INFLUENCE OF BIG DATA ANALYTICS ON OPERATIONAL AGILITY OF SELECTED STATE ENTITIES IN KENYA

BY

OUMA ANTHONY ODHIAMBO

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Supervisor: Pauline Wambui

Declaration

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other university. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the thesis itself.

Name of Candidate: Ouma Anthony Odhiambo

Signature: .....

Date: .....

Approval by supervisor

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

Prof. /Dr MS. PAULINE ……..

Signature ……Pauline Wangunyu……..

Date …11/09/2020……..

Dedication

I dedicate this project to my lovely wife, kids and parents for their love, support and encouragement during the entire study period.

Acknowledgements

First, I wish to thank Almighty God and acknowledge all the people who made this project proposal possible. I acknowledge my supervisors for their sacrifice they accorded me during the project period. Their efforts are highly appreciated.

Abstract

Big data technologies assist companies to effectively fathom their markets and retain their created opportunities by obtaining plentiful data. Various firms resources related to big data should be well understood in order to know how the companies can create value intensify agility and eventually improve the general performance by using the big data analytics. The study had the three objectives including determining the effect of people capabilities, task capabilities and data capabilities of big data analytics on operational agility of selected state-owned entities in Kenya. The theories selected to support the study were the Resource Based Theory of Competitive Advantage and the Schumpeterian's innovation model. The study used purposive sampling, targeting a sample of 139 participants, and had a response rate of 64.7%, representing a sample size of 90 respondents distributed among the Huduma Centres within the Nairobi Metropolitan region. The study used SPSS for data analysis, narrowing to inferential analysis and linear regression for establishing correlation between the variables. The findings were that 80.0% and 65.0% agreed that big data analytics was associated with informed operational strategies and enhanced decision-making respectively. From the regression analysis, it was found that all the three variables (people- *p-value of 0.036*; task- *p-value of 0.025*; and data capabilities- *p-value of 0.042*) significantly influenced operational agility as their p-values were below the alpha value of 0.05 (at 95.0% confidence level). Recommendations include encouraging large governmental institutions to embrace big data analytics (BDA) to improve operational agility, and instituting BDA to aid in decision-making, execution and measuring of tasks, and for providing operational strategies based on data analytics outcomes.

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List of Abbreviations/Acronyms

BD: Big data

BDAC: Big data analytics capability

FPER: Firm performance

IT: Information Technology

ROA: Return on assets

ROI: Return on investments

SPSS: Statistical package for social scientists

KPIs: Key performance indicators

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Chapter one introduces the background information on the big data analytical capabilities, the uses, significance and what it has managed to do to the business sector in terms of evidence-based decision-making. The section also provides information on the problem statement, the research objectives, research questions, scope of the study, significance of the study, and the limitations expected in the study. The operational definitions of the project are also explained at the end of chapter one.

1.1 Background of the Study

In the world of competition, change of consumer demand, influence of technology and globalizations have led to need for better operational strategies. Large and small organizations in developed and developing countries have embraced big data analytical capabilities to improve operation agility. Many firms have also adopted BDA to enhance customer service experience. There are limited studies done in developing countries to establish the link between big data analytical capabilities and operational agility of big firms (Wu, Straub & Liang, 2014). Big data technologies enable organizations to understand their market in a better way control opportunity by accessing plenty data (Davenport, Harris & Morison, 2010). Various organizations associated with the use of big data need should be well understood in order to discover how firms can be in a position to create value, increase suppleness, and eventually improve general performance by applying big data analytics.

Lu and Ramamurthy (2011) asserts that big data analytical capabilities are described as processes and tools that are used frequently to dissolve and large datasets in gaining meaningful understandings, has received much consideration in information system

research given its ability to improve company's performance. Operational agility is explained as the capacity of companies' business procedures to achieve haste, precision and cost economies when searching for opportunities for invention and competitive act (Huang, Pan & Ouyang, 2014). Davenport and Dyché (2013) contend that operational agility is known to be a crucial factor of a company's success in the prevailing swiftly varying environment. A company with a high agility represents the speed with which it can adopt to the variations in the business industry. Firm agility represents a valuable capability which can greatly contribute to determining the firm's immense performance (Davenport, Harris, & Morison, 2010).

Despite numerous studies carried out by Davenport and Dyché (2013), Lu and Ramamurthy (2011), Davenport, et al. (2010), Wu, Straub and Liang, (2014), it is noted that there exists deficiencies in evidence on the link between big data analytical capabilities and operation agility of firms in State owned entities in Kenya thus pertinence of this study to unfold the research gaps.

According to big data (BD) specialists, the BD ideology consist of a variety of approaches, such as the "3Vs": *volume* (the quantity of existing datasets in big data makes an important attribute, because that kind of data is taken as excluded from the traditional management techniques of databases); *velocity* (the speed at which data is gathered); and *variety* (unstructured data are created by different sources like the e-mails, communication and social media). Resources and abilities make the central factors of operational performance (operational agility). Where 'resources' refers to the touchable and untouchable assets (e.g., technology, human & organizational), 'capabilities' are subcategories of the company's resources which cannot be transferred and are aimed at ensuring the productivity of other resources (Kiron et al., 2014). According to (Morgan et al., 2009) capabilities are too known as touchable or

untouchable processes that enhance deployment of other resources and ensure productivity is generally achieved. Generally, capabilities signify a distinct type of resources whose aim is to intensify productivity of other resources owned by the company.

Big data analytics has been associated with increased operational decisions and improved performance of key functions in a firm. The use of big data has both benefits and challenges. Big data has a variety of uses including identification of potential challenges after enough customer information has been collected telling customers recommendable products after learning and interpreting their buying behavior and coming up with better strategies in order to avoid repeat problems. 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 challenges of big data were associated with increased fraud, high likelihood of losing the finer details on customer demands, and the aspects of generalization which could lead to biased decisions.

Operational agility is also supported by the competitive advantage acquired when firms use big data. If a firm is able to perform better than the competitors and edge them in the gaining market section, then it can be said that the firms have gained competitive advantage. A study by Miller and Nyauncho (2015) noted that numerous challenges associated with big data were theft of critical information, lack of trust from customers, competition from other established players, as well as the changing customer preferences. In addition, handling of big data requires training of staff, and hiring of new staff to handle the extended roles. Mishandling of data by staff can also lead to increased exposure to data, especially loss and manipulation. With the accrued benefits (and some

challenges of big data) it becomes possible for an organization to use the data to make informed choices on the operational strategies.

1.2 Problem Statement

The ideal situation would be that governments use the capacity of big data to improve their resource decisions and improve their overall performance (Kelkar et al., 2016). Through the use of big data, it is highly likely that an organization can identify areas that contribute most to the ultimate mission of creating more value. For-profit making organizations, state agencies and other financial sector players have unique challenges in defining as well as measuring success, a challenge that can be partially be solved through using big data analytics. The use of smarter analytics in big data technology ensures organizations save time, money and energy while maximizing resource use. Key categories of resources that state entities have challenges in managing include money, physical assets and people. Scholars agree that using big data analytics helps in improving efficiency as well as the overall operational capability.

The current status of use of big data in decision making and improving operational agility is not well-documented, especially the fact that big data is a recent phenomenon (Kiron, Prentice, & Ferguson, 2014). Ohlhorst (2012) asserts that some big companies have been left behind in adopting big data analytics, creating a prerequisite and environment for failing in managing competition. While 91% if the fortune 1000 companies have invested heavily on big data analytics to remain ahead of competition, it is not clear how the top Kenyan government and non-government organizations have embraced and invested in big data for efficient operational agility (Karuitha, 2016). Studies by Mbaluka (2013), Ndambo, (2016) and Roth (2012) found conflicting conclusions on the state of Kenyan government entities adopting big data analytics to

ensure maximum operational efficiency. It has been concluded that there is limited use of the big data analytics in making decisions on key decisions like; customer and product profitability; customer acquisition and retention strategies; customer satisfaction strategies; marketing segmentation; operations and performance management; and supply chain and delivery channel strategies among government entities (Murungi, 2015). The gaps identified include the challenge of bureaucracy in adopting big analytics, an aspect that slows down the operational efficiency of state entities (Kshetri, 2014). As Mbaluka (2013) and Kibe (n.d.) indicates, big data management is a big challenge for many large corporations, and the effects have not yet substantively been associated with operational agility in the firms.

This study will thus seek to identify whether the selected organization is embracing big data analytics to improve on key functions including people, task and data capabilities to improve on the operational agility. The effects of the decision-making capability based on big data analytics needs to be shown on how it affects operational capability of firms, and how it is able to significantly improve key functions.

