggered by a customer's close proximity to an advertisement billboard belonging to a company they are affiliated to. As long as the customer is carrying a membership/ loyalty card belonging to the company they will be targeted (van Bommel & Edelman, 2015). When the customer is close enough to read the ad, a text message is sent to their mobile phone offering a new product such as an upgrade from the current credit card they own after the company has analysed their buying behaviour (van Bommel & Edelman, 2015).

The 'Customer Relationship Management System' adopted by various financial institutions in Kenya in collaboration with Microsoft is yet another application where

big data analytics is maximized. The system captures all data entered by their clients and uses it to improve the customer experience by saving on time and allowing the client to select exactly which area they need assistance in (Karikkandathil, 2016). In addition, financial institutions can now sieve through large volumes of data in the form of emails, customer feedback and even text messages with added ease (Olhorst, 2012).

2.4 Challenges of Using Big Data Analytics

A challenge is a situation that tests someone's capabilities to formulate a solution. Commercial banks and insurance companies contribute to the economy in that they develop procedures for collection of money from depositors and lend it to borrowers. In addition, they facilitate the flow of funds that are necessary for investment by organizations, individuals, households and even government agencies. This takes place when one of the parties purchases financial assets that were previously owned by the other party (Madura, 2013). Commercial banks and insurance companies face a number of challenges by virtue of their transactions.

Volume is a one of the challenges of utilizing big data analytics and it translates to the amount of data that is available. The challenge is how to maximize the use of all the data. As of 2012, over 2.5 trillion gigabytes of data are created every day, an amount which is expected to rise daily (McAfee & Brynjolfsson, 2012). Lack of enough skilled personnel to carry out the data analytics plus testing the accuracy of the data itself are challenges as well (Krishnan, 2013).

Getting the right technology to carry out data analytics is a costly exercise and puts an added strain on a firm's budget (McAfee & Brynjolfsson, 2012). This is especially true if it causes diversion of funds from other projects. The variety of data means the different data types collected in an environment comprising big data. This data may be in the form of text messages, images or even audio or video. This makes it difficult to process and also time consuming (Russom, 2011).

Understanding the results of big data analytics can be taxing especially if done by novices in the field who must bear in mind that the data landscape is constantly changing (Krishnan, 2013). Velocity is defined as the speed at which data is generated, collected, processed and analyzed in real time (Fosso, Wamba, et al., 2015). This factor forces commercial banks and insurance companies to employ sophisticated systems for data capture, analysis and storage in order to make real time decisions (Bragge et al., 2012).

The attributes of big data are summarized as the 3Vs. These are 'volume', 'velocity' and 'variety.' The volume (size) of data that financial institutions receive on a daily basis is huge. The result is that decision making isn't as simple as more data translates to more data that needs to be analyzed before making any concrete decision (Davenport, 2013). The techniques of data capture, processing and storage that were in use ten years ago will not work as effectively today.

The loss of millions of shillings by companies in Kenya through fraud is a major problem that can be potentially solved by use of big data analytics (Wahito, 2015). The slow growth in the Kenyan economy can be attributed to decline in tourism,

agriculture and manufacturing (Gibendi, 2015). Data is available that contains the exact figures of the decline. The problem is that there is a shortage of qualified personnel to analyze the data and provide solutions in a timely manner (Gibendi, 2015).

Velocity of big data is characterized by rapidly updating data sets that traditional data management tools are not equipped for (Inmon, 1997). These rapidly updating data sets require real-time analysis, another feature which is not favored by traditional data management tools. Furthermore, intelligent systems are required to determine which information is relevant and which to discard in a real time setting (Zikopoulos, 2011). In addition, distributed databases and file systems plus cloud computing technologies are also a requirement if a firm considers itself to be in a competitive position in the big data analytics world (Inmon, 1997).

Regulatory requirements for financial institutions that are imposed by the government include the storage of an increasing amount of historical data (Babin et al., 2006). The Central Bank of Kenya offers risk management guidelines tailored to ensure that sufficient data from transactions are stored after capture from system logs, failure to which the Central Bank of Kenya can penalize them under laws already put in place depending on the offence (Central Bank of Kenya, 2013). These large volumes of data make analytics processes slower.

There is a shortage of skilled labor in the big data analytics realm and the process of determining the best use of the data that has been analyzed through various sources is an uphill task. This is because it may require a team of experts to sieve through what is useful and what is not in order to find the best way to proceed with little baggage from what is of no use (Krishnan, 2013).

2.5 Big Data Analytics and Competitive Advantage

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 (mind tools, 2015). Firms that use big data analytics in their operations have been found to lead in their various industries (McAfee & Brynjolfsson, 2012).

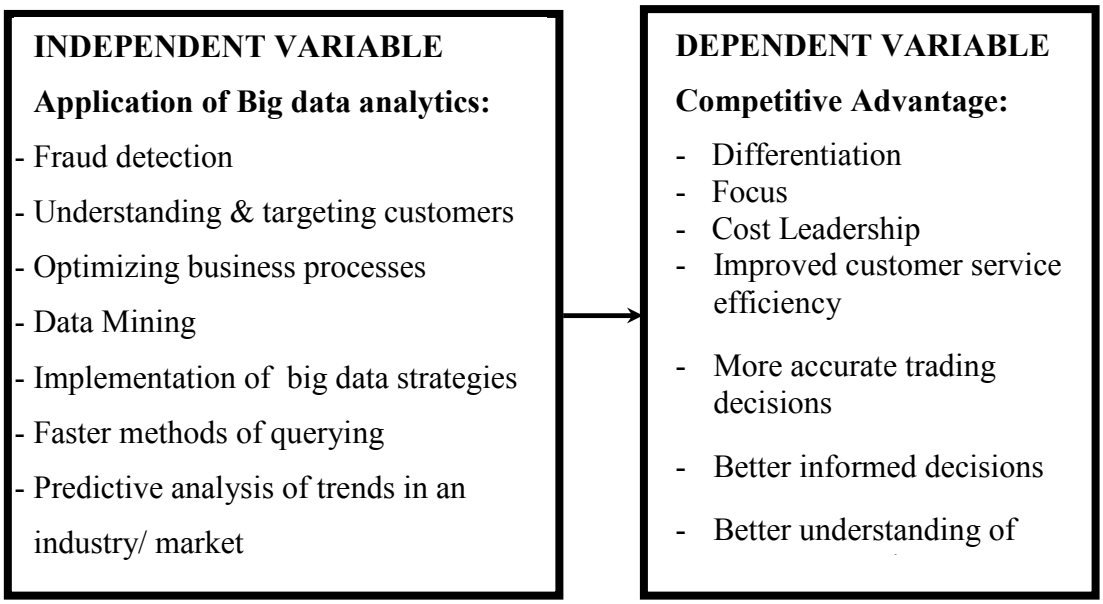
The Focus strategy works best when companies concentrate on a niche market instead of targeting the general market (mind tools, 2015). In a study on sustainable competitive advantage of insurance companies in Kenya, the researcher's dominant finding was that constant evaluation of strategies employed 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, 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 commercial banks across America. This has

