The University of Newcastle, Australia

Leveraging Big Data-based Competitiveness in Emerging Markets: A Dynamic Capabilities Perspective

by

Andrew G. Mwatha

B.A (Kenyatta University, Kenya), MBA (Heriot Watt, Scotland)

Dissertation submitted to the Faculty of Business and Law for the partial fulfilment for the degree of Doctor of Business Administration (DBA)

August 2020

Declaration

I hereby certify that this thesis has been composed solely by myself, under normal supervision. The thesis contains no material which has been accepted, or is being examined, for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968 and any approved embargo.

Acknowledgements

This scholarly effort has benefitted immensely from various persons, some of whom I mention here. First, I would like to express my sincere gratitude to my supervisor Prof. Ken Kamoche for his immense guidance, patiently supporting and motivating me throughout completing this dissertation. Second, I wish to thank my various course instructors at the University of Newcastle Business School; each uniquely shaped my academic understanding of how to assiduously work towards the end goal – a robust doctoral dissertation.

I wish to thank all the senior business managers from the participating companies for granting my requests to interview with them and allowing me to use their organizations as cases for this research. Finally, special thanks to my wife Doreen, and sons Mumo and Baruch, for their unstinting support, prayers, and understanding as I hibernated for hours on end to work on this study.

Abstract

Big data is hailed as a pivotal competitive differentiator. Accordingly, firms invest in big data capabilities for managing and appropriating value from big data. However, despite testimonials of success with big data, empirical theory on the mechanisms by which big data creates value remains limited. Drawing on the dynamic capabilities view, this study proposes that, amidst market turbulence, big data capabilities hone the firm's dynamic capabilities that drive and shape its value creation agenda. The main research question explored is how value creation through emergent, customer-focused business models rests on the firm's big data-mediated dynamic capabilities and the enabling mechanisms. The study argues that firms with strong big data capabilities effectively orchestrate the value targets of marketing, efficiency, and innovation. Data from 24 Kenyan business firms, a proxy for emerging markets contexts, is used for empirical validation through a qualitative, interpretive approach. The results show that big data capabilities strengthen a firm's sensing, seizing, and transformation capabilities for competitive positioning. This study can help academics and practitioners understand big data's business value proposition from the dynamic capabilities perspective. However, the investigation's primary limitation remains since cross-sectional data is used, and the sampled firms may not be fully representative of the entire Kenyan economy.

Keywords: Big data, Big data capabilities, Dynamic capabilities, Competitiveness, Value creation.

Table of Contents

List of Figures

List of Tables

Abbreviations

API	Application Programming Interface
ATM	Automated Teller Machine
BD	Big Data
BDA	Big Data Analytics
BDC	Big Data Capabilities
BDIP	Big Data Innovation Processes
BDMP	Big Data Management Processes
CEO	Chief Executive Officer
COVID-19	Coronavirus Disease
CRM	Customer Relationship Management
CSBP	Customer Service Business Processes
DC	Dynamic Capabilities
DCV	Dynamic Capabilities View
DMS	Document Management System
DM	Digital Marketplace
DME	Developed Market Economy
DVD	Digital Versatile Disc
DW	Data Warehouse
EFT	Electronic Funds Transfer
EID	Early Infant Diagnosis
EM	Emerging Markets
EMR	Electronic Medical Records
EOC	Emergency Operations Centre
ERP	Enterprise Resource Planning software
FPCV	Firm Performance, Competitiveness and Value creation
GoK	The Government of Kenya
GT	Grounded Theory
HCD	Human Centered Design
HIV	Human Immunodeficiency Virus
HO-BDC	Higher-Order Big Data Capabilities
HREC	Human Research Ethics Committee
ICT	Information and Communications Technology

IDC	International Data Corporation
JSON	JavaScript Object Notation
LO-BDC	Lower-Order Big Data Capabilities
MBE	Member of the Order of the British Empire
MCORT	Market/Customer Orientation
M&E	Monitoring and Evaluation
MEP	Managerial entrepreneurialism
mLab	Mobile Laboratory
MM	Mobile Money
MP	Mobile Phone
NACOSTI	National Commission for Science, Technology and Innovation
NFC	Near-Field Communication
NoSQL	Not only SQL
OD	Open Data
OLP	Organizational Learning Processes
RDBMS	Relational Database Management Systems
RFID	Radio Frequency Identification
RQ	Research Questions
SAP	Systems Applications and Products in data processing
SMACIT	Social, Mobile, Analytics, Cloud, Internet of Things
SMS	Short Message Service
SPRM	Strategy, Planning, Research and related Mechanisms
SSI	Semi-structured interview
SSOT	Single Source of Truth
SST	Sense, Seize, Transform
SQL	Structured Query Language
T4A	Text for Adherence
USSD	Unstructured Supplementary Service Data
VHS	Video Home Systems
VOD	Video-On-Demand
VRIN	Valuable, Rare, Inimitable, Non-substitutable
XML	Extensible Mark up Language
YTC	You Tube Channel

Chapter 1: Introduction

1.1 Background of the research

On 23 February 2017, Uber taxi prices in the Kenyan capital, Nairobi, suddenly spiked. The surge, which lasted from morning till late evening, was attributed to strike action by Uber's business partners – cab drivers - who had grounded their vehicles in protest against a fare pricing structure recently introduced by the company, which prescribed minimum cost of journeys to various destinations within the city (Njanja, 2017). Sensing a mismatch in demand for and supply of taxi services, Uber's 'invisible hand' (Grampp, 2000) automatically enforced market equilibrium through upward adjustment of fares. The invisible hand is obviously a scientific data algorithm that the ride-hailing firm uses to collect geospatial data from cab users and drivers, perform sundry analytics about market conditions, and institute business decisions. Though seemingly trivial, the Uber-Nairobi public transport situation illustrated how the archetypal modern business enterprise could use big data (BD) to understand markets and customers contemporaneously and thereby prescribe potentially profitable pathways.

In today's digital-mediated, dematerialized, information-driven business environment, big data has become a critical economic input and is widely acclaimed as the competitive differential for successful businesses. Big data is touted as the next frontier for innovation, competition, and productivity; the emergent raw material for new 'data-based' as well as 'data-driven' products and services; the ultimate renewable resource, being created continuously and monetized in unimaginably vast quantities (George et al., 2014; Haskel & Westlake, 2018; Koch & Windsperger, 2017; Tempini & Aaltonen, 2014). Despite these claims, there is a limited conceptual understanding of why big data creates business value. Research on the use of big data has only commenced; it remains lacking in scientific rigor, riven with fragmented academic discourse and ontological vagueness, so its practical value to firms is questionable (Gandomi & Haider, 2015; Geoffrey, 2013; Kitchin & McArdle, 2016; Needham, 2013).

To narrow the knowledge lacuna, this study relies on the dynamic capabilities view (DCV) of firm performance and competitiveness to explore how big data may lead to competitive differentiation and business value in a dynamic marketplace characterized by big data-based digital technologies, shifting consumer needs and preferences, and heightened competitor rivalry. The main argument of the DCV is that, in turbulent markets, sustained competitive advantage derives from the firm's ability to orchestrate its resource base effectively, sense and seize opportunities arising while managing attendant risks (Eisenhardt & Martin, 2000; Helfat & Winter, 2011; Teece et al., 1997). Deriving from the capabilities and big data literature, the concept of big data-based capabilities is emerging and is advanced in this study as a framework to better understand how firms leverage big data to respond aptly, promptly, and continuously to market disruptions.

The rest of chapter one is structured as follows: Section 1.2 introduces the research problem. Section 1.3 outlines the research objectives and justification. Section 1.4 presents the research questions. Section 1.5 presents the theoretical framework. Section 1.6 presents the research method. Section 1.7 presents the structure of the dissertation.

1.2 The research problem

The modern business firm is increasingly faced with conditions of rapid technological change, "a Schumpeterian world of innovation-based competition, price/performance rivalry, increasing returns, and the 'creative destruction' of existing competences" (Teece et al., 1997 p. 509). High-velocity markets, replete with disruptive big data-based digital technologies, exert acute competitive pressures on firms to the point where most traditional strategies are offering only marginal returns. In the prevailing environment, a growing body of anecdotal and empirical evidence suggests that big data holds new value-creation possibilities for firms. For example, in a study of 330 quoted North American companies McAfee et al., (2012) showed that big data-driven companies outperformed their peers on objective measures of financial and

operational results, a fact reflected in measurable increases in stock market valuations; Weill & Woerner (2015) report that the Commonwealth Bank of Australia designed a big data-based customer-centric mortgages model whose estimated return on investment was 109%; According to Chandy et al., (2017), M- Kopa, a Kenyan based enterprise, deploys a big data-based business model that facilitates customer's access to clean, cheap energy; Huy (2019) reports that the Chinese e-commerce giant Alibaba transacted $38.4 billion in sales within 24 hours, during its 2019 Singles' day shopping blitz; Uber, the online, on-demand car service operates in 200 cities worldwide, has an estimated market valuation of $41 billion and over 1.1 million drivers using its platform, even though the firm does not own motor vehicles (Marr, 2016); In Kenya, Safaricom, East Africa's largest and most successful telecommunications company contracted Flytxt, a Netherlands based provider of mobile consumer analytics to help develop a big data solution to improve customer experience through contextually relevant engagement with customers throughout their lifecycles ("Safaricom partners with Flytxt to improve customer experience", 2016). Big data has become the dominant organizing principle for creating and capturing value in the digital age; it has superseded price as the most effective signaling mechanism in the economy, birthing the epoch of data capitalism, a system in which the commoditization of data bestows disproportionate business power towards the entities who have access to, and the capability to make sense of the information implicit in the data (West, 2017; Mayer-Schönberger & Ramge, 2018).

Abetted mainly by large-scale digitization and related datafication (Ylijoki & Porras, 2016), the new big data-driven paradigm is impacting corporate decisions, with firms investing in big data-based digital capabilities to outperform competitors through optimized operations, superior customer offerings, innovative business models, and related business outcomes. Nonetheless, few firms realize optimal value from big data. Additionally, it is not clear how exemplar firms reap value from big data as the field is still relatively new, imprecisely

understood, and bereft of robust theorization on exactly how such data augments the firm's value creation agenda. Extant theories on firm competitiveness and value creation, such as the influential Resource-based view (RBV), offer insufficient guidance on this subject. The RBV, for instance, tells us that a firm's intangible assets like big data can enhance its competitive success if such assets possess valuable, rare, inimitable, non-substitutable (VRIN) qualities and are used to deploy sui generis strategies which competitors find hard to replicate (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). In a big data world, however, the idiosyncrasy implied by RBV is tenuous; unlike normal private goods, big data is often non-rival and non-excludable, meaning that it can be simultaneously used by competing firms for business purposes (Parsons, 2016). Further research, explicating dynamic capabilities - rooted in behavioral theory aspects such as routines and processes, organizational learning, and managerial decision-making, has also shined light on the firm competitiveness and value creation conundrum. The capability-based theorizing of the firm (Helfat et al., 2009; Helfat & Peteraf, 2009; Teece et al., 1997; Teece, 2007, Teece, 2014a, 2019) offers a promising theoretical lens for updated apprehension of how big data impacts firm performance and value, in particular, through the emerging big data-based capabilities (BDC) framework (Braganza et al., 2017; Gupta & George, 2016; Sena et al., 2019; Wamba et al., 2017). Accordingly, this study builds on and uses BDC to explore and foster understanding about the mechanisms by which big data creates positive impacts on decisions, processes, customers, or other value targets for the firm.

1.3 Research objectives and justification

Following the defined problem statement, the goal of this research is to foster a better understanding of big data's value creation potential for Kenyan business firms in their eternal quest for economic value creation and sustainable competitive advantage, within a dynamic marketplace. Emerging studies in the strategic management domain (see Table 1) imply the need for enhanced apprehension of the nexus between big data and its competitive success.

Table 1

Illustrative Big Data studies in Strategic Management

Authors	What was studied
Ramadan et al., (2020)	Examined how big data analytic capabilities, and data availability, impact a firm's innovation capabilities, resulting in sustainable competitive advantage
Bean (2017)	Surveyed executives of Fortune 1000 US-based companies on the use of big data analytics; Expense reduction was cited the most popular reason for investing in big data, and, the lack of a "data-driven" culture, rather than technology, was noted as a major obstacle to big data adoption
Ji-fan Ren et al., (2016)	Explored the relationship between information system-enabled big data analytics investments and improved firm performance amongst Chinese firms.
Niebel et al., (2018)	Analyzed the contribution of big data analytics to a firms' innovative performance, reflected in product innovations, amongst German firms
Grover, et al., (2018)	Theorized the role of BD-based IT investments/ capabilities in strategic value creation and proposed a framework of value creation from big data and analytics
Lozada et al., (2019)	Examined how big data analytics capabilities in Colombian firms contribute to enhanced agility in product/ service co-creation and robust collaboration with the firms' stakeholders.
Anwar et al., (2018)	Examined the impact of technological and personal big data capabilities on the performance and competitiveness of Chinese firms
Mikalef et al., (2020)	Studied how big data analytics capability strengthens dynamic capabilities amongst Norwegian firms, with consequent positive payoffs for firms' marketing and technological capabilities.
Shabbir & Gardezi (2020)	Tested the relationship between big data analytics and organizational performance in small and medium Pakistan enterprises, posited that BDA had a positive and significant impact on operational capabilities, a relationship partially mediated by knowledge management practices.
Côrte-Real et al., (2017)	Using European firms' data, studied the linkage between big data analytics and knowledge assets, organizational agility, and performance.

Authors	What was studied
Garmaki et al., (2016)	Studied big data analytics impact on firm financial and market performance; posited a mediated effect via operational performance.
Raguseo & Vitari (2018)	Studied the impact of the business value of big data analytics on the financial performance of a firm, and the mediating effects of customer satisfaction and market performance.
Wamba et al., (2017)	Using data from Chinese firms, studied the impact of big data analytic capabilities on firm performance, its possible mediation by process-oriented dynamic capabilities, and proposed a big data analytics capability model.
Guirguis (2020)	Through a systematic literature review, studied how big data potentially enhances a firm's performance by improving its decision-making processes.
Gupta et al., (2020)	Studied big data predictive analytics as an organizational capability, noted the criticality of talent factors in the development of firm dynamic analytical capabilities for achieving superior performance.

Despite the increased attention by academicians and practitioners, empirical research on the competitive potential implicit in big data remains limited and rudimentary (Günther et al., 2017; Ji-fan Ren et al., 2016; Lozada et al., 2019; Mikalef et al., 2020; Tabesh et al., 2019). Concomitantly, the potential of value creation embedded in the big data paradigm remains under-exploited and a challenge for many businesses (Elia et al., 2020; Sena et al., 2019). Consequently, as noted in the 'British Journal of Management, Special Issue 2019: Call for Papers, Big Data and Performance', there is a need for research to augment collective understanding of the internal mechanisms through which big data-driven strategies can enhance competitive performance (Sena et al., 2017).

Within the relatively new field of big data, strategic management scholars have an opportunity to build theory around the role of big data and today's corporate- and business-

level strategy (J. Mazzei & Noble, 2020). In response to such calls, this study will help progress our collective knowledge of big data and business value beyond *who* and *what*, to *why* and *how*, and *now what*, establish guidelines and a conceptual framework for big data, thereby avoid the trap of *dustbowl empiricism* – being enamored with the claims of big data, but without paying attention to the logic or meaning (De Mauro et al., 2015; Friend Wise & Williamson Schaffer, 2015; Fosso Wamba et al., 2015; Given, 2008; Ylijoki & Porras, 2016). Similar to the cited studies (Table 1) this research is primarily situated within the 'design, planning and positioning' school of thought in the strategic management domain (Mintzberg, 1990; Sarbah & Otu-Nyarko, 2014).

Three main objectives are pursued in this study, the first one being to enhance understanding of how ubiquitous big data can enhance firm competitiveness, create value, and the path towards such value creation. Using Kenyan business firms cases, the study will more precisely examine the role of dynamic capabilities and BDC on the firm's value targets such as efficiency and innovation. Contributing towards a theory-backed understanding of big data impact on business, the study aligns with a critical goal of scientific inquiry – to increase ordered knowledge about a phenomenon of interest (Miner, 2007). Conversely, by countering atheoretical apprehension of big data, the study minimizes the likely risk of a misdiagnosis of the phenomena, thereby offering practical guidance to firms that wish to exploit big data for competitive advantage. Secondly, the study aims to complement emerging research that seeks to develop and validate BDC as a multi-dimensional construct (Akter et al., 2016; Chen et al., 2015; Gupta & George, 2016).

This paper's novelty lies in its third objective - to advance scholarship on big data adoption in developing countries markets, using Kenyan case firms as a proxy for such contexts. As noted by various scholars (Alalawneh & Alkhatib, 2020; Barzilai-Nahon, 2006; Cullen, 2001; Joubert et al., 2019; Zeng & Khan, 2019), research examining how value can be

generated from big data is preponderant in developed economies but scarce in emerging markets, a situation euphemistically referred to as the 'digital divide,' and which calls for redress. Finally, by focusing on how big data contributes to the emergence of consumer-focused business strategies, this study aims to enrich the ken of knowledge towards a demand-side perspective of value creation, an endeavor hitherto constrained by academy tendency to cling rather inappropriately, to the well-known supply-side, resource-based perspectives on value creation. (Priem, 2007; Priem et al., 2013; Setia et al., 2013).

1.4 Research questions

Pursuant to the stated objectives, the key research questions (RQs) to be answered are framed as shown below, followed by an explication of the study's theoretical framework.

- RQ1. How are firms using big data for business value creation, and what are the mechanisms by which big data delivers value?;
- RQ2. What is the relationship between big data and DC?;
- RQ3. Are emergent customer-focused business models predicated on the firm's BDC-mediated DC?