1.3 Research Objectives

The specific research objectives were to:

1. Determine the effect of people capabilities of big data on operational agility of selected State-owned entities in Kenya.
2. Establish the effect of task capabilities of big data on operational agility of selected State-owned entities in Kenya.
3. Establish the effect of data capabilities of big data on operational agility of selected State-owned entities in Kenya.

14. Research Question

The research was supported by the following research questions;

1. What are the effects of people capabilities of big data on operational agility of selected State-owned entities in Kenya?
2. What are the effects of task capabilities of big data on operational agility of selected State-owned entities in Kenya?
3. What are the effects of data capabilities of big data on operational agility of selected State-owned entities in Kenya?

1.5 Purpose of the Project

The purpose of the project was to assess the influence of big data analytical capabilities and how they influence operational agility of the selected state agency. Through the study the researcher was able to determine whether operational agility could be improved by big data analytical capabilities like people, task and data capabilities.

1.6 Significance of the Study

The outcomes are expected to greatly aid state organizations and other firms using big data to make use of the concept in advancing their operational agility. The findings benefit different stakeholders, including the government and its agencies, scholars, and the public/clients. The government is able to appreciate and institutionalize the importance of data, task and people capabilities using the big data analytics, while improving its operations by making informed decisions. Scholars also benefit from the findings as they can act as reference point for future studies in the field of big data. Public and clients served by state agencies or organizations using big data to make

decisions are likely benefit from improved service delivery, efficiency and innovations based on what the firms see beneficial to the organization.

1.7 Assumptions and Limitations of the Study

It is assumed that the selected organization - Huduma Centres, have their operational decisions based on the big data generated daily from their clients. It is also assumed that since the inception of the central service centres, they have been able to use big data to make operational decisions.

One of the major limitations anticipated in the study was the effect of the coronavirus pandemic that has limited the normalcy and the capacity to work. Due to the restricted movements and the social distancing measures, the process of data collection was adversely influenced, limiting the efficiency. The challenge was solved by making appointments and following up on calls to ensure questionnaires were filled.

1.8 Scope of the Study

The study covered Huduma Centres within Nairobi metropolitan region. The Huduma Centres have focused on handling many of citizens' registry and services, making it inevitably handle big data. The scope is on the use of big data analytics to make informed decisions on their operational strategies. The study also covers three independent variables; people capabilities, task capabilities, and data capabilities, and one independent variable, operational agility.

1.8 Definitions of Important Operational Terms

Big data: This is a term used to mean large volume of data that is both structured and unstructured, mostly including day-to-day operations. Big data does

not only focus on the amount of data but on the structure and quality. Big data also means that the data is too large to deal with it in traditional data-processing means.

Big data Analytics: this is the processing and examination of large sets of data gathered over a period of time for the key purpose of uncovering hidden but useful trends and patterns for making business decisions. The big data analytics is used in uncovering key findings that care used to identify new revenue opportunities, competitive advantage, and to improve customer service.

BDAC: Initials for big data analytics capability

Capabilities: A subset of resources, which represent an "organizationally embedded non-transferable firm-specific resource whose purpose is to improve the productivity of the other resources possessed by the firm.

Operational agility: this shows the competitive advantage the firm enjoys by using big data analytics to enhance the efficiency of strategic operations, translating to improved firm performance.

People capabilities: This include the aspects of making decisions, executions of tasks, coordinating people, and nurturing talents among the staff to improve on the areas that can increase the operational capabilities of the staff, using the big data analytics.

Task capabilities: Task capabilities focuses on the analysis that identifies the strengths and weak points of staff, strategies, policies, roles, and programs among other operational aspects of an organization. For this study, it narrows to how operational tasks are delivered.

Data capabilities: For this study, data capabilities explain how data can be used to achieve operational task and goals. Data capabilities include having advanced analytics models for optimization and predicting outcomes, data security, data governance and standards, storage, and utilization, and visualization and optimization.

CHAPTER TWO: LITERATURE REVIEW

This chapter focuses on the theoretical literature, borrowing from theories that relate to the use of analytics of big data. It also presents empirical literature based on what has been done on big data in Kenya and across the world. Conceptual framework is also presented, where the association between independent and dependent variables is shown. Research gaps are also shown.

2.1 Theoretical Review

The selected philosophies employed by the study were Resource based theory and Schumpeterian's innovation theory. The two theories fit in explaining how use of big data can be banked on to maximize operational performance of firms. The theories explain the application of big data analytics that is capable of guiding on efficient use of resources for the enhanced operational capability. A large number of companies have grown interest in big data recently which has led to the big data analytics capability (BDAC) in the bid to ensure effective performance of the firm, in this case the operational capability. Though, BDAC only pay off for some firms and not all. Therefore, only a few firms have obtained the huge impacts through big data (Kaushik, 2016).

2.1.1 Resource Based Theory of Competitive Advantage

Resources refer to anything that could be known as strength or weaknesses of a particular organization (Wenerfelt, 1984) additionally, conferring to the theory a firm refers to a package of resources and abilities (Amit & Zott, 2001). A firm can be said to be creating value if organizing and uniquely integrating a set of the resources and skills with the aim of cutting the organizational costs and increase the output or revenue

compared to what the firm would produce if it didn't have the skills and resources. Resources owned by an individual firm include capabilities (people, task and data), information, administrative processes, and familiarity (including big data analytics). The resources give a firm the capability to design, implement and enhance its efficiency and usefulness through a selected tactic. An organization is in a position to attain its competitive advantage using the resource-based theory when the rivals or other organizations in the industry are not able to use it for improving production and efficiency. To reach a level where firms cannot duplicate the levels of performance, a firm needs to ensure there is value worthy to copy but hard to copy, a value that should be unique compared to the competitors, and have no strategically equivalent substitutes for the resources. The theory thus asserts that with resources, in this case, big data analytics coupled with people, task and data capabilities, and then it becomes easy for a firm to improve its performance, in this case operational agility. The resource-based theory will be applied in this study to express how the unique resource of big data can be used to make informed choices, and enhance operations.

2.1.2 Schumpeterian's innovation theory

According to Schumpeterian innovation theory, innovation refers to the origin of creation of value that stresses on the essentiality of technology and research & development (R&D) (Dumbill, 2012). The theory proposes that creation of value can be done through presenting new goods, methods of production, sources of supply and markets and arranging the industry through technical innovation (Amit & Zott, 2001) which then bring about development of the economy. Products already in existence, services and technologies are mergeable to form new products or services which result to being the initial step of coming up with another product or service. The vicious cycle

forms the basis of surge in the formation of new markets which results to creative destruction in other words the Schumpeter's gale") which explains the destruction of entire old markets and establishment of new markets. This theory has a vital concept or aspect that involves creation of new goods and services from products, services and technology already in existence if integrated properly. The theory was initiated in 1930 an industrial period when "combining existing products and services", explained the making of touchable and physical goods (Schumpeter, 1934). This theory was thus based on the concept of establishment new and upgraded services and products. Additionally, it asserts preferences of the consumers are not instant but rather something innate which explains that consumers will always know what they need regardless of the change in the economy of their country or region.

Innovation from a wide view can happen in a broad diverse area which includes the existing business procedures, marketing image and strategic location of the organization which all depend in the manner the existing resources of the organization are integrated and organized. The new markets or products are formed integrating and reorganizing of the resources which are classified into two groups: knowledge-based and input resources. Input resources are said to comprise the touchable resources like equipment, people, property, rights and capital whereas the former are the untouchable ingredients required to productively combining the resources in a manner to create value. The knowledge-based resources work on input resources by offering understanding of the distinct input and coordinative understanding of how the distinct input resources can work together to give the organization an improved value. The theory this explains the manner in which innovation of big data analytics is shaping the operation capability and ultimately the performance of the firm.

2.2 Empirical Literature Review

2.2.1 People Capabilities of big data and operational agility

Lee, Chai, Kweon and Kim (2017) researched on whether enactment of Big Data Analytics improves firm's value of market noted that investors were sensitive to the stock markets based on the prospects of a firm's strategies succeeding. The study noted that firms which showed strong people/staff capabilities had favourably better operational strategies that attracted more investors. The study further noted that based on big data capabilities, a firm was able to apportion resources to influence key investments. The study had limitation in that the sample of the respondents was limited as it focused on key top executives who shared their opinions on the people capabilities based on BDA strategies. The study also focused on the measuring the effects of BDA strategies based on a firm's, ROI (return on investments) and ROA (return on assets, which are influenced by other factors.

Fosso, Wamba and Akter (2016) on the empathetic of the big data analytics noted that the results can be taxing if done by staffs who are novices in the field. The big data keeps changing with increased velocity in which data is generated (Kaushik, 2016). Malburg (2000) noted that there was a challenge of getting the right technology in big data analytics which might be costly and strenuous on the organization's budget. The collection of big data might also require expertise among the staff, leading to training budgets as pointed out by Kaushik.