disadvantaged other banks without the finances to purchase the software (Wayner, 2012).

2.6 Conceptual Framework

Conceptual frameworks are theoretical structures that encompass principles, rules and assumptions holding together the ideas of a concept in a broad spectrum (Zikmund, 2003). The conceptual framework in Figure 2.6 shows the relationship between the application of big data analytics by a firm and the resultant gain in terms of competitive advantage. Refer to Figure 2.6.



Source: Author, 2016

2.7 Summary of Literature Review

The journals, articles and books that have been published in relation to big data analytics and competitive advantage are numerous. The material used in this research paper relates to the stated objectives but also highlights the need for the adoption of big data analytics in financial institutions in Kenya, specifically in the commercial banking and insurance industry.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

Chapter three provides a summary of the research methodology that was utilized for this particular study. The sections are divided into five categories; research design, population targeted, sampling technique, the data collection and analysis methods used.

3.2 Research Design

Research designs involve the collection, measurements and various types of analysis of all the data collected for the purpose of a study (Cooper, 2008). A descriptive survey was utilized for the purpose of data collection for this research. Descriptive surveys provide a clear profile of the aspects of interest from an individual, organizational and industry oriented perspective. 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 (Mugenda & Mugenda, 1999).

3.3 Population Targeted

The population targeted for the study done comprised commercial banks and insurance companies in Nairobi, Kenya. There are 42 commercial banks and 49 insurance companies in Nairobi (Insurance Regulatory Authority, n.d.)

3.4 Sampling Design

A sample of 20 commercial banks and 25 insurance companies was undertaken due to the limited time allocated for data collection and analysis. The sample was selected

based on the judgmental basis taking into account the companies' usage of big data analytics.

3.5 Data Collection

This research used primary data that was gathered using structured questionnaires. Administration of the questionnaires was done using a 'drop and pick up later method.' The data was collected from managers dealing with company strategies and/ or information and communication technology managers in the selected companies. The questionnaire was divided into sections. Section A covered the demographics of the company personnel which included age, gender and length of service. Section B covered the extent of application of big data analytics within the respective organizations. Section C covered the challenges faced in the use of big data analytics in the organizations. Section D covered competitive advantage as a result of the use of big data analytics in the organizations.

3.6 Data Analysis

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

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \mathcal{E}$$

Whereby:

Y = Competitive advantage

X_1 = Fraud detection

X_2 = Data Mining

X_3 = Business process optimization

X_4 = Prediction of market trend analysis

X_5 = Understanding & targeting customers

X_6 = Implementation of big data strategies

X_7 = Faster methods of querying

β_0 = Constant

ε = Error

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1 Introduction

Chapter four of this research study presents the analysis and findings made by the researcher. The findings documented are of the relationship between big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi, Kenya. This chapter also discusses the findings in comparison with relevant theory and literature as established by other authors in the same field of study.

4.2 Response Rate

Response rate refers to the degree to which the final data set comprises all the members sampled. It is obtained 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 45 managers dealing with company strategies and/ or information and technology managers in the selected commercial banks and insurance companies, as they understand the big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi Kenya. The questionnaire rate of return findings are shown in Table 4.2.

Table 4.2: Response Rate

Response	**Frequency**	**Percentage**
Responded	32	71.1
Did not respond	13	28.9
Total	**45**	**100.0**

Source: Research Data, 2016

The analysis of the results is based on 45 questionnaires that were distributed, 32 of which were received fully filled. As shown in Table 4.1, 32 out of the 45 questionnaires were received from the respondents fully filled which accounts to a 71.1% response rate. On the other hand 13 of the questionnaires (contributing to 28.9% of the sample) were not received. According to Kothari (2006), a 50% rate of response is considered 'adequate', 60% is 'good', while 70% and above is rated to be 'very good.' This is in agreement with Bailey's (2000) assertion that a response rate of 50% is 'adequate' and one that is greater than 70% is considered 'very good.' Based on this assertion, the resultant response rate of 71.1% 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.

4.3 Background Information

The background information section of this study seeks to provide demographic information of all the respondents working in commercial banks and insurance companies in Nairobi. Respondents are well represented in this section under age of the respondent, gender, highest level of education and duration of service of the respondent in the organizations, department and job titles.

4.3.1 Gender of the Respondents

This study was aimed at establishing the distribution of the respondents in terms of gender. The gender of the respondents was of importance to the study because it could help the researcher find out if they obtained responses from both male and female personnel; a vital key in order to obtain a balanced, realistic and accurate result. The respondents sampled gave a result as per Table 4.3.1

Table 4.3.1: Gender of the Respondents

Gender	Frequency	Percentage
Male	21	66
Female	11	34
Total	**32**	**100**

Source: Research Data, 2016

Majority of the responses were obtained from the male respondents. From the study, 66% of the respondents were male staff members, while 33% of them were female personnel working in the selected institutions. This indicates that the organizations have both female and male management 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 genders.

