THE ADOPTION OF BIG DATA ANALYTICS BY SUPERMARKETS IN KISUMU COUNTY

BY

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A Research Project Submitted in Partial Fulfilment of the Requirements for Award of the Degree of Master of Business Administration, School of Business, University Of Nairobi

October, 2015

DECLARATION

This research project report is my original work and has not been submitted for a degree in any University.

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This research project has been submitted for examination with my approval as University Supervisor.

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DEDICATION

This work is dedicated to the Almighty God, my caring and loving family, my workmates who stood by me through their cooperation and constant encouragement not to give up because of the challenges of mixing study and work. I cannot forget my loving wife, Mrs. Margaret Ochieng' who supported me, morally, emotionally and materially during the period of course work and when undertaking this project. My siblings, Liz, Lily, Beryl, Judy, Ben and Denis were dear to me as they kept on asking me: Daddy when are you graduating? This question motivated me to work harder and never to let them down.

ACKNOWLEDGEMENTS

ABSTRACT

The main aim of this study was to establish the extent of adoption of big data analytics (BDA) in enterprises in Kenya with emphasis on supermarkets in Kisumu County and to determine the factors affecting the adoption of BDA in supermarkets in Kenya. The need for the study arose in view of the fact that 'Big data' has become one of the most talked about trend within the business intelligence (BI), analytics and data management markets. Business executives understand the advantages accruing from employing predictive and customer analytics in their operations but this is slowed down by organizational and skills issues. Recent information system researches about this technology also indicate that there is lack of focus on the factors that impact its organizational adoption.

The study had three objectives namely, to determine the extent to which supermarkets in Kisumu County have adopted BDA technology, to establish the challenges of adoption of this technology and to establish factors leading to the usage of this technology. The understanding of these factors and challenges will influence the adoption of BDA. Similarly, the understanding of the technology, organization and the current trends and how BDA can create competitive advantage from the increasingly large and diverse data sets will also determine the success of adoption of BDA as a business tool.

This study was guided by multi-perspective Technology – Organization - Environment (TOE) framework and diffusion of innovation which was used as theoretical base to determine the factors affecting the adoption of BDA in supermarkets in Kisumu county. A cross- section study design and quantitative approaches was used for data collection. It was a case study of the 5 leading Supermarket chains and the 3 independent supermarkets in Kisumu county. Primary data was collected through a closed ended questionnaire administered to the senior level managers, middle level managers and lower level staff of the 5 leading Supermarket chains and the 3 independent supermarkets in Kisumu County. The Statistical package for the social sciences (SPSS) software was used to facilitate data organization and analysis and descriptive statistics to summarize nominal data. The regression technique was used to test the research model (TOE).

The results of the study found out that there was high rate of computer usage in all the supermarkets and many supermarkets had not put in place the software for managing unstructured data. Though many respondents indicated high adoption of big data analytics, it was clear that the meaning of big data and big data analytics was not very clear judging from the response in terms of infrastructure and required skill. The study also found out that there were a number of challenges hindering the adoption of big analytics technology by supermarkets in Kenya.

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LIST OF ABBREVIATIONS

BDA   Big Data Analytics

BI   Business Intelligence

CCTV   Closed Circuit Television

DOI   Diffusion of Innovation

IBM   International Business Machines

IDG   International Data Group

IS   Information Systems

IT   Information Technology

SAS   Statistical Analysis System

TOE   Technology – Organization– Environment

UBM   United Business Media

UK   United Kingdom

CHAPTER ONE: INTRODUCTION

1.1 Background

The development of big data analytics (BDA) technology has transformed business decision making process and results to be more data driven. BDA influences how businesses interact with customers by helping them build long term relationship, realize value and incorporate all sources of data (United Business Media, 2013). It is a technology that helps to receive and store data generated from a multiple of sources which include digital processes, social media, sensors and mobile devises and use analytics to gain useful insight on customer behavior. The advancement made in both storage technology and computing power has made it feasible to collect and store this data (Yan, 2013).

Studies carried out on usage of BDA reveals that the new technology increases overall efficiency of management and decision making compared to the traditional analytics systems (Agarwal, 2013; Chen et al 2012; SAP 2012). Randall and Fovargue (2011) found out that many supermarkets have understood the value of big data in communicating to their customers. They argued that supermarkets have used BDA to build up an institutional memory of each customer's likes, dislikes, what channel or promotions they have responded to, in order to target their communications more effectively in the future. They recommended that supermarkets need to incorporate data from new and emergent channels into their communication mix, such as web behavior, social media and user generated content and that by so doing they will generate a much

deeper view of every customer which is vital for satisfying their marketing promises and gaining true competitive edge.

However IS research lack focus on the factors of BDA adoption and hence its exploitation and widespread usage. Thus, the factors of adoption of BDA is worthy of investigation in the context of supermarkets in view of the fact that they stand to gain competitive advantage by analyzing the huge amount of data received from many sources for better decision making, attracting new customers and maintaining customer loyalty. Motivated by the above theoretical gaps the researcher proposes to use Technology – Organization – Environmental (TOE) (Tornatzky and Fleischer, 1990) Framework and Diffusion of Innovation Theory (DOI) (Rogers, 1995) to investigate the factors leading to adoption of BDA in Supermarkets in Kisumu County.

1.1.1 Big Data Analytics

Big data refers to data sets whose size is beyond the ability of typical database software tools to capture, store, manage, and analyze (Manyika et al., 2011). The definition of big data varies from sector to sector and the industry depending on the capabilities of the organization managing the data set and the applications being used to process and analyze the data set. For example, hundreds of gigabytes of data may be considered to be big data in one organization whereas in another organization big data may be tens or hundreds of terabytes. In the marketing context, big data refers to the ability to gather large volumes of data, often from multiple sources, and use it to produce new kinds of observations, measurements and predictions about individual customers (Council of Economic Advisors, USA, 2015)

Big data can also be defined according to its characteristics as given by Laney (2012) who defines big data as high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization. Some researchers view the term big data as ambiguous because it sets up data as negative from the implication that 'big' is 'bad' (Andrade et al., 2014). However, from the definitions we have looked at the main features of big data (quantity, variety and speed) are more of technical properties that do not depend on the data itself but instead on the evolution of computing, storage and processing technologies. The implication of these definitions is that it is not the volume, speed and variety of data that is important but how they may contribute to innovation and value addition to the business.

On the other hand BDA refers to tools and methodologies that are used to transform massive quantities of raw data (structured and unstructured) into "data about the data" for analytical purposes (Emmanuel, 2011). A study guide by SAP Solutions argues that BDA has traditionally been expensive and inefficient, but new analytical platforms optimized for big data are heralding a brave new world (SAP, 2012).They gave examples of Hadoop, an open-source Apache product, and Not Only SQL (NoSQL) databases which don't require the significant upfront license costs of traditional systems, and these are making setting up an analytics platform more accessible than ever before. Nyanducha (2014) argues that running analytics on big data reveals insights about a business, its strengths, weaknesses and the market in which it operates. He states further that analytics provides new perspective that can fuel innovation in product development, partnerships and services.

1.1.2 Supermarkets in Kisumu County

Kisumu County is one of the new devolved counties of Kenya. Its borders follow those of the original Kisumu District of the former Nyanza Province in western Kenya. Its headquarters is Kisumu City. It has a population of 968,909 with 409,928 living in Kisumu City (Kenya National Bureau of Statistics, 2010). The land area of Kisumu County totals 2085.9 km². Kenya has countless supermarkets scattered all over the country but the five main supermarket chains with branches in big towns and cities including Kisumu County are listed below.