Biesdorf, Court and Willmott (2013) on his study concerning the issue of big data and plans for future noted that the three Vs. of Volume, Variety and Velocity were crucial in

changing the process of making decisions. The study further noted that competitive advantage of firms using “differentiation”, “cost leadership” and “focus” were able increase the operational capability and agility. Tredger (2013) supported the findings by indicating that data revolution in Kenya as made it possible for big data projects and partnerships with multi-nationals to thrive, giving an example of mobile money transfer. The study also concluded that majority of big firms were depending on key insights from data collected from customers to make informed decisions. In aiding task capabilities, big data was responsible for identifying performing staff, rewarding strategies, and changes in service delivery as influenced by the customer responses.

2.2.2 Task Capabilities of big data and operational agility

A study by Arora and Rahman (2016) regarding the study of big data analytics for competitive advantage observed that there was likelihood of creating significant opportunities in meeting customers’ expectations. Through identifying tasks which can be implemented by use of big data analytics, it becomes possible to select the strategies that have better operational performance than others. Their study proposed a theoretical model on how big data can be applied to enhance performance of companies, arguing that big data on its own cannot confer competitive advantage to any firm. The study by Arora and Rahman further noted that competitive advantage through task capabilities was through identifying ways in which big data should be handled to complement other firm assets. The study was limited in the conceptual model it applied, and thus there was need to examine the robustness of the model empirically in the studies to be done at a future date.

Another study by Prescot (2016) asserted that task capabilities enabled by big data included discovering patterns, trends and insights from the raw data. In understanding

the patterns and trends, a firm is capable of producing tasks which when implemented improve the overall efficiency of firm operations, and consequently improving on the firm performance. The tasks need resources that are firm precise, tacit path dependent and socially intricate. The study by Prescot was limited in that it focused on a single sector/industry and thus the findings could not be generalized into other sectors of the industry, without conducting further studies.

An investigative study by Galletti and Papadimitriou (2013) on how big data analytics (BDA) can be seen as the major driver of operational capability in many large firms. The authors assert that implementation of big data analytics at its infant stage can enhance task delivery, especially in shortening decision-making phases. The study acknowledges that there are hurdles in implementing big data analytics, thus delaying the course of task completions. Since big data technologies cannot operate alone, skilled operators are needed to make the progress anticipated while embracing big data analytics. The mandate, capability, knowledge and the expertise of the staff engaged in handling big data should also be key components of executing tasks using big data analytics. The study had limitations which included the limited number of interviews to represent the entire organization, and that the firms having BDA are still few in their early phases of the process.

According to McAfee and Brynjolfsson (2012) the greatest challenges facing BDAC are talent in management, making of decisions across various functions abilities and IT infrastructure. Similarly, Barton & Court (2012) identified three angles of abilities which include: management of big data and ability to forecast and optimize models; manning various sources of data by IT infrastructure and the ability of front-line workers to understand the tools. Kiron et al. (2014) states that emphasis should be put on culture of management, infrastructure of data management and skills when choosing the major

dimensions. Recently Wixom et al. (2013) in their study viewed BDA strategically, data and individuals to intellectualize BDAC scopes. Big data has added new scopes to analytics and gives improved opportunities for understandings and not limited to new human and technical resources as a result of its distinct characteristics". It is therefore evident that some scholars do not support the inclusion of ability of BDA management, the ability of BDA infrastructure and capability of BDA talent as the main scope of BDAC.

2.2.3 Data Capabilities of big data and operational agility

Most companies in the financial sector have substantially invested in big data analytics according to a study done by Ndambo (2016) concerning big analytics and competitive advantage of commercial banks in Kenya. The results founded on a purposive sampling of 45 firms which included 20 commercial banks and 25 insurance companies were that the addition of the big data analytics systems in daily operations enabled the firms to obtain higher levels of insights in operational setting, thus improving operational efficiency. The study further identified several challenges related to addressing big data analytics, including high likelihood of experiencing fraud, and exposure to risks of biased conclusions. Through addressing the challenges of big data, then it was concluded that big firms could achieve their maximum potential. The limitation of the study was the fact it narrowed to commercial banks within Nairobi and did not consider other institutions, other than financial ones.

According to Davenport & Dyches, 2013 BDAC forms one the main organizational capabilities known as the building blocks of competitive advantage in the big data setting. The features of value, shortage, imperfect exceptionality and organization form the sources of larger firm operations. Barney & Hesterly, (2012) argued that operational

performance is the economic value creation compared to marginal opponent in its corresponding industry. Robust IT capabilities form the major scopes in a big data setting hence the level of their application in different business functions distinguishes the organizations operations and consequently firm performance. Therefore, researchers have progressively illuminated the key function of distinctive IT capability to activate deploy IT- founded resources integrated with other firm's resources and capabilities to influence the performance of a firm.

While trying to identify the key function of IT capability on the performance of a organization in a big data setting, Davenport et al. (2013) argued that, " As big data evolves, the architecture will develop into an information ecosystem: a network of internal and external services continuously sharing information, optimizing decisions, communicating results and generating new insights for businesses". The recent theoretical framework in the big data arena unfolds that a big number of the studies BDAC take advantage of the RBT making use of the capability dimensions in IT.

According to Davenport, Harris and Morison (2010) emphasis should be put on: management of big data capabilities, across the major business and operations role; human resource capabilities which can be viewed as data scientist and improved IT infrastructure ability to influence operations and ultimately the performance of the firm.

According to Wixomet et al., (2013) BDAC is broadly known to play a key role in rising operational agility, which ultimately influences performance of the firm (FPER). The framework offers proof of a relationship that exist between BDAC and FPER in for example, optimization of price and maximization of profit Davenport, Harris & Morison (2010) profitability, sales and market share (Manyika et al., 2011); and return on investment (ROA) (Barton and Court, 2012). Exemplary operational performance of an organization in big data setting results from distinct combinations of organizational

(BDA management), physical which is the IT infrastructure and human resources (which involves the analytics expertise) which are complexly integrated, valued and not easy to copy. The analytics of big data leads to added value and offer new perspectives by enhancing extrapolative analysis and modelling practices hence improving operational performance.

A research done by Ramaswamy (2013) found that firms with big investments in big data were making excess profits and obtaining competitive advantages when compared to the industry. The huge investment in big data analytics shows that a firm with data capabilities (collection, processing, and making sense from the huge data) were able to decipher the most suitable approaches for running an organization. Big data capabilities thus enable firms to enhance revenue generating activities from engaging the customers and stakeholders through collecting information about business operations. Coordination of BDA gains high attention in the big data setting, representing a type of routine ability that forms the cross-functional synchronization of analytics functions throughout the organization (Wang, Kung, & Byrd, 2018). Controlling functions of BDA are done by guaranteeing appropriate commitment and usage of resources which include budgets and human resources.

2.3 Conceptual Framework

The theoretical framework identifies relationships that exist between dependent and independent variables. In this research paper, the dependent variable is the operational agility of the selected organization (Huduma Center) and the independent variables are task capabilities, people and data capabilities. People capabilities contribute to operational agility by contributing to making key decisions, enhanced planning, proper coordination of operations, having proper controls and checks on the data and the

outcomes. The capacity of the staff to make decisions and commands to the big data, possession of the right technology, and having road maps to handle data analytics enables efficient execution of operational roles. The task and data capabilities enable the execution of the key operational strategies. The study has the following proposed conceptual framework;