1.5 Theoretical framework

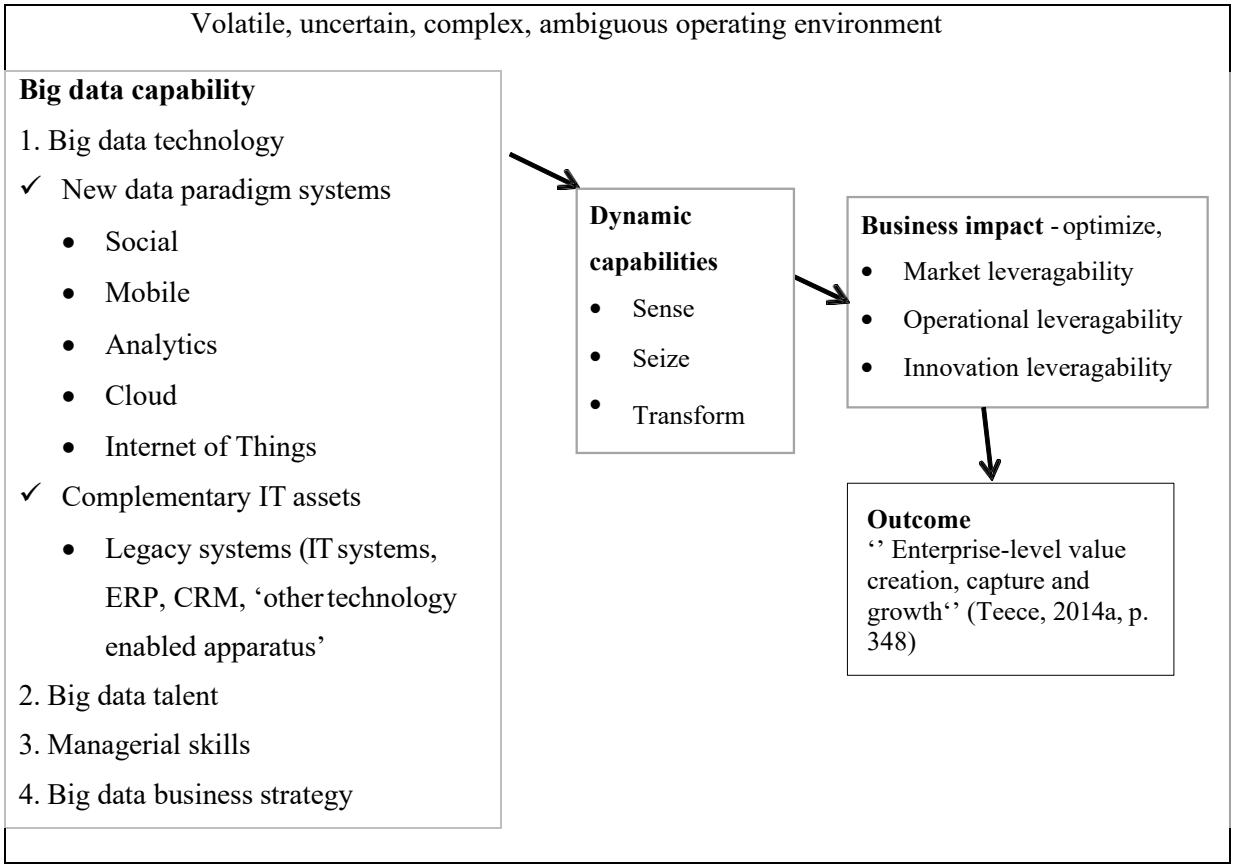
This study will use the DCV in conceptualizing BDC as an enabler of the firm's dynamic capabilities. The DCV has frequently been used in managerial research as the primary theoretical basis for understanding how big data impacts business firms (Rialti et al., 2019). Principally, the DCV seeks to explain how firms dynamically respond and adapt to changing business conditions in order to preserve and enhance their competitive success - the very raison d'etre of strategic management (Helfat & Peteraf, 2009; Teece et al., 1997). In dynamic markets, firm-level capabilities for orchestrating its resource base (including, crucially, technology-based ones like BDC) become a fundamental driver of economic value creation. Within an operating environment where volatility, uncertainty, complexity, ambiguity

(VUCA) is manifesting as the 'new normal in business (Du & Chen, 2018), a firm's BDC undergirds its ordinary and dynamic capabilities for maintaining competitiveness.

BDC is broadly defined as the the firm's competency set for leveraging big data, to transform the business into a competitive force (Akter et al., 2016; Kiron, 2014. The notion of DC extends the construal of big data from technological infrastructure to include processes, structures, talent and, management, facets that collectively are significant in effective transformation of big data into actionable insights, and its application in operational and strategic decision-making. This study draws on BDC constructs – principally, technology, talent and managerial capabilities - which have been highlighted by various scholars, and robustly tested in prior empirical studies (for instance, Akter et al., 2016; Chen et al., 2015; Chen & Swink, 2015; Fosso Wamba et al., 2015; Gupta &George, 2016; Hassna & Lowry, 2016; Janssen et al., 2017; Popovič et al., 2016; Ross et al., 2019; Wamba et al., 2017; Wang & Byrd, 2017; Wang & Hajli, 2017). Figure 1 shows the nomological framework proposed in this study, assessing relationships between BDC, DC and, resultant firm performance, competitiveness and value creation (FPCV) in a VUCA environment.

Figure 1

Conceptual Framework for Big Data Value Creation



Big data technology-related construct includes elements of 'new data paradigm' - social, mobile, analytics, cloud, internet of things – plus various software, hardware, and related technological apparatuses which are critical as support for processes of dynamic capabilities (sensing, seizing, transformation), enabling firms to optimize business leveragability (Ross et al., 2019; Sebastian et al., 2020; Wamba et al., 2017). Big data talent refers to the technical abilities necessary to handle big data's technological components and analytical requirements (Hassna & Lowry, 2016; Mikalef et al., 2020; Zeng & Khan, 2019).

Managerial skills mostly revolve around the capacity to learn, recognizing the value of and supporting big data initiatives (for instance, through resource provisioning), understanding where to apply insight efforts, inculcating a data-driven culture, orchestrating organizational processes, generally adapting the firm to changing conditions, to achieve business objectives

(Amit & Schoemaker, 1993; Mikalef et al., 2020; Teece, 2019). Big data business strategy relates to the ability to understand the essential business drivers, market trajectory including the disruptive potential of big data; consequently determining a general strategic approach as well as developing and validating big data specific use cases (Agarwal & Brem, 2015; Schneider, 2018)

Leveragability refers to the potential value that can accrue to the firm, predicated on its dynamic capabilities being enhanced through the adoption of big data capabilities (Edwards, 2011). Specifically, the constructs of market, operational and innovation leveragability are derived from the literature (Ghasemaghaei & Calic, 2019; Hassna & Lowry, 2016; Lu & K. (Ram) Ramamurthy, 2011; Mathrani & Lai, 2021; Mikalef et al., 2019; Paiola & Gebauer, 2020). BD-based market leveragability aspects include market intelligence, digital customer service, and engagement options. For instance, BDC facilitates, optimized customer segmentation and pricing strategies, reimagining current revenue streams, exploitation of the potential of new markets and counteracting competitors. BD-based operational leveragability includes operational efficiencies, risk management, and performance management; in response to market or demand changes, BDC confers firms with the ability to rejig and align internal business processes towards these objectives. BD-based innovation leveragability includes product/ service innovation and business systems.

The proposed framework adopts the view that enterprises rely on multi-level dimensions (market, operational and innovation capabilities) for value creation; This is consistent with dynamic capability scholars whose empirical work suggests that value creation is facilitated through factors that include product and process development (Helfat, 1997; Lepak et al., 2007). Relatedly, Amit & Zott (2001) indicates that value creation in e-business arises from various sources that include efficiency gains and product offerings.

1.6 Research method

Big data is an emerging phenomenon, and research into big data adoption in firms' competitive strategies is still a novel field, especially in emerging economies. There is limited theorizing found in the literature about big data-based dynamic capabilities; the framework advanced in this study as a suitable explanans on how big data delivers firm performance, competitiveness, and value creation. Due to the inherent difficulty of decomposing complex social and technical phenomena, such as big data and dynamic capabilities, into quantitative figures, this study takes a predominantly interpretivist lens. Interpretivism is best suited to nascent theory research like big data, as opposed to mature fields, which would lend themselves easily to a positivist paradigm (Edmondson & McManus, 2007).

Consistent with the interpretivist outlook, qualitative methods of study will be employed, with case study as the data generation strategy, the aim being to produce rich insights into the phenomena of interest. Case study is widely accepted in social science research as a strategy for in-depth investigation of a contemporary issue like big data and business value creation within a bounded system. (Creswell, 2007; Yin, 2003). Multiple case studies are used (Yin, 2009). The empirical site for the study is a spectrum of Kenyan firms theoretically sampled from various sectors of the economy to identify available, information-rich cases (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). Semi-structured interviews, based on a topic-guided questionnaire (Given, 2008) are used to collect data from key managerial staff who have an intimate understanding of the business operations, resources, and the competitive environment of their organizations. The ensuing data analysis follows grounded theory-based techniques such as in-vivo coding, open and selective coding (Eaves, 2001).

1.7 Structure of the dissertation

This study is structured as follows: Chapter 1, 'Introduction' starts by sketching the inexorable rise and growing importance of the big data phenomenon, which brings to the fore

a BDC imperative if firms are to successfully and sustainably compete in the dynamically changing business environment. Existing knowledge gaps on value creation perspectives are highlighted, setting the study's significance from an academic and managerial perspective. The proposed theoretical framework and research method for the study are also introduced.

Because of its novelty, big data tends to be shrouded with imprecise and fragmented academic discourse, limiting its business value exploitation. To inject clarity, Chapter 2, 'Literature Review' starts by explicating the big data concept. The existing scholarly and practitioner literature on the potential value proposition of big data is examined. Key competitiveness and value creation theories are then reviewed, noting the weaknesses associated with each one in a big data era. This is followed by a discussion on the emergence of big data-based competitiveness capabilities that rest on the DCV. Chapter 3 covers the study's research methodology – the objectives, research hypotheses, the philosophical stance adopted, the population to be studied, sampling procedures, data collection, and analysis methods. Chapter 4 discusses data analysis and results arising. Key findings are found in Chapter 5, along with the study's limitations and areas requiring further research.

Chapter 2: Literature Review

2.1 Introduction

Businesses have always generated and used data for competitive advantage. However, with the advent of massive digitization (transmission of information in the form of umpteen, discrete, minuscule signals called 'bits' or 'bytes'), datafication (transformation of digitally captured information into manipulable datasets) as well as advancements of information and communication technologies (ICT), data has proliferated and continues to expand ever more rapidly ("Data, data everywhere," 2010; Mohanty et al., 2013; Porter & Millar, 1985; Raguseo, 2018). Big data centrism, also euphemistically referred to as big data or digital transformation, is sweeping across the business world, with claims that there are significant potential payoffs for organizations investing in big data-based capabilities (Sharma et al., 2014). However, big data is a relatively recent phenomenon, a disruptive technology gaining currency, but one where the discourse is still fragmented (Gandomi & Haider, 2015; Needham, 2013; Parsons, 2016). There is a lack of ontological clarity about big data, yet such understanding of the phenomena is necessary to correctly grasp its implications and expropriate its potential (Kelp, 2015; Kitchin & McArdle, 2016). Therefore, this chapter starts by explicating the big data concept. Various facets and definitions of big data are reviewed, leading to a systematized understanding of the phenomenon. Next, the existing scholarly and practitioner literature on big data's potential business value proposition is examined. Following, the theoretical basis for big data's impact on the firms' competitiveness and value creation – the dynamic capabilities view – is examined. Finally, the emergence of a big data-based capabilities framework is discussed.

2.2 Understanding big data

Excepting the descriptor 'big,' data merely refers to observations or measurements related to an entity. Below we look at the following questions: How does data become big, or

to put it differently, where does big data come from? What is the form and structuralization of big data?

Delimiting big data

Data is created from multiple sources. Big data, in particular, comes from a panoply of sources that include: machine logs; sensors; GPS signals; Cloud; the internet of things; social media; mobile phones; emails, videos, archives; business applications; satellite images; and its existence has been facilitated by innovations in technology and affordability of digital devices (McAfee et al., 2012; Yang et al., 2017). Big data originates from web-based application programming interfaces (APIs). An *API* is a strategic tool that enables the interchange of data and collaboration. For instance, Google Maps API allows developers to embed Google Maps and create mashups with other data streams (Berman, 2013; Collins & Sisk, 2015). Non-API data, for instance, archived hard copy documents, can be made API-malleable through digitization.

The sources of big data can be conceptualized in terms of internal versus external frames of reference. Internally classified big data resides within the organizational boundary or 'firewall,' for instance, data from the firm's ERP modules, internal documents such as employees' payroll or an expense claim form, in-house customer call centers, website logs, sensors, and controllers. Externally classified data resides outside the organizational boundary, for instance, social media, government, the stock exchange, industry, or weather forecast data.

Big data ranges from structured (stable schema), semi-structured (evolving schema) to unstructured (no schema) data. Structured data is found in relational databases and legacy corporate transactional systems. Semi-structured data includes blogs, XML (extensible markup language, a document marking language used in some internet pages), JSON (JavaScript Object Notation, a syntax for storing and exchanging data), social profiles, Twitter feeds, Facebook posts. In contrast, unstructured data includes graphics, images, videos, audio, emails,

memoranda, articles, call center conversations, website clicks, climatology and weather records, telemetry, WhatsApp messages, SMS (Short Message Service). More than 80% of the data created is unstructured or semi-structured. The ability to ingest data from multiple sources and formats is essential in a big data environment (Gantz, & Reinsel, 2012; Kitchin & McArdle, 2016; McKendrick, 2010; Ohlhorst, 2012; Zwolenski, & Weatherill, 2014).

Big data manifests in sundry forms, including text, numbers, symbols, images, sound, electromagnetic waves, blankness (an empty space can represent data), all of which can either be quantitative or qualitative in nature. Quantitative relates to the numeric, measurable, physical aspects of a phenomenon or entity, such as length, height, weight, area, cost, volume, distance, speed, time, humidity, temperature, decibels, age. Quantitative data can also arise by ascribing numerical values to the non-physical aspects of phenomena, for instance, social class, educational attainment, quality of life rankings. Quantitative data lends itself to easy manipulation through the traditional, widely available computational capabilities to reveal insights or be recombined to produce entirely new data. The qualitative aspect of data refers to the observable, non-physical aspects like color, texture, smell, taste, beauty, appearance. Qualitative data is not easily turned into crunchable numbers, but with breakthroughs in information communications technology, various techniques for systematically extracting qualitative data insights now exist, such as text mining and sentiment analysis. The distinction between quantitative and qualitative data is essential. Whereas quantitative data can, for instance, reveal correlations between variables, qualitative data helps identify the inherent causal relationship. Quantitative data can, for instance, indicate the percentage of customers lost during checkout at an online store, but it may not explain the reason why. Qualitative data can, however, reveal the underlying reason (Stewart, 2014).

Big data processing technologies

Big data can be understood by considering how data processing systems have evolved.

The traditional frameworks for data management are anchored in Relational Database Management Systems (RDBMS), which handle systematic, highly structured data. In an RDBMS, data is organized in tables with columns and rows. Individual databases are linked based on one or more relations enforced through a unique key. Structured Query Language (SQL) is used for querying data held in RDBMS. Various RDBMS commercial databases are developed and marketed by companies such as IBM, Microsoft, Oracle. Although an RDBMS can handle pretty large datasets, it is not a scalable solution nor able to handle unstructured data. Therefore, the more proficient NoSQL (not only SQL) database systems have been developed to handle the expanding gamut of unstructured big data. NoSQL databases operate with unstructured data from multiple servers, processed with agility and at a massive scale. Examples of NoSQL databases include MongoDB, HBase, Oracle NoSQL database and, CouchDB. No single technology is sufficient for a big data environment; therefore, SQL and NoSQL databases are not mutually exclusive. The appropriate big data technological deployment depends on each enterprise's unique context (He, 2014; Hurwitz et al., 2013; Lai, 2012; Ma, 2016; TechAmerica Foundation, 2012; Teich, 2016).

Big data uses distributed computing technology – bits and pieces of data are stored, accessed, and analyzed across various databases and servers, in distributed locations, connected via networks. Google, for instance, uses about 1,000 computers to answer a single search query. When a user initiates a search for data on Google, the search engine crawls and indexes trillions of pages on the web (there are over 60 trillion pages on the web and counting); dynamic algorithms pull up clues of what the user needs, ranks the results using over 200 factors, and returns the relevant results in a variety of forms, all in about 1/8 of a second (Google, n.d.; Marr, 2016).

Varied definitions of big data

Laney (2001) defined *big data* as datasets characterized by high volume, velocity, and

variety – the 3V's framework. Volume refers to the massive amounts of granular data available. In the ever-expanding hierarchy of big data, volume moves progressively from Bits to Yottabytes and still growing. Computers store and process data in Bits and Bytes. A Bit is a binary digit; it can hold only one of two values, '0' or '1'. Electronic documents such as spreadsheets, pictures, music are stored in a binary format, '0' or '1'. Electronic communications such as email, Twitter, social networking use binary to route information from source to destination. Just like an atom, a Bit represents the smallest unit of storage in the computer world. However, a Bit is too small to be of much use. Therefore, Bits are grouped together to make a Byte. Eight (8) Bits make a Byte, meaning that a computer can process 8 Bits at a go (1 Byte in one chunk or 'bite'). 1024 Bytes, often approximated as 1000 (10^3) for practical purposes, make one Kilobyte. Progressively, 10^6 Bytes = one Megabyte; 10^9 Bytes = one Gigabyte; 10^{12} Bytes = one Terabyte; 10^{15} Bytes = one Petabyte; 10^{18} Bytes = one Exabyte; 10^{21} Bytes = one Zettabyte; 10^{24} Bytes (i.e, 10 followed by 24 zeroes) = one Yottabyte (Bit and Bytes, n.d.; Hua et.al, 2014; Indiana University, 2018).

What does data volume imply? In daily life, a Formula 1 car fitted with 150 sensors generates 20 gigabytes of data that can help analyze the mechanical soundness of its components, and non-mechanical measures such as driver reactions, pit stop delays, communication between crew and driver all of which contribute to the overall performance of the racing car (George et al., 2014); Walmart, the world's biggest retailer with over 20,000 stores in 28 countries was reportedly investing in a Cloud facility to process 2.5 Petabytes of data every hour (Marr, 2017). According to an IDC report, the amount of data in the digital universe is estimated to grow from 33 Zettabytes (ZB) in 2018 to 175 ZB by 2025. If the entire dataset of 175 ZB were to be stored in DVDs, they would create a stack encircling the earth 222 times (Reinsel et al., 2018). The *volume* aspect of big data indicates the advanced capabilities required to record, store and analyze data.

Variety refers to the structural heterogeneity of a dataset – the increasing plurality of data sources, varied schema, and multidimensional fields. Velocity reflects the pace at which big data flows back and forth from the data generating sources. Instead of data flowing in a stochastic fashion, it is constantly streaming, processed rapidly, updated, and changed, especially as it is repurposed for new uses or even made obsolete. An example is a closed-circuit television system used to monitor traffic conditions on the highway, data being sent to a central server where various analytics are produced in real-time. Velocity implies that data has to be collected, analyzed, and utilized promptly and rapidly to maximize value to the business.

Other V's, including veracity and value, has been added to Laney's (2001) original 3V's conceptualization framework of big data. Veracity highlights the aspect of data trustworthiness, while value refers to the usefulness of the data (Dijks, 2012; Emani et al., 2015; Gantz & Reinsel, 2012; Kitchin & McArdle, 2016; Marr, 2015; Younas, 2019). However, veracity and value are user idiosyncratic qualities; data is basically neutral; its benefits are realizable only if the enterprise undertakes a process of value-addition, for instance, abstraction, classifying, sorting, linking, presentation, interpretation, based on a context or frame of reference. Other authors (for instance, Chen & Zhang 2014; De Mauro et al., 2015; Fosso Wamba et al., 2015; Hurwitz et al., 2013; Lewis, 2015; Manyika et al., 2011; Mayer-Schönberger & Cukier 2013; Mills et al., 2012; Provost & Fawcett, 2013; Russom, 2011) have defined big data in slightly nuanced versions, illustrating the profound socioeconomic and technological significance of big data (Chen et al., 2014), but retaining the core 3V descriptors by Laney (2001).