Figure 1.0: List of Supermarkets in Kenya

NO	NAME OF SUPERMARKET CHAINS
1	Nakumatt
2	Tuskys
3	Naivas
4	Uchumi
5	Ukwala

Source: www.https://en.wikipedia.org/wiki/list_of_supermarket in Africa#AOKenya

There are also 3 other independent supermarkets in Kisumu county: Yatin, Tumaini and Khetias. In total there are 8 supermarkets in Kisumu County. Supermarkets use loyalty cards to collect information on their customers which are then stored in their big computers. Data mining is then carried out on this data to get more information on customer behavior. Other supermarkets have started using data analytics to get more information on their customers. For example, Uchumi supermarket uses data analytics to

get information on the frequency of the customers to their shop, what item they bought and how often they come to their shop. Supermarkets also face increasing competition among themselves. Therefore, every Supermarket is looking for a marketing tool to attract and retain more customers and improve business operations. Interestingly, supermarkets have access to vastly more information than the traditional retail outlets. The information comes from many different sources including sensors used to gather customer behavior, CCTV, posts to social media sites, digital pictures and videos posted online and from cell phone GPS signals and the information can be obtained almost as soon as it's generated. These big data sets can be mined for use in predictive analytics which allow the supermarkets to optimize operations by predicting customer's habits.

According to research conducted by IBM (2013) the majority of retailers are still struggling to become customer – oriented. The use of BDA enabled technology as a strategy can help supermarkets to capture, store and analyze the big data sets to acquire richer, deeper and more accurate insights into their customers thereby gaining competitive advantage.

1.2 Statement of the problem

The rise of big data has led to a huge focus on exploring how organizations can harness information to gain a competitive advantage. McKinsey report (May, 2011) predicted a 60% margin increase for retail companies who are able to harvest the power of big data. However, despite the numerous big data benefits that are well documented, how many organizations across the globe are putting it to use and in which way? BDA is increasingly emerging as a new technology that increases overall efficiency of

management and better decision-making. When compared to traditional analytics system, BDA is able to enhance the productivity and performance of organizations in real-time. Many studies on adoption of BDA have focused on telecommunication (Oghuma, 2013), employment trends, 2012 – 2016 in the UK (Randall et al. 2011) and how companies gain by assimilating BDA in full scale and in decision making and for operations (Aggrawal, 2013).

Research from IBM conducted by IDG Connect (2013) on the move towards big data projects across core African markets in Kenya and Nigeria revealed that infrastructure readiness was already very high, yet skills still seem fairly low. The research revealed that smaller organizations with 100 – 499 employees only a small percentage of 40% were looking to fully outsource big data projects. The research also found out that there was lack of local information on Big Data which certainly needs to be addressed for the technology to be implemented effectively. Another research by Mckinsey (2012) found out that the majority of companies in Africa have barely considered the implication of social media, e-mail and multimedia on the marketing of their products and how they can use the data to communicate with their consumers. Studies on BDA in Kenya and specifically on Supermarkets are limited yet as stated above; Supermarkets accumulate a lot of data from different sources. This study aimed at filling this knowledge gap by attempting to answer the following research question: a) To what extent has BDA been adopted by supermarkets in Kisumu County? b) Which challenges are being encountered in the adoption of BDA in supermarkets in Kisumu County? c) What are the factors leading to the usage of BDA

1.3 Research Objectives

The general objective was to investigate the adoption of big data analytics by supermarkets in Kisumu County. Specifically to:

a) Determine the extent to which supermarkets in Kisumu County have adopted BDA technology

b) Establish the challenges of adoption of this technology

c) Establish factors leading to the usage of this technology

1.4 Value of the study

The study was of immense significance to the corporate executives and business managers who want to leverage their information assets to gain a comprehensive understanding of markets, customers, products, distribution locations, competitors, employees and more. The findings can also contribute to the growing body of literature in BDA in the retail industry. The creators and producers of BDA technologies will gain from the findings of the study by addressing the shortcoming arising from the use or non use of the technology. Producers of goods and services would be interested in the findings of this study as this motivates them to invest in BDA to help them extract data from surveys, purchases, web logs, product reviews from online retailers, phone conversations with call centers with an aim of developing a nuanced understanding of why certain products and services succeed and why others fail. They will also be able to spot trends that will help them feature the right products in the right marketing media.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter is divided into four sections: section 2.1 is the introduction which introduces the chapter; section 2.2 describes the theories of adoption of IT based innovations; section 2.3 underlies the concept of BDA on Supermarkets stating the benefits, challenges and determinants of BDA while section 2.4 examines empirical studies on BDA.

2.2 Theoretical Literature Review

Many studies have been undertaken on the adoption of new technology and the studies suggest that technology usually appears as a continuous and a slow process (Hall and Khan 2002). Further, successful implementation of new technology is influenced by the skill levels of workers and the state of the capital goods. If the new technology requires complex new skills and it is time consuming or costly to acquire the adoption might be slow (Rosenberg as quoted by Hall and Khan, 2002). A large number of theories on the adoption and diffusion of IT based innovations have been tested. Adoption of innovation being a dynamic and a complex process can be better understood by use of multiple of models. IT innovation diffusion research has drawn on varied theoretical framework to explain IT adoption. Specifically at the firm level, the Technology – Organization – Environment (TOE) (Tornatzky and Fleischer 1990) and the diffusion of innovation (DOI) theory (Rogers 1995) have been used. Other theories of technology diffusion include Technology Acceptance Model (TAM) (Davis, 1989) which is similar to diffusion theory but places more emphasis on psychological predispositions and social

influences such as beliefs, attitude and intentions as important factors of technology adoption.

2.2.1 Technology- Organization – Environment (TOE) Framework

Technology-Organisation-Environment (TOE) framework developed by Tornatzky and Fleischer (1990) has been tested and validated by many studies and used to determine factors that influence the adoption of new technology by enterprises (Zhu, et al., 2002, Awa, et al., 2012, Oghuma, 2013, Scot, 2007 among others). The studies found out that various technological, organizational and environmental factors facilitate or inhibit adoption of new technology in enterprises. For example, Oghuna (2013) used TOE Framework to study factors that influence the adoption of BDA in Telecommunications industry in Korea and found out that the significant factors that influence adoption of BDA in Telecommunications based on Technology included relative advantage, technological readiness, technology competence, triability and compatibility; based on organizational included big data awareness, Innovativeness, human resources expertise, top management support and IT competence; based on environmental included regulatory support, regulatory compliance, security and privacy protection, fair competition, customer satisfaction, regulatory environment, customer trust, business value, customer churning and customer consent.