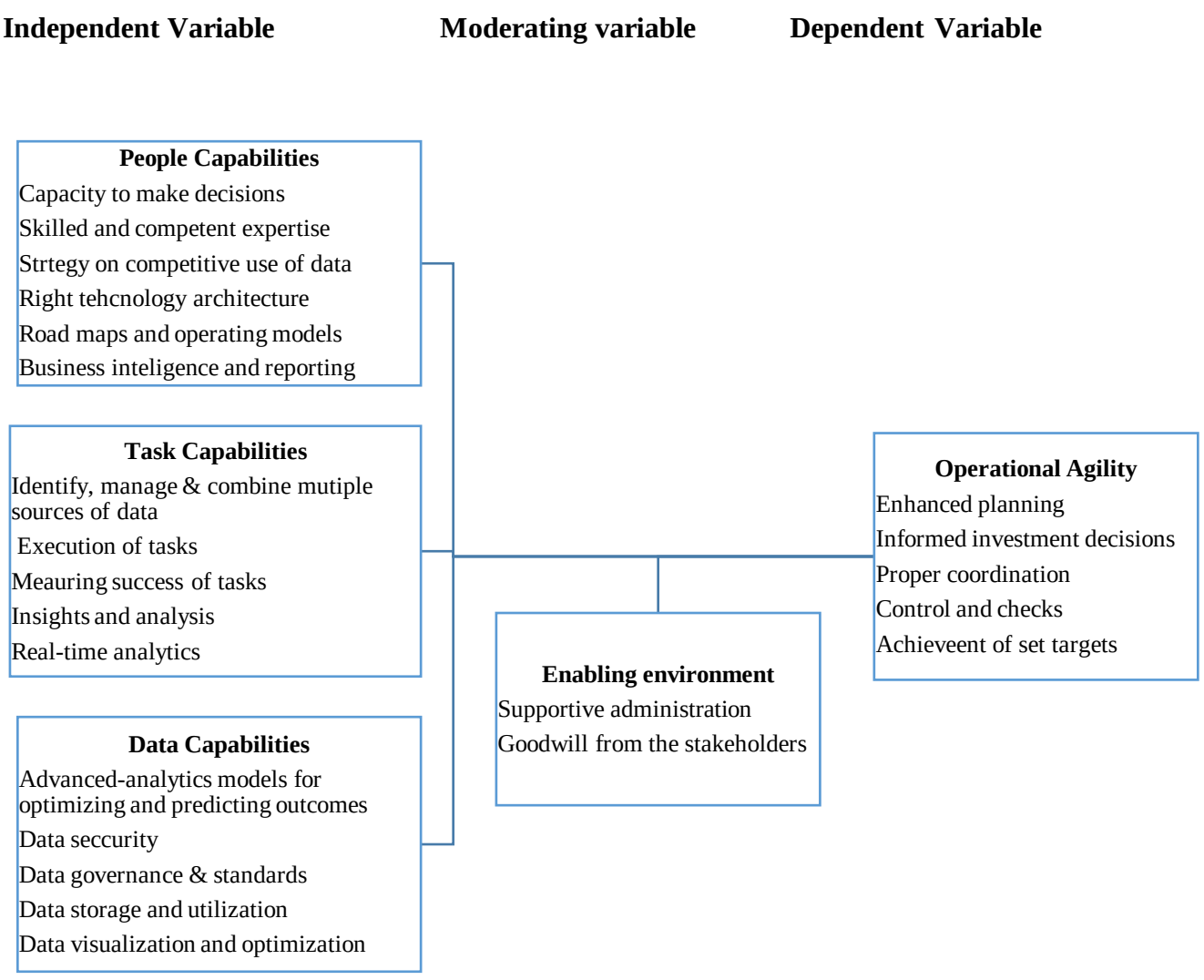

Figure 2.1 Conceptual Framework

People capabilities include the aspects of making decisions, executions of tasks, coordinating people, and nurturing talents among the staff to improve on the areas that can increase the operational capabilities of the staff, using the big data analytics. In addition, components like capacity to make decisions, having skilled and competent expertise enhances people capabilities, leading to successful execution of roles. In having a roadmap and operating model, the management of the firm is able to keep track of the employees' actions and processes. Through the roadmap, it is possible to validate the quality of key performance indicators (KPIs) selected. The people using the big data analytics are also able to make key decisions as generated by the big data to formulate strategies towards achieving the organization's mission and vision.

Task capabilities focuses on the analysis that identifies the strengths and weak points of staff, strategies, policies, roles, and programs among other operational aspects of an organization. In understanding insights and analysis from the task capabilities, the organization should be able to understand the key dynamics in the market, key opportunities, unique patterns and trends, thus influencing decision-making. Execution of tasks is based on the commands and information fed on the big data analytics, which contributes to info graphics and other visualization instruments for enhancing decision making and operational strategies. The tasks executed should also contribute to the operational agility when measured to ascertain whether the anticipated outcomes were achieved or not.

Data capabilities include having advanced analytics models for optimization and predicting outcomes, data security, data governance and standards, storage, and utilization, and visualization and optimization. Data security is associated with well-kept organized data that can be trusted for improved-decision making processes. Security

should be enhanced by having strategies to deter the rising global security threats, having algorithms to detect anomalies, and having systems to detect and reduce cyberattacks. If the big data capabilities can enhance and project an easy visualization and optimization, then the management is able to understand the dynamics, trends and patterns thus making informed decisions on the best operational strategies. The visualization outcomes like charts, graphs, tables, dashboards, maps and info graphics contribute to operational agility that translates to firm performance. In governance and standards, a well-governed and protected data through security keys and restricted access can enhance operational agility by providing real-time, uncorrupted and dependable data. The moderating variable in improving operational agility is an enabling environment provided by the administration, and goodwill to embrace and utilize big data analytics.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

Chapter three explains how the data was collected, as well as how the data collected was analysed. Research design, data sources, data collection instruments, and analysis of data are discussed in detail. The chapter explains the process of data collection and the consequent actions that inform how the data was assembled, analysed and interpreted to answer the research questions.

3.1 Research Design

The study used a cross-sectional descriptive survey design. The survey was conducted among the selected respondents in Huduma Centers within the Nairobi Metropolitan region. The survey design was preferred for this study as it allows the researcher to collect more information within a short period of study. Both qualitative and quantitative data were collected to aid in answering the research questions. The cross-sectional survey design is also used when the data collection process is short, and has limitation of resources. The descriptive design provided information describing how big data relates to operational efficiency.

3.2 Sources of Data

The study sought information from departmental managers, ICT managers, data managers, and staff dealing with big data in the selected organization. The study gathered information from Huduma Centers spread across the Nairobi Metropolitan region, covering Nairobi County (Huduma Center (HC) GPO, HC City Square, HC Kibra, HC Makadara, HC Eastleigh), Kiambu County, and Machakos County Huduma center. The study mostly depended on primary data from the selected respondents.

Triangulation was also done to incorporate secondary sources of information from scholarly publications, thus supporting the primary data with what has been found about using big data in enhancing operational capabilities. In summary, primary data was gathered from respondents, and supported by secondary data from scholarly publications.

3.3 Tools and Methods for Data collection

The study used one tool for the research; the questionnaire. Questionnaire had five sections, starting with the demographic information, a section each on the three independent and one dependent variable. The sections included the demographic information section, people capabilities, task, and data capabilities. The last section was operational agility, where prompts were presented as either open-ended or closed-ended questions. The questionnaire also had five-point like scale questions for each section. Open ended questions were put after every section to help gather any information that could not be captured under the closed-ended questions.

Data collection was through the use of questionnaires. Data collection happens at the Huduma Centers within the Nairobi Metropolis, covering Nairobi, Kiambu and Machakos Counties. The researcher got permission from the University, before proceeding to collect data.

3.4 Sample Size and Sampling Method

The study used a purposive sampling where respondents were selected based on their knowledge and experience in the area of handling big data. Purposive sampling was applied as the experts dealing with big data were not as many to warrant a random

sampling or any other sampling approach. The sampling method was thus the most appropriate for the nature of the study, and the characteristics of the respondents.

Sample size was based on Fisher formula suggested by Hossan-Chowdhury, (2011) and Zou (2012). The formula for the sample size was as follows;

$$n = \frac{z^2pq}{e^2}$$

n - Desired sample size *n* less than 10, 000)

z - Standard normal deviate at 1.96 corresponding to 95% confidence interval

P - Estimated proportion of target population (The staff dealing with big data at the organization _Huduma Centers- are mostly managers and few data staffs. The 10% ((0.1) represent those staff) is the proportion selected to represent the other staff in giving information on the big data aspects).

q - I – p (q is calculated as 1-p, and p is the proportion of targeted population)

e- - The error margin 0.05

$$n = \frac{z^2pq}{e^2}$$

$$n = \frac{1.962^2 \times 0.1 \times 0.9}{0.0025} = 138.6$$

= 139 respondents

The **139 respondents** were distributed across the Huduma Centers within the Nairobi Metropolitan area. Targeted persons were information officers, data officers, managers and those dealing with making of key decisions.

3.5 Data Analysis Methods

Data was processed and analysed using SPSS (Statistical Package for Social Sciences) where information from the questionnaire was fed into the software for processing. Inferential statistics and linear regression were used for the purpose of analysing and interpreting the data. Inferential statistics included the mean, standard deviations, and average of the scores given by the respondents. Linear regression was used to show correlation between the dependent and the independent variable. It helped ascertain whether the variables had correlation, and whether the independent variables meaningfully influenced the dependent variable.