4.3.2 Age Brackets of Respondents

This study sought to investigate the age brackets of the respondents. This was aimed at understanding how the respondents were distributed across the various age brackets and consequently their opinions on the topic of study. With reference to the findings depicted in Figure 4.3.2, majority (comprising 44.0%) of the respondents indicated that they were between 36 and 40 years old, while 30.0% of them indicated that their ages were between 40 and 50. In addition, 18.0% of those that responded reiterated that they fell into the age bracket of between 31 and 35 years, whereas 8.0% of them were aged above 50 years. The results depicted in Figure 4.3.2 show that respondents in the study were well distributed in terms of age. The results also indicate that the

respondents are aware of technological advancements and productivity levels of their companies and can constructively contribute to these areas. From this data there is an even distribution in the ages of the respondents, thereby giving a balanced outcome.

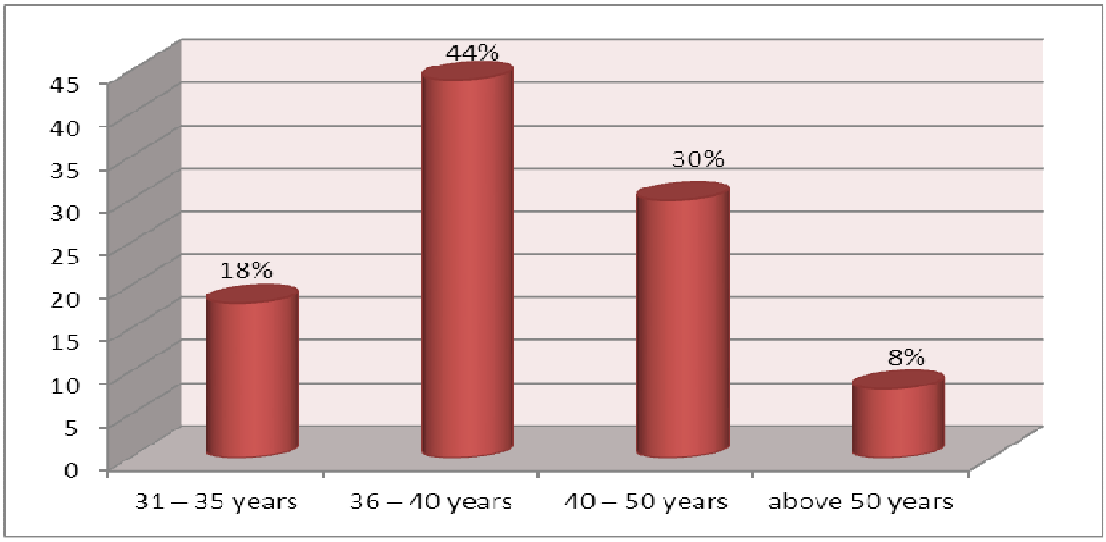


Figure 4.3.2: Age Brackets of the Respondents

On the companies that respondents worked for, 56.25% of the respondents were drawn from insurance companies, while 43.75% of them were drawn from commercial banks. The study carried out by the researcher sought to establish the positions of the targeted personnel in the companies as this has an influence on the responses depending on the nature of the study. Personnel in higher job positions with higher job titles may respond more effectively to issues of policy while people in lower job groups may give more appropriate findings on the operational issues of the subject matter. Majority of the respondents were department heads, followed by unit heads while the smallest proportion comprised of senior officers. These groups were in a better position to give appropriate responses. This gave the implication that the majority of the respondents were able with adequate designation to direct key decisions regarding matters on big data analytics.

4.3.3 Length of Time Served in a Commercial Bank or Insurance Company

The years of service of an employee are important in examining the reliability of the information collected from a given population under investigation. The results presented in figure 4.3.3 show the working experience of the respondents in commercial banks and insurance companies in Nairobi. With reference to the study, 43.8% of those who responded unanimously selected the option of having worked with commercial banks and insurance companies for a period of 6 – 10 years, 34.4% of them had been employees of the named institutions for 10 – 15 years, 12.5% of those that responded had been employees in commercial banks and insurance firms for 1 – 5years. Further, 9.4% of the staff members who responded had been employees of the named institutions for between 16 – 20 years. Owing to the dynamic nature of operating environment of the financial institutions in Kenya, the experience of the most current and up-to-date information on the state of big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi Kenya is essential.

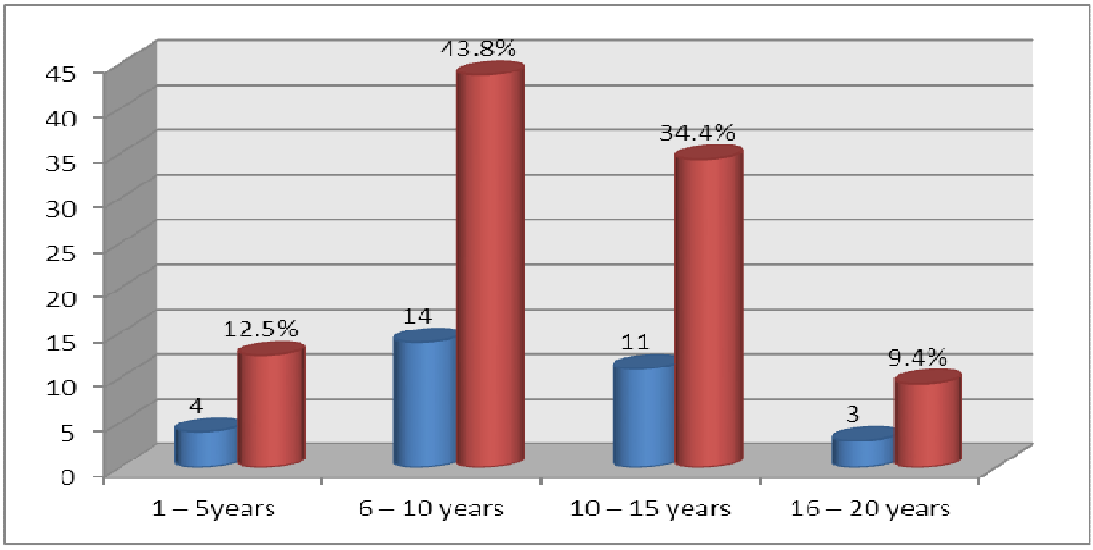


Figure 4.3.3: Length of Time Served in Commercial Banks and Insurance Companies

4.3.4 Number of Staff Employed in Commercial Banks and Insurance Companies

The study was also aimed at establishing the number of staff members employed in commercial banks and insurance companies in Nairobi. Accordingly, 53.1% of the respondents indicated that their companies employed between 1000 and 3000 staff members, while 47.9% of them reiterated that their firms employed less than 1000 employees. These findings show that the firms are well staffed to cope with the increasing demand for financial services and products. This is an indication that the sampled firms are a representation of the real situation of the contribution of financial institutions in Nairobi through their employment creation and financial services hence the need to have effective big data analytics for competitive advantage. This is shown in Figure 4.3.4.