Figure 2.0: Technology – Organization – Environment (TOE) Framework
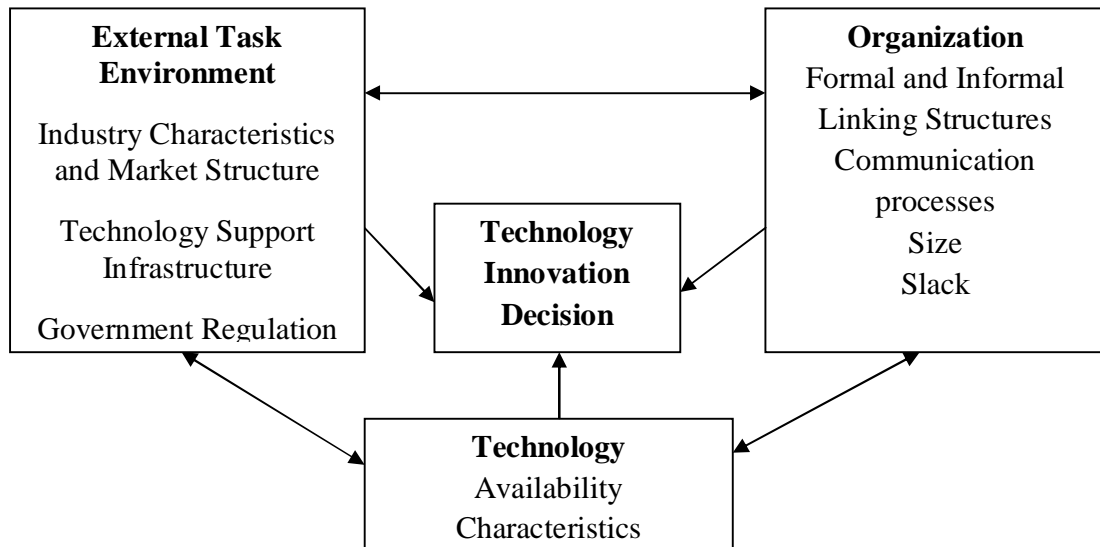
Source: Tornatzky and Fleischer, 1990

2.2.2 Diffusion of Innovation Theory (DOI)

Researchers have used DOI theory to describe the factors that affect the spread of innovation in retail industry (Alqahtani and Wamba 2012). According to Rogers (2003) five innovation characteristics may determine the decision to adopt or not to adopt an innovation; Relative advantage: the degree to which an innovation can bring benefits to an organization; Trial ability: the degree to which an innovation may be experimented with; Complexity : the degree to which the results of an innovation is difficult to use; Observability : the degree to which the results of an innovation are visible to others; and compatibility : the degree to which an innovation is consistent with the existing business processes, practices and value systems. Therefore if we consider BDA as a technological innovation, decision makers will evaluate whether this technology has relative advantage over traditional systems. In the BDA context, complexity may be the immaturity of BDA

technology, lack of common standards, the difficulty of integrating BDA with existing enterprises' information systems and business processes. This pauses a challenge of customization and high costs (Tsai et al. 2010 as cited by Agrawal 2013). Studies have shown that companies that perceive high technology complexity act more cautiously in adopting BDA and assimilating it into their enterprises. Early DOI studies have also demonstrated that organizational characteristics such as organizational readiness that includes availability of technical and financial resources, organizational culture, management support and organizational size will influence the adoption intention decision.

2.2.3 Technology Acceptance Model (TAM)

Technology Acceptance Model is a theory that has been widely cited by many scholars in explaining the adoption of IT in various fields (Heili and Assar, 2009; Ramdani and Kawalek, 2008; Hao, 2013). It is derived from the theory of reasoned action (TRA) and it explains how users come to accept and use technology. The model suggests that the factors that influence users decision about how and when to use a new technology are perceived usefulness (PU) : the degree to which a person believes that using a particular system would enhance his or her job performance; perceived ease of use (PEOU) : the degree to which a person believes that using a particular system would be free from effort (Davis, 1989). However TAM has been continuously upgraded to include other factors to help explain and predict the adoption of new technology apart from using only PU and PEOU. The following figure explains the Technology Acceptance Model.

Figure 2.1: Technology Acceptance Model
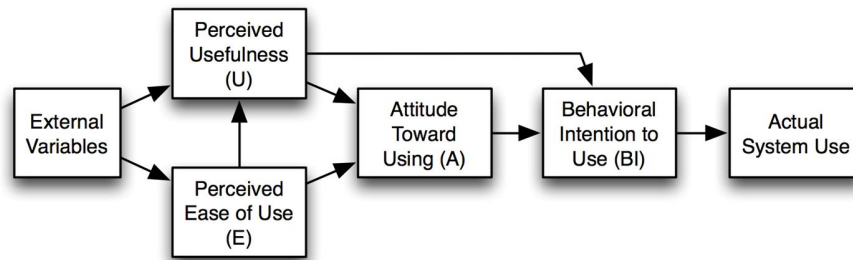
Source: Davis (1989)

TAM has been upgraded by incorporating Roger's (1995) diffusion of innovation and Adjez's (1991) theory of planned behavior (TPB) to include the subjective norms and perceived behavioural control to explain perceptions of ease or difficulty of performing an act given resource constraints.

2.3 Benefits of Big Data Analytics

Businesses continued growth depends on attracting new customers. BDA drive identification and recruitment of new customers and turn leads into revenue by leveraging all types of data and applying varying forms of analytics. By using BDA businesses are able to target messages to the customers most likely to be receptive to them. Research has shown that it is more expensive to acquire customers than it is to retain them (United Business Media, 2013). Through BDAs this long-standing dynamic can be changed and the cost of acquiring customers reduced by enabling businesses to target prospects more accurately and affectively.

BDA cut marketing costs by reducing what United Business Media (2013) in their report sponsored by IBM referred to as spray-and-pray marketing. They argued that in spray-and-pray marketing businesses send every offer to every potential customer in its database and hoping that a few offers will prove fruitful something that makes marketing very expensive. By using BDA businesses are able to feed customers with customized offers (United Business Media, 2013).

2.4 Big Data Analytics challenges

The business challenge with the installation of BDA is the complexity of the amount of data in terms of volume, variety and velocity of structured and unstructured data coming from social media networks, emails, sensors, Web activity logs and other sources that do not fit easily into traditional data warehouse systems. Other organizational challenges identified by Bain and Company study include overcoming internal resistance of adopting BDA as a new way of doing business (Bain and Company, 2013). They argue in their study that since the value of BDA may not be apparent to everyone, senior managers may need to help people change their everyday behavior by providing incentives for analytics – driven behaviours and continuously making reference to the importance of BDA delivering business results. Other organizational challenges include hosting and maintaining the technological infrastructure, setting privacy policy and access rights and determining accountability for compliance with local laws and data security.

Studies also indicate that larger firms that have invested in old technology may find it difficult to adapt to new technology because it may be too costly (McElheran, 2012).

The availability of skilled labour is another challenge that inhibits the adoption of BDA. Research carried out in the United Kingdom (SAS, 2013) and in Kenya and Nigeria (IDG Connect, 2013) found out that infrastructure development for BDA in all the countries was very high except skilled labour that was very low and this inhibited the availability of big data technologies and services.

2.5 Empirical studies on Adoption of Big Data Analytics

Empirical studies on the adoption of big data analytics have been carried out and documented in scholarly publications (Verheij, 2013; Oghuma, 2013, Tambe, 2012); the studies have investigated various factors that lead organization to adopt a technology such as BDA. IBM (2012) studied how organizations view big data and to what extent they were using it to benefit their businesses. The study was a survey of 1144 businesses and IT professionals in 95 countries across 26 industries. The respondents represented a mix of disciplines including both business professionals (64 percent of the total sample) and IT professional 46 percent. The survey confirmed that most organizations were in the early stages of big data development with the majority focusing either on understanding the concepts (24 percent) or defining a roadmap related to big data (47 percent). Other factors that inhibited the adoption of big data included legal, ethical and regulatory considerations, lack of advanced analytical skills and costs associated with upgrading infrastructure.

MIT Sloan Management in collaboration with IBM Institute of Business Value (2011) investigated how organizations use big data analytics to gain insight and guide action. The survey covered more than 3000 business executives, managers and analysts from

organizations located around the world. The findings from the survey were that top-performing organizations were twice as likely to apply BDA to their activities; the biggest challenges in adopting BDA were managerial and cultural; and visualizing data differently will become increasingly valuable.