3.6 Ethical Considerations

The researcher explained to the respondents about the objectives of the study, along with the targeted outcomes, and the expectations. It is important that the respondents were informed before engaging them in data collection process. The study was conducted with strict adherence to ethical standards and practices in research. Before the research was carried out, authorization was sought from the University board. A letter to permit data collection was also be obtained from NACOSTI before the study was conducted. The researcher ensured there was informed consent from the respondents before embarking on the process. In the letter consent, the researcher clearly stated the purpose of the study, the outcomes and the respondents' rights of withdrawing from the study at their will. In addition, the data collected was handled with care, confidentiality and anonymity was kept to protect the respondents from exposure to unauthorized sources. The researcher also was open to share the results with any willing respondents on the findings.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

Chapter four unfolds the results of the research study, and the relationship between the study variables. The chapter further presents demographic information (age, gender, level of education, length of service in the existing position, and the role of staff/respondent). Detailed sections of people, task, data capabilities and operational agility are also presented. Correlation between the dependent and the independent variables is also shown on at the end of chapter, along with a summary.

4.1.1 Response Rate

The study embattled a sample was **139 respondents** across the seven Huduma Centers in Nairobi (GPO, Makadara, Kibra, Eastleigh and Nairobi City Square), Kiambu and Machakos. Out of the targeted 139 respondents, 90 managed to respond, and return the questionnaires issued. This led to a response rate of 64.7% as shown on table 4.1.

Table 4.1 Response Rate

Variable	**Frequency**	**Percentage**
Targeted	139	100.0%
Response	90	64.7%
Non-response	49	35.3%

Source: Research data (2020)

The response rate of 64.7% was considered adequate based on the prevailing circumstances where many staffs were not working from offices. The researcher capitalized on the few who were present across the five Huduma Centers (HC) in Nairobi. According to Phillips, Reddy and Durning (2016), a response of above 60.0% was adequate to allow interpretation of results. The same opinion was held by Fincham (2008) who indicated that response rates approximating 60% for most researches would

be ideal for ensuring representativeness (and avoidance of bias). The response rate was thus used to explain the findings and interpretation of the data.

4.2 Demographic Information

The study engaged elements like gender, age, the level of education, profession/role of the respondent, and the period they have served at their current position. Demographic information helps in explaining the nature of the respondents and the features that could explain their reactions to big data analytics and their capabilities.

4.2.1 Gender of the Respondent

Gender distribution of the respondents was as follows;

Table 4.2 Gender of the Respondents

Gender	**Frequency**	**Percent**
Male	49	54.4
Female	41	45.6
Total	**90**	**100**

Source: Research data (2020)

There were more males at 54.4% than female (45.6%) staff respondents who participated in the study. The distribution was based on the staff who were associated with data handling, and those who were available at the time of survey. This also points to the fact that many males might be associated with big data roles in the Huduma Center.

4.2.2 Age of the Respondent

The age of the respondents helps in understanding the majority of the people who are actively involved in handling big data and doing analytics at the selected institution. Age distribution might also inform on how the operational performance of a firm fares, based on the technical experience of staff, at the need to train young staffers, and energy and

potential to improve on the efficiency of using big data analytics to inform operational key decisions. The summary of the age of respondents is shown on table 4.3.

Table 4.3 Ages of the Respondents

Age bracket (in years)	**Frequency**	**Percent**
20 – 30 years	19	21.1
31 – 40	34	37.8
41 – 50	24	26.7
above 50 years	13	14.4
Total	**90**	**100**

Source: Research data (2020)

It was observed that majority of respondents were aged 31-40 years at 37.8%, followed by those aged 41-50 years at 26.7% and then those below 30 years at 21.1%. The findings also show that those aged 50 years and above were the fewest at 14.4%. This could reflect the fact that data analytics work at Huduma Center is mostly handled by staff aged 30 to 50 years as the two groups contribute over half (64.5%) of all the sampled respondents.

4.2.3 Level of Education of the Respondent

The level of education of the respondents was presented on table 4.4 as shown;

Table 4.4 Level of Education

Level of Education	**Frequency**	**Percent**
Secondary	4	4.4
Diploma	17	18.9
Degree	36	40.0
Masters	21	23.4
Others specify (post-graduate diploma)	12	13.3
Total	**90**	**100**

Source: Research data (2020)

It was noted that most of the staff respondents were those with degree at 40.0%, followed by 23.4% of those with masters' degree, and then 18.9% with diploma. Those with secondary education as the highest level of education completed were 4.4%. It was also noted that those with degree and above were the majority, forming 76.7% of the total respondents.

4.2.4 Length of Period in Service at the Current Position

The length of period of service at the firm is associated with aspects like experience in delivering the roles, experience on how big data analytics has been sued to improve operational agility, and the dynamics of big data. The summary of period of service was summarized in table 4.5 as shown.

Table 4.5 Period of Stay at the current place

Length of period of stay	**Frequency**	**Percent**
Below one (1) year	7	7.8
Between 1- 3 years	11	12.2
Between 3-5 years	24	26.7
Above 5 years	48	53.3
Total	**90**	**100**

Source: Research data (2020)

It was noted that over half of the respondents (53.3%) handling data and key decisions had stayed at the organization for over five years. The staff with less than three years' experience (below one year, and those with between one to three years) were 20.0% while the balance (80.0%) had over three years and more working at the institution, hence had enough experience on how big data was generated, processed and used to influence operational agilities.

4.2.5 Role of the Respondent at Huduma Center

The roles or duty at the institution also informs whether the respondents were mainly involved in processing the big data, and making use of it in making critical operational decisions. The summary of the type of professions/roles is shown on table 4.6

Table 4.6 Profession of the Respondent

Profession	**Frequency**	**Percent**
Data Analysts	15	16.7
Departmental Manager	9	10.0
Customer Service Officer (front desk)	28	31.1
Other category (data officers)	38	42.2
Total	**90**	**100**

Source: Research data (2020)

Data officers formed the majority of the respondents at 42.2% (n=38), while the other majority category were customer service officers (31.1%). The two groups formed 73.3% of the total staff handling data at the Huduma centers while data analysis and departmental managers were 16.7% and 10.0% respectively. Different staffs explain how their roles influence decision-making at the institution, most acknowledging that the data collected is mostly used for making crucial operational decisions.

4.3 People Capabilities of BDA and Operational Agility

People capabilities include the aspects of making decisions, executions of tasks, coordinating people, and nurturing talents among the staff to improve on the areas that can increase the operational capabilities of the staff, using the big data analytics. From the conceptual framework and the tools, people capabilities included using of big analytics to enhance decision-making, using competence to handle big data, establishing association between big data analytics and operational agility through informed strategy, and acquiring right technology, resources and expertise through using identifying the

gaps in operational agility. The study presented prompts defining people capability using five-point likert scale, with the following options; 1=strongly agree, 2=agree, 3=not sure, 4=disagree and 5=strongly disagree. The summary of the results is presented in table 4.7;

Table 4.7 Summary of responses on people capabilities and big data analytics

Statement	**SD**	**D**	**NS**	**A**	**SA**	**Mean**	**SD**
Huduma Centers use big data analytics to enhance decision-making	13.8	10	11.3	20	45	3.73	1.467
The organization uses skilled and competent expertise to handle big data	10.5	13.2	6.6	43.4	26.3	3.62	1.296
The use of big data is associated with enhancing operational agility through informing strategy	4	6.7	9.3	28	52	4.17	1.107
Through the use of big data analytics, a firm acquires right technology	10.4	2.6	7.8	26	53.2	4.09	1.289
Using big data enhances operational strategies in making road maps and operational models	9	11.5	19.2	19.2	41	3.72	1.347
Business intelligence and reporting can be improved by embracing big data analytics	20	6.3	13.8	27.5	32.5	3.46	1.501
Big data analytics promotes people capabilities that in improve operations	19	19	5.1	35.4	21.5	3.22	1.465

Source: Research data (2020)

Key: SD = Strongly disagree, D= Disagree, NS= Not sure, A= Agree, and SA= Strongly Agree, SD= Std. Deviation