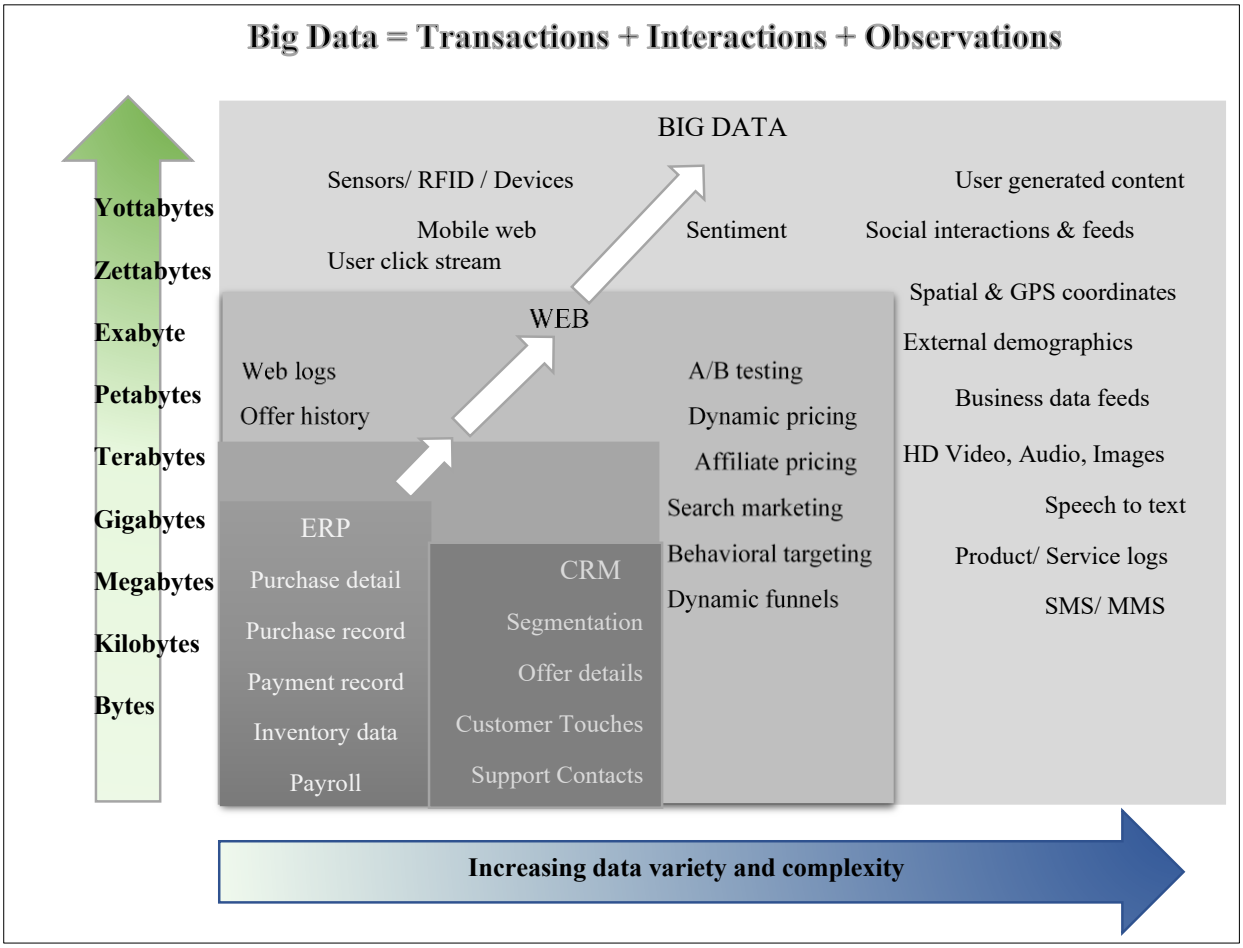
Towards a consensual definition of big data

The literature reveals a convergence around certain core ideas that contribute to the understanding of big data: Data is *big* in terms of volume, velocity, and variety, not necessarily

because of veracity or value; Data is a combination of the traditional enterprise transactional data, or legacy data, plus interactive data, or new paradigm data; Data is digital, and is handled through various digital apparatus. Data is viewed from many angles – the generators of data, the properties of data, the technological requirements for storing, processing, analyzing, sharing the data and, the potential impact of the data on business enterprises. Keeping within the 3V's framework, big data can be summarized as referring to the digitally mediated observations or measurements, characterized by high throughput, velocity, and multidimensionality. Figure 2 below graphically summarizes the various aspects of big data.

Figure 2

Diverse Viewpoints of Big Data



Adapted from Moniruzzaman & Hossain (2013). With permission.

2.3 Big data's business value proposition, and challenges

The proliferation of information, computing, and communications technologies in today's digital economy has seen high volume, variegated data incessantly flowing from disparate sources, within and without the enterprise, mediate virtually every economic transaction (L'Hoest, 2001; Varian, 2016). Data statistics of life in the digital world are telling. For instance, in every minute of 2019, the estimated data created on the internet included: 694,444 hours of video streamed on Netflix; 188 million emails sent; 41.6 million and 18.1 million messages sent via Facebook Messenger and WhatsApp, respectively; 390,030 apps downloaded from Google and Apple Play Store; 1 million Facebook logins; 511,200 tweets sent on Twitter; 4.5 million videos watched on YouTube; 231,840 calls made on Skype; 55,140 posts by Instagram users; 92,340 posts published by Tumblr users; 9,772 rides taken by Uber users; 1,389 reservations booked via Airbnb; 4.8 million GIFs served; 4.5 million Google queries, up from a paltry 10,000 queries per day when the search engine firm was founded in September 1998 (Hamaker, 2019; Rognerud, 2008; Statista, 2019). With each click, swipe, post, share, and like, firms are inundated with data, often at a rate beyond their ability to apprehend and comprehend.

Scholars and business practitioners alike rightly hold that the ever-burgeoning, multidimensional and fine-grained database – big data - holds big promise for business. A survey of executives of Fortune 1000 companies using big data showed that firms are investing in big data–based capabilities for a variety of value-additive purposes, including revenue enhancement, expense reduction, increasing operational efficiency, innovations of customer offerings (Bean, 2017). Big data fundamentally alters the way firms operate and compete. It is used to support and drive business by transforming processes, providing new opportunities, strategies, and minting new business models (Management Association; Information Resources, 2017). Big data provides information about the operating environment, enables the

firm to develop corporate capabilities and cognitive frames for continuously sensing and responding promptly to market disruption or change, and facilitates efficient, intelligent business operations (Baskerville et al., 2005; Constantiou & Kallinikos, 2015;). Davenport (2014) notes that big data delivers business value in three main ways: cost reductions, better decision-making, and improvements in products and services. Big data improves specific activities such as customer relationship management - allows rapid response to customer needs, creates new value streams for customers. The ability to analyze and use big data is touted as being crucial for competitive advantage as managers can radically measure, answer hitherto difficult questions about their businesses, and directly translate the insights gained into improved decision making and performance (George et al., 2014; McAfee et al., 2012; McGuire et al., 2012; Marques et al., 2019; Zhang & Yue, 2013). Big data presents opportunities for innovations as vast amounts of data are constantly created, refreshed, recombined into new products, services, processes, and business models. In their survey of over 3,000 business executives from 108 countries and over 30 industries, Lavalle et al. (2011) found that big data offers value to firms through big data analytics, with most top-performing organizations using analytics five times more than lower performers. Gobble (2013) observed that data is a tool for developing new or enhanced customer offerings; for instance, the Schindler Group embedded sensors in elevators to sense data that helped in predictive maintenance of the equipment (Sebastian et al., 2020). Additionally, Chen et al. (2012), Zheng et al. (2013) note that companies innovate with data-as-a-service.

Amidst the reported successes, firms experience considerable big data challenges that include: process-cum technological difficulties related to the capture, processing, and analyzing of big data; lack of BD-savvy techies and business managers; availability and credibility, especially of external data; data privacy requirements; technology related financial costs (Arunachalam et al., 2018; Brunsdon & Comber, 2020; Fisher et al., 2020; Lynn et al.,

2020; Rawat & Yadav, 2021; Vidgen et al., 2017; Vijai & Nivetha, 2020).

A growing tally of empirical and conceptual studies captured (Table 1) illustrates the sustained academic and practitioner interest in big data use in business. Therefore, the following section reviews the theoretical basis by which big data could create value for businesses, focusing on the dynamic capabilities view (DCV) and for depth of understanding, juxtaposing the DCV with other pertinent literature streams.

2.4 'Big data theory' for business impact – the dynamic capabilities view

A strategic management theory is necessary to provide a framework, to bring scientific rigor to the challenges firms face in adopting big data to solve business questions and create value. (Coveney et al., 2016; West, 2013,). From the literature, various theoretical frameworks have helped shape our understanding of how firms create and sustain competitive advantage. Teece et al. (1997) have identified three main ones: First, the five forces framework (Porter, 1980), which states that, within its industry context, a firm can cultivate competitive advantage by creating defensible positions against competitive forces; the firm identifies opportunities in the external business environment, then aligns internal resources to carve out an attractive niche position, primarily through cost leadership and product differentiation, and thereby outperform rivals. However, the framework fails to accurately account for how firms in the same industry outperform each other, as illustrated by the story of the Silicon Valley-based electric cars manufacturer, Tesla, Inc. Compared to erstwhile dominant auto giants with vast assets and long-established corporate capabilities like Toyota, General Motors, Ford and Chrysler, Tesla made its debut only in 2003, and successfully overcame the automobile industry's high costs of entry, economies of scale and network effects. More significantly, Tesla pioneered data-driven driverless cars on public roads, which, although plagued by a series of teething misadventures, propelled the company to become America's most valuable carmaker by January 2020, with a market capitalization of US$ 89 billion, exceeding the combined market

value of General Motors and Ford by $2 billion (Randewich, 2020; Stringham et al., 2015; Swaminathan & Meffert, 2017).

The second framework associated with Shapiro (1989) suggests that firms can gain competitive advantage by manipulating the market environment, using the tools of game theory; competitive outcomes become a function of the effectiveness with which firms keep their rivals off balance through strategic investments, pricing strategies, signaling and the control of information. This approach is, however, critiqued for short-termism, and especially under conditions of rapid technological changes, such as big data; information control is hardly possible in a big data era and, obsessiveness with continuous Machiavellian tricks would likely distract the firm from pursuing long-term and sustainable competitiveness agenda. Besides, winning in the marketplace is not solely determined by strategy, but rather by a combination of strategy and the capability to execute the strategy, cycling through the OODA (observe, orient, decide, action) loop faster than the competitors (Bromiley, 2005; Coram, 2002).

The third framework, the resource-based view (RBV), states that competitive advantage is predicated on firm-specific valuable, rare, inimitable, non-substitutable (VRIN) tangible and intangible resources, including capabilities, provided that the resources, augmented by isolating mechanisms, are used to deploy sui generis strategies which competitors find hard to replicate. The idea of intangible assets (of which big data is such) creating value for the firm is not a trifling matter. For instance, Mayer-Schönberger & Cukier (2013) report that when Facebook, eBay, and Google combined net assets stood at $125 billion, their market capitalization was $660 billion, the difference being attributable to the investing public's perception of the companies' prized assets, such as search algorithms, and vast caches of data on their customers, all of which go unrecorded on the companies' balance sheets. Despite the absence of generally accepted financial standards for valuing data, investors still strongly affirmed data's immense value through stock market valuations. Still, in a big data

world, the idiosyncrasy implied by RBV is challenging to achieve; This is because big data is non-rivalrous and self-generative (Glazer, 1991), meaning that when acquired and used by an incumbent firm, that does not diminish its subsequent availability to, and use by other firms. A single piece of data can drive multiple competing algorithms, analytics, and applications simultaneously. For instance, airline ticket pricing data available to a booking site like Expedia.com is equally available to rival sites and often at near-zero marginal cost (Kitchin, 2014; MIT Technology Review Insights, 2016; Taylor, 2016). Whereas the RBV rightly creates a nexus between a firm's VRIN resources and capabilities, it seems to ignore resource development and resource configuration; the theory takes firm-specific resources as a given, not as outcomes of innovation and orchestration by strategic managers over time, within dynamic market environments. RBV is therefore regarded as a relatively static theory. Just like Porter's competitive forces model, it fails to account for competitive advantage in highly dynamic markets. (Gräbner et al., 2016; Priem & Butler 2001; Teece et al, 1997; Zahra et al., 2006).

Extending and redressing critical shortcomings of the RBV, a capability-based theory of the firm (Helfat et al., 2009; Teece, 2007, 2014a, 2019; Teece et al., 1997) emerged as an explanans set for the sustainable competitive advantage of firms. Capabilities are seen as the foci for a firm's adaptation to internal and external contingencies, ensuring its survival. Amit & Schoemaker (1993, p. 35) defined *capabilities* as the firm's "capacity to deploy resources, usually in combination, using organizational processes, to affect a desired end…[the capabilities are] "information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interaction among the firm's resources." Similarly, Teece (2019, p. 7) states that, "capabilities arise in part from learning, from combining resources, and from exploiting complementary assets. Many capabilities become embedded in routines, and some reside with the top management team". It is therefore observed that the

capabilities view of the firm essentially recognizes the role of organizational and managerial processual routines, managerial cognition and entrepreneurialism, knowledge, information in orchestrating the firm's resource base for competitive success.

Analytically, capabilities are best understood and are often divided into ordinary capabilities (OC) and dynamic capabilities (DC). OC enables the firm to optimize its core business functions - administration, operations, and governance – to produce and deliver to the market a defined set of products and services using available technologies. OC abet technical efficiency, 'doing things right' to 'earn a living in the present. On the other hand, DC is concerned with 'doing the right things' that adapt the firm to rapidly and discontinuously changing market conditions; the 'right things' are focused on enhancing the firm's long-run competitiveness - identify potentially valuable opportunities, orchestrate the required resources to exploit the opportunities and manage competitive threats, and effectuate necessary transformations. (Teece et al., 1997; Teece, 2007, 2010, 2017; Winter, 2003).

DC are defined by Teece (2007, 2012, 2014a) in terms of three broad organizational processes: sensing - identification, and evaluation of business opportunities and risks; seizing - mobilizing resources, including capabilities, to exploit and capture value from the opportunities, while managing risk; transformation or reconfiguration - continuously renewing resources and capabilities, to maintain competitiveness. In a similar vein, based on a synthesis of disparate literature, Barreto (2010) describe DC as the ''firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base" (p. 271). DC are the outcome of organizational and managerial processual routines, managerial perception/ cognition and entrepreneurialism, knowledge, and information, orchestrating the firm's resource base for competitive success. (Helfat et al., 2007; Medeiros et al., 2020). Strong DC enable the firm to develop conjectures about the market trajectory, business problems, and technology, validate,

fine-tune and act on them by realigning assets and activities in a process of continuous innovation and change that serves to enhance firm effectiveness, build competitive advantage, and resiliency within the changing environment (Teece, 2014a).

Whereas DC have an external market orientation, in emerging economies where product, factor, and capital markets are still immature, firm internal efficiency can be a basis for competitive advantage and rent differentials, hence the salience of OC as well as DC (Amit & Schoemaker, 1993; Li & Liu, 2014). The existence of strong big data-based OC's such as ERP's, IT, and information systems, even if widely adopted by competitors, may still be a competitiveness factor in developing country contexts where a digital divide has been shown to exist – diffusion of big data-based digital technological innovations happens gradually, and therefore, profits can persist for many years before being competed away (Chandy et al., 2017; Cullen, 2001; Rogers, 1995; Teece, 1980; Teece, 2007). Based on the preceding, this study retains the essential Teecian definitional aspects of DC, but with a slight modification to render the concept better suited to emerging economies contexts: DC refers to a firm's potential to systematically orchestrate value-enhancing actions, formed by its propensity to sense opportunities and threats, seize the sensed opportunities while managing the threats, and continually transform itself by enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise's intangible and tangible assets. This innovation in definition is similar to Li & Liu (2014) study wherein they argue for a modified view of DC to fit 'Chinese-like transition economies.' The following section discusses the relationship between DC and BDC.

2.5 Big data capabilities and dynamic capabilities

2.5.1 Big data capabilities

To capture value from big data, firms develop and invest in big data capabilities – BDC. In ordinary usage, a capability is the power or ability to do something. Helfat & Winter (2011)

describe it as a specific-purposed and repeatable capacity to perform a particular activity in a reliable and at least minimally satisfactory manner. BDC, therefore, refers to the firm's ability to leverage its big data resources (tangible and intangible) to uncover data insights for decision making and competitive advantage (Gupta & George, 2016). More specifically, as per Wamba et al. (2017), BDC comprises of big data-related "tools, technologies and infrastructure including social media, mobile devices, automatic identification technologies enabling the internet of things, and cloud-enabled platforms for firms' operations to achieve and sustain competitive advantage" (p.356).

Similarly, Hassna & Lowry (2016) view BDC as consisting of three constructs: BD data infrastructure capability, BD management capability and, BD science capability; BD infrastructure includes the hardware, software, and related technologies that facilitate the collection, storage, retrieval, integration, and analysis of data for business use. Ross et al. (2019) suggest that key elements of big data - social, mobile, analytics, cloud, internet of things, and related big data technological capabilities – combine to form a BDC that offers critical support for sensing, seizing and transformation processes. Mikalef et al. (2019) propose that BDC is comprised of the tangible, human, and intangible resources of the firm. Other authors (for instance, Executive Office of the President, 2014; Garmaki et al., 2016; Mikalef et al., 2020; Zeng & Khan, 2019;) concur that BDC is created through a unique blend of technology, big data talent, managerial skills, alongside strategies, processes, and structures, to create a capability, which will be difficult to match by competitors. Based on the preceding, this study defines *BDC* as consisting of BD technology (includes the hardware, software, and related technologies such as SMACIT, complementary IT assets, ERP's), BD talent, BD strategy, and management, its purpose being to manage big data for business value creation.

2.5.2 Linkage between big data capabilities and dynamic capabilities

The DCV provides a suitable theoretical basis for understanding how big data

contributes to repeatable and sustainable firm performance, competitiveness, and value creation. In the face of relentless competition, firms are impelled to constantly adapt, renew and reconfigure their internal and external competencies to address the rapidly changing conditions; this is the notion of dynamic capabilities as explicated by scholars, describing them variously as organizational processes that generate value for the firm (Eisenhardt & Martin, 2000); business processes for achieving various business objectives, for instance, performance of operational tasks associated with transactional systems such as Enterprise Resource Planning, Customer Relationship Management, Supply Chain Management (Braganza et al., 2017;Teece, 2007); data and analytical tools used to diagnose and improve performance (Sharma et al., 2014; Thirathon et al., 2018); data-centric approaches such as big data to improve firm performance through new business insights and quality decisions (Kowalczyk & Buxmann, 2014); integrated technological infrastructure for managing big data to extract knowledge, including IoT, storage, machine learning and AI capabilities (Aziz et al., 2019; Gil et al., 2019; Williamson, 2017). Additionally, Teece (2012) notes the vital role that top management entrepreneurial and leadership skills play in ‘’ calibrating opportunities and diagnosing threats, directing (and redirecting) resources according to a policy or plan of action, and possibly also reshaping organizational structures and systems so that they create and address technological opportunities and competitive threats.’’ (p. 1398).