These studies both support the Framework of Tornatzky and Fleischer (1990) and the theory of Davis (1995). The Technology – Organization – Environment (TOE) framework suggests that the technological context, organizational context and environment context are the three important factors that influence the process by which organizations adopt and implement innovations (Tornatzky and Fleischer 1990). TOE framework is consistent with the Roger's Diffusion of Innovation Theory (Rogers 1995) which emphasized that technological characteristics and both internal and external characteristics of the organization are the drivers for technology diffusion. However, TOE framework and DOI theory have been used to assess organization adoption of DBA mostly in Telecommunication, E – commerce and Enterprise Systems (Oghuma (2013); Awa et al. (2012), Ramdani and Kawalek (2008)) and not in Supermarkets which emerging literature and empirical evidence suggest that they stand to gain competitive advantage if they adopt BDA in their business model.

2.6 Conceptual Framework

From the empirical studies on BDA technology and its adoption in various industries and organizations we have presented a model based on the conceptual and determinants of adoption intentions as shown in Figure 2. In this study the conceptual framework are the factors that affect the adoption of big data analytics by the supermarkets. The

independent variables include technical, managerial and environmental. The dependent variable is the adoption of big data analytics by the supermarkets.

Figure 2.2: Conceptual Framework
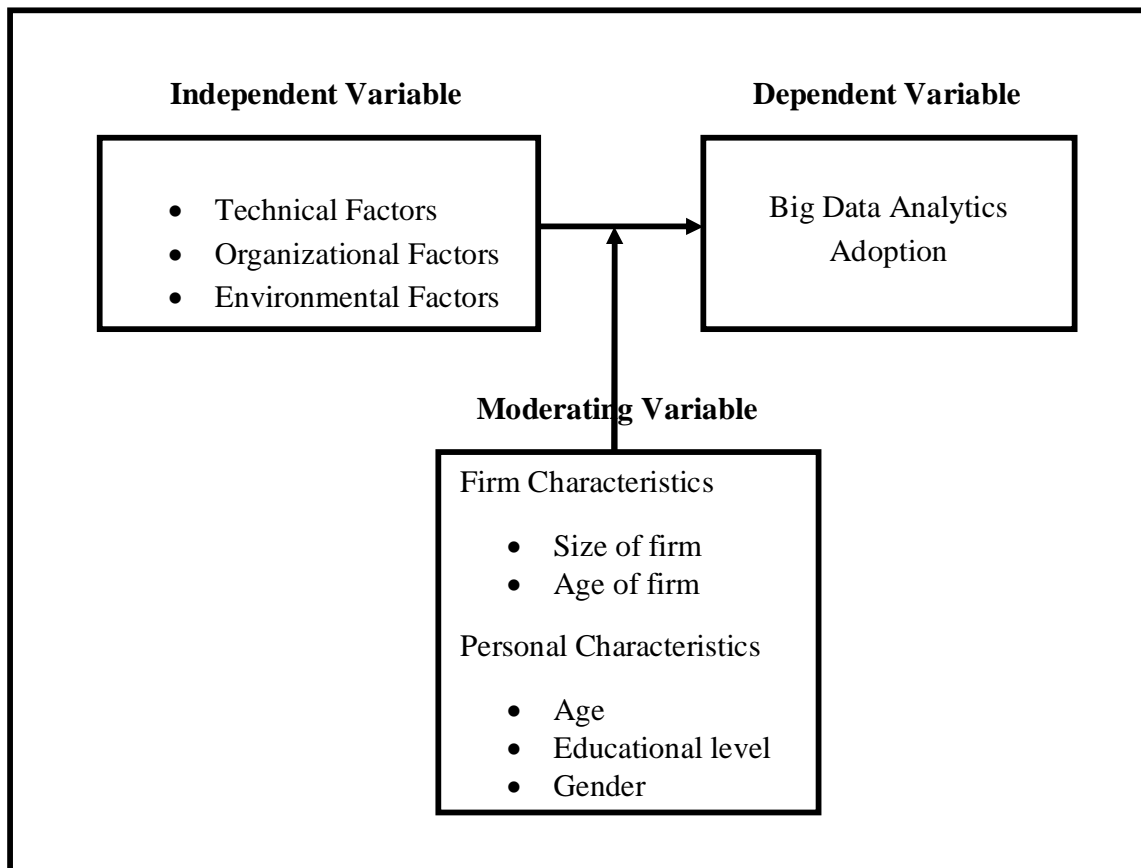
Source: Author, 2015

The model is based on Tornatzky and Fleischer (1990) because it has been used to examine a number of technological innovations. Here, Supermarkets are the adopter of the new technology and BDA adoption is influenced by technical, managerial and environmental factors. The measurable technical variables will include technological competence and technical capacity; organizational variables will have the top management support, management culture and perceived financial cost as predictors that

may influence the management of supermarkets to adopt BDA in their operation. Finally environmental variables will have competitive pressure, regulatory /government policy and data security and privacy as predictors of adoption. Firm characteristics such as firm size and age of the firm, personal characteristics such as level of education, gender and age of the workers may indirectly influence the adoption of BDA in supermarkets.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

In this study a multi - perspective Technology – Organization – Environment (TOE) framework as theoretical base is used. A cross – section study design with quantitative approach was used for data collection. The methodology involves a case study of the 5 leading supermarket chains and the 3 independent supermarkets in Kisumu County. A case study is chosen because it allows us to probe deeply and to analyze intensively the dynamic interactions within the retail chains (Alqahtani, et al., 2012). A case study is also a recommended research methodology because it is well suited to answer our research questions such as "why" and "how" (Yin, 1994). It was a descriptive case study with the primary function of gaining deeper understanding of the factors that affect the adoption of BDA in business enterprises with emphasis on supermarkets in Kisumu County in Kenya.

3.2 Population and Sampling

Dattalo (2008) defines population as a theoretically specified aggregation of elements where an element is a unit which is an object or person. He further defines sampling as a strategy used to select elements from the population. The population of this study is the 5 leading supermarkets chains and the 3 independent supermarkets in Kisumu County. Purposive sampling was used to select the elements for the study in all the 8 supermarkets in Kisumu County.

3.3 Data Collection Procedures

Five leading supermarket chains and three independent supermarkets in Kisumu County participated in this study, namely: Nakumatt, Tuskys, Naivas, Ukwala, Uchumi, Tumaini,

Yatin and Khetias. The study used primary data that was collected through the use of a closed ended questionnaire administrated among the sampled respondents which comprised of 2 senior managers, 2 chief supervisors, 2 section heads and 2 customer care managers (marketing and customer) in each of the eight supermarkets. The questionnaire had five sections. The first section contained questions on the bio data of the management, the second part contained answers to questions on the background of the organization, third part answered questions on objectives one, the fourth part answered questions on objective two while the fifth section answered questions on objective three. The questionnaires were administered by the researcher through drop and pick method.

3.4 Data Analysis

The researcher used both descriptive and regression analysis to analyze the data collected from the study. Descriptive analysis was used to analyze objectives one and two and regression analysis for objective three. The two analyses were adopted to enable the researcher to conduct a comprehensive analysis. Since the dependent variable is dichotomous logistic regression analysis will be used for objective three. The logistic model is specified as follows:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where X_1 stand for technological variable, X_2 for organizational variable, X_3 for environmental variable, α_0 is the constant, β_1 - β_3 are equation coefficients and ε is the error term. Testing the independent variables is equivalent to testing whether the coefficients β_0, β_1, β_2 and β_3 are non zero.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter contains presentation and interpretation of study findings. The chapter also contains finding on the general information of respondents and the supermarkets, the items related to the usage of big data analytics, the challenges and factors affecting the adoption of big data analytics. The findings are represented and interpreted in line with the study objectives. There were 35 completed questionnaires representing 55% respondents. This response was considered to be adequate and representative in line with Mugenda and Mugenda (2003) observation that a response of 50% is sufficient for purposes of statistical analysis and also allow generalization of the findings.