It was observed that 65.0% of the respondents agreed that Huduma centres have been using big data analytics to enhance decision-making. This was however disputed by 23.8% of the respondents while another 11.3% were not sure. The mean of 3.73 and a standard deviation of 1.46 indicates that majority of the respondents agreed that HC were using big data analytics for making critical decisions. On the aspect of whether Huduma Centers use skilled and competent expertise to handle big data, majority of the respondents at 69.7% agreed to the statement, while 6.6% were not sure, and 23.7% disagreed. People capability is associated with using big data analytics to enhance operational agility through adopting informed strategy. About 80.0% of the respondents agreed that the use of big data is associated with enhancing operational agility through

informing strategy while 10.7% disagreed. It was also noted that 79.2% of the respondents agreed that using big data analytics, a firm is able to acquire new technology, expertise and capacity to make operational decisions. On whether using big data enhances operational strategies, preparing road maps and operational models, 60.2% agreed while19.2% were not sure, and the other 20.5% disagreed. A study by Jayakrishnan, Mohamad and Yusof (2018) noted that using big data and big data analytics enabled organizations to make clear road maps and operationalize models that could improve performance of firms. This study found that 60.2% of the staff at the Huduma Center agreed that using big data was associated with identifying gaps in operational strategies, and making adjustments to the plans to enhance performance. The findings relate to the conclusions made by Krittika, Vishvakarma, Sharma and Lai (2017) who noted that big data analytics was crucial for business operations among profit-oriented firms, and necessary for public service firms. In addition, there was 60.5% of the staff who agreed that big data analytics were associated with improved business intelligence and reporting. In the case of business intelligence, a study by Mikalef et al (2018) on how big data analytics improve business intelligence, the conclusions were that firms embracing BDA were capable of recording significant business improvements. Finally, on people capability as enabled by big data, 56.9% of the sampled staff reported that BDA promoted people capabilities that consequently improved firm operations. There was however 19.0% of people who disagreed that BDA was positively associated with people capabilities. A study by Wamba *et al* (2017) concluded that BDA was a component that big firms needed to embrace to improve operational agility and ultimate operational performance. From the open prompts, majority of the comments (n=18) agreed that using BDA promoted people capabilities that included increased capacity to make decisions, acquisition of skilled and competent

expertise, and improved business strategy. The findings in this study mirrored the recommendations by Mandal (2019) that embracing big data and big data analytics was a precursor to informed operational models, right technology, and decisions that could positively change the operations of a firm.

4.4 Task Capabilities of BDA and Operational Agility

Task capabilities as conceptualized in this study include capacity to identify, manage and combine multiple sources of data for streamlined operations, efficient execution of tasks, and capacity to measure success of task execution. Task capabilities also included the capacity to provide insights, analytical skills, and presentation of real-time analytics (including real-time info graphics) about an operation. The perceptions on task capabilities and operational agility were measured on a five-point likert scale, where the summary of the results is presented in table 4.8.

Table 4.8 Summary of responses on task capabilities and big data analytics

Statement	SD	D	U	A	SA	Mean	SD
Use of big data analytics enables identification, management and utilization of data sources	13.8	10	11.3	20	45	3.73	1.467
Big data analytics enables easy execution of tasks that involve big volumes of data	12.9	17.1	10	32.9	27.1	3.44	1.39
Through big data analytics, it is possible to measure success of staff tasks	12.7	13.9	16.5	32.9	24.1	3.42	1.336
Big data analytics helps in unraveling insights and trends in key performances	17.9	12.8	5.1	32.1	32.1	3.47	1.501
BD Analytics enables real-time decision-making, improving operations	20	10	6.3	25	38.8	3.53	1.567
Using big data capabilities simplifies execution of operational tasks	19.2	10.3	10.3	34.6	25.6	3.37	1.46
The task capabilities of big data analytics affects operational efficiency of a firm	6.5	9.1	7.8	29.9	46.8	4.01	1.23

Source: Research data (2020)

Key: SD = Strongly disagree, D= Disagree, NS= Not sure, A= Agree, and SA= Strongly Agree, SD= Std. Deviation

There was 65.0% of the respondents who agreed to the statement that use of big data analytics enabled identification, management and utilization of data sources. About 23.8% of the respondents disagreed to the statement while 11.3% were not sure. This means that using BDA enables identification of important sources of data and consequent use thus making operational insights. It was also found that 60.0% of the respondents agreed that BDA enabled easy execution of tasks, especially those involving big volumes of data. There were also 30.0% of the respondents who disagreed that BDA does not aid in execution of tasks, based on their experienced at their station of work. The findings in this study agree with Schüll and Maslan (2018) who concluded that using big data analytics was likely to promote easy and timely execution of tasks, especially those related to processing complex, multiple and big volume data. The same findings also relate to the conclusions made by Raj and Kumar (2017) who opined that BDA enabled easy identification, management and consequent utilization of key data sources that in turn influenced how an organization made key operational decisions.

On the case of measuring success of execution of tasks, 57.0% of the staff agreed to the statement, that BDA was capable of facilitating measuring whether tasks were executed as expected. The results of execution could be monitored by checking the outcomes against the set objectives, timelines, and inputs dedicated to the tasks. The findings on BDA analytics supports measuring execution of roles is supported by findings by Chetty (2019) who concluded that large, widespread tasks could be measured through the use of big data, while offering comparison options. The study also found that 64.2% of the respondents supported the fact that BDA helped in unraveling insights and trends of key performance indicators (KPIs). Most firms measure their performance based on KPIs, where using BDA can enhance monitoring and evaluation on whether a firm has achieved its set KPIs. A study by Oncioiu *et al* (2019) also pointed that BDA was

critical in ascertaining whether a form had achieved its set goals, and thus could inform the next phase of strategy, whether to terminate, improve or adjust a program.

It was also noted that BDA enabled real-time decision making as well as improving operations as this was supported by 63.8% of the staff interviewed. There was however 30.0% and 6.3% of the respondents who disagreed or were not sure (uncertain) whether BDA enabled real-time decision-making. This could be attributed to the large number of customer care staff (front desks) who were mostly engaged in capturing the data, and not being involved in key decisions making. There was also another 60.2% and 29.5% of the respondents who agreed and disagreed respectively that using big data capabilities simplified execution of operational tasks. In addition, 76.7% and 15.6% of the respondents agreed and disagreed respectively that task capabilities using big data were associated with operational efficiency of a firm. The high percentage at 76.7% points to the importance of BDA in influencing execution of tasks, measuring success of tasks, provision of real-time analytics, and providing opportunity to make real-time decisions. A report by Liu *et al*. (2019) concluded that using BDA provides info graphics and real-time analytics that can identify gaps in service delivery, can monitor individual staff performance, and detect key areas performing as expected or otherwise. This study finding also relate to those by Raj and Kumar (2017) who concluded that using BDA provided operational efficiency since abnormalities could be detected easily and in time to allow rectifications.

4.5 Data Capabilities of BDA and Operational Agility

Data capabilities include having advanced analytics models for optimization and predicting outcomes, data security, data governance and standards, storage, and utilization, and visualization and optimization. Data capabilities provide options that enhance operational agility of a firm. For instance, inclusion of data governance

practices like data security, privacy, and control of use enables an organization to better handle critical roles. The prompts measuring data capabilities on operational agility were presented to respondents and the summary of the results is presented in table 4.9;

Table 4.9 Summary of responses on data capabilities and big data analytics

Statement	**SD**	**D**	**U**	**A**	**SA**	**Mean**	**SD**
Big data analytics improves operations by providing advanced analytics models for optimization and prediction of outcomes	10	7.5	13.8	32.5	36.3	3.78	1.292
Through providing data analytics, it is possible to ensure data security, hence operational safety	9	7.7	7.7	44.9	30.8	3.81	1.217
Big data analytics comes with data governance and standards procedures that ensure informational safety	19	7.6	16.5	21.5	35.4	3.47	1.509
Data capabilities like big data storage and utilization provide support to firms for making operational decisions	3.8	0	2.5	31.6	62	4.48	0.875
Through data capabilities like visualization and optimization, it is possible to improve operational agility	5	3.8	7.5	50	33.8	4.04	1.012
Provision of supportive environment, like goodwill from administration and stakeholders improves operational agility	6.4	7.7	7.7	35.9	42.3	4	1.184

Source: Research data (2020)

Key: SD = Strongly disagree, D= Disagree, NS= Not sure, A= Agree, and SA= Strongly Agree, SD= Std. Deviation

It was observed that 68.8% of the respondents agreed that big data analytics was associated with improved operations through providing advanced analytics models for optimizing and predicting outcomes. Further, another 17.5% of the respondents disagreed while 13.8% being not sure of whether BDA influenced operations through providing advanced analytics models. Advanced analytics models enable optimization of data, and further projections of possible business/operational scenarios. Embracing big data analytics ought to come along with analytics models that organizations can use to

model future dynamics of operations. For instance in Huduma Center, they can predict changes and patterns of customers seeking certain services, in specific periods, and categorize in special groups (Mandal, 2019). A study by Rialti *et al*. (2018) further notes that using advanced analytics model, a firm can decide on expansion, remodeling and even other long-term plans.