Big data’s impact can therefore be understood from the perspective of the organizational and managerial competencies, routines and activities, processes, structures, mechanisms, patterns, firm assets, and knowledge, as these are the underpinnings of the firm’s DC (its ability to sense, seize, transform), being facilitated by the firm’s BDC. The BDC-enhanced DC can help create sustained value through market leverage, operational leverage, and innovation leverage, as aforementioned in the theoretical framework section 1.5

2.6 Research gaps in the existing studies

A number of key gaps in the existing literature have been identified. Firstly, there is a lack of consensual understanding about big data. Starting with Laney (2001) 3Vs framework as a baseline, definition of the big data phenomenon has evolved over time as scholars added other Vs such as 'veracity' and 'value'. Veracity relates to the accuracy of data while value refers to its economic or social usefulness. However, veracity and value are largely user idiosyncratic qualities, determinable a posteriori; data is basically neutral; its benefits are accrued if the enterprise undertakes a process of value orchestration based on a context or frame of reference. Similar with other strategic corporate assets, data has to be managed aggressively and professionally in order to extract value. Though potent, data is not endowed with magical properties - left alone, data is dumb, it does not lead managers to make the right, value-enhancing decisions ((Kijima & Arai, 2016; Redman, 2008).

The lack of ontological clarity about big data is compounded by the fact that big data is 'implicitly defined' by reference to diverse frames of reference - socioeconomic phenomenon, information technology, analytical tools, digital gadgets, storage technologies, processes and infrastructures. Big data has far reaching implications on the conduct of business. Even though there is a convergence around certain core ideas that contribute to the understanding of the phenomenon, lingering conceptual vagueness about the 'bigness' of big data leads to divergent, inconsistent research themes that hinder a better grasp of the relevant factors which impact its adoption and exploitation.

Secondly, there exists a dearth of theory grounded understanding about the mechanism by which big data delivers business value. Extant and influential value creation theories – notably, Porter's (1980) five forces, Shapiro's (1989) game-theoretic approach, and the RBV framework – were noted to be insufficient explanans; they rest predominantly on analogue era assumptions which lack validity in a digital-mediated, dematerialized, information-driven

economy where BD is the key economic input (Haskel & Westlake, 2018; Koch & Windsperger, 2017) and, ambidexterity, agility as well as adeptness in its use alters the very competitive basis for firms, giving rise to a plethora of new sources of value creation. A strategic management theory is therefore necessary to provide a framework, to bring scientific rigor to the challenges firms face in adopting big data to solve business questions and create value. (West, 2013, Coveney et al., 2016).

Thirdly, existing studies (Table 1) are predominantly quantitative in nature, concerned with theory testing rather than theory development. However, quantitative approached are better suited to mature fields where definitions and constructs of phenomenon. In a nascent field like big data, quantitative studies yield anomalous findings. Fourthly, extant studies are mainly generated in advanced economies. By contrast, empirical works from developing countries, Kenya in particular, are rare, thereby limiting our understanding of big data's business value proposition in such contexts.

2.7 Conclusions

This chapter reviewed the big data phenomenon in its varied perspectives. The commonly cited theoretical lenses for understanding how big data is expected to deliver business value are discussed, noting their inherent shortcomings. A review of existing studies on firms' adoption of big data, and their limitations, are presented. Overall, enhanced understanding of big data's nexus with value creation processes is imperative, so that relevant theory can emerge to guide the adoption of big data by firms. To address the gaps noted in the literature, this study uses the DCV to enhance understanding of the theoretical basis by which big data impacts firm performance, competitiveness, and value creation for Kenyan firms in a dynamic marketplace characterized by big data-based digital technologies, shifting consumer needs and preferences, and heightened competitor rivalry. An interpretive qualitative approach is used. The research methodology is discussed more fully in the next chapter.

Chapter 3: Research Methodology

3.1 Introduction

The literature review in Chapter 2 disclosed significant knowledge gaps – the paucity of theory grounded insight about the mechanism by which the emergent big data phenomenon delivers business value. Additionally, the literature revealed the nascent academic efforts towards a big data-based capabilities framework to help fill the lacuna. Arguably, theory development is critical to the advancement of knowledge; the instant study contributes to that pursuit by enhancing theory-based understanding of how big data enhances firm performance, competitiveness, and value creation.

This chapter discusses the methodology for achieving the research objectives, answering the research questions as stipulated in Sections 1.3 – 1.4. A discussion of the research paradigm, the ontological and epistemological positions underpinning the study, is provided. Following, matters of the research methodology, case study strategy, data collection, and analysis methods are addressed. Also discussed are pertinent ethical issues and the rubric for assessing the quality of the qualitative study. The chapter ends by reviewing the limitations associated with the chosen research design.

3.2 Research paradigm

A research endeavor rests on certain paradigmatic locations. A paradigm is a set of fundamental beliefs or worldview – comprising epistemology, ontology, methodology, and axiology – that guides the action taken in connection with a disciplined inquiry into a phenomenon of interest. The purpose of a scientific inquiry is to move from what is believed to be true (ontology) to what is known to be true (epistemology) about a phenomenon. Ontology refers to beliefs about reality or what truth is. There are two broad types of ontology – realism, and relativism. Realism believes that there is a single, external, unchanging truth about a phenomenon, capable of discovery through objective measurements and subsequently

replicable to other situations. Contrariwise, relativism implies there are multiple versions of the truth about the studied phenomenon, such truth being tempered by context, therefore ungeneralizable, but may be transferred to other similar contexts. A researcher's beliefs about reality, or what truth is concerning a phenomenon (ontology), dictates how its knowledge is developed, i.e., the nature of the relationship that the researcher takes in respect of the phenomenon being studied and the steps taken to ascertain its truth or falsity (epistemology).

Two epistemological stances exist – etic and emic. The etic approach states that research should be done objectively so that the researcher does not influence the gathered data; thus, truth is discovered through objective measures. The researcher adopts a detached posture. By contrast, emic epistemology implies an immersive approach, talking to participants, understanding the context, seek an in-depth understanding of what is going on, and thereby discover the truth about the phenomenon. Realism ontology leads to an etic epistemology, while relativism ontology leads to an emic way of approaching research (Chisholm, 1989; Denzin & Lincoln, 2005; Guba & Lincoln, 1994; Jonker & Pennink, 2010; Kivunja & Kuyini, 2017; Mackinnon & Powell, 2008; Truncellito, 2019).

This study is situated primarily in a pragmatic paradigm since the underlying concern is to understand how big data can work to resolve the firm's eternal quest for performance, competitive advantage, and value creation (Rumelt et al., 1995) in rapidly changing environments. A pragmatic bent acknowledges that the researcher can adopt the philosophical and methodological approach that best fits the particular issue under investigation (Kaushik & Walsh, 2019). As noted by Bryman & Bell (2011), Punch (2016), the pragmatic paradigm has emerged and gained credibility in business research and social sciences generally. Contrasted with the mutually exclusive, diametrically opposite, positivist and constructivist paradigms, a pragmatic philosophy is likely to generate more robust inferences through depth and breadth to answer the complex question of firm value creation through big data-mediated DCs.

The pragmatic paradigm implies a relativist leaning ontology, meaning that there is no single, context-free reality of how big data instigates business value, but rather multiple realities as constructed by the managers of the firms sampled across various industry contexts; the inherent epistemological assumption is predominantly interpretivist, implying that knowledge about big data value creation manifests through the varied perspectives of the managers interviewed (Bryman & Bell, 2011; Guba and Lincoln, 1994). Interpretivism suits fledgling theory research like big data, contrasted with more mature fields of study (Edmondson & McManus, 2007). It is expected that study participants' diverse experiences would frame their understanding of what value creation through big data entails in their respective businesses; this is consistent with observations by Baum & Rowley (2002), Davern & Kauffman (2000), that firms realize value from big data at the work-practice level, referring to what individual actors inside the organizations do with big data in their day to day interactions. For example, actors collect and analyze data, discuss insights, make decisions, and act and interact based on data-driven insights. Additionally, at the organizational level, idiosyncratic structures, norms, resources, and procedures are established to coordinate activities towards firm goals, for instance designing new or improved big data-based business models.

3.3 Research methodology

3.3.1 Qualitative interpretive research

Consistent with the pragmatic and interpretivist outlook, this study adopts a qualitative research (QualR) methodology. A qualitative interpretive approach is used to elicit individual participants' experiences concerning the studied subject matter through questions of 'how' and 'why' instead of focusing on variables and hypothesis falsification, commonly used in positivist-leaning studies. The goal of qualitative interpretive research, which aligns with this study, is to understand the production of meanings and concepts through comprehensive, rich,

contextual accounts and conversations with the study participants (Creswell, 2017; Flick, 2009; Gephart, 2004; Mason, 2002; Myers, 2013). Contrastingly, a positivist quantitative research (QuantR) approach is considered unsuitable for this study. QuantR aims to provide a numerical description of responses, representativeness, and generalization from a large sample to the broader population, manipulating variables concerning results (Creswell 1994, 2013). QuantR fits mature fields of study where known constructs and variables easily lend themselves to testable hypotheses for theory testing. However, the big data field is still newish; therefore, theory development – facilitated through a qualitative interpretive mode of inquiry - precedes theory testing. Additionally, flexibility without rigid categorization and the exploration of meaning behind the participants' experiences with big data fits this qualitative study (Casula et al., 2020; Creswell, 2013).

3.3.2 Case study method

For data collection, a case study method is used. Simons (2009) defines *case study* as a strategy for the in-depth exploration, from multiple perspectives, of the complexity and uniqueness of a subject of interest, in 'real-life.' Within QualR, case study is considered suitable for empirical inquiry into a contemporary phenomenon of interest, such as big data, within its real-world context, to aid the development of nascent theory. Consistent with the chosen QualR methodology, case study helps elicit rich and holistic insights to research questions of 'how' and 'why' (Benbasat et al., 1987; Eisenhardt, 1989; Eisenhardt and Graebner, 2007; Yin, 2009, 2013), thereby allowing the emergence of tentative hypotheses for future research. Further, Cavaye (1996), Darke et al. (1998), and Walsham (1995) argue that case study is appropriate for rendering contextualized understanding about a phenomenon in big data-related fields, for instance, the process of information technology adoption and innovations in organizations. Hence, case study strategy is used in this study to elicit an understanding of big data business impact in the sampled organizations' specific contexts.

Despite its broad appeal in QualR, case study strategy suffers from some weaknesses: Case studies are perceived as lacking the rigor usually ascribed to quantitative studies (Yin, 2003); Interpretive case study naturally begets copious amounts of qualitative data – thick descriptions - which, although beneficial, quickly become unwieldy, time-consuming, yet there are no standard analytical processing techniques for such data (Bryman & Bell, 2011); Darke et al., 1998; Finally, as noted by Darke et al., (1998), Perry, (1998), and also experienced during this study, organizations tend to shy away from qualitative research interviews, which may limit the empirical sites available.

3.3.3 Multiple case studies

Multiple cases drawn from various industries are used in this study to maximize insights, robustness, and generalizability of deductions as compared to single case studies. Multiple case studies' evidential value is considered solid and reliable (Baxter & Jack, 2008; Vannoni, 2015; Yin, 2013). By allowing varied exploration of the research questions, multiple case studies aid better theoretical evolution (Eisenhardt & Graebner, 2007).

3.4 Sample selection and unit of analysis

3.4.1 Participant companies

The following considerations guided sample selection: First, the realization that, generally, firms avoid qualitative, interview-type study requests (Darke et al., 1998 Perry, 1998), preferring the more common, quantitative, fillable questionnaire-type studies; Secondly, a recognition that all firms, irrespective of industry or size, are confronted with a big data imperative (Fitzgerald et al., 2013). Accordingly, selection of firms was pragmatically based on the anticipated learning opportunity (Bryman & Bell, 2011), the sample being reflective, to the extent practical, of industry diversity, while also mixing firms that are traditionally expected to be big data proficient (for instance technology firms), and those that may be ‘polar opposites’ (for instance a law firm), but have a big data-related story to tell. Patton (1990)

advises aiming for such variation, but the fundamental principle being that the cases be worthy of in-depth study.

As the research objective is to enhance understanding of the big data phenomenon and theorize its business impact, instead of theory testing, theoretical sampling was used to identify study cases. *Theoretical sampling* is a non-random sampling approach where cases are chosen for theoretical reasons – their potential for illuminating constructs and relationships for the studied phenomena (in this case, big data), not for statistical significance. The cases may also provide examples of polar types (Eisenhardt, 1989; Eisenhardt & Graebner, 2007).

To maximize participation, a total of 58 cross-industry firms, theoretically sampled, were contacted for this study, out of which 24 agreed and were interviewed. The unit of analysis is the firm. The selection method is consistent with Eisenhardt's (1989) recommendation that theoretical sampling is appropriate for qualitative case studies, four to ten cases being reasonable, but with a caveat that there is no ideal number. For instance, Pettigrew (2012) reports having used eight cases in a study on the competitiveness of British industry; Creswell (1998) cites 20–30 interviews for grounded theory studies; Miles & Huberman (1994) suggest that studies exceeding 15 cases risk becoming unwieldy; While conceding that the literature does not prescribe the number of cases appropriate for a study, Perry (1998) notes that "the widest accepted range seems to fall between two to four as the minimum and ten, 12 or 15 as the maximum" (p.793). Irrespective of the number of cases used, Patton (1990) summarizes the debate thus: "the validity, meaningfulness, and insights generated from qualitative inquiry have more to do with the information-richness of the cases selected and the observational/ analytical capabilities of the researcher than with sample size" (p.185).

3.4.2 Individual participants

Informed, senior-level business or information and communications technology managers - persons who evince understanding about the pivotal role that big data plays in

driving their firms' business objectives - participated in this study. They were identified through the researcher's professional contacts and LinkedIn, based on their publicly posted profiles. Gelinas et al. (2017) note that the use of social media sites, such as LinkedIn, to identify promising research participants is gaining prominence. Participants were then contacted by email, physical visit, phone calls, WhatsApp messages, provided with an explanation about the nature and purpose of the study, and a formal invite package comprising of 1. the detailed participant information statement (Appendix A); 2. evidence of research approvals provided by the University of Newcastle human research ethics committee (HREC) and, the Kenyan national commission for science, technology, and innovation (NACOSTI); 3. the research consent form (Appendix B). A convenient interview date and time were eventually agreed upon, often entailing several follow-ups by the researcher, given that participants were senior-level employees with demanding and evolving work schedules.

3.5 Data collection

3.5.1 Semi-structured interviews

Data was collected through a topic-guided, semi-structured interview (SSI) questionnaire (Appendix C). SSIs are appropriate where probing, open-ended questions are asked, requiring the respondents to reflect deeply on the subject matter and express themselves freely. SSIs provide reliable, quality, comparable, qualitative data, but the approach tends to be labor-intensive during the subsequent analysis of the data (Adams, 2015; Galletta & Cross, 2013). SSIs were therefore used for the instant study, providing leeway for participants' responses to questions of 'how' and 'why' big data impacts business at an operational and strategic level; participants frame what they understand and see as necessary about the questions asked, thereby allowing unanticipated insights to emerge. This routine is especially important due to the subjective and context-specific nature of DC and big data business value creation process. SSI also offers flexibility to the researcher, modifying the order and drift of

questions, depending on interviewee responses (Bryman & Bell, 2011). As noted by Strauss & Corbin (1990, p. 183), ‘’some questions or foci with which you entered the interview will quickly get dropped, or seem less salient, or at least get supplemented’’.

3.5.2 Data collection procedure

Interview sessions were held with each participant individually, either at their respective workplace or by Zoom, which became the norm after the Covid-19 outbreak due to health-related restrictions. Interviews lasted between 26 – 75 minutes, depending on the participant’s time constraint. Similar to Prasad (1993), broad and exploratory ‘grand tour’ questions were used to guide the discussion along the important issues, flexibly allowing participants to articulate their viewpoints, but following with probing, ‘mini’ tour questions to drill down on relevant aspects indicated by the interviewee. Depending on participant consent, the interviews were audio-recorded or captured through researcher notes. The interviews form the primary data source for this study. However, tangential data was independently obtained from sources such as company websites and documentation, industry and general press articles.

3.6 Data analysis

For analysis of the qualitative data, this study follows an inductive approach, analogous to grounded theory (GT), to seek out and conceptualize codes and themes related to big data-facilitated processes, routines, structures, and mechanisms in the data. With GT-like approaches, data collection, analysis, and theory development proceed recursively and stand in close relationship to one another (Bryman & Bell, 2011; Strauss & Cobin, 1998). An inductive, GT-leaning approach is a widely accepted strategy in qualitative research whereby theoretical constructs emerge inductively from data that is systematically gathered and analyzed (Bulawa, 2014) and is recommended as highly applicable in the study of emerging technologically driven phenomena (Sutton et al., 2011) such as big data.

Salient GT-related analytical procedures applied in this study include 1. Coding –

reviewing transcripts and ascribing labels, themes, or categories to theoretically significant parts (Charmaz, 2008), based on three key questions as suggested by Glaser (1978, p. 57): "what is this data a study of?", "what category does this incident indicate?", "what is actually happening in the data?". Before coding, the audio-recorded interviews were first transcribed verbatim in Microsoft Word through repeated listening of the recordings, then read and re-read each transcript actively, analytically, and critically - 'immersing' into the data' - to exhaustively note ideas of interest about the research questions (Braun & Clarke, 2013); Concurrently, generating, making sense of and refining patterns of meaning into codes and themes around big data-based routines, processes, structures, while ensuring that the analysis remained faithful to the interviewee's lingo, thereby allowing a deeper level understanding of responses, unsullied by the researcher's preconceived ideas about the data; 2. Constant comparison - confirming (or disconfirming) the connection between data and emerging theoretical constructs until 'theoretical saturation' (i.e., incremental learning is negligible) is reached (Charmaz, 2000; Eisenhardt, 1989; Glaser, 1978, 1992; Strauss & Corbin, 1998;).

3.7 Ethical considerations

For effective and meaningful research inquiry, the researcher upheld requisite ethical norms to protect research participants, including informed consent and ensuring confidentiality (Bryman & Bell, 2011). Ethical approval was granted by the University of Newcastle human research ethics committee and by the Kenyan regulatory authority, the national commission for science, technology, and innovation. Before their participation, the informants were notified in writing about the study particulars, including the purpose and benefits of the research, what was expected of them, potential risks, how their privacy as firms and individuals is protected and, their rights. Express consent was sought and obtained from each participant for the conduct and recording of interviews. Participants were offered the opportunity to ask any questions or clarifications about the study.

3.8 Towards high quality qualitative research

According to Finlay (2006), the quality of a research study rests on the rigor of its design or absence thereof. This research's case study strategy is often critiqued as lacking objectivity and rigor (Remenyi et al. 1998). However, objectivity is a 'positivist ontology'-inflected concept, which presupposes that reality is singular, a view rebutted by this study's equally valid relativist ontology, which argues that multiple, idiosyncratic realities may exist in connection with the studied phenomenon. Rigor is achieved in this study by adopting a consistent and coherent research design: the paradigmatic position – pragmatism - is stated upfront, and the ontological and epistemological basis, as well as research methodology, is aligned accordingly. Additionally, the use of multiple case studies enhances reliability as it affords scope for triangulation of insights gained, thereby augmenting external validity and replication logic (Eisenhardt & Graebner, 2007; Miles & Huberman, 1994; Yin, 2003).