4.1 General Information

The general information of respondents were measured in terms of gender, age, education levels, job title and that of the supermarkets in terms age, size and adoption of Big Data Analytics.

Table 4.1 Distribution of respondents by Gender

Gender	Frequency	Percentage
Male	26	74.3
Female	9	25.7
Total	**35**	**100**

Source: Author, 2015

Results from table 4.1 above regarding gender indicate that there were more male respondents (about 74.3%) than the females (25.7). This would imply that most of the people in top management are males.

Table 4.2 Age of respondents

Age	Frequency	Percentage
Below 30	13	37.1
30 - 40	16	45.7
41 - 50	6	17.1
Total	**35**	**100**

Source: Author, 2015

The observation from table 4.2 above showing distribution of respondents by age groups indicate that the majority of the respondents were between 30 – 40 and below 30 (45.7 % and 37.1% respectively) while those 41 and above were only 6%. The implication here is that most of the supermarkets are being managed by the middle aged people.

Table 4.3 Distribution by Education Level

Level of education	Frequency	Percentage
PhD	1	2.9
Masters Degree	3	8.6
Undergraduate Degree	19	54.3
Tertiary Education	5	14.3
High School	6	17.1
Other	1	2.9
Total	**35**	**100**

Source: Author, 2015

Results from table 4.3 above revealed that majority of the respondents had attained an undergraduate degree (54.3%) followed by those who had attained high school and tertiary level of education (17.1% and 14.3 % respectively) while those with masters and PhD degrees were 8.6 % and 2.9 % respectively. The one respondent with other education level (2.9%) had indicated that he had both masters and PhD degrees. These findings here indicate that most of the supermarkets are managed by well educated class of people. This therefore implies that there are high chances of these supermarkets being well managed due to application of Big data Analytics.

Table 4.4 Distribution by Job Title

Job title	Frequency	Percentage
Director	1	2.9
Executive Manager	1	2.9
Manager of Business Unit	4	11.4
Information Officer	1	2.9
IT Manager	1	2.9
Marketing Manager	5	14.3
Customer Care Manager	1	2.9
Other	21	60.0
Total	**35**	**100**

Source: Author, 2015

On the assessment of job title of the respondents, the results from table 4.4 revealed that the majority of the respondents had other titles (Supervisor, Loss control officer, Sales Person, Team Leader, Asst. Manager, Security Officer, IT Clerk, and Accountant) (60%) followed by Marketing Manager and Manager of Business Unit (14.3% and 11.4% respectively) while the rest of the respondents were Director (1%), Executive Manager (1%), IT Manager (1%), Information Officer (1%) and Customer Care Officer (1%). These findings indicate that there is no uniformity in job titles by various supermarkets. In some supermarkets instead of a manager they have a Team Leader. However their managerial roles are similar because they are the people entrusted with giving information about the firm/organization.

Table 4.5 Distribution by Age of Organization

Age of the firm	Frequency	Percentage
1 - 5 years	8	22.9
6 - 10 years	3	8.6
11 - 15 years	10	28.6
16 - 20 years	2	5.7
Over 20 years	12	34.3
Total	**35**	**100**

Source: Author, 2015

The results from table 4.5 above regarding age of the firm/organization indicate the age of the majority of the firms/organization is between 11 – 15 and those over 20 (28% and 34.3% respectively) followed by those which are between 1 – 5 (22.9) while those between 6 – 10 were 3% and those between 16 – 20 were 5.7%. The findings here indicate that the majority of supermarkets have been in the retail business for long and matured in the business.

Table 4.6 Distribution by Size of Firm

Size of Firm	Frequency	Percentage
1 - 100 Employees	11	31.4
101 - 1000 Employees	12	34.3
1001 - 10000 Employees	7	20.0
10000 + Employees	5	14.3
Total	**35**	**100**

Source: Author, 2015

The results of table 4.6 above regarding the size of the firm/organization reveals that the largest numbers of employees were between 101 and 1000 and 1 – 100 (34.3% and 31.4% respectively) followed by firms/organizations with employees between 1001 – 10000 and above 10000 (7% and 5% respectively). The implication of this findings are that larger supermarkets employee the biggest number of employees whereas the smaller ones had fewer employees.

Table 4.7 Distribution by Use of Big Data Analytics

Responses	Frequency	Percentage
Yes	21	60.0
No	13	37.1
3	1	2.9
Total	**35**	**100**

Source: Author, 2015

The researcher also investigated the supermarkets that had adopted Big Data Analytics technology and the results in table 4.7 above reveal that the majority of the supermarkets had adopted Big Data Analytics (60%) while only 3% had not adopted Big Data Analytics and the remaining one supermarket (2.9%) was not sure whether they had adopted BDA.

4.2 The items related to the usage of Big Data Analytics by the supermarkets

This section addresses the first objective by asking the respondents to indicate the items related to big data analytics technology which were being used by the supermarkets to show the extent of adoption.

Table 4.8 Distribution by Rate of Computer Usage

Extent of usage	Frequency	Percentage
Medium Extent	11	31.4
Large Extent	24	68.6
Total	**35**	**100**

The results of table 4.8 above indicate high rate of computer usage by the majority of supermarkets (68.6%) while the rest of the supermarkets the rate was medium (31.4%). These findings indicate that the majority of the supermarkets had already put in place the hardware necessary for hosting big data analytics software and also that the workers were computer literate.

Table 4.9 The type of BDA technology/Software adopted

Type of BDA technology	Frequency	Percentage
Relational Databases (Oracle, DB2)	16	45.7
Business Intelligence Tools	4	11.4
In-Memory Platforms	1	2.9
NoSQL Databases	3	8.6
Don't know/Unsure	1	2.9
Others	2	5.7
More than one software	8	22.9
Total	**35**	**100**

Source: Author, 2015

There is a recognition here of the predominant use of relational databases software as a means of collecting, storing and processing raw data, as this came top of table 4.9 above at 45.7%, with a big proportion of respondents indicated the use of more than one software/technology (22.9%). A significant minority of respondents (11.4%) indicated the use of BI tools and another small proportion of respondents indicated the use of NoSQL technology (8.6%). Only 1% of the respondents indicated the use of In-Memory

Platforms for storing and processing raw data, other respondents indicated the use of other software (5.7%) with only 2.9% of the respondents indicating they were not sure of the software or technology being used.

The implications of these findings are that the adoption of big data analytics in supermarkets is still at an early stage. The big number of respondents indicating the use of relational databases and a significant number of respondents indicating the use of business intelligence tools and a small proportion of respondents indicating the use of NoSQL, In-Memory Platforms, the known technologies for storing and analyzing big data point to a different understanding of what big data consists of, as relational databases and business intelligence tools only manage structured data as opposed big data which can store and analyze large volume of unstructured data coming at high velocity and variety of sources.

Table 4.10 Total Amount of Data managed

Responses	Frequency	Percentage
Less than 100GB	8	22.9
100GB to 1TB	20	57.1
1TB to 5TB	2	5.7
100TB	5	14.3
Total	**35**	**100**

Source: Author, 2015

The respondents were asked to state the amount of data managed by their firm/organization and over half of the respondents as shown in table 4.10 above indicated they managed huge amount of data between 100G – 1 TB (57.1%), 1TB – 5TB (5.7%) and 100TB (14.3%) with a significant proportion also indicating they manage data less than 100GB (22.9%). These findings imply that the amount of data managed by supermarkets qualify to be referred to as big data as big data is measured in terabytes, petabytes and exabytes.