Big data analytics has been used to ensure data security and thus operational safety. This statement was supported and opposed by 75.7% and 16.7% respectively. It is expected that firms with large data volumes invest in data governance and standards procedures that are accredited with enhancing informational security (Liu *et al*., 2019). About 56.9% of the respondents agreed that embracing data governance and standard procedures enabled informational safety while 26.6% disagreed. On the aspect of BDA providing necessities to support decision making, 91.6% of the respondents agreed that once a firm invests in big volume data, there is need for having capacity to store and utilize data in enabling operational decisions. The findings in this study were supported by Schüll and Maslan (2018) who informed that embracing BDA as a tool for operational performance required technical, human resource, and hardware investments.

The findings also indicate that 83.8% and 8.8% of the respondents agree and disagreed respectively that data capabilities like visualization and optimization were likely to ensure proper coordination, enhanced planning, and making of informed investment/operational decisions. Operational agility is achieved by a firm having an edge over the competitors in the market, an aspect that was boosted by having advanced decision-making through BDA (Mikalef *et al*., 2018). It was also observed that 78.2% and 14.1% of the respondents agreed and disagreed respectively that providing supportive environment, goodwill from the administration and other stakeholders enables staff to use BDA to improve operational agility. This is achieved through

enhanced planning where staff are able to base their decisions on evidence, instituting controls and checks where close monitoring is needed, and setting goals based on the data to enhance operational targets (Krittika, Vishvakarma, Sharma & Lai, 2017). Comments from the open prompts also point to the fact that many of the respondents noted that data capabilities were enhanced by having easy analytical models, easy techniques to use, and providing data security to the big data volumes.

4.6 Big Data Analytics and Operational Agility

Operational agility formed the dependent variable where it had aspects like enhanced planning, informed investment decisions, proper coordination, having institutional controls and checks, and having set milestones based on the data evidence. The prompts explaining operational agility were analysed and the summary of the results is presented in table 4.10.

Table 4.10 Summary of responses on big data analytics and operational agility

Statement	SD	D	U	A	SA	Mean	SD
Big data analytics has the capacity to enhance planning and execution of tasks	10.1	11.4	5.1	30.4	43	3.85	1.36
Big data analytics presents informed investment decisions for firms	11.4	8.9	2.5	25.3	51.9	3.97	1.396
Through using big data analytics, proper coordination of operations is possible	9	1.3	3.8	35.9	50	4.17	1.178
Big data analytics enables operational controls and checks	11.4	2.5	7.6	38	40.5	3.94	1.274
Through using big data analytics, it is possible to execute roles and achieve goals	13.2	23.7	13.2	34.2	15.8	3.16	1.317

Source: Research data (2020)

Key: SD = Strongly disagree, D= Disagree, NS= Not sure, A= Agree, and SA= Strongly Agree, SD= Std. Deviation

Operational agility was measured based on five components that were measured based on five-point likert scale. On whether, BDA had the capacity to enhance planning and

execution of tasks, a high majority of 73.4% and 21.5% agreed and disagreed respectively. This further meant that majority of staff sampled believed that BDA had the capacity to influence operational agility through enhancing the component of planning and implementation of tasks. Jayakrishnan, Mohamad and Yusof (2018) supported the fact that BDA is a great tool for organizations generating large volumes of data. The findings are also similar to what Wamba and Akter (2015) termed as operational symbiosis where big data enhanced planning and implementation of operational functions.

There was a 77.2% of the respondents who agreed that BDA presented informed investment decisions for organizations. The was also a 85.9% of the respondents who agreed that using BDA ensured proper coordination of operations by being able to identify areas to adjust and improve. Further, only 13.9% disagreed that BDA enabled operational controls and checks while a majority at 38% and 40.5% agreeing and strongly agreeing to the statement. Respondents (at 50.0%) noted that through using BDA, it was possible to execute roles and achieve set goals. There was however another 36.8% who disagreed with the statement. The mixed findings on whether BDA enables execution of roles and consequent achievement of goals could be attributed to a significant portion of sample being front service staff, whose work is mostly to collect, collate and present the data as gathered from customers. A study by Saggi and Jain, (2018) points to the fact that many times large firms embrace BDA technology to make informed decisions, allow coordination, and check on whether the employed strategies are leading to the expected outcomes. The findings are thus similar to those by Aktar and Wamba (2016) who concluded that many international firms were venturing into BDA to edge out competition, remain competitive, and plan ahead to avoid uncertainties.

4.7 Regression Results for Independent Variables and Operational Agility

In order to establish the relationship between the study variables, a linear regression analysis was done. The regression was to establish whether the independent variables of task, people and data capabilities had a significant association with the dependent variable, operational agility. The regression results were presented as follows;

Table 4.11 ANOVA Table

ANOVA[a]

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	3.788	3	1.263	1.222	.048[b]
	Residual	77.51	49	1.033		
	Total	81.297	52			
a Dependent Variable: Operational agility						
b Predictors: (Constant), People capabilities, Task Capabilities, Data capabilities						

Source: Research data (2020)

From the analysis of variance, it was found that the variables were significant predictors of operational agility. At a significant value of 0.048, then the three independent variables of people, task and data capabilities were found to influence operational agility at Huduma Centres. The model therefore means that it was significant and that the three variables related to big data analytics were predictors of operational agility.

Table 4.12 Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.454	0.868		2.825	0.006
People capabilities	0.12	0.179	0.078	0.672	0.036
Task capabilities	0.2	0.147	0.157	1.361	0.025
Data capabilities	0.074	0.107	0.079	0.691	0.042
a Dependent Variable: Operational agility					

Source: Research data (2020)

The three independent variables collectively were found to influence operational agility at Huduma Center. It was found that people capabilities had a significant influence on the operational agility as the *p*-value was 0.036, meaning it was below the set standard of 0.05 showing that it was a critical predictor of operational agility. Task capability was also a significant predictor of operational agility with a p-value of 0.025. Data capabilities were also significant predictors of operational agility as the p-value was 0.042. The three variables were thus major predictors of operational agility at Huduma Center.

4.8 Summary of Chapter Four

The chapter presented data results and findings, along with discussions on how the independent variables interacted with the dependent variable. The objectives of the study were to determine the effect of people capabilities, task capabilities, and data capabilities of big data on operational agility of a selected state owned entity in Kenya narrowing to Huduma Center. The response rate was satisfactory at 64.9%, with more males at 54.2% participating in the study. Majority of the respondents were aged 30 years and above (79.2%) and most had a bachelor degree and above. In addition, 79.2% of them had served at Huduma Centers for at least three years.

On people capabilities of BDA, majority of the respondents indicated that Huduma Centers use BDA to enhance decision-making (65.0% agreeing); that use of big data is associated enhancing operational agility through informing on operational strategies (80.0% agreeing); and that use of BDA enhances operational strategies through making road maps/strategic targets and operational models (60.2%). Further, majority of the sampled staff (56.9%) agreed that BDA promotes people capabilities that in turn

improve operations. On task capabilities, respondents (65.0%) agreed that BDA allows identification, management and utilization of data sources. Further, majority agreed that BDA enables monitoring and measuring of operational tasks. Through provision of real-time decision-making, and simplifying execution of operational tasks, it was possible to enhance operational efficiency/performance.

Data capabilities were also found to influence operational agility in many aspects. For instance, respondents agreed (68.8%) that BDA improves operations through providing advanced analytics models that ensure optimization and projections/prediction of outcomes. The moderating factor of supportive environment was also found to influence operational agility as promoted by BDA since 78.2% agreed to the statement. On the dependent variable, most of the staff stated that BDA influenced planning, execution of tasks, proper coordination and thus it enhanced operational agility and performance of Huduma Center. From the regression analysis, it was found that all the three variables (people, task and data capabilities) significantly influenced operational agility as their p-values were below the alpha value of 0.05 (at 95.0% confidence level), meaning they were all positive significant predictors of operational agility.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter presents the conclusions and recommendations of the study based on the findings. The chapter also presents recommendations for future practice.

5.2 Summary of the Study

The study was about how big data analytics influences operational agility of selected state entities in Kenya. The study had the three objectives including; including determining the effect of people capabilities, task capabilities and data capabilities of big data analytics on operational agility of selected State-owned entities in Kenya. The theories selected to support the study were the Resource Based Theory of Competitive Advantage and the Schumpeterian's innovation model. The two relate to the study in that they show how a firm can use its resources, especially big data analytics to have a competitive advantage in its operations. The findings indicated that peoples' capabilities were significant predictors of operational agility (*p-value of 0.036*). The findings also pointed that task (*p-value of 0.025*) and data capabilities (p-*value of 0.042*) were significant predictors of operational agility.