Besides the objectivity question, the other commonly used research quality criterion in QuantR - internal validity, reliability, generalizability (Bryman & Bell, 2011) – are not appropriate for assessing the quality of QualR; perhaps another reason why QualR ‘’tends to evoke a lot of questions and worries’’ (Korstjens & Moser, 2017, p. 120). However, Lincoln & Guba (1985) posit that the comparable standard for assessing QualR is ‘trustworthiness,’ a construct which Shenton (2004) notes is gaining popularity in academia. Trustworthiness is the guide used for this study; according to Bryman & Bell (2011), Lincoln & Guba (1985), trustworthiness includes credibility, transferability, dependability, and confirmability.

In QualR, credibility or authenticity (Ghauri, 2004) mirrors internal validity in QuantR. Credibility is concerned with whether the study tests what is intended, essentially asking whether the results make sense, are consistent, and dependable (Merriam, 2002; Rashid et al., 2019). Measures for enhancing the credibility of QualR include adopting proven research practices, respondent corroboration of the data, and triangulation (Lincoln & Guba, 1985;

Shenton, 2004; Tracy, 2010).

Transferability, the equivalent of ‘generalizability’ in QuantR, speaks to the QualR findings' replicability in other settings; The researcher facilitates transferability through thick, contextual descriptions that become meaningful to outsiders who may rely on the study (Lincoln & Guba, 1985; Shenton, 2004).

Dependability and confirmability, a synonym for reliability in QuantR, refers to the stability of findings and their confirmability over time. To this end, the researcher transparently describes the research process followed, and maintains records of the study, essentially leaving a proper ‘audit trail’ by which other researchers can understand the process and procedures underlying the key decisions and findings arising from the study (Lincoln & Guba, 1985; Shenton, 2004).

3.9 Limitations of the research design

This study has some immanent limitations. Big data impacts all firms, regardless of size or industry; therefore, although the 24 cases studied are expected to elucidate the research questions, the sample does not necessarily reflect the whole gamut of Kenyan business enterprises or other emerging economies (Wan et al., 2019). For deeper understanding and generalizability, there is a need for larger sample size studies, covering several economic contexts; corroborative quantitative studies; longitudinal data studies for comparison with the cross-sectional data used in this study. Table 2 summarizes the research methodology discussed above

Table 2

Total Research Methodology

Research questions ✓ RQ1. How are firms using big data for business value creation, and what are the mechanisms by which big data delivers value?; ✓ RQ2. What is the relationship between big data and DC?; ✓ RQ3. Are emergent customer-focused business models predicated on the firm's BDC-mediated DC?	
'Pragmatic' Research paradigm o Relativist ontology o Interpretivism epistemology (Bryman & Bell, 2011; Chisholm, 1989; Denzin & Lincoln, 2005; Edmondson & McManus, 2007; Guba & Lincoln, 1994; Jonker & Pennink, 2010; Kivunja & Kuyini, 2017; Mackinnon & Powell, 2008; Truncellito, 2019; Guba & Lincoln, 1994; Punch, 2016)	
Research Methodology	
Mode of inquiry	o Qualitative interpretive approach (Creswell, 2017; Flick, 2009; Gephart, 2004; Mason, 2002; Myers, 2013)
Data collection strategy	o Case study o Multiple case study (Baxter & Jack, 2008; Benbasat et al., 1987; Cavaye, 1996; Darke et al., 1998; Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Simons, 2009; Vannoni, 2015; Walsham, 1995; Yin, 2009, 2013)
Sample selection o 24 Participant companies (**unit of analysis**) o 24 individual, 'informed', senior-level managers	o Theoretical sampling (Bryman & Bell, 2011; Eisenhardt, 1989; Eisenhardt & Graebner, 2007; Patton, 1990).
Data collection tool	o Topic-guided, semi-structured interview questionnaire (Bryman & Bell, 2011; Strauss & Corbin, 1990)
Data collection procedure	o Physical interviews plus Zoom/Google meet, post-Covid (Prasad, 1993)
Data analysis	o Inductive, grounded theory-like approach (Braun & Clarke, 2013; Bryman & Bell, 2011; Bulawa, 2014; Charmaz, 2000, 2008; Eisenhardt, 1989; Glaser, 1978, 1992; Strauss & Cobin, 1998; Sutton et al., 2011)

Chapter 4: Findings

4.1 Introduction

The previous chapter discussed and justified the research methodology for this study. The current chapter presents a detailed analysis of findings. Twenty-four firms drawn from various industries participated in this study, as explained more fully under section 3.5.1. The researcher conducted qualitative interviews with senior-level business managers, using a semi-structured, topic-guided questionnaire, as explained more fully under section 3.5. Table 3 presents the participant firms' details, a profile of the managers interviewed, and a summary of the interview scripts. Data analysis followed an inductive approach, GT-leaning approach, as explained under section 3.6.

Table 3

Details of Participant Companies and Managers Interviewed

Case	Company	Industry	Brief company introduction	Research Participant Manager Title	Date of interview	Interview duration
C1	A24 Media (‘A24M’)	Media - Audiovisual	A24M is a pan-African media company that produces various audio-visual digital media content - including feature stories, series programs, documentaries, films, and photography – primarily about Africa. The firm traces its history to the legendary photojournalist Mohamed ‘’Mo’’ Amin, MBE, best remembered for his 1984 Ethiopia famine television footage, which galvanized international charity response to the crisis. ("Mo Amin commemorated," n.d.).	Founder & Chief Executive Officer	17 Jun 2019	40 mins
C2	LICABO *pseudonym*	Financial services - bank	Established over fifty years ago, LICABO is a large publicly quoted Kenyan bank with a multi-country presence across East Africa and millions of customers.	Head of Data and Strategy	20 Jun 2019	55 mins
C3	mHealth Kenya (‘mHK’)	ICT - Mobile health solutions	mHK is a Kenyan commercial enterprise that develops big data-based mobile solutions for the health sector. Since its inception about eight years ago, the firm has strategically leveraged donor finance and relationships, mainly the US Centers for Disease Control and Prevention, developing core capabilities in BD technology and talent, which enhance the firm’s innovation potential to create new or improved digital offerings, modify its operating and related capabilities for competitive advantage (Zawislak et al., 2013).	Founder & Chief Executive Officer	18-Jun-2019 & 29-Apr-2020	75 mins
C4	Bonfire Adventures (‘Bonfire’)	Tours, travel & events	Founded in 2008, Bonfire is a family-owned Kenyan company offering tours, travel, and events services to individual and corporate clients. The firm has been regularly feted as a leading travel agency for Kenya and Africa by the World Travel Awards™ (see, for instance, "Africa's leading travel agency 2018," n.d.)	Managing Director	17 Jun 2019	34 mins
C5	AGRICO *pseudonym*	Agriculture - agricultural inputs	AGRICO is a Kenyan company that sells a growing range of agricultural inputs – including improved grain storage technologies, farming implements, seed dressings, herbicides,	Product Marketing Manager	14 Jan 2020	47 mins

Case	Company	Industry	Brief company introduction	Research Participant Manager Title	Date of interview	Interview duration
			insecticides, fungicides, fertilizers – in East Africa, helping farmers to increase crop yields and profitability.			
C6	HOTCHA *pseudonym*	Hospitality - hotel chain	Founded over forty years ago, HOTCHA is a chain of hotels, among the largest hospitality establishments in Eastern Africa.	Group IT Manager	18 Jun 2019	35 mins
C7	GALES *pseudonym*	Legal services - legal firm	GALES is one of the oldest and largest legal firms in East Africa, providing a diverse range of legal services	Head of IT	26 Jun 2019	49 mins
C8	Text Book Centre ('TBC')	Diversified bookseller	Founded in 1964, TBC has grown to become the leading bookstore chain in East and Central Africa, selling a wide variety of educational and related content, stationeries, IT products and accessories.	Strategy and Planning Manager	3 Dec 2019	43 mins
C9	Nouveta	ICT - Digital solutions	Established in 2016, Nouveta is a customer engagement and experience company whose primary business is developing payments solutions that allow customers and their service providers or merchants to transact with ease. The company has developed its own digital platforms, integrated with channels that engage customers (such as SMS, USSD, web, apps, and social media), and with client-internal systems to enable a broad range of business services.	Founder & Chief Executive Officer	3 Jun 2020	52 mins
C10	INVERE *pseudonym*	Investments & real estate	INVERE is a large company engaged in investments and real estate, serving individual and institutional investors.	Senior Software Engineer	2 Jun 2020	36 mins
C11	INSCER *pseudonym*	Insurance - Underwriter	INSCER is a large insurance company in Kenya.	Head of Digital & Innovation	25 May 2020	66 mins
C12	REINS *pseudonym*	Insurance - Insurance agency	REINS is a Kenya-based insurance brokerage company affiliated with an entity that handles high volume payments transactions between individuals and large government-related bodies in Kenya.	Business Development Manager	27 Jun 2019	42 mins
C13	Kentainers Limited ('Kentainers')	Manufacturing	Founded in 1989, Kentainers is a Kenyan company that manufactures and distributes a wide range of water, sanitation, agriculture and commercial products throughout East Africa.	Director/ Chief Executive Officer & ICT Manager	31 Jan 2020	51 mins

Case	Company	Industry	Brief company introduction	Research Participant Manager Title	Date of interview	Interview duration
C14	Absolute Adventure Safaris ('Absolute Adventures')	Taxis, tours & courier	Absolute Adventures is a Kenyan transport company incorporated in 2006, providing cab and parcel delivery services, primarily to corporate clients within Kenya, plus tours and safaris within Eastern Africa. The firm has a fleet of 63 vehicles. Operating via *Absolute Cabs* trade name, the bulk of the firm's revenue derives from corporate cab services in Kenya.	Managing Director	2 Jul 2019	64 mins
C15	Crowe Erastus & Co. ('Crowe')	Audit & advisory services	Crowe is a Kenyan-based audit firm, established in 1997, an affiliate to Crowe Global; the 8th ranked global accounting firm. Crowe offers audit and advisory services, primarily to non-profit organizations operating in Kenya.	Partner	24 Jun 2020	31 mins
C16	FURNT *pseudonym*	Furniture Retail	Established in 2012, FURNT is a large furniture retail company that sells a diversified range of home furniture and accessories in Kenya.	Head of IT	25 Apr 2020	42 mins
C17	Tangazoletu	ICT - Fintech	Established in 2007, Tangazoletu is a Kenyan B2B financial technology (Fintech) company that develops IT and mobile solutions for clients in Eastern Africa – banks, microfinance institutions, savings and credit cooperatives (SACCO's), insurance companies and, mobile service providers.	Founder/Chief Executive Officer	21 Jan 2020	25 mins
C18	CHAGRO *pseudonym*	Agriculture - Agrobusiness, chemicals	CHAGRO is a large company domiciled in Kenya, serving the farming community in sub-Saharan Africa with agrochemicals and seeds and related agricultural services.	Business Development Project Manager	4 Jul 2019	49 mins
C19	AMOTORS *pseudonym*	Automotive sales & service	Established over fifty years ago, AMOTORS is a large company that sells a range of passenger and commercial vehicles, maintenance parts and servicing, for clients within East Africa.	Group IT Manager	6 Dec 2019	72 mins
C20	Strathmore University ('Strathmore')	Education - Higher learning	Strathmore is a private institution of higher learning which was chartered in 2008, giving it full recognition as a university. Currently, the university has one Faculty, Information &	Manager - Institutional Data Analysis Unit, upon request by the Vice Chancellor Designate	27 Jun 2019	38 mins

Case	Company	Industry	Brief company introduction	Research Participant Manager Title	Date of interview	Interview duration
			Technology, housing five schools – Business, Law, Humanities & Social Sciences, Accountancy, Tourism & Hospitality.			
C21	Vestergaard E.A	Food Security and health	Vestergaard E.A. is a Kenyan based company, part of Vestergaard S.A., a global food security and health company that produces and sells improved grain storage solutions, among other products in the African market.	Regional Manager Africa - Food Security	8 Jun 2020	46 mins
C22	ADCOMS *pseudonym*	Communications & Advertising	ADCOMS is a large Nairobi-based firm that provides holistic communications service (traditionally known as advertising) to corporate clients across sub-Saharan Africa.	Head of Digital	3 Jul 2019	28 mins
C23	Bluewave Insurance Agency ('Bluewave')	Insurance - Insurance agency	Bluewave is a Kenyan insurtech company established in 2016 to provide a range of microinsurance products to the hitherto underserved market segment of low and medium-income earners. Bluewave was the winner of the 2018 Nairobi Regional Seedstars Summit, an annual global competition for entrepreneurial technology startups in emerging markets (Jackson, 2019). Currently, the company serves Kenya, Malawi and Rwanda markets.	Actuarial Analyst, upon request by the Founder/ CEO	22 Jan 2020	47 mins
C24	COSAC *pseudonym*	Financial services - SACCO	COSAC is a savings and credit cooperative (SACCO) entity that operates in Kenya, providing financial services to its 'members' (an idiom for customers) who include a new growth segment of hitherto underbanked micro businesses.	Chief Executive Officer	10 June & 24 July, 2020	55 mins

4.2 Research findings

Discussed hereunder are the findings of the research and interviews of the 24 firms, with the data analyzed thematically to identify characteristics that reveal significant trends and patterns in big data use. The interviewees were essentially asked questions and provided responsive insights into big data adoption indicators and the big data-facilitated organizational and managerial processes (includes structures, routines, mechanisms). For qualitative analysis, and pursuant to the research questions, the findings articulated relate to such processes amongst the firms studied. Four broad but interrelated themes emerged, manifesting important aspects in explaining differential firm performance and value creation: 1. Big data management processes (BDMP); 2. Big data innovation processes (BDIP); 3. Organizational learning processes (OLP); 4. Managerial entrepreneurialism (MEP). These organizational-cum-managerial processes facilitate a firm's sensing, seizing, and transformation activities by which firms seek to match market turbulence and create value. The findings are discussed next, being interspersed with pertinent, detailed participant quotes, effectively 'letting the data speak' (Gould, 1981), to support the robustness of interpretations arrived at, consistent with the recommendation of Langley & Abdallah (2011).

4.3 Organizational big data management processes

The research found two key, indissociable big data management routines in operation amongst the firms studied: 'combinative capabilities' (Kogut & Zander, 1992) and big data analytics, as described below.

4.3.1 Combinative capabilities

Big data implies its existence in high volume, variety, and velocity dimensions and the imperativeness of firms accessing it for business purposes. The DC literature suggests that firms need to develop capabilities to inter alia, integrate internal and external competencies to expeditiously address rapidly changing environments (Teece et al., 1997), and that such

integration occurs through specifically identifiable processes (Eisenhardt & Martin, 2000). In the rapidly evolving, digital technology-mediated business environment, the ability to integrate and ingest disparate, multidimensional, often streaming sources of data in real or near real-time is a key prerequisite for reaping optimal value from the data (Gantz, & Reinsel, 2012; Gupta & George, 2016; Ji-fan Ren et al., 2016; Kitchin & McArdle, 2016; McKendrick, 2010; Mikalef et al., 2018; Ohlhorst, 2012; Zwolenski, & Weatherill, 2014;). Firms need to purposefully harness big data before turning it into knowledge and insights for decision-making.

As noted by Aydiner et al. (2019), harnessing big data requires its acquisition, storage, and processing, and this is one of the most fundamental components in BDC. Case findings in this study show that firms invest in processes for effective and efficient integration of internal and external data resources. Such processes are akin to Kogut & Zander's (1992) 'çombinative capabilities,' referring to firm processes for integrating, synthesizing, and applying technological knowledge in the context of a competitive environment. Data integration creates a unified, 360° view of the business, so the firm's business managers' can reference a single source of truth (SSOT) for improved decision quality and organizational productivity (Müller et al., 2018). Data integration, therefore, is a combinative capability that enhances the firm's potential for sensing and seizing.

Firms seek to achieve integration through various processes, some of which exhibit commonalities in key features (Eisenhardt & Martin, 2000), for instance, the ERP and its variants such as the CRM. According to Čirjevskis (2019), ERP systems facilitate sensing capability. Beheshti (2006), O'Leary & Markus (2006) note that ERP's are a vital organizational data management routine, providing the business with reporting capabilities about costs and operations to facilitate not only the day-to-day, tactical decisions but also the strategic decisions that enhance competitive positioning. According to Dunaway et al. (2019),

ERP's are a source of competitive advantage since the data, information, and knowledge enabled by a firm's ERP are not only scarce but also difficult to imitate, being unique to the firm.

Other data combinative processes found in the study include: data warehousing (DW), Cloud, plus related digital tools, all of which help the firms to proficiently extract and consolidate data from new and old/legacy systems, from internal and external sources, process and render the data available/ useable for business purposes. In the literature, DW is cited as a technology that facilitates firms to extract, integrate and deliver variegated data from various applications and systems for decision-making purposes (Reddy et al., 2010) and is seen as a paradigm shift in the strategic decision- making environment (Ponniah, 2010; Santos et al., 2019). The literature, for instance, Ferraris et al. (2018), Muhic & Bengtsson (2019), Wong (2016), also notes that Cloud helps a firm to cost-effectively and efficiently access IT resources from competent external parties, thereby enhancing functional capabilities. Additionally, and crucially, Cloud resources facilitate the development of strategic innovation capabilities that enhance the firm's capacity to keep up with the changing business environment. Exemplars of data combinative/ data integration processes from the study are outlined below.

A24M – Linux servers & Cloud: The firm's vast media archive is stored in 250TB Linux servers. Since its founding in the 1980s, A24M built a rich media repository of analog VHS tapes, which have been recently digitized - converting them from analog into digital media files for encoding audio, and video for distribution to customers via a VOD (Video On Demand) product. The firm is also producing new digital content to augment its strategic media assets, resulting in nearly 16,000 hours of content, a feat which the CEO interviewee averred is unrivaled by any other media house in Kenya. Apart from storage requirements, the expected VOD product relies heavily on big data capability to process streaming request data from sundry customer devices, match against the database of digital content held, billings, and

payments data, and fulfill the customer request (Fernández-Manzano et al., 2016). However, the CEO acknowledged the enormous infrastructural challenges that come with hosting the associated content; he observed that whereas content storage problems can be mitigated through off-shore Cloud hosting, for instance, with Amazon Web Services, latency problems could arise and persist. Existing literature has cited latency to be one of the characteristics of big data that bedevils data management practices (Santos & Singer, 2012). Quick retrieval of content by customers, with no latency or buffering, is a crucial selling point that A24M wishes to capitalize on with the VOD product.