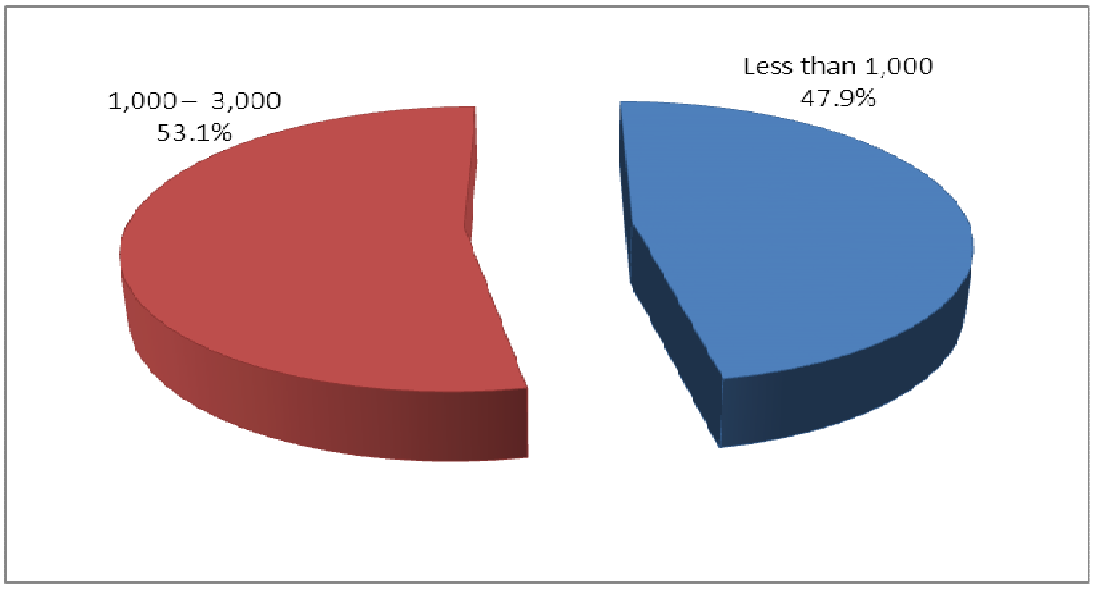


Figure 4.3.4: Number of Staff Employed in Commercial Banks and Insurance Companies

4.3.5 Firms' Length of operation

The research study further sought to ascertain the age of the commercial banks and insurance companies. Table 4.3.5 shows the results.

Table 4.3.5: Firms' Length of Operation

Length of Operation	Frequency	Percent
5-10 years	7	21.9
11- 20 years	10	31.3
21-50 years	14	43.8
Total	**32**	**100.0**

Source: Research Data, 2016

With reference to the findings exhibited in Table 4.3.5, 43.8% of the company employees that responded indicated that their firms have been in operation for a period of 21-50 years, 31.3% of the firms had operated in the industry for a period of 11-20 years, while 21.9% of them indicated that their firms had been in operation for 5-10 years. This is a clear indication that most of the firms sampled had been operating in their industry for a long time hence are better placed to respond to the issues sought by this study concerning the relationship between big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi.

4.3.6 Value of Firms in Terms of Total Assets

Commercial banks and insurance companies in Nairobi Kenya are believed to contribute significantly to the country's GDP through their operations. As such the research aimed at ascertaining the value of the firms in relation to total assets. According to the results depicted in Figure 4.3.6, half of the population studied (50.0% of the respondents) indicated that their companies owned assets worth more than 10 billion Kenya shillings. 34.4% of the population stated that their firms had assets valued at between 5 billion to 10 billion Kenya shillings, 99.4% of them indicated that their companies had total assets worth between 2 billion and 5 billion Kenya shillings while 6.3% of the respondents indicated that their companies had assets valued below 2 billion Kenya shillings.

These results imply that the findings in the study are representative of the value of assets owned by commercial banks and insurance companies in Kenya and how they can utilize them in big data analytics to enhance competitive advantage. Figure 4.3.6 shows the findings of this study.