Table 4.11 Data Type collected and Analyzed

Data type	Frequency	Percentage
Transactional Data	12	34.3
Multimedia Data	2	5.7
Archived/Historical Data	2	5.7
Mobile Data	1	2.9
Others	1	2.9
Most of the above	17	48.6
Total	**35**	**100**

Source: Author, 2015

The researcher also investigated which data type was collected and analyzed by the firms/organizations and over half of the respondents (48.6%) indicated that they collected and analyzed all of the data type in table 4.11 above followed by transactional data at 34.3%, while a significant minority indicated they collected and analyzed multimedia data (5.7%), Archived/ Historical data (5.7%). A small number also indicated they collected and analyzed mobile data and other type of data (2.9% each). These findings

lead to the conclusion that supermarkets have seen the importance of collecting and analyzing nontraditional data type to gain insight about the business and the customers even though quite a significant number are still relying on traditional data.

Table 4.12 Low Rate of BDA Usage

Responses	Frequency	Percentage
Yes	12	34.3
No	23	65.7
Total	**35**	**100**

Table 4.13 High Rate of BDA Usage

Responses	Frequency	Percentage
Yes	23	65.7
No	12	34.3
Total	**35**	**100**

Source: Author, 2015

Results from the tables 4.12 and 4.13 above regarding the rate of big data analytics usage indicate that there is high rate of big data analytics usage (65.7%) by the supermarkets compared with the low rate of usage (34.3%). This would imply there is infrastructure in place to enable the high rate of usage by supermarkets.

4.3 Challenges of using big data analytics technology by supermarkets

This section addresses the second objective on the challenges that are hindering the adoption of big data analytics by supermarkets. The respondents were asked to indicate the extent to which the challenges outlined had hindered the usage of big data analytics in their firms/organizations and the challenges mentioned are given in the results analysis represented in table 4.14.

Table 4.14 Results analysis for challenges affecting usage of big data analytics technology

Challenges	N	Mean	Std. Dev.
Internal resistance to adopting BDA as a new way of doing business	34	3.21	1.553
Data security and privacy laws	34	2.94	1.632
Lack of skill	34	2.71	1.605
Lack of capacity to store nontraditional data types	34	2.50	1.354
It is too costly	34	2.50	1.308
Hosting and maintaining the technological infrastructure	34	1.76	0.955
Complexity of the amount of data in terms of volume, variety and velocity	34	1.74	0.963

Source: Author, 2015

The results in the table revealed that complexity of amount data in terms of volume, variety and velocity and hosting and maintaining the technological infrastructure as major challenges (mean = 1.74 and mean = 1.76 respectively) considering a five point scale where 1 means that the respondents strongly agreed that they were a challenge followed by lack of capacity to store nontraditional data types and the technology being costly

(each with mean = 2.50). The results also revealed that lack of skill and data security and privacy laws as other challenges (mean = 2.71 and mean = 2.94 respectively). The respondents were indifferent whether internal resistance to adopting BDA as a new way of doing business was a challenge (mean = 3.21). The implication of these findings is that supermarkets are still facing many challenges that have hindered them from adopting BDA technology.

4.4 To establish the relationship among the factors affecting adoption of BDA in Supermarkets

This section addresses the third objective on the factors affecting the adoption of big data analytics in supermarkets and establishes the relationship among the factors. The researchers run a descriptive analysis of the factors affecting the adoption of big data analytics in supermarkets to examine the level at which respondents agreed or disagreed with the factors. To establish the nature and direction of the relationships that exist among the study variables the researcher used Regression analysis where high usage BDA was the dependent variable and Technical, Organizational and Environmental factors as the independent variables.

4.4.1 Descriptive statistics of the Technical factors affecting adoption of BDA in supermarkets

Descriptive statistics of the technical factors affecting the adoption of BDA in supermarkets are reported in table 4.15 below

Table 4.15 Results analysis for the technology factors affecting adoption of BDA in supermarkets

Variables	Mean	Std. Deviation	N
Complexity, easy to implement and use BDA	2.74	1.333	34
Trialability, BDA tried and accepted by firm / organization	2.53	1.419	34
Observability, many firms / organization using big data to drive their business processes	2.47	1.542	34
Compatibility, right infrastructure, technical skills and IT	2.41	1.459	34
Relative advantage, big data has more benefits	1.76	.890	34
High Rates of BDA Usage	1.34	.482	35

Source: Author, 2015

The results in table 4.15 above reveal that the means range from 1.76 to 2.74. Comparison of means suggests that respondents agreed that the technical factors affected the adoption of BDA in supermarkets.

4.4.2 Descriptive statistics of the Organizational factors affecting adoption of BDA in supermarkets

Descriptive statistics of the organizational factors affecting the adoption of BDA in supermarkets are reported in table 4.16 below.

Table 4.16 Results analysis for the organizational factors affecting adoption of BDA in supermarkets

Variables	Mean	Std. Deviation	N
Digitalization of operation made it possible	2.24	.987	34
Organization culture and mission is conducive for development of BDA	2.03	1.000	34
Top management supports implementation of BDA	1.85	1.048	34
High Rates of BDA Usage	1.34	.482	35

Source: Author, 2015

The results in table 4.16 above reveal that the means range from 1.85 to 2.24. Comparison of means suggests that respondents agreed that the organizational factors affected the adoption of BDA in supermarkets.

4.4.3 Descriptive statistics of the Environmental factors affecting adoption of BDA in supermarkets

Descriptive statistics of the organizational factors affecting the adoption of BDA in supermarkets are reported in table 4.17 below.

Table 4.17 Results analysis for the environmental factors affecting adoption of BDA in supermarkets

Variables	Mean	Std. Deviation	N
Privacy security of customer information major barrier	2.68	1.536	31
Govt encouragement through provision of access to Internet and digitalization services	1.79	.978	34
Competition calls for innovative ways of doing business	1.76	.890	34
High Rates of BDA Usage	1.34	.482	35

Source: Author, 2015

The results in table 4.16 above reveal that the respondents strongly agreed that the environmental factors corresponding with means 1.76 and 1.79 affect adoption of BDA in supermarkets.

4.4.4. Regression analysis explaining big data analytics adoption from Technical, Organization and Environmental Factors

The relationship between the factors that affect the adoption of big data analytics was investigated using Pearson product – moment correlation coefficient. Tables 4.18, 4.19 and 4.20 indicate the results.

Table 4.18.The relationship between technological factors that affect adoption of big data analytics in supermarkets (N = 34)

Variables	Pearson Product Moment Correlation Coefficient (r)					
	1	**2**	**3**	**4**	**5**	**6**
1. Relative advantage : Using big data analytics has provided many benefits to the firm/organization	1					
2. Compatibility: The firm has the right infrastructures, technical skills and IT platform to implement big data analytics technology	.637**	1				
3.Complexity : It is easy to implement and use big data analytics technology	.534**	.908**	1			
4.Triability: Big data analytics has been tried and accepted by the firm/organization	.606**	.945**	.893**	1		
5.Observability: Many firms/organizations are already using big data analytics to drive their business processes	.569**	.908**	.755**	.893**	1	
6. High rate of big data analytics usage(BDA Adoption)	.616**	.808**	.666**	.772**	.738**	1

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

Source: Author, 2015

Table 4.18 indicates that there was a positive, strong significant correlation, r =.616, n (34), p < 0.01 between Relative Advantage of the technology factors and adoption of big data analytics, there was a positive, strong significant correlation, r =.808, n (34), p < 0.01 between Compatibility of the technology factors and adoption of big data analytics, there was a positive, strong significant correlation, r =.666, n (34), p < 0.01 between Complexity of the technology factors and adoption of big data analytics, there was a positive, strong significant correlation, r =.772, n (34), p < 0.01 between Triability of the technology factors and adoption of big data analytics, there was a positive, strong significant correlation, r =.738, n (34), p < 0.01 between Observability of the technology factors and adoption of big data analytics. This implies that for the supermarkets to adopt big data analytics all the technological factors have positive significant influence on adoption of the technology.