LICABO - data warehousing: The bank has invested in a data warehouse and a 'central monitoring system' that integrates disparate data sources – transactional data from the bank's traditional legacy system, social media data, and voice data – to optimize customer service and operations. Data integration capability enables the bank to provide real-time customer service, monitor operations, and troubleshoot. The interviewee stated, '*'as part of the analytics program, we have what we call the data warehouse…and the main concept is to have one source of truth; data from all platforms will come into one central venue, where we will say, this is our truth… we have a central monitoring system that is able to pick data from any system we have in the bank…it's real time; when we have an issue we know, even as the customer is experiencing it, we know, and we start to focus on that…in terms of our ATMs, POS solutions, branches, mobile apps...we actively monitor…it's part of our digital journey, you know at the bank we have so many processes, we are automating those processes…we do process re-engineering so that we are able to serve at a faster rate, with less returns (reduced errors or mistakes).*

HOTCHA – Sundry data management capabilities: The hotel chain has invested in CRM, SQL, Oracle, and Cloud, enabling the capture of guest data throughout the 'customer journey,' from booking to check-out. For instance, during the guest hotel stay phase, various

touchpoints - the spa, the hardness or softness of the pillows in the room, anything for which the customer expresses a 'like' or 'dislike' – are all 'datafied' (Mayer-Schönberger & Cukier, 2013), and the insights used for immediate, personalized attention to guest welfare, and for learning to improve their future stay experience. The interviewee explained the firm's shift to the Cloud: "*Most of our latest investment is Cloud. As a policy, any application investment we are doing, it can't be on-premise because we've seen the benefits… we used Cloud, license paid in perpetuity, for the mission-critical people.*" Cloud capabilities offer efficiency, flexibility, and economy to the firm.

GALES – Document management system: As the firm's legal information or data is naturally voluminous, predominantly semi-structured or unstructured (text, image, video, audio, etc.), found in clients' files and sundry legal repositories, the ability to efficiently store, retrieve, process and analyze such 'big' legal data is becoming the *sine qua non* for generating and delivering business value through improved productivity, organization, and communication throughout the firm. Accordingly, the firm has invested in a big data-based document management system (DMS) to achieve effective storage, high indexing throughput, and efficient data lookup (Siddiqa et al., 2016). The interviewee stated, '*'And there is also another system… a document management system (DMS), there are various in the industry. Now, on the DMS, that's purely for documents…you sent me an email giving instructions, that's a record I have it there; you sent me a title deed, you want me to do ABCD; you sent me a scanned copy, anything, a recording…all documents sit in the DMS… We are able to access that information across multiple mobile devices… when the (matter) is closed, it still remains as a record, so you come back twenty years from now…we simply query the system; the system is quite interactive, we simply query…and see what happened twenty years ago…''* Although the DMS was noted by the interviewee as a capability that is available to all players in the industry, it may nevertheless be a source of competitiveness if use of the technology has not

been widely adopted. Like other professional services firms, the DMS provides full and active organizational memory in which knowledge is created, circulates fluently and grows, and provides the dynamism and agility necessary for competitive posturing (Fraj et al., 2015).

TBC – ERP, CRM: The bookstore chain is investing in a new ERP and CRM system for rich customer views and insights for possible cross-selling of products. The interviewee stated, "…*(on) how we are using technology to engage the customer, or even predict the customer trends… as we speak now we are actually migrating from the old ERP system; we are going to the SAP, which now has that ability to (for instance do) customer profiling… the one we have is outdated, it's a bit rigid in terms of customization (yet)… you can only hit those (sales) numbers, (if) I get you as my customer (to put) more products in the basket; if you've been buying books alone, then I push to you IT (products), then we will be getting a lot from you. And you can only do that if you have a very robust CRM system that is able to link your (customer) data, your preferences…Up to March (2020), we will be doing migration to our new ERP system and I think, after that now we will be looking at the CRM system''.*

INVERE – Data warehouse, CRM: The firm has developed a centralized data warehouse that collates disparate internal data systems to promote a holistic view of the business and data-based decision making, with prospects for improved decision quality and organizational productivity (Müller et al., 2018). The interviewee stated, *''…at some point we developed a data warehouse, …this is to capture all data from all systems. We have other systems, more than ten other systems that (we) manage, including real estate, our CRM – (it) is also developed inhouse – intranet systems, systems on finance, etc. So, we have all this data, but then we needed to put it in a single store so that it's easier for us to analyze. And that is why we built this…a data warehouse where we host all the data…".* Specifically, on the data integrative functionality of the CRM, the interviewee stated, *''What we have is a system that is called the INVERE CRM. Now, this is where… everyone who interacts with INVERE is*

recorded. So, this system is able to communicate to the banking system, or to the financial system…and they are able to share data; such that when a deal is closed, you'll be able to see that deal has been closed''.

Kentainers - ERP: The manufacturing firm has invested in *ebizframe* ERP to remedy weaknesses noted with previous software. The CEO noted that *ebizframe* provides reports and analyses more flexibly than its predecessor: *''functionally, this ERP – (and) I mean every software for that matter, there are some limitations - whereas when we started using ebiz, it gives you the leeway, the kind of information you want to take out and create let's say the reports, analyses or whatever you need… you can customize this, that's the advantage of ebiz''.*

Absolute Adventures – Cloud: The firm has invested in a Cloud hosted-server for efficient big data storage and processing. The interviewee stated, *''we actually use (a) provider in Canada... that's where the sever is. Because we also need to look at, what would happen if, maybe internally, our backup goes down, or maybe, the internet for example, doesn't work. There are all those things to consider. Because if its offline (the system), it means you cannot access the booking, it means you'll be in the dark.''*

FURNT – ERP, Cloud: The furniture retailer has invested in a web-based ERP, enabling synchronization of data processes from the various business functions and production of information to coordinate its large volume of operations. The ERP handles the company's items through purchasing, warehouse receipting, transfers to various showrooms, sales, payments to suppliers. The interviewee stated," *we have (a) different system that we call ERP… and basically, being in retail, what we have is a system that captures inventory, the sales, and also the financial part. So this is a system that has been deployed, it's using one database, but it's deployed within all our branches... So, somebody accessing the system from…(the branches), they are all accessing the same system…And currently, actually we are in the process of moving the system to the Cloud".*

AMOTORS - ERP, CRM: The automobiles firm has invested in an industry purposed ERP, with an embedded CRM, which helps intra-firm knowledge integration, improved

coordination, and better customer service outcomes, as explained by the interviewee: ‘’*In my time at AMOTORS, I (have) actually implemented two ERPs…when we implemented (the initial ERP), one of the most critical module that (lacked)…was the CRM module. And in the automotive industry, the business is actually not in the selling of the car, it is in the after-sales. That is where the money is made. Because, the moment I sell you that vehicle, I potentially have another 5 to 7 years to make money from you on the after-sales…So in (the new ERP)… being a very automotive-centric solution, CRM is actually one of the most, I'd even say it's the most important module because it connects everything''*. The interviewee's views align with Iansiti & Clark's (1994), whose study found that, in the automobile industry, strengthened integration processes positively correlate with firm performance.

Bluewave – Cloud: Customer service delivery for the microinsurance insurtech relies on Cloud-hosted servers and various data analytic tools. The interviewee stated, "*all our servers are hosted in (the) Cloud, that's the Amazon Cloud, for which they are very secure, and also at the same time, we can save a lot of data…*"

COSAC – ERP, Cloud: The firm has invested in an ERP as the core banking system, integrating data from the SACCO's customer service channels - point of sale (POS) gadgets and a mobile banking platform. The interviewee stated, "*To the core banking system, in our case, we call it ERP, Xtreme ERP. It's hosted internally, though we have a backup in the Cloud."*

4.3.2 Big data analytics routines

Big data's value lies in its analysis, leading to the identification of propitious events, extraction of meaning, and generation of insights into business operations and the market environment. Various indicators of big data analytics (BDA) adoption were found among the companies studied, including KPI's reporting via dashboards; online transaction processing cum analytical systems, event analytics, social media analytics; text, video, audio analytics;

data querying and text mining; web analytics; scenarios simulation; predictive modeling; forecasting (Cao & Duan, 2014; Chen et al., 2012; Lavalle et al., 2011), suggesting that BDA is becoming a competitive requirement. The research finds that BDA improves the firms' agility for decision making in aspects such as market intelligence, maintaining incentive alignment, controlling costs, maintaining quality, developing new or improved customer offerings and business processes, optimizing inventories, all of which contribute to firm competitiveness. Below are examples of BDA found in the cases studied.

The banking firm, LICABO, uses customer transactional behavior and customer experience analytics, combining data from the bank's internal financial system, social media, voice, and related sources, to not only know what customers are transacting, how they are transacting but also their lived experiences while at it. The bank combines traditional CRM data and social media data as explained by the interviewee: "*we do a combination of the traditional, because that is where the majority of our data still sits, we (also) do a bit of the social aspect… apart from that, we have the calling system. The actual interaction we have with the customer is recorded, and it can be a basis for further analysis. (Our capabilities) have really expanded to getting data from everything (many sources)…".* Analytics enables latent customer needs to emerge, providing opportunity for their fulfillment through targeted marketing and product design. Previously, the bank would focus on its traditional core products - such as loans, checking, and savings accounts – and push these to the customer. With BDA, the bank can assess a customer at a more granular level, develop conjectures about their unmet needs, design and serve up more relevant, personalized products. The interviewee stated, '*'when selling…initially we would go in blindly… just check their accounts (the customer accounts) and maybe see who has, say, fixed deposit; but now we are going further than that (and ask), what does the data say about you: are you transacting?...which product are you consuming from us, and the products you are consuming, are they active?…before we speak to*

that customer, we have enough data (about them) to say, this is what the customer needs from a 'now' perspective, and what they will look for, in a futuristic perspective…''. The interviewee further explained that BDA allows better customer segmentation; therefore, the bank's salesmanship efforts can be focused on specific industry segments and help inculcate specialist competency in each industry.

The mobile health solutions provider, mHK, uses BDA from its flagship mobile laboratory (mLab) system to facilitate timely healthcare interventions for patients. mLab measures a series of granular process events spanning the time it takes for a patient's HIV test to be completed. Concurrently the system issues due notifications to the concerned patient and the health care worker on process status. Analytics are similarly at the core of the firm's other big data-based digital products: The T4A (Text for Adherence) mobile phone-based application analyses events and sends SMS (short message service) alerts to patients about scheduled times for taking medication or doctor appointments, and for health care workers to easily monitor patient adherence to the prescribed care and treatment regimens; The firm's EMR (electronic medical records) system captures and presents real-time analyses of sundry patient-related data points, to help improve clinical decisions and health outcomes; A COVID-19 management app, aptly named ''Jitenge'' (Swahili term for 'self-isolation'), tracks and analyses tracer data of suspected COVID cases, their temperatures and other vitals throughout the mandatory 14-day quarantine phase, thereby helping stall the spread of the pathogen.

To enhance marketing capability and drive sales, the travels/tours/events firm, Bonfire utilizes the newer forms of social media descriptive analytics, combined with traditional data retrieved from sales reports, log files, and customer databases. The marketing manager tracks and analyses 'likes' and comments posted by the public across all the company's social media interfaces. The interviewee stated, *''the sales reports, of course (are analyzed); then we also keep a record of the inquiries; and also, each platform has its own report. If it is Facebook, it*

does its report; so we look at those reports and analyze, and know where to invest more (i.e. understand where to focus marketing efforts)''.

Informal yet innovative BDA plays a significant role in the business of the agri-inputs firm, AGRICO. WhatsApp analytics - instantly shared video and image data - yields insights that are applied towards various decision-making. WhatsApp data has crucially facilitated first-to-market moves as explained by the interviewee: ''… *one of the key technologies for us has been WhatsApp, and that has become valuable, even beating (the) competition, if you can imagine (it). Of course, it has had its risks that have also burnt us in some ways, but, in being able to get communication on time – sometimes… it's the one that unlocks the business for that week, or two weeks… nothing else, not emails, not (phone) calls, has been as useful as that''.* Analytical capabilities premised on WhatsApp allow the firm to gather quick, nuanced market intelligence. The interviewee stated, "*We don't need to make trips to our suppliers (referring to distributors of AGRICO products). And again, this is also a factor of WhatsApp… that sort of social communication that you need to have with your suppliers to know what's happening, that has been enabled by WhatsApp, which makes it better for us in knowing, 'okay, this time, this is what is happening in that market, you don't have to write a formal email, and then only find out the formal things…because of WhatsApp, people are able to chat informally.* The interviewee noted that unlike conventional written communication (notably email), WhatsApp engenders a feeling of informality and bonding with the suppliers, which increases the possibility of obtaining unconstrained, raw narrations, giving more incisive views about the market conditions. WhatsApp data is also used in verifying field conditions and customer complaints as stated by the interviewee: *''this again goes to WhatsApp – initially, if you wanted to find out how the field looks like, you had to go to the field (physically). But now all I need to do is tell (the field rep), 'you are saying the maize doesn't look good (in the farms), send me a picture, or send me a video… or (if) a customer has complained somewhere, (I tell*

the field rep), 'oh, take a picture, I need to see what the customer is complaining about'. And so, this, I know it influences our business, first of all in the sense that, we are able to respond, response time is much, much faster.. and, yeah, that has made a difference'' The interviewee gave further illustrations of data analytics: customer payments are tracked and analyzed in real-time, for improved cash flow management and, prompt, evidence-based decisions on whether to advance trade credit to the affected customers; analysis of social media interactions with farmers resulted in the identification of unmet needs, and subsequent opening of a new sales outlet.

The hotel chain, HOTCHA, defines and produces sundry analytics along the 'customer journey' value chain through its established customer-centric data structures. For instance, website clicks by prospective customers are tracked, analyzed, used to engage and convert the leads into actual customers; Geo-location data is analyzed to push information and welcome messages to customers (Estes, 2016); Social media data is tracked to manage the risk of adverse publicity. The interviewee stated, "…*we have location sensing. If you walk in, and we knew you in our history it's easy for us to know you've come again, (we) just start pushing (information) and welcoming you on your mobile; if we don't know you, we harvest your information, now we have to seek permission… another source of data, still out there, is we do social listening; we use tools, in case anybody mentions us, bad or good, we capture. And we are able to communicate and resolve issues before they escalate and expire*''; CRM data enables personal connection with guests, for instance, treating them to a surprise birthday with a cake from the chef, made to guest-specific nutritional requirements. Data analytics is also used to effectively control and manage food expenditure, a key budget item for the hotel chain. The interviewee explained that HOTCHA follows a 'localism' strategy - one that is becoming increasingly popular with multinational brands such as Starbucks and Walmart (Kurland et al., 2012) – whereby a majority of food items are purchased from farmers within areas where the

hotels are situated, thereby spurring the economy of the resident communities. Food prices data is collected at the purchasing points, then analyzed at the firm's central store for potential arbitrage opportunities. The interviewee stated: "*We don't buy most of the things from big sources; it's the usual 'mama mboga' (a Kiswahili term, commonly used as a euphemism for smallholder farmers) who grows vegetables. As a matter of policy, we like to support the host community. Being in X properties, we have purchasing points all over, and we can notice some areas where food is cheaper. Without all these data collection points, we would not have such visibility''.*

BDA also finds applicability in the legal services sector. GALES, a legal firm, uses analytics from its big data-based technology knowledge repository - the DMS – which allows and enhances the quantity and quality of searchable facts and information held in client files and legal documents. More precise information (as contrasted with the 'noisy' type) begets efficiency gains - reduces the risk of sub-optimal legal advice to clients, and cuts organizational slack as well as possible delay costs (Bulkley & Van Alstyne, 2004).

For INVERE, the real estate-cum-financial investments firm, the specter of ever-mutating risk of financial fraud necessitates the development of detection routines that include analysis of descriptive data for unusual or suspicious activity. To proactively anticipate and deter fraud, the manager develops scenarios about what could happen and likely impact to the business. Additionally, the firm is embedding big data-based artificial intelligence (AI) analytics in its risk management routines to provide agility for managing 'known unknowns' (Teece et al., 2016). The interviewee stated, '*'Right now, as you can see, we are processing instant withdrawals…this is especially for our money market fund… it raises the necessity for us to address the issue of security, and we are looking at that from a data analysis perspective… we need to move to artificial intelligence, and analyze this data further… (with) automated withdrawals to the banks as well as to MPESA, (and) very soon we are going to introduce (this)*

to Airtel money, this pushes the level of risk very high and the best way to address that at this time would be to use fraud detection models, and that's what we have embarked on building''. The interviewee further noted the use of CRM analytics that afford granular views of the firm's customers, for instance, the type of customer – high net worth versus retail. Such differentiation enables targeted messaging and marketing. Besides, Twitter-based analytics is used to mine customer sentiments and manage the risk of negative publicity. He stated, ''*We use Twitter heavily, to fight bad reputation, to also address clients' requests. You notice that mainly, clients will not raise their issues elsewhere but on Twitter, so that's a very key platform to see these problems and issues, and (address them)''.* As noted by Kiron et al. (2014), knowledge gained through analytics leads to better engagement and improved customer experience.

Operating in a highly competitive insurance market, the insurance underwriting firm, INSCER, maps and analyses the 'customer journey' with data from manual and digital sources, producing insights for a better contextual understanding of the customer, their satisfaction, and 'pain points', and customer profiling for targeted marketing. For instance, data from social media platforms, Google analytics, emails, and text messages are used to conduct customer sentiment analysis as explained by the interviewee:*''... Using the Word cloud technology, we are able to determine…which word has been mentioned the most, so we are able to tell (whether) our customers (are) happy about this topic, or what our customers say – if the most mentioned word, for example, is 'impatient,' or 'garage,' or 'my car,' then you can do some deep analysis of that, and you can see what customers are actually saying about it… you can get the sentiment of the message without necessarily reading each and every message from over 30,000 customers… so we've constantly been looking to ask ourselves, 'what can we do more, better than the competition?'... we have been keen to understand the customer preferences, the customer trends…we are collecting information to inform us on the customer*

journey…''. INSCER also uses BDA to manage the risk of fraud, identify and negotiate cost reduction opportunities with service providers, and improve operational efficiency. The interviewee stated, *''…We have come a long way…from static reports to simple dashboards; And now we have complex dashboards, which have…real time data; And what you find is that we have got dashboards running on Power BI as well as Qlik Sense technologies…and we have all our managers using these technologies, each to check on their areas of preference, either…for purposes of fighting fraud, looking at trends which we should react to''.*

The insurance broking firm, REINS, mines its database for data points such as customers locality, contact details, nature and size of business, all crucial variables which inform marketing initiatives. The insights gained have expanded the firm's revenue streams by selling other insurance covers over its core motor insurance business. The interviewee stated, '*'as we speak, every other SME, every other corporate, requires a number of insurance policies: they require WIBA (Workmen's Insurance Benefits Act), they require fire and burglary, they require fidelity (cover) for those handling money; so what we've been doing is, through the data that we have, it now gives us an opportunity, that we can be able to approach them easily''.*

The manufacturing firm, Kentainers, uses big data digital technology - a Radio Frequency Identification time tracking (RFID-TA) system as a management tool to secure compliance (Kamoche & Newenham-Kahindi, 2012). The RFID-TA generates metrics to continuously sense, measure, analyze employee work attendance (a proxy for the level of effort and performance), and reward the employees accordingly, for instance, through overtime pay. The RFID-TA provides the behavioral impetus necessary for task-oriented employees to perform effectively towards attaining business goals by serving as an incentive and control system. Commenting on the system, the ICT manager stated: *''This is RFID technology. We don't need to write what time did you come in, what time did you go out…any time you swipe,*

the data is collected. The line function will do whatever they want to do with the data…you can be able to do your analyses…you see (for) human beings, the way labor is, there has to be some guidelines, what time did you come in, (and) what time did you go out. So, time analyses is there''. Galbraith et al. (2002) and Eisenhardt & Martin (2000) have observed that such performance control cum measurement systems may constitute the micro-foundations of firm dynamic capabilities. The firm operates other analytical procedures: 1. An automated, real-time information system tracks customer orders, from initiation to delivery. As each procedural step occurs, event-based data (order logged, order payment received, product loaded onto the truck for delivery, delivery commencement, delivery arrival) and related information is captured, analyzed, and based on the pre-defined business rules, real-time operational decisions (providing due notifications, most notably to the customer) are taken. The firm realizes that for their type of business, customers expect to be kept in the know. The ICT manager stated, *''the advantage of doing this… you see, with a customer, he needs communication and updates, from the time you buy to the time (of) production, to delivery… we are constantly in touch with our customer, from the time you buy to the time we dispatch''*. This ability to meet customer expectations using big data-based technology represents a dynamic capability; 2. Customer feedback is elicited through a convenient digital feedback management system, and the data is analyzed for marketing and product improvement insights. The ICT manager stated, *''…there is a booth at the reception…a podium with a touch screen; it will 'talk' to you (the customer)…from there we get feedback. You know we are dealing with so many walk-in customers, (each) has his own analysis, how he sees our product, how he sees the company… this performs as a suggestion box, you can put your comments, you can put your complaints…we have that real-time (visibility). So, we are also looking at a way where our salespeople (when they) go to the field, we can extend this to the field. When they come to your store, it does that (collect feedback), we receive that real-time''*.