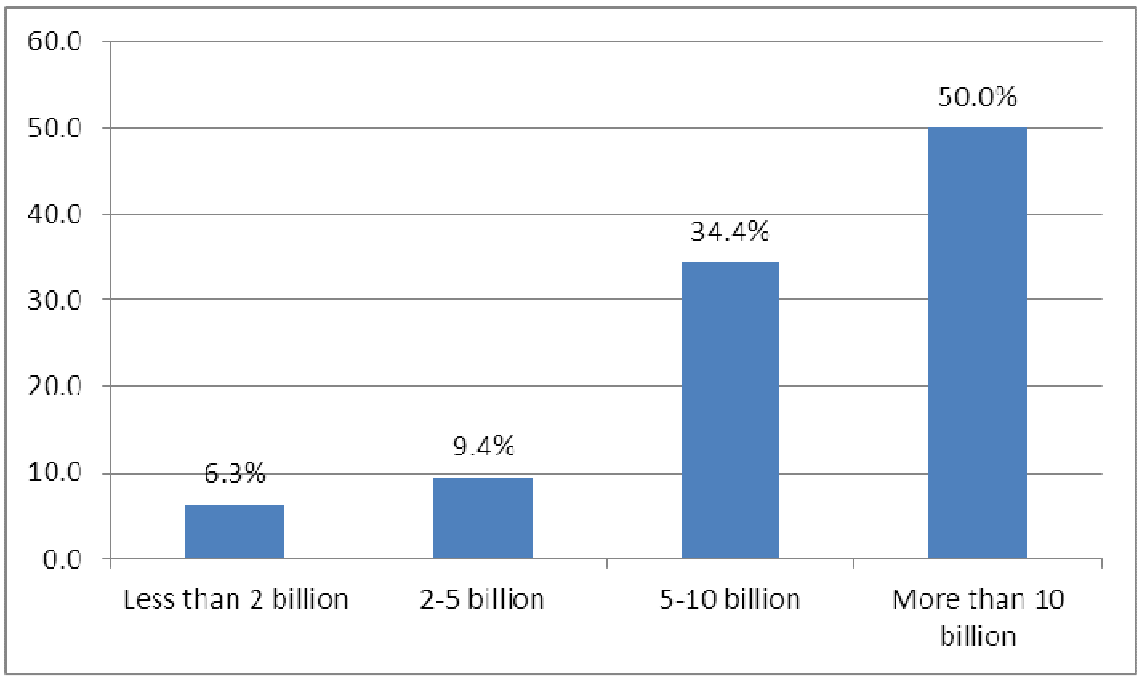


Figure 4.3.6: Value of the Firms in Terms of Total Assets in Kenya Shillings

4.4 Big data Analytics Application in the Organizations

The first objective of this study was to establish the extent of application of big data analytics in commercial banks and insurance companies in Nairobi, Kenya. Respondents were requested to indicate the extent to which big data analytics tools are used in the organizations for various purposes. The scale used for the questionnaire was categorized 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. The collected and analysed findings of the section are displayed in Table 4.4.

Table 4.4: Extent to which Big Data Analytics are Used for Various Purposes

Application of Big Data Analytics	Mean	Std. Dev.
Statistics	3.546	0.5905
Predictive Analysis	3.614	0.7162
Data querying	3.516	0.6197
Fraud detection	3.467	0.6322
Data mining	3.533	0.6190
Business Process Optimization	3.583	0.7725
Strategy Implementation	3.552	1.1843
Data Querying	3.332	1.4923
Market trend prediction	3.593	0.6582
Telephone communication	3.249	0.7078
Business-Transactions/ Processes	3.489	0.6323

Source: Researcher, 2016

From observing the study, the largest population of the respondents reiterated that commercial banks and insurance companies use big data analytics for predictive analysis to a large extent as shown by a mean score of 3.6146. The market trend prediction is shown as having a mean of 3.5937, business process optimization scored a mean of 3.583, strategy implementation shown garnered a mean of 3.5528, statistics to a large extent that is indicated by a mean score of 3.546, data mining to a large extent as shown by a mean score of 3.533 and data querying to a large extent as shown by a mean score of 3.516.

In addition, the respondents recapped that their companies utilize big data analytics for business-transactions/ processes, fraud detection, data querying and telephone

communication to moderate extents. This is exhibited by recorded mean scores of 3.489, 3.47, 3.332 and 3.249 respectively. 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.

4.5 Challenges Faced in the Use of Big Data Analytics

To establish the challenges of the use of big data analytics in commercial banks and insurance companies in Nairobi, Kenya, the study requested the respondents to select the extent to which their firms face various challenges in big data analytics 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 4.5.

Table 4.5: Extent to which Firms Face Challenges in Using Big Data Analytics

Challenges	Mean	Std. Dev.
Regulatory requirements	3.594	0.658
Too much data	3.656	0.693
Different types of data available	3.479	0.632
Speed of the data	3.604	0.672
Lack of data privacy	3.490	0.632
Security of the data	3.552	0.694
Understanding the data	3.563	0.612
Lack of enough trained personnel	3.533	0.645
Lack of required technology	3.303	0.519
Information access	3.582	0.600
Employee resistance	3.401	0.676
Inadequacy of current tools	3.533	0.645
Integration with company mission	3.303	0.519
Information sharing	3.401	0.676

Source: Researcher, 2016

The results of this section are analyzed in line with a scale of 1 to 5; whereby, to a very great extent = 5, to a great extent = 4, to a moderate extent = 3, to a little extent =2 and to no extent = 1. To obtain the corresponding measure of agreement, the calculated weighted mean is rounded off to the nearest whole and the result counter-checked against the matching number in the key provided on the questionnaire. The highest ranking mean score was 3.656 which corresponds to a measure of 4 which means that a majority of the respondents were of the opinion that their firms face too much data as a challenge in the use of big data analytics 'to a great extent.' The staff members further recapped that the commercial banks and insurance companies in Nairobi experienced challenges with the speed of the data, regulatory requirements, information access, understanding the data, security of the data, lack of enough

trained personnel and inadequacy of current tools for purposes of big data analytics. They selected the option of 'to a great extent' that is indicated by mean scores of 3.604, 3.594, 3.582, 3.563, 3.552, 3.533 and 3.533 respectively.

The respondents also added that the organizations faced challenges of lack of data privacy, different types of data available, employee resistance, information sharing, lack of required technology and integration with companies' missions to 'moderate extents'. This is indicated by mean scores of 3.490, 3.479, 3.401, 3.401, 3.303 and 3.303 in that order.

Companies in the financial industry specifically commercial banking and insurance firms have invested in data warehouses and tools designed for business intelligence 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 optimize their business operations. The addition of big data systems in the daily running of company operations enables organizations to gain deeper insights into big data 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.

4.6 Competitive Advantage of Big Data Analytics Use in the Organizations

Another objective of this research study was to determine the relationship between big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi, Kenya. Accordingly, the respondents were required to select the most accurate option that indicated the level/ extent to which their organizations realized various advantages as a result of using big data analytics. 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 4.6.