5.3 Conclusion

The study was on how big data analytics influences operational agility in a selected state entity in Kenya. The case study was that of Huduma Centers in Nairobi Metropolitan area. The study objectives included determining the effect of people capabilities on operational agility; determining the effect of task capabilities of big data on operational agility; and to establish the effect of data capabilities on operational agility. The study had more males at 54.2% compared to the other remainder of females. Majority of the

participants were those aged 31-40 years, and majority had at least a degree (masters and post-graduate).

People capabilities of BDA and operational agility

It was concluded that people capabilities were a significant predictor of operational agility as well as the other two independent variables (*p-value* of 0.036). Operational agility was thus greatly influenced by big data analytics' peoples' capabilities. Big data was found to influence how staff in large state entities are able to make decisions, to strategize on competitive use of data, to use right technology, and to have business intelligence and reporting. Over 65.0% of the participants indicated their institution to be using big data analytics while another 56.9% indicated that BDA promoted people capabilities that was associated with improved operations.

Task capabilities of BDA and operational agility

It was concluded task capabilities of BDA were significant predictors of operational agility in Huduma Centers (*p-value* of 0.025). On task capabilities, it was concluded that BDA enabled identification, management and utilization of data sources (supported by 65.0% of the participants). BDA was also associated (by 60.0% of respondents) with easy execution of tasks that involve big volumes of data. Using BDA, it was possible to measure success of key performance activities. The study also concludes that task capabilities of BDA affect operational efficiency of a firm (as supported by76.7% of the participants).

Data capabilities of BDA and operational agility

It was concluded that data capabilities of BDA were a significant predictor of operational agility at Huduma Centers (*p-value* of 0.042). It was concluded that BDA improved operations by providing advanced analytics models for optimization and prediction of outcomes. It was also found that BDA enhanced informational safety,

along with improved operational decisions. BDA through data capabilities was also associated with improved operational agility as supported by 83.8% of the respondents. In terms of enabling environment from institution, it was found that supportive environment including goodwill from the administration and stakeholders was associated with improved use of BDA and consequently enhanced operational agility.

5.4 Limitations of the Study

The study was limited by the number of the respondents that could participate in the study as the Huduma Centers are not many. This limitation was however solved by having a sample size adequate to represent the views and perceptions of the staff dealing with big data, thus giving credible data for analysis. Another possible limitation was the approach of data collection, which in this case was hampered by bureaucracy, where the respondents took long before answering the survey tools and sought to follow long processes for answering the questions. The researcher kept following up until the tools were filled.

Corona virus was also a limitation in that it distracted movements, affecting data collection process. Because of the pandemic, the process of data collection was thus adversely affected, extending the period of data collection. This was also influenced by the social distancing measures where meeting respondents was a challenge. The limitation was solved by having the research and the research assistants abiding by the social distancing measures, and seeking assistance from facility managers.

5.5 Recommendations

From the study's findings, the following were recommended;

1. That large government institutions institutionalize big data analytics to enhance key operational strategies

2. That large governmental institutions embrace BDA to enhance people capabilities and operational performance through improved decision-making, business intelligence and reporting
3. Large institutions use BDA to enhance task and data capabilities by simplifying optimization models and prediction of outcomes.
4. Institutions needing to improve operations need to embrace BDA for execution and measuring success of tasks.

5.6 Suggestions for Further Studies

The study covered three capabilities associated with big data analytics (BDA) and thus more components can be studies on how they influence operational agility. Study can be done to narrow to how, for instance, financial institutions can benefit from the BDA system. The study narrowed to Huduma Centers in Kenya, studies on the influence of BDA can be extended to other large state entities, in and outside Nairobi. Furthermore, studies on how acceptance and utilization of BDA for operational agility can be done among governmental and non-governmental institutions.

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Appendices

Research Tools

Appendix One: Letter of Introduction

RE: Letter of Introduction

My name is Anthony Odhiambo Ouma, a student of Masters of Science degree in Information Technology Management at the University of Nairobi.

I am undertaking a survey on Influence of big data analytics on operational agility of selected state entities in Kenya, leading to the production of my master's project report.

I would be obliged at your voluntary assistance in this project, by consenting and supporting completion of a questionnaire which covers certain aspects of the topic.

Any information provided will be treated with confidentiality and none of the participants will be individually identifiable in the resulting report.

Thanks in advance for supporting the course.

Best Regards,
Anthony O. Ouma

Appendix Two: Questionnaire

The questionnaire is meant to collect information on the impacts of big data on operational efficiency at selected Huduma Centers in Nairobi Metropolis. Kindly fill in the following questionnaire to enable the researcher to gather academic data. The responses will help in understanding the impacts of big data analytics on operational agility in Huduma Centers in Nairobi Metropolitan region. Info obtained will only be used for the sole purpose afore-mentioned and will be handled with integrity by the researcher.

Section A: Demographic Information

Please tick where applicable.

1. What is your gender?

Male ☐ Female ☐

2. What is your age?

Age Bracket (Years)	
20 – 30	
31 – 40	
41 – 50	
above 50	

3. Which is your highest level of education?

Level of Education	
Secondary	
Diploma	
Degree	
Masters	
Others specify	

4. How long have you served in your current position?

Below one (1) year [ ]

Between 1- 3 years [ ]

Between 3- 5 years [ ]

Above 5 years [ ]

5. What best describes you in relation to Huduma Center?

Data Analysts [ ]

Departmental Manager [ ]

Customer Service Officer [ ]

Other category [ ]

SECTION B: PEOPLE CAPABILITIES

The following statements are designed to help measure how big data analytics have an influence on operational agility at Huduma Center. Kindly rate the prompts using the five-point likert scale with 1=strongly agree, 2=agree, 3=not sure, 4=disagree and 5=strongly disagree.

Statement	**Strongly agree**	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**
Huduma Centers use big data analytics to enhance decision-making					
The organization uses skilled and competent expertise to handle big data					
The use of big data is associated with enhancing operational agility through informing strategy					
Through the use of big data analytics, a firm acquires right technology					
Using big data enhances operational strategies in making road maps and operational models					
Business intelligence and reporting can be improved by embracing big data analytics					
Big data analytics promotes people capabilities that in improve operations					

Other comment on how big data influences people capabilities and consequently improves operational agility

……

Section C: TASK CAPABILITIES

The following statements are designed to help measure how big data analytics have an influence on operational agility at Huduma Center. Kindly rate the prompts using the five-point likert scale with 1=strongly agree, 2=agree, 3=not sure, 4=disagree and 5=strongly disagree.

Statement	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Use of big data analytics enables identification, management and utilization of data sources					
Big data analytics enables easy execution of tasks that involve big volumes of data					
Through big data analytics, it is possible to measure success of staff tasks					
Big data analytics helps in unraveling insights and trends in key performances					
BD Analytics enables real-time decision-making, improving operations					
Using big data capabilities simplifies execution of operational tasks					
The task capabilities of big data analytics affects operational efficiency of a firm					

Other comments on how big data analytics enable operational agility of Huduma Center

……
…….....

Section D: DATA CAPABILITIES

The following statements are designed to help measure how big data analytics have an influence on operational agility at Huduma Center. Kindly rate the prompts using the five-point likert scale with 1=strongly agree, 2=agree, 3=not sure, 4=disagree and 5=strongly disagree.

Statement	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Big data analytics improves operations by providing advanced analytics models for optimization and prediction of outcomes					
Through providing data analytics, it is possible to ensure data security, hence operational safety					
Big data analytics comes with data governance and standards procedures that ensure informational safety					
Data capabilities like big data storage and utilization provide support to firms for making					

operational decisions					
Through data capabilities like visualization and optimization, it is possible to improve operational agility					
Provision of supportive environment, like goodwill from administration and stakeholders improves operational agility					

Any other comment on how task capabilities improve operational agility

……
……..

Section E: OPERATIONAL AGILITY

The following statements are designed to help measure how big data analytics have an influence on operational agility at Huduma Center. Kindly rate the prompts using the five-point likert scale with 1=strongly agree, 2=agree, 3=not sure, 4=disagree and 5=strongly disagree.

Statement	**Strongly agree**	**Agree**	**Not sure**	**Disagree**	**Strongly disagree**
Big data analytics has the capacity to enhance planning and execution of tasks					
Big data analytics presents informed investment decisions for firms					
Through using big data analytics, proper coordination of operations is possible					
Big data analytics enables operational controls and checks					
Through using big data analytics, it is possible to execute roles and achieve goals					

Any other comment on how big data analytics improve operational agility

……
……..

Appendix Three: Project Schedule

The project is expected to take four months as shown on the project schedule.

Activity/Time	Jan-20	Feb-20	March-20	Apr-20	May-20	June-20	July-20	Aug-20
Proposal Writing								
Proposal Presentation								
Proposal Corrections								
Data Collection								
Data analysis and report writing								
Defence and corrections								
Final corrections and handover								