Table 4.19 The relationship between organizational factors that affect adoption of big data analytics in supermarkets (N = 34)

Variables	Pearson Product Moment Correlation Coefficient (r)			
	1	**2**	**3**	**4**
1.　　Top management supports implementation of big data analytics as a business innovation for competitive advantage by availing resources	1			
2.　　Digitization of operation has made it possible to implement big data analytics to bring down internal coordination costs	.738[**]	1		
3.　　Organization culture and mission is conducive for the development of big data analytics technology	.901[**]	.761[**]	1	
4.　　High rate of big data analytics usage (BDA Adoption)	.525[**]	.544[**]	.554[**]	1

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

Source: Author, 2015

Table 4.19 indicates that unlike technological factors that had positive, strong significant correlation, organizational only showed a positive significant correlation with r = .525, n(34), p< 0.01 between top management support, r = .544 , n(34), p < .01 between digitization bring down internal cost and r = .554, n(34). P < .01 between organization culture and adoption of big data analytics. This implies adoption of big data analytics by supermarkets were not so much influenced by organizational factors.

Table 4.20 The relationship between environmental factors that affect adoption of big data analytics in supermarkets (N = 34)

Variables	Pearson Product Moment Correlation Coefficient (r)				
	1	2	3	4	
1. Competition in the industry has called for innovative ways of doing business	1				
2. Government encouragement through provision of access to Internet and digitization of services create enabling environment for big data analytics technology	.848**	1			
3. Privacy and security of customer information is a major barrier to implementation of big data analytics	.227	.213	1		
4. High rate of big data analytics usage (BDA Adoption)	.329	.409*	.560**	1	

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

*Correlation is significant at the 0.05 level (2 - level).

Source: Author, 2015

There was weak positive, significant correlation, $r = .329$, n (34), between competitive pressure and adoption big data analytics, there was strong positive correlation, $r = .409$, n (34), $p < .05$ between government encouragement through provision of access to Internet and digitization of services creating and enabling environment and the adoption of big data analytics, there was strong positive correlation $r = .560$, n (34), $p < .01$ between privacy and security of customer information and adoption of big data analytics.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents summary of the findings, draw conclusions and make recommendations.

5.2 Summary of the findings

The first objective of the study was to determine the extent to which supermarkets in Kisumu County have adopted BDA technology. The findings indicate that 68% of the supermarkets had high rate of computer usage, a basic infrastructure for implementing and adopting BDA technology, with 45.7% using relational database software, 22.9% using multiple software in data storage and analysis, 11.4% were using business intelligence for data analysis but a small number 8.6% were already using NoSQL the right software for managing big data an indication of low level of the right big data analytics technology. The findings also indicate that 57.1% of the supermarkets stored and managed data sets of between 100gigabytes and 1 terrabytes which is the minimum amount of data that qualifies to be recognized as big data while 48.6% of the supermarkets collecting and analyzing a variety of data type including transactional, social media, sensor, multimedia, spatial, historical and mobile data. A large number of supermarkets (65.7%) indicated high rate of big data and analytics usage. From these findings it means that the extent of adoption of big data analytics is still at an early stage particularly with the use of the right software such as NoSQL which is appropriate for analyzing a variety of big data sets, the data sets being collected and analyzed is also very low. The difference with this research compared to the ones done before is the fact that

the empirical part of the research was with senior managers of supermarkets. Nearly all of the researches done were concentrating on telecommunication, leaving out other sectors. Only one research was found related to usage of big data analytics (Agarwal, 2013).

The second objective was to establish the challenges of adopting BDA technology by supermarkets. The findings indicate that complexity of amount of data in terms of volume, variety and velocity was a major challenge with a mean of 1.74 with standard deviation of 0.963 on five point scale where 1 indicate strongly agree, hosting and maintaining the technological infrastructure was the other major challenge with a mean of 1.76 with a standard deviation of 0.955. Lack of skill was another challenge with a mean of 2.71and standard deviation of 1.605, security and privacy laws was a challenge with a mean of 2.94 and standard deviation of 1.632, other challenges included lack of capacity to store nontraditional data with a mean of 2.50 and standard deviation of 1.354, its cost being has was another challenge with a mean of 2.50 and standard deviation of 1.308. Internal resistance to usage of BDA was not a challenge with a mean of 3.21 and standard deviation of 1.553.

The third objective which was to establish factors leading to the usage of BDA technology in supermarkets in Kisumu – Kenya, with respect to technology, organization and environment, the findings show that technological, organizational and environmental factors had an influence on the adoption of BDA technology. And that influence or effect is positive. This is in consonance with earlier studies (Zhu, et al 2002, Awa, et al 2012,

Oghuma, 2013 and Scott, 2007) which confirm that technological, organizational and environmental factors has influence on adoption of BDA.

5.2 Conclusions

In reference to Gender, majority of respondents were males 26 (74.3%) while females were 9 (25.7%). As per Age factor, data in respect to age was collected and the results of analysis shown in table 4.2. Forty five point seven percent of the respondents were in the age bracket 30 - 40 while 37.1% were under the age of 30 and 17.1% were between 40 and 50. Thus majority of the respondents are youthful. Data in respect to education of the workers was collected and the results of analysis are shown in table 4.3. Responses were received from workers with various education levels, 2.9% of the respondents had PhD, 8.6% had masters' degree, 54.3% had undergraduate degree, 14.3% had tertiary education, 17.1% had High school and 2.9% had other qualifications. The majority of the respondents were graduates. Data collected in reference to job title was shown in table 4.4. Responses show various titles of the workers, 2.9% had designation as Director, 2.9% had a designation of Executive Manager, 11.4% had a designation of Manager of Business Unit, 2.9% had a designation of Information officer, 2.9% had a designation of IT Manager, 14.3% had a designation of Marketing Manager, 2.9% had a designation of Customer Care Manager while 60.0% had other designations. The large number of workers with other designation was as a result of supermarkets having different job titles yet they perform the same roles, for example in one supermarket there is no manager but a team leader. Data collected with regard to age of the organization was shown in table 4.5. The organizations that had been in existence between 1 – 5 years were 22.9%, those in existence between 6 – 10 years were 8.6 %, those in existence between 11 – 15 years

were 28.6%, those in existence between 16 – 20 years were 5.7% and those in existence for over 20 years were 34.3%. This shows that most of the supermarkets had been in business for over 20 years. In terms of size of the organization with respect to number of employees, the results of the respondents are shown in table 4.6. Supermarkets with between 1 – 100 employees were 31.4%, those with employees between 101 – 1000 were 34.3%, those with 1001 – 10,000 employees were 20.0% and those with employees over 10,000 were 14.3%. A significant number of supermarkets had employees between 100 and 1000 while a small number of them had employees 10,000 and above. Data collected in reference to adoption of big data analytics is shown in table 4.7. The respondents had to indicate "Yes" if they had adopted BDA and "No" if they had not. Those who indicated Yes were 60% and those who indicated No were 37.1% with 2.9% not sure.