Table 4.6: Extent to which Banks and Insurance Firms Realized Advantages

Advantages of using Big Data Analytics	**Mean**	**Std. Dev.**
More differentiation compared to other companies	3.5521	0.6938
Better focus on Customer needs	3.5104	0.7677
Reduced operational costs	3.4896	0.6323
Improved customer service efficiency	3.582	0.572
Better Informed decisions	3.5833	0.7755
More accurate trading decisions	3.3333	0.8165
More product innovations	3.6146	0.7162
Faster business transaction speeds	3.4896	0.6323
Use of more customer focused strategies	3.5937	0.6582
New data discovery	3.6146	0.7162
Faster querying and referencing of data	3.4896	0.6323

Source: Researcher, 2016

With reference to the results shown in Table 4.6, majority of the staff members who responded reiterated that their organizations realized more product innovations, new data discovery, use of more customer focused strategies, better informed decisions, improved customer service efficiency, more differentiation compared to other companies and better focus on customer needs due the use of big data analytics to great extents. This is shown by mean scores of 3.6146, 3.6146, 3.5937, 3.5833, 3.582, 3.5521 and 3.5104 respectively. On the other hand they recapped that the commercial banks and insurance firms comprehended reduced operational costs, faster business transaction speeds, faster querying and referencing of data and more accurate trading decisions to moderate extents. This is shown by mean scores of 3.4896, 3.4896,

3.4896 and 3.3333 correspondingly. From these results it is clear that big data analytics devices enable better communication and real-time decision making.

4.7 Inferential Analysis

Inferential analysis is employed 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.

Table 4.7.1: Model Summary

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.832	.692	.600	.0378

Predictors: (Constant), Fraud detection, Data mining, Business process optimization, Prediction of market trend analysis, Understanding and targeting customers, Implementation of big data strategies, Faster methods of querying.

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 (competitive advantage of commercial banks and insurance companies) that is explained by the seven independent variables (fraud detection, data mining, business process optimization, prediction of market trend analysis, understanding and targeting customers, implementation of big data strategies, faster methods of querying). The seven

independent variables that were studied revealed that there exist a strong relationship between big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi which is represented by adjusted R^2. This is a clear indication that the seven independent variables contribute approximately 60.0% to the competitive advantage of banks and insurance companies in Nairobi while factors and aspects that have not been studied in this research contribute to 40.0% to the competitive advantage of banks and insurance companies in Nairobi.

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 4.7.2: ANOVA Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.787	1	.447	4.617	.034
	Residual	62.191	31	.351		
	Total	63.978	32			

Source: Research Data, 2016

Predictors: (Constant), Fraud detection, data mining, business process optimization, prediction of market trend analysis, understanding and targeting customers, implementation of big data strategies, faster methods of querying

Dependent Variable: Competitive advantage of commercial banks and insurance companies in Nairobi

For the analysis, all the independent variables relevant to the study were combined and utilized. The results of Analysis of variance (ANOVA) for regression coefficients

are shown in Table 4.7.3. The analysis revealed that the significance of F statistic is 0.034 which is clearly less than 0.05. This clearly implies that there exists a significant relationship between fraud detection, data mining, business process optimization, prediction of market trend analysis, understanding and targeting customers, implementation of big data analytics strategies, faster methods of querying and competitive advantage of banks and insurance companies in Nairobi.

Table 4.7.3: Coefficient of Determination

	Un-standardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	1.112	1.223		0.000	0.000
Fraud detection	0.637	.075	0.235	3.133	0.020
Data mining	0.220	0.096	0.215	2.240	0.018
Business process optimization	0.396	0.204	0.155	0.760	0.015
Understanding targeting customers	0.395	0.106	0.279	2.632	0.025
Prediction of market trend analysis	0.439	0.106	0.086	0.811	0.014
Implementation of big data strategies	0.383	0.089	0.026	0.292	0.039
Faster methods of querying	0.295	0.106	0.279	2.632	0.016

Source: Research Data, 2016

Dependent Variable: Competitive advantage of commercial banks and insurance companies in Nairobi, Kenya.

A multiple regression analysis was required for the study in order to ascertain the relationship between the parameters of competitive advantage of commercial banks and insurance companies in Nairobi and the four variables of strategic e-sourcing practices. With reference to a table generated by the SPSS program, the equation ($\boldsymbol{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \mathcal{E}}$) is translated to:

$$Y= 1.112 + 0.637X_1+ 0.220X_2 + 0.396X_3+ 0.260X_4 + 0.439X_5 + 0.383X_6 + 0.295X_7$$

Taking into account the regression equation established, comprising all factors (fraud detection, data mining, business process optimization, prediction of market trend analysis, understanding and targeting customers, implementation of big data strategies, and faster methods of querying) constant at zero, competitive advantage of commercial banks and insurance companies in Nairobi would be 1.112. Data aided findings that have been analyzed also show that when all other independent variables are taken from zero, a unit increase in fraud detection will lead to a 0.637 increment in competitive advantage of commercial banks and insurance companies in Nairobi; a unit increment in data mining leads to a 0.220 increment in competitive advantage of commercial banks and insurance companies in Nairobi, a significant unit increment in business process optimization leads to a 0.396 increase in competitive advantage of commercial banks and insurance companies in Nairobi and a unit increase in understanding targeting customers leads to a 0.395 increment in the competitive advantage of commercial banks and insurance companies in Nairobi.

Further, a unit increment in prediction of market trend analysis will certainly lead to a 0.439 increment on the competitive advantage of commercial banks and insurance companies in Nairobi; there will be a 0.383 increment in competitive advantage of commercial banks and insurance companies in Nairobi, if there is a unit increment on the implementation of big data strategies. There will be a 0.295 increment in the competitive advantage of commercial banks and insurance companies in Nairobi if there is a unit increment in faster methods of querying.

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. The highest difference

was registered in the fraud detection variable (t-value=3.133, $p < 0.05$) while the least variance was noted on the implementation of big data analytics strategies variable (t-value=0.292, $p < 0.05$). These results provide the inference that fraud detection is more of a contributor to the competitive advantage of commercial banks and insurance companies in Nairobi, followed by prediction of market trend analysis, then business process optimization, then implementation of big data analytics strategies, after which comes faster methods of querying, then understanding and targeting customers while data mining is the least contributer to competitive advantage of commercial banks and insurance companies in Nairobi.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This final chapter in the study 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 chapter one. 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 big data analytics and competitive advantage of commercial banks and insurance companies in Nairobi, Kenya.