For the taxi/tours firm Absolute Adventures, BDA provides 'ubiquitous informing' (Baesens et al., 2016) on a real-time basis for its vehicles, the information being leveraged for quick decision making on optimal use of the core revenue-generating asset, the firm's fleet of vehicles. Customers are kept updated on their cab bookings' status, an aspect which the firm notes to be an essential point of leverage for competitiveness. The interviewee explained, *"...we have trackers in the cars, so that, at any given time, the people in the control (room), they can be able to see the location of these cars… so, when we receive a booking,…it will be put on our portal… then, (we) dispatch the vehicle (to the customer). The dispatch will…be determined by…the nearest cab. So this…gives us the management (ability) to control the bookings. And now, of course, quick access. We realize that people (customers) are more confident when they receive that text that tells you, 'this is the booking reference, this is the pickup point, time and date, and that is … the drop-off point', so that in case there is any mistake, (the customer) can call and say, 'change that, it's supposed to have been this and that'".*

FURNT, the furniture retailer, analyzes sundry data collected from the firm's customers to help in product design, service improvement, and targeted marketing as explained by the interviewee: "*...this kind of data will tell us the areas that we need to improve. For example, if it's maybe service from our staff, we will look at how the customers rated us… if it's something like product - the value, like 'do you (the customer) get value for money for that product'? So from that we are able to develop maybe the next (generation) product that you are going to buy; we will have in mind the specific products that the customers need...and then at the same time, we also (use data to) target…because we will, at times we request the customers to give us, (say), their age group and basically, this will help us to…target our specific…audience out there."*

BDA is used by the agrobusiness/ chemicals firm CHAGRO for farmer engagement,

marketing campaigns, assessment of farm conditions, product market positioning and, calculating farmer productivity. The firm has established various mechanisms – M&E (monitoring and evaluation) tools, Salesforce.com, social media, satellite technology, and a proprietary platform - that capture and analyze farmer, agricultural and market-related data. M&E data comprising of qualitative farmer interviews, their GPS, and photos of products purchased is collected via an App during farmer field visits, then relayed to the CHAGRO server in real-time for analysis. Satellite technology is used to collect weather and crop data from digitized fields as stated by the interviewee: "*The main purpose of satellite technology – we are currently offering this to seed multipliers - it is used as quality control. For instance, during maize production, there is a stage (flowering stage) you need to remove the female tarsals to prevent self-pollination. If self-pollination happens, you are unlikely to produce hybrid maize; instead, you will produce a generic with low yields. People (workers) are sent to remove them (tarsals) by hand, and you find that, in many cases, people will remove them thoroughly at the edges of the farm, but less so in the inner parts of the farm. And this is one of the main challenges in maize seed production. So you find that now we are able to leverage technology, to be able to see whether that kind of work (removing female tarsals) was done properly (in the inner parts of the farm)… (using satellite) we get a lot of data; And we can be able to use this data for prediction…quite a new field in Kenya, but we are also trying to learn more about it and implement it. I have already done it for the past one year…We did (digitized) 10,000 hectares last year…"*. The firm's Facebook page generates data for farmer engagement, including product campaigns. The interviewee stated, "*We are getting a lot of data through social media. We have a Facebook page…. since we formed it last year, we have more than 2,000 messages. And we also do some campaigns there, and we are able to pull a report to see how the campaign performed*…" CHAGRO also obtains analytical data via a digital learning platform that has been set up for farmers to access learning materials and agri-information

through a shortcode. The platform has protocols for the management of various crops, with approximately 300,000 farmers enrolled. The interviewee stated, "… *we give farmers the shortcode, and they can be able to pull information on agriculture, based on what they want. We have protocols for (various crops)…people (farmers) are sending hundreds of questions at the back end, and we also gather information on what challenges farmers get… we are able to know what kinds of diseases farmers are reading about, what kind of pests farmers are reading about, what types crops they are interested in, etc*." Salesforce.com is another data source for CHAGRO - farmers submit their questions, and experts answer them through the platform. As noted by Killen et al. (2008), dynamic capabilities include such structures and processes, continually monitored and adjusted by the firm to meet the dynamic environment's changing requirements.

For AMOTORS, BDA streamlined the hitherto missing interface between sales and service departments, allowing the firm to redress customer vehicle servicing glitches and offer better post-sale customer service, with prospects for increased revenue. The interviewee stated, ‘*’So, the basics… (that could tell us, for instance), this customer has bought a new (vehicle), and he’s supposed to have two free services…it became a very big issue, and half the time, if not 90% of the time, those two services were never done for free; because, the sales department that sold the vehicle has no way of communicating to the service department…I remember us having, you know, such complaints, and we are like, this is a very simple issue to sort out. As long as these guys (service department) can see you bought the vehicle (from AMOTORS), it’s coming for two free services; you should be entered in the system once… you (the customer) should not be dealing with the service department like you are dealing with a brand new company. Those are some of the frustrations I’d say that we set out to sort out’’*. The interviewee further explained that the firm also tracks and reports vehicle service analytics for clients with large fleets purchased from the firm.

For Strathmore university, BDA is used to support various business aspects. For instance, data captured through the university website and social media platforms are turned into analytics used to map the student journey from inquiry to graduation and design practical marketing approaches. The interviewee stated, *''So if you look at how we're using data currently, right now, we're synthesizing a lot of student information we put together. So we are able to, for example,… map the entire student journey, from when a student comes to make an inquiry…at that stage, we can actually look at how popular (our) programs are, (and) additional programs that people ask for….we are looking at what kind of client is interested in certain kinds of programs, so we can actually guide our marketing and sales team with better marketing support…we are not just taking inquires from students, without asking ourselves why…it helps in terms of our marketing strategy. (Also in assessing), for example, is our sales team effective?; because we follow the customer from when they come to enquire, to when and if they enroll…we can actually see… we ask them (students), 'where did you hear about us, is it through Linkedin?, Facebook?…we (also) monitor applications coming in…are we getting better quality of applicants, or is (there) deterioration; who wants to come to Strathmore?''.* Data is also used to assess the university's internationalization strategy as stated by the interviewee: ''*The data…, really what it does,… it's there to ensure that we can monitor and evaluate ourselves on a frequent basis on how far we are in terms of achieving our strategy, and what information we need and what resources we need to mobilize…. we have a strategy for internationalization…(with data); we are able to see where applications are coming from; because we also have marketing campaigns internationally, so we can see how many applicants we got from Canada, Nigeria, Ghana. All that is actually mapped…so we can actually see all that information''.*

The communications/ advertising firm ADCOMS analyses data to create descriptive and predictive models about consumer trends, depending on the client need to be served. The

interviewee stated, *"...data is quite broad; mostly what we look at is consumer data and trends. I'll give you the example of, say, digital media, I'll be looking at data around, let's say airlines - I'll be looking at volume data, how many people are looking at, searching for tickets: what is their age group? What is their LSM, which is the living standard measure,... so there is opportunity (in data)".* Besides data modeling, customer behavior analytics are used to understand individual customer's aspects such as needs, preferences, values, thereby inform marketing strategies, and assess competitor performance. The interviewee stated, "…*you have the data that informs your strategies, and this is usually around behavioral data… so that you understand the psyche of a consumer of a brand…and that data obviously now covers many things - people's interactions with different brands, looking at category data as well, you know, what is your competitor doing better than you are.*" The firm uses data to rapidly measure the performance of various marketing projects and to reconfigure if necessary. The ability to sense and deploy resources quickly in response to market feedback is an indicator of DC. The interviewee stated,"… *let's say we are running a campaign, the data that is reported back to us in terms of performance… we now look at that data and draw out actions. So you say, what's working, what's not working? ... and how can I improve on both fronts, improve on what's working, and improve on what's not working and that's done almost (instantly)… we have a social listening tool… which measures the volume of conversation on social media and can give you an indicator of whether you are in a negative territory, positive territory and will give you numbers as well. So, we use that also to inform the client and say, 'hey, we've launched this thing, and this is what people are saying'; and if it's in the negative territory, you know, it's hit the wrong button (the campaign has failed). So you find quick ways of, of course, correcting".*

Bluewave, the microinsurance provider, uses AI and analytics in the business processes of managing default risk, fraud, product design, pricing, effective marketing. Data helps reveal

potentially uncreditworthy individuals, and concurrently, the firm designs custom-fit products, to extenuate the risk of clients defaulting on their insurance premiums through inability to pay. The interviewee stated, "*…the low-income earners (that we target), it is a very risky profile sometimes; because it is not easy to assess such cases. So we are using big data analytics in such a way that we are able to look at the consumer behavior, and able to come up with specific products targeting those consumers… pricing products which target specific customers, and also marketing by targeting specific customers*". In fraud prevention, the firm uses an algorithm to collate data from various social media platforms to create a rounded view of a claimant, a triangulating mechanism to authenticate a lodged claim's validity before its payment. The interviewee stated, "…*On the side of claims, the new digital technology has assisted us to detect and prevent most of the fraudulent claims. For instance… nowadays, in a layman's language, if someone dies, or if someone is sick, there is a high chance that someone will go to social media - WhatsApp or Facebook and say maybe, 'quick recovery, so and so'. So, we are able to mine that data if someone lodges a claim…"*

4.4 Big data digital innovation processes

The research findings show that having sensed incipient change in the market environment, firms are responding through big data-based digital innovation processes or capabilities. Innovation capability has long been recognized in the literature as one of the critical elements in a firm's ability to adapt to change, drive competitive advantage and organizational performance (Barney 1991; Grant, 1996; Teece 2010). Innovation entails developing new or improved products, business processes, creation of entirely new business models and markets, to serve customer needs (Kuhlmann, 2010; OECD & Eurostat, 2019). With today's Schumpeterian-like conditions, technological innovations are predominantly digital in nature (Kohli & Melville, 2019; Nambisan et al., 2017; Yoo et al., 2010). Through big data innovation capabilities, firms transform knowledge/ ideas and resources into novel or

improved products/ services, organizational processes and structures, or business models. Therefore, artifacts such as digital solutions and digital technologies found in the cases studied all indicate the existence of big data innovation capabilities (Nambisan et al., 2017; Tai et al., 2017; Wiesböck, 2018).

According to McGuire et al. (2012), Nambisan et al. (2017), big data fosters novel pathways of creating and capturing value along the dimensions of new or improved products, services, platforms, customer experiences, and business routines. The innovation outcomes may not always be digital, though made possible by using big data and big data-based technologies and processes. The range of big data technology-based innovations identified in this study includes product/service innovations, business model innovations, or business process innovations, which all lead to competitive advantage by aligning businesses with market needs and enhancing firm profits, in either a short or a long term (Adler & Shenbar, 1990; Nisula & Kianto, 2013; Nambisan et al., 2017; Ylijoki et al., 2019). The below vignettes provide instantiation of the big data-based innovation capabilities.

4.4.1 Big data-driven products/services, business models

A24M – Streaming platform: The firm is leveraging its big data technologies and talent to strategically shift focus from being primarily a B2B media content provider to B2C streaming, video-on-demand (VOD) business model, plus a television channel. The CEO interviewee stated, *"we are trying to do VOD. We are also designing our own TV channel. For both products, we need a platform. The platform can be 'white label,' but we want our own platform. I have hired a guy from Silicon Valley for the last nine months to create the platform*". He explained that the company wants to emulate the Netflix model: "*Netflix is the biggest VOD platform, but their platform is more highly valued. We want to put our own content on our own platform, then get that content to the public".*

Several months after the CEO's interview, A24M launched 'Yebo'

(www.Yebo.live/en/), hailed as Africa's first factual storytelling VOD platform airing world-class shows and documentaries and features. According to Monzon (2020), Yebo disseminates documentaries, short stories, weekly shows, and other offerings accessible to the viewing public through the web and social media links.

mHK – Digital health solutions: The firm's business model leverages big data, having designed and rolled out various digital health innovations that include mLab (mobile laboratory), originally developed to reduce the turnaround time (TAT), from when a patient's blood specimen is received for HIV testing at a local health facility, to receipt of the ensuing test result. The process was hitherto lengthy and predominantly manual since the health facility had to aggregate and ferry specimens to one of the few central testing labs. After that, a printout of the test results would be physically transported back to the originating health facility. mLab digitized the test transmission process. Overtime, pivoting off the initial TAT metric, mLab was incrementally enhanced to produce more granular process insights such as the date when results were picked from the testing lab, notifying if/ when test results were read (or not read) by the healthcare worker, exceptionally flagging results that require immediate attention by the healthcare worker, especially unsuppressed viral load cases for adults, or positive early infant diagnosis (EID) cases. Since its launch in 2017, mLab has transmitted over two million HIV results and is used in over 850 health facilities countrywide. The interviewee stated, *''With mLab, the gap that it was trying to fill (through digitization of physical process) was, the gap of picking (test) results from the central testing lab) lab to the (health) facility, and reducing the turnaround time… over time, we've made the app smarter…and we even have a dashboard. So the system is able to tell us how many results were read (by a healthcare worker), how many were not read… it also has the capability of sending messages to patients so that if your results are ready and they are at the facility, instead of the healthcare worker calling the patient, a message goes to the patient telling them (to) visit the facility…''*

Pivoting around mLab's experience, mHK has designed other big data-based, innovative healthcare market solutions. Three such solutions are 1. T4A, a mobile phone-based system that messages medication and doctor scheduling for patients. The interviewee stated, '*'we are using SMS communication to communicate with patients, and the health care workers… the goal for the platform is to help in increasing adherence for appointments, medication, treatment of patients, and for health care workers to easily monitor appointments, and follow up on those people who are not adhering, because they have (their) information''*. T4A has undergone three version changes for improved service and ease of support by mHK techies; 2. An automated hospital management system incorporating an EMR - electronic medical records - module. The big data literature, for instance, Dash et al. (2019), cites EMR as one of the most prevalent applications of big data in healthcare. For each patient, their EMR is a master database that contains structured and unstructured data. Embedded interactive platforms for capturing and processing the data, and presenting real-time analyses, help improve clinical decisions and health outcomes; 3. 'Jitenge,' a COVID-19 disease surveillance system that helps track suspected 'positive' cases' adherence to health quarantine guidelines. 'Jitenge' is interfaced with the separate Kenya government's COVID-19 web application for enhanced data richness. Since going 'live' on 28 March 2020, 'Jitenge' tracked a total of 2,190 individuals.

Nouveta – Digital revenue & financial management products: The firm's portfolio of big data-based digital products include: 'RevenueSure,' a revenue management platform; 'Blink,' a digital wallet for students and schools; 'Shule,' a schools management platform; 'SACCObenki,' a mobile banking solution for savings and credit cooperative organizations (SACCO). The interviewee stated, *"…our flagship product is called 'RevenueSure'… that's a play of words between revenue and Assurance. So, (what) RevenueSure does, it's a service delivery platform that enables corporates both in the private and public sectors to serve their*

customers better, especially around revenue collection and revenue administration … RevenueSure has digital channels for service delivery. It has web portals, and it has a mobile app and USSD attached to it… We also have another product called 'Blink'… (it) is a digital wallet, and our idea around the Blink is to target schools… together with Blink, targeting schools, we have a product called 'Shule'… it is a digital school management platform… and then now the other product we have is (for) SACCO banking… we've built a product called 'SACCObenki,' which enables SACCOs to have their own unique and proprietary mobile banking solution".

REINS – Digitized motor insurance, data monetization: The firm is spearheading digital delivery of motor insurance services in the country, with plans for replicating the capability to other types of insurances. The interviewee stated, ‘’*the intention of having REINS was to digitize insurance sale and delivery; that (clients) are able to log in to REINS, it's a portal, and am able to (transact). For example, now we have automated motor, and I have (a number of) insurance companies that I am partnering with…on motor (insurance)… that we've agreed to digitize the product with''.* Additionally, the firm is leveraging its client database to expand the revenue base by selling bulk SMS services to other entities depending on need. The interviewee stated, *''… We even sell the blast SMSes at Ksh 1, or Ksh 0.80 (per SMS) depending on the data that you want to push out.''*

Tangazoletu - Fintech products: The firm's business model is fully big data-based, with various products developed that include ‘SpotCash,’ a mobile banking solution cum ERP for SACCO's, winner of the ‘Think Business Banking Awards 2015’. The interviewee, the firm's founder CEO, stated, ‘*'our biggest solution right now is mobile banking for SACCO's, which came from just an observation - after working with SACCO's – that people are spending too much time going to the SACCO, to ask, 'has my salary been paid?', 'can I get a loan?', what's my balance?'… We worked with a SACCO in Marsabit (county)… we just decided, why*

not put this thing on the phone, so that guys can check, and they find… (whether) salary is paid or not. So, most of our solutions are based out of coming to fix a specific challenge in the market''. The firm also developed 'Lipa na MPESA,' the highly popular payments platform for East Africa's largest telecommunications company, Safaricom (Ondieki, 2017).

Bluewave - microinsurance products: From being a traditional insurance agency, the firm reinvented its business model upon recognizing and seizing on a market opportunity – provision of affordable microinsurance to the lower end of the market using big data-based mobile technologies. The interviewee stated: '*'Bluewave first of all, we started as an insurance agency, but we saw that there was need to innovate using technology so that we are able to reach the clients at the bottom of the pyramid, specifically those who have been left out of the conventional insurance…currently, we have products in micro health insurance…in life insurance such as hospital cash, total permanent disability…those are some of the products we have launched. And we are also looking at agriculture sector''*. The firm designed and sells 'Imarisha Afya' (enhance health) as its flagship micro health insurance product.