The results indicated majority had adopted BDA. As per first objective, the study was successful as it identified the extent to which the supermarkets in Kenya had adopted BDA technology. The research was able to identify that even though most of supermarkets had high rate of computer usage and access to variety of data, most of them had not put in place the right software such as NoSQL and Hadoop/MapReduce for collecting, storing and analyzing both structured and unstructured data associated with big data. As per the second objective many supermarkets still face challenges of storing large volume of data from many sources and speed. Most face challenges of infrastructure, skill and cost. With regard to third objective, the factors that affect adoption of BDA by supermarkets in Kenya are Technical, Organizational and Environmental. Most still use transactional databases for data collection, storage and analysis.

5.3 Limitations of the study

This study was conducted on adoption of big data analytics by supermarkets in Kisumu County of Kenya; however a number of limitations arose as one supermarkets could not take part in the study because authority had to come from the headquarters in Nairobi, some supermarkets had limited the number of respondents to the questionnaire claiming they were busy, other respondents did not respond to all the items in the questionnaire while others responded late. Due to these limitations there is still room for further investigation of the adoption of big data analytics as a tool business operation. The study focused on management that had little IT knowledge, future studies be carried out on adoption of big data analytics with more attention to system analysts or managers in the organization. Big data analytics is a relatively new technology in Kenya, this study has been unable to measure the actual level of adoption as suggested by Technology – Organization – Environment Framework (Tornatzky and Fleischer, 1990) and Theory of Diffusion (Rogers, 2003). It has been found that the study failed to collect sufficient data to support the theoretical frame work of the study which intended to explain the adoption of BDA by supermarkets in Kenya.

5.4 Recommendations

The study found out that the usage of computers for business operation is very high with majority of the supermarkets using traditional databases which allow them only to collect traditional data leaving out nontraditional data which is rich in customer information it is therefore recommended that management should source for other software such as Hadoop, and NoSQL which have the capability of collecting, storing and analyzing unstructured data enabling managers to gain more insights about the business and the

customers. The supermarkets should also train their IT staff on the uses of this technology.

The study found out that there were technical, organizational and environmental issues, it is therefore recommended that supermarkets should outsource the technology from well established vendors who will induct the workers on the benefits of using the technology and managers should avail more funds in their budget for the acquisition of the technology and training of the staff.

The study also identified data security and privacy laws as a challenge in adopting big data analytics it is therefore recommended that supermarkets come up with a policy on data management to overcome such issues.

5.5 Suggestions for further research

The study confined itself to use of BDA as driver of business in supermarkets, however decision making has become data driven and this therefore necessitate the study to establish data driven decision making in other sectors such as manufacturing.

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APPENDICES

APPENDIX I: INTRODUCTION LETTER

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Dear Sir/Madam,

RE: INTRODUCTION LETTER

I'm a postgraduate student at the University of Nairobi undertaking a Master of Business Administration research project titled **"The adoption of big data analytics by Supermarkets in Kisumu County".**

The purpose of this letter is to kindly request you to respond to the questionnaire that is needed to collect data for the project. The information obtained is to be used for academic purposes only and will be treated with utmost confidentiality.

Yours faithfully,

George F.O. Ochieng

APPENDIX II: QUESTIONNAIRE

QUESTIONNAIRE

This survey is designed to understand the extent of usage of big data analytics as business intelligence tool in decision making and factors hindering its usage. Please give appropriate responses in the questionnaire in relation to your use/not use of big data analytics.

Section (A) General Information

In this section, you are expected to respond to the following items related to the firm/organization where you work

1)   Please specify your Gender

    Male [ ]   Female [ ]

2)   What is your age bracket?

    Below 30 [ ]   30 – 40 [ ]   41 – 50 [ ]   51 – 60 [ ]   Over 60 [ ]

3)   State your highest level of education

PhD [ ]   Masters Degree [ ]   Undergraduate degree [ ]

Tertiary education [ ]   High school [ ]   Others Specify ------------------------

4)   What is your Job Title in the firm/organization?

Director [ ]   Executive manager [   ] Manager of business unit [   ]

Information Officer [   ] IT Manager [   ] Marketing Manager [   ]

Customer Care Manager [   ] Others, specify…………………………………………

5)   What is the age of your firm/organization

   1 – 5 years [ ]   6 – 10 years [   ]   11 – 15 years [   ]   16 – 20 years [   ]   Over 20

   years [ ]

6)   Please specify the size of your firm/organization in terms of employees

1-100 employees [ ]   101 – 1000 employees [   ]   1001 – 10000 employees [   ]

10,000 + employees [   ]

7)   Has your firm/organization adopted Big Data Analytics?

Yes [ ]   No [ ]

SECTION (B)

In this section you are expected to respond to the following items related to your firm's/organization's usage of Big Data Analytics

8)   Please rate your firm's/organization's in terms of Computer Usage

Small extent [   ]   Medium extent [   ]   Large extent [   ]   Others, specify ---------------

9).Which of these Big Data Analytics technologies/software have been adopted by your Firm/Organization? You may choose more than one item

   Relational Data Bases e.g (ORACLE, DB2,etc) [   ]   Business Intelligence Tools [   ],

Hadoop/ Map Reduce [   ]   In-Memory Platforms [   ]   Other Open Source Technologies [ ]   NoSQL databases [   ]   Don't Know/Unsure [   ]

Others Specify ………………………………………………………………..

10) Specify the total amount of data managed by your firm/organization

Less than 100 Gigabytes (GB) [   ]   100 GB to 1 Terabyte (TB) [   ]   1 TB to 5 TB [   ]

5 TB to 10 TB [   ]   10 TB to 100 TB [   ]   100 TB + [   ]   Others, specify ---------

11)   Specify which of the following data types are being collected and analyzed by your

firm/organization. Your may choose more than one item.

Transactional data [   ] Social Media data [   ]   Sensor data [   ]   Multimedia data [   ]

Spatial data [   ]   Archived/historical data [   ] Mobile data [   ]   Voice data [   ]

Others, specify ---

12) The rate of your firm/organization usage of Big Data Analytics is very low

Yes   [   ]   No   [   ]

13)   The rate of your firm/organization usage of Big Data Analytics is very high

Yes   [   ]   No   [   ]

SECTION (C).

The following are some of the challenges of using big data analytics technology.

Please tick [√]in the appropriate boxes to indicate the extent to which the challenge has hindered the usage of Big Data Analytics in your firm/organization

CHALLENGE	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
14) Complexity of the amount of data in terms of volume, variety and velocity					
15) Hosting and maintaining the technological infrastructure					
16) Lack of capacity to store nontraditional data types					
17) It is too costly					
18) Internal resistance to adopting BDA as a new way of doing business					
19) Lack of skill					
20) Data security and privacy laws					

SECTION (D).

*The following statements relate to the factors affecting adoption of big data analytics.
Please [√] tick in the appropriate boxes to indicate the extent to which you agree
with each statement as having influenced your adoption of big data analytics by your
firm/organization.*

STATEMENTS	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Relative advantage : Using big data analytics has provided many benefits to the firm/organization					
Compatibility: The firm has the right infrastructures, technical skills and IT platform to implement big data analytics technology					
Complexity : It is easy to implement and use big data analytics technology					
Triability: Big data analytics has been tried and accepted by the firm/organization					
Observability: Many firms/organizations are already using big data analytics to drive their business processes					

STATEMENTS	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
Top management supports implementation of big data analytics as a business innovation for competitive advantage by availing resources					
Digitization of operation has made it possible to implement big data analytics to bring down internal coordination costs					
Organization culture and mission is conducive for the development of big data analytics technology					
Competition in the industry has called for innovative ways of doing business					
Government encouragement through provision of access to Internet and digitization of services create enabling environment for big data analytics technology					
Privacy and security of customer information is a major barrier to implementation of big data analytics					

We thank you for your participation and wish you well!