5.2 Summary

As per the study's findings, companies in the financial industry specifically commercial banks and insurance firms, typically have data warehouses and business intelligence tools for reporting on and analysing customer behaviour to better anticipate their needs, and optimize operations. There are challenges in the management of big data analytics that if addressed, can help organizations capture the full potential of the availability and use of big data. Since there are companies with different ranges of technological challenges, it goes without saying 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 utilization of big data, 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 established that commercial banks and insurance companies already have hands-on experience with big data 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 big data management. Investigating banks represented those still looking at big data management requirements and technologies and are far from implementing big data solutions. The category of commercial banks without any big data management initiatives comprised commercial banks that were thinking of allocating exploratory budgets for investigation and growth of big data.

There is another category that didn't have big data management initiatives in the pipeline but were still trying to understand how the technology would fit into their organizational strategy. This is a clear indication that commercial banks and insurance firms are at the early stages of deploying big data management initiatives. This can tell us that the respective firms that have made implementations are piloting and experimenting, those that are planning might be developing strategy or carrying out knowledge gathering about the initiative.

The study also ascertained that commercial banks and insurance firms 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 analytics/ technologies enable correlation of data and/ information from multiple sources to determine fraudulent incidences. Harnessing the value of big data entails being able to use it for fast, fact-based decisions that lead to the realization 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. Big data management initiatives help commercial banks and insurance companies 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 big data to reduce costs and developing new products or product features and business models using additional insight gleaned from big data analytics.

5.3 Conclusion

The big data revolution has found a niche in the commercial banking and insurance industry in Nairobi, considering the valuable data that they've 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. Commercial banks and insurance companies in Nairobi have been reaping the benefits of big data analytics 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 commercial banks and insurance firms in Nairobi are able to make strides in various ways through the utilization of big data analytics tools that enable them to derive utility across various spheres of their platforms including sentiment analysis, financial crime management, product cross selling, risk management, regulatory compliance management and much more. Commercial banks and insurance companies are taking a business-driven and practical approach to big data analytics and this is exhibited in the manner in which they formulate company

strategies. These companies are massively extracting potential solutions to the problems they are currently experiencing and those that they foresee as potentials drawbacks. By redefining their big data technological strategies in addition to extending avenues for exploring sources of data capture, these companies have managed to improve on their infrastructures over time.

5.4 Recommendations

The study recommends that commercial banks and insurance firms should prioritize on technology investments and use a test-and-learn mentality to determine how fast- and deep-to go when it comes to big data management initiatives. Commercial banks and insurance firms should understand immediate and strategic information needs of the organizations which will help them in understanding why they are interested in big data analytics and if they require assistance with the existing investments in data platforms they are currently utilizing. They should develop a reliable and detailed vision and seek guidance from companies that have grown after embracing big data analytics. In addition, these companies need to know the right technologies to invest in based on current business strategies that complement overall company goals and investments.

The study also recommends that commercial banks and insurance firms 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 big data and the rise of increasingly more complex scenarios.

The study finally recommends that it is vital for commercial banks and insurance companies to ensure that their strategies are in line with other firms that could

potentially affect their way of business. To get commercial banks and insurance firms on the path to greater success in the area of big data 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. As there are many ways of finding business value from data that companies 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.

5.5 Limitations of the Study

Commercial banks and insurance companies do not easily share their data due to the nature of its sensitivy. As such, there were difficulties in getting the required information that was adequate for the success of the research. In addition, the time allocated for the data collection was a limiting factor. Understandably, the respondents did not have an air of urgency and more often than not 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.

5.6 Recommendations for 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 big data analytics adoption in operations management can contribute to a companies' financial performance and how this can be measured.

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APPENDICES

Appendix I: Letter of Introduction

Re: Letter of Introduction

My name is Davis Ndambo. I am currently a Master of Business Administration student at the University of Nairobi, specializing in Management Information Systems. I am undertaking a survey on 'Big Data Analytics and Competitive Advantage of Commercial Banks and Insurance Companies in Nairobi, Kenya' that will lead to the production of my final project 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 final report.

Thank you in advance for your assistance.
Kind regards,

Davis Ndambo.

Appendix II: Research Questionnaire

This questionnaire is part of a post-graduate research for the purpose of documenting a study on the application, challenges and competitive advantage of the use of big data analytics in commercial banks and insurance companies in Nairobi, Kenya. Your firm has been selected for this study. The information provided by you will be treated with absolute confidentiality and its use shall solely be for this study. Thank you for taking a few moments of your time to fill in the questionnaire.

SECTION A: GENERAL INFORMATION CONCERNING ORGANIZATION.
Kindly indicate with (✓) as appropriate.

1. What is your gender?

☐ Male ☐ Female

2. In which age group do you fall?

☐ 18 – 25 years ☐ 26 – 30years ☐ 31 – 35 years
☐ 36 – 40 years ☐ 41 – 50 years ☐ above 50 years

3. Which type of organization do you work for?

☐ Bank ☐ Insurance company

4. What is your position within your organization? .....

.....

5. How long have you worked in your organization?

☐ less than 1 year ☐ 1 – 5years ☐ 6 – 10 years
☐ 11 – 15 years ☐ 16 – 20 years ☐ More than 20 years

6. How many employees work in your organization?

☐ Less than 1,000 ☐ 1,000 – 3,000
☐ 3,001 – 5,000 ☐ More than 5,000

7. How long has your organization been in business?

- ☐ Less than 5 years
- ☐ 5 – 10 years
- ☐ 11 – 20 years
- ☐ 21 – 50 years
- ☐ More than 50 years

8. What is the value of your firm in terms of total assets in Kenya Shillings?

- ☐ Less than 2 billion
- ☐ 2 – 5 billion
- ☐ 6 - 10 billion
- ☐ More than 10 billion

9. How many branches does your organization have in Nairobi? _____

SECTION B: BIG DATA ANALYTICS APPLICATION IN YOUR ORGANIZATION.

10. Kindly indicate the extent to which big data analytics is used in your organization for each of the following purposes using the scale: (1) – **No Extent**, (2) – **Little Extent**, (3) – M**oderate Extent**, (4) – **Large Extent**, (5) – **Very Large Extent**. Kindly indicate with (✓) as appropriate.

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

SECTION C: CHALLENGES FACED IN THE USE OF BIG DATA ANALYTICS IN ORGANIZATION.

11. Kindly indicate the extent to which your organization faces each of the following challenges in the use of big data analytics using the scale: (1) – **No Extent**, (2) – **Little Extent**, (3) – **Moderate Extent**, (4) – **Large Extent**, (5) – **Very Large Extent**. Kindly indicate with (✓) as appropriate.

	No Extent	**Little Extent**	**Moderate Extent**	**Large Extent**	**Very Large Extent**
Regulatory requirements					
Too much data					
Different types of data available					
Data accuracy concerns after using big data analytics tools					
Difficulty in understanding the data after using big data analytics tools					
Lack of enough trained personnel					
Lack of required technology					
Difficulty accessing information					
Employee resistance to change					
Inadequacy of current tools to complete tasks required					
Difficulty of integrating tools with company mission					
Difficulty of information sharing with other users					
Use of big data analytics is expensive					
Others (Please indicate)					

SECTION D: COMPETITIVE ADVANTAGE AS A RESULT OF USE OF BIG DATA ANALYTICS IN ORGANIZATION.

12. Kindly indicate the extent to which your organization has realized each of the following advantages as a result of using big data analytics using the scale: (1) – **No Extent**, (2) – **Little Extent**, (3) – M**oderate Extent**, (4) – **Large Extent**, (5) – **Very Large Extent**. Kindly indicate with (✓) as appropriate.

	No Extent	**Little Extent**	**Moderate Extent**	**Large Extent**	**Very Large Extent**
Narrower segmentation of customers thus better product offering					
Reduced operational costs					
Improved customer service efficiency					
Better Informed decisions					
More accurate trading decisions					
More product innovations					
Faster business transaction speeds					
Use of more customer focused strategies					
New data discovery					
Faster querying and referencing of data					
Automation of business processes					
Narrower segmentation of customers thus better product offering					
More differentiation compared to other companies					
Better methods of keeping data safe					
Enhanced cyber security					
Others (Please indicate)					

Appendix III: List of Commercial Banks and Insurance Companies in Nairobi, Kenya.

List of Commercial Banks in Nairobi, Kenya

1 ABC Bank (Kenya)
2 Bank of Africa
3 Bank of Baroda
4 Bank of India
5 Barclays Bank of Kenya
6 Stanbic Bank
7 Chase Bank (In receivership)
8 Citibank
9 Commercial Bank of Africa
10 Consolidated Bank of Kenya
11 Cooperative Bank of Kenya
12 Credit Bank
13 Development Bank of Kenya
14 Diamond Trust Bank
15 Ecobank Kenya
16 Middle East Bank Kenya
17 National Bank of Kenya
18 NIC Bank
19 Oriental Commercial Bank
20 Paramount Universal Bank
21 Prime Bank (Kenya)
22 Sidian Bank
23 Spire Bank
24 Standard Chartered Kenya
25 Trans National Bank Kenya
26 United Bank for Africa
27 Victoria Commercial Bank
28 Equity Bank
29 Family Bank
30 Fidelity Commercial Bank
31 First Community Bank
32 Giro Commercial Bank
33 Guaranty Trust Bank Kenya
34 Guardian Bank
35 Gulf African Bank
36 Habib Bank
37 Habib Bank AG Zurich
38 Housing Finance Company
39 IM Bank
40 Imperial Bank Kenya (In receivership)
41 Jamii Bora Bank
42 Kenya Commercial Bank

List of Insurance Companies in Nairobi, Kenya

1. AAR Insurance Kenya Ltd
2. A P A Insurance Ltd
3. Africa Merchant Assurance Company
4. Apollo Life Assurance Ltd
5. AIG Kenya Insurance Company Ltd
6. British-American Insurance Company
7. Cannon Assurance Ltd
8. Capex Life Assurance Company Ltd
9. Liberty Life Assurance Ltd
10. CIC General Insurance Ltd
11. CIC Life Assurance Ltd
12. Continental Reinsurance Ltd
13. Corporate Insurance Company
14. Direct line Assurance Company
15. East Africa Reinsurance Company
16. Fidelity Shield Insurance Company
17. First Assurance Company Ltd
18. G A Insurance Ltd
19. Gateway Insurance Company Ltd
20. Geminia Insurance Company Ltd
21. ICEA LION General Insurance
22. ICEA LION Life Assurance Company
23. Intra Africa Assurance Company Ltd
24. Invesco Assurance Company Ltd
25. Kenindia Assurance Company Ltd
26. Kenya Orient Insurance Ltd
27. Kenya Reinsurance Corporation
28. Madison Insurance Company Kenya
29. Mayfair Insurance Company Ltd
30. Mercantile Insurance Company Ltd
31. Metropolitan Life Insurance Kenya
32. Occidental Insurance Company Ltd
33. Old Mutual Life Assurance Company
34. Pacis Insurance Company Ltd
35. Pan Africa Life Assurance Ltd
36. Phoenix E. A Assurance Company Ltd
37. Pioneer Assurance Company Ltd
38. Real Insurance Company Ltd
39. Resolution Insurance Company Ltd
40. Resolution Insurance Company Ltd
41. Shield Assurance Company Ltd
42. Takaful Insurance of Africa Ltd
43. Tausi Assurance Company Ltd
44. The Heritage Insurance Company Ltd
45. The Jubilee Insurance Company
46. The Kenyan Alliance Company Ltd
47. The Monarch Insurance Company Ltd
48. Trident Insurance Company Ltd
49. UAP Insurance Company Ltd