4.4.2 Big data-driven innovation in business practices/ processes

LICABO – Reimagining 'Know Your Customer' process; Coopetition with Fintechs, open API's: In adapting to the competitive financial sector environment, the bank reimagined the traditional 'Know Your Customer' (KYC) procedure to sense potential business opportunities. By law, all banks in Kenya are required to 'know' their customers by collating certain basic data about the customer. LICABO conducts KYC through visits to the customer premises, the managers being equipped with digital tools for effectively capturing and making sense out of the interactions through data. The interviewee stated, ''*this aspect of regulation is something we are actively pursuing… the old model was to make the customer come to you, but we are moving from that and saying, 'go visit that customer, see whether they are happy, and we have tools to be able to record that visit, whatever discussion that arose from there,*

and if there is any issue that arose… it's all automated in a system somewhere.'' The bank has essentially reframed conventional KYC thinking from being a mere regulatory device, extending it, in combination with BDC, to a process that may help the bank discern latent business opportunities faster than the competition. This capability of boldly reimagining a procedure, unconstrained by the status quo of regulatory and technological constraints (Ackoff et al., 2006), is vital in an economy like Kenya where open banking – characterized by the upsurge of a slew of diffuse, agile, and unregulated fintech startups - is increasing. Unlike the mainstream banks, which mainly base their investing and lending decisions on customers' financial assets, the fintechs use big data (information about people and their businesses) as the new collateral, in the process disintermediating the banks from their traditional customer base.

As an additional adaptive measure to the fintechs disruptive trend, LICABO is pursuing a coopetition strategy - simultaneously competing and cooperating with rivals (Brandenburger & Nalebuff, 1996) – with such entities and through open APIs (application programming interface). The interviewee stated: *''For some (fintechs), we are in the process of collaborating better, because they already have the customer facing solution, and all we need to do is find a methodology where we fit in with them. For some its finding a product that can reach that customer the same way they are…so it's a combination of things we do. Some its, lets compete at the same level…and for some…can we have a symbiotic relationship''.* After the interview, the researcher independently learnt that LICABO took the unprecedented decision of opening up its APIs to software developers and the business community, which corroborates the point about coopetition with fintechs. Basically, an API is "a way for two computer applications to talk to each other over a network (predominantly the internet) using a common language that they both understand" (Jacobson et al., 2011, p. 5). Open APIs not only expose the bank assets such as data, services, or products to external parties but, more importantly, facilitate potentially profitable partnerships with such parties through cross-selling and upselling

opportunities (Zachariadis & Ozcan, 2016).

Bonfire – Director's personal Youtube channel: The firm recognizes that, before making the purchase decision, customers often need to know, yet lack, information about the type of experience to expect in a particular holiday destination. The firm's directors, therefore, use their personal Youtube channel (YTC) to share their own experiences about various travel destinations with potential clients. Concerning the YTC, the CEO said: *"We market our experiences there (the destinations visited) but keep traffic (flowing) by showing them our daily lives''.* The customer-centric use of big data technology provides value-added service for the customer, as it bridges their 'information asymmetry,' promotes the Bonfire brand and, ''a committed and ongoing relationship with consumers, to achieve sustained levels of financial viability over time'' (Mandlik & Kadirov, 2018, p. 306).

AGRICO – WhatsApp business capabilities: In aligning to the highly competitive and oversupplied agri-inputs market where sales margins are tight, AGRICO leverages social media big data-based technological capability, the newish, increasingly popular, easy to use social media freeware, WhatsApp Messenger, inculcating much needed organizational agility - speed and innovative business processes – thereby allowing the firm to retain a strong focus on the market and exploit profitable sales opportunities that would otherwise have remained untapped. WhatsApp enables the firm and its clients to share various data types - text, audio, video, images – used for analytical purposes and decision making.

HOTCHA – AI capabilities: The hotel chain plans to invest in modern, big data-based AI technological capabilities to meet emerging customer trends and preferences and business needs. These include face recognition for activities like opening hotel room doors and virtual tours. The interviewee explained: *''We want to go to facial recognition…Mariott has started doing that…a great number of the population is the millennial; millennials want tech service, and we've identified it's easy to attract them. We are building a hub, an F&B hub, and 60% is*

going to target the millennials…it will be exciting. Another thing that is on the cards - people like to come here, they go to museum, they go to Masai Mara, and all sorts of things. We are going to have a product called virtual; virtual touring. You pay a small fee, and you just go the museum with the google… you don't go there physically, because of the traffic jam and the rest…''

GALES - e-filing: The firm introduced e-files for clients to coordinate critical workflow, time tracking, and billing. A client file is essentially a legal database. Its digitization allows attorneys to analyze the legal contents efficiently - voluminous, varied, often unstructured data - and acquire meaningful legal insights for decision making. Systematized electronic legal records defray the administrative burden associated with retrieval and storage of physical files, ensure data is available promptly, increase attorney productivity, reduce costs for the firm and the client, and generally enhance the quality of legal service provided. The e-file is integrated with accounting for accurate and efficient client billing. The interviewee stated, ''*I want to take you back to the traditional set up of a legal firm – one could just walk into a law firm, and say you need representation, maybe you have a matter in court, so the secretary or the person who meets you at the firm, would open a (physical) file… Presently, where we are, you walk to GALES, and you need representation on a certain matter, we open a physical file, and there is also an e-file,… we have an accounting system where anything that is done on that file, the accounting system tracks… billing is also automatically generated at the end, once the matter is determined…you can simply query the system, it gives a breakdown of why you (the client) owe this much,…and am able to invoice…I think it's a very smooth system''.*

TBC – e-commerce platform: The firm has introduced an e-commerce platform that increases the opportunity for customers to buy the firm's products without physically going into a store. The interviewee explained as follows: ''*…we have… a very well developed e-*

commerce model through our website, which now allows us to make deliveries across the country. Someone logs onto our website, goes through the stocks that we have, classified in terms of educational, professional, everything, so wherever you are you are able to select, pay for it, define your destination and now we will be able to deliver to you…we are using our e-commerce platform a lot to push volumes, not just within the country, but outside the country….we are trying to push traffic away from the bookstores, so that it's at your (the customer's) convenience.

INVERE – client self-service & instant access: The firm's money market product attracts a high volume of retail clients who transact low amounts frequently. To right-size customer capabilities for the product, the firm researched, monitored, and pivoted different mechanisms, focusing on the customer need for speed. Finally, it settled on the most promising mechanism that allows customers to withdraw their funds instantly. Fast retrieval of funds when needed is a critical customer value proposition; this is because funds invested in the money market are mainly held either for transactions motive – cash to meet current personal and business exchanges – or for precautionary purposes – cash meant as security for any emergencies arising (Davidson, 1990). Additionally, the market regulator, the Capital Markets Authority, requires that money market investments be available for redemption within a short period. The interviewee stated, *''...for retail clients, we did a business case, (that) we would have to have a different approach… here we want to focus on the retail clients, a client who has 10000, 20000 shillings, they would rather have it in (an electronic wallet)… and to be able to give them this solution, then we have to give them sort of a self-service; they can deposit however they want, they can withdraw whenever they want… so it was the need for the business to venture into the regulated market,…that necessitated that automation, to make it cheaper or us to handle them... so, the technology bit, we embarked on research on how we are going to do this… we decided to go directly to MPESA and have it sort of like our back-end. For the*

bank withdrawals,… again, we embarked on another research and decided, why don't we use Pesalink, which offers instant withdrawals? And then we partnered with one of our payments service provider, and through them, we were able to establish an integration that now allows clients to withdraw instantly…'' Organizational processes around the continuous search for the custom-fit big data-based technological solution, learning and monitoring, implementation and recalibration when a solution seemed deficient, selection of the right payments service partner, all illustrate INVERE's purposeful modification of its resource base to align with market expectations.

INSCER- Cloud service platforms: By mapping the customer journey, the firm is able to pinpoint frustrations faced by customers, then ameliorate the 'pain points' with innovative big data-based technological processes, but in a process of eternal vigilance, because, as stated by the interviewee, ''…*with data, and with innovation, once you solve one pain (point) for the customer, there is another pain (point) awaiting you further down the road; (one) that you don't know, and the customer also doesn't know.*

Illustrative of its innovativeness streak, INSCER is launching a Cloud-hosted self-service digital platform where customers can buy insurance products online and similarly lodge their claims online. Besides, all systems used by customer-facing employees are hosted in the Cloud for convenient access. The interviewee stated, ''… *our goal is to make sure that all customer-facing solutions are on the Cloud. All systems that are in use by customer-facing employees are also on the Cloud because the customer-facing employees are meeting customers in (say) the garage, they are meeting customers in the hospital, they are meeting customers at their place of work, …and they need to be able to update the information and the conversations on a real-time basis, for processing in the back-end''.*

REINS – AI: The firm is exploring an upgrade of its current human manned customer chat facility to an AI-based chatbot, providing a fast, always online, 24-hour call center. The

interviewee stated, *''I saw that (automated Chatbot) with another company, and…I was to decide with the CEO, we really want to put it on our (system)… theirs is real artificial intelligence; so, I saw it, and we want to embed it on ours, so that, it can be able to help…''*. Besides having accumulated a large database overtime but bereft of advanced analytics capability, REINS is working with an external analytics provider to help analyze the firm's database for deeper marketing insights.

Kentainers – digitized business operations: The firm employs an array of big data-based digital business processes that include: 1. ERP software; 2. RFID-based staff attendance tracker; 3. Real-time information system to notify customers about the status of their orders; 4. Accessible Rich Internet Application (ARIA) strategy tool which facilitates responsiveness and interactivity – as each department prepares its own set of activities and budget, their actions can be contemporaneously reviewed by management; 5. Salesforce, a Cloud-based customer relationship management software, for enhanced interaction with the customer, from generating sales leads through to after-sales; 6. A digital system to elicit customer feedback about products and customer service; 7. Digital showcasing for products; 8. CCTV for security and ground operations surveillance; 9. Upcoming business processes include document management systems, barcoding of products, and digital logistic display board.

Absolute Adventures – Business processes interface & integration: To improve coordination and customer value-add, the firm plans to interface the internal analytics capability with its corporate customers, an 'Uber-like' user-centricity focus. The interviewee said, *''…more and more, we want to push this to the clients - (because) we realize it's the same thing that organizations are doing - so that clients are able to manage their own bookings and follow up. That way we also feel that there will be efficiency, what we've always been looking out for…basically what you just need to do, is to create an account for the user. Once that account has been created, then the user will be able to log on, and do their own bookings, if*

they want to cancel, if they want to amend…this is similar to how you can log on to an Uber page and (transact)…it's the same''. Another aspect of innovative business processes is exploring end-to-end integration of functions from customer booking, vehicle assignment, pricing, billing, and reporting. The interviewee stated: '*'we are working to link (booking) this now with the tracker, so that on real time basis, we can actually see which car is headed to pick who, how far it has gone, or whether it has now reached the point of pick-up…we've done this, booking interface with dispatch, its only now that part of the tracking and the accounting part, that (we are) currently working on…at the same time we are working on how then it will be able to reflect the pricing, once the customer has made the booking…and then, probably even on completion of the trip, instead of filling in the voucher, automatically it sends the soft copy to the client's account. We want to move (in step) with technology, do away with paperwork''*.

Crowe – Efficiency and quality processes: To improve efficiency and quality of audit work, the firm has invested in relevant big data-based technological processes and mechanisms to capture and process vast amounts of data and coordinate audit work within the firm. These include 1. 'CaseWare,' a Cloud-based tool used for distributed audit data collection, sharing, and collaboration amongst audit staff, for analysis and eventual reporting to clients; 2. 'Huddle,' a network tool for collaboration with clients and network partners; 3. IDEA (Interactive Data Extraction and Analysis), a data analytical tool capable of handling large and complex datasets. The interviewee stated, *''Our audit processes are computer-based; and (they are) Cloud-based, meaning that we have a lot of collaboration that happens between our teams wherever they are, supervisors and customers. Our main audits (tool), which is an international software, it's called CaseWare Working Papers… we also use other tools, like we have a tool called Huddle. This is our Crowe network tool that is used for collaboration. So if I want to collaborate with our customers, our network partners, wherever, in US, UK, we*

use Huddle, and there we share information, including files for audit and reviews. If you are dealing with a client who has a lot of data that needs to be tool-assisted, at Crowe, we have that tool that does that. It's called IDEA, which we use to run various data analytics on our clients' data…''

FURNT – e-commerce capabilities: The firm has developed an e-commerce website where furniture and related products are displayed to customers to peruse and purchase electronically. The interviewee stated, *''…the e-commerce website…it's currently running…So, basically what happens is, we put (display) our products there, and somebody who is willing to buy, they can click on the product, and then add to cart, and then from there, they have the…opportunity of maybe paying via M-PESA, or bank transfer, or using their swipe card…we call it, the website, it's a 'click' (store), then the branches, we call them 'brick-and-mortar' (store). So if you compare the website and the brick-and-mortar, the cost of running the website is quite minimal, and that's why we try to direct most of our customers to the website''.*

Tangazoletu – Modularization: Big data enables the firm to undertake modularization - selling a converged system as unbundled micro-products. Modularization is not an insignificant paradigm as it allows exploitation of the 'kadogo economy' (Handley, 2019), a local phenomenon whereby buyers prefer to purchase products in small quantities. The trend finds applicability among small and medium-sized businesses who may opt to first invest in limited aspects of big data digital technology, based on need or budgetary constraints, but with the option of later integrated enhancements as the business grows. The interviewee stated, ''*…we build the technology, but we modularize it, so that people are able to take them up based on their need. So, instead of selling somebody a whole, huge, enterprise system, if they are a small back-office only SACCO, they can take the back-office module and the finance module, and they are happy to run. If they are as big as UNAITAS (a SACCO), who is almost*

a bank, then they need to take all the processes, including the payroll, the HR management, asset management…so the systems are all modularized, and they can accommodate the (needs of) different kinds of people''.

Strathmore – Data modeling, AI & learning analytics: The University is experimenting with advanced analytics and plans to use AI-face recognition technology to capture data from walk-in inquiries in the admissions office. The insights will help determine conversion rates, inform marketing efforts, and decisions about staff coverage in the admissions office during times of peak demand. The interviewee stated, ''*We hope to be able to monitor traffic in our admissions office, to learn… we have a few models already developed that can monitor the number of people who come here and exit, and using facial recognition… it's something that we have for the future…so we've created an advanced analytics concept, eventually after we get the basics right, and have a real good look at the way things are running, will get onto that''.* The ability to learn by experimenting with advanced big data technologies and willingness to fail before getting it right indicates seizing dynamic capabilities. The University also plans to implement learning analytics to monitor student academic performance, proactively encourage students to stay engaged with, and complete their studies. The interviewee stated, ''*Again (as) part of advanced analytics, (there) will be something called learning analytics…(we) want to be able to implement learning analytics in Strathmore. It helps…map the student experience;… predicting (which) students will drop out,…looking at the attendance and actually being able to predict whether the student is likely to drop put or not. Now with that, we can be able to prompt the mentor to kind of come in and look at, maybe there are some issues happening, so we can actually be able take advantage (of the situation), and talk to (the student),…see what is happening to encourage them to stay involved (with their academics)*''.

Vestergaard – Digital marketplace: Previously, the firm sold hermetic grain storage

bags to farmers using the conventional distributor-retailer model, which has proved infeasible as it makes the product expensive for the final buyer. In response, Vestergaard is reengineering the business model to a digital marketplace (DM) codenamed 'Chombo' (Swahili for 'container'), meant to match the demand for storage bags by farmers – the firm's final customers - and suppliers of the devices, facilitating exchange transactions between the two parties. The ability to scan market and technological developments and choose the appropriate technologic-based business model indicates dynamic capabilities. The interviewee stated, ''*…we have redesigned our product…with a specific price point in mind, and we are launching this; because that was the data that we got from the customer… along with this lower price now, we want to help entrepreneurs to start community-based warehouses… using our new, cheap storage bags. So that's what 'Chombo' is about…of course, this is an IT based solution. It will be mobile-based. And so, what the application will do is that, it will create a marketplace between between buyers and sellers. So the buyers are the entrepreneurs…(they) can go and meet the farmers and tell them, 'register to the 'Chombo,' I'll buy your maize at market price, and I'll store it for you. And then what the 'Chombo' does is that it's like an inventory and ledger management system. When (the entrepreneur) sells the maize, the people who have supplied the maize (farmers), they will receive a percentage of the profit…So that is like (an) IT data solution that we are we are providing alongside our bags; and the reason we're doing this is that, we know that this will be a fast way for us to get our bags to be used by small scale farmers.''* The interviewee also noted that the 'Chombo' platform would enable the firm to charge a minimal transaction fee for users, effectively sell a digital service in addition to the storage bags. He stated, '*'Of course, we're going to make money now from people who use the application. Yeah, it's like MPESA, (we will) charge a commission on the transaction. This is how we're going to prepare ourselves through selling a digital service in the future. So that will allow us now to enter into a new segment*''.

ADCOMS – Automated, digital marketing platform: The firm has invested in a proprietary big data-based marketing platform whose objectives are to improve advertising effectiveness, sales, and customer management. The interviewee stated, ‘’… *we have a product,… a (digital) marketing platform. So obviously, looking at where the trends are heading, we created a platform internally’’.*

COSAC - Point of sale-cum-customer visits, m-banking: Facilitated by big data-based technologies, COSAC focuses its business model on serving underbanked clientele through two main big data-based customer service procedures: Point of sale- cum-customer visits and mobile banking. The interviewee CEO explained that the SACCO firm's members/customers' expectations and financial behavior are evolving – they expect quick, reliable, transparent, 24/7 service. Also, the main clientele, microbusinesses, tend to shy away from banking halls, but they readily transact when approached personally at their business locales. In adapting to these realities, COSAC has developed and empowered its frontline employees – the firm's marketers – with point-of-sale (POS) gadgets for use during regular physical visits to customers to facilitate banking transactions. The CEO stated: ‘*’we have the marketing staff, walking around with the gadget, called a POS, which is integrated with our core banking system. It's like a moving branch. They are able to… go to 'mama mboga', so within a day they are able to cover quite a large number…because, in most cases you find that, business people, unless they see you physically (they will not deposit the monies); some of them will do it via mobile phone, but they say it is expensive, because there is a charge (a mobile service provider transaction fee), but now when you go and collect, they will comfortably give it (the money) to you. Once they see you they'll give you, but once you talk on phone, ''ati tuma'' (and you tell them to send the money via mobile), they will promise, but they will not. So now when they (the sales reps) go there, they collect, issue a receipt; the system, those POSes, those gadgets are integrated with our system, with our core banking system*

(ERP)''. The firm idiosyncratic process - POS combined with physical visits - enhances customer transactions and growth and provides an opportunity for garnering latent market insights that can be leveraged for value. COSAC has also invested in a mobile banking platform that facilitates real-time, continuous customer transactions, a capability which the CEO said is imperative: ‘*''And we've made it in such a way that, 24/7, you (the customer) are able to do whatever you want (i.e to transact as necessary)… once he (the customer) is assured that he can… access it (his money) through the (system), so ''ikifika kule ianze kukwama kwama, munakuwa na shida na yeye'' (if the customer cannot access his money with ease, after having banked it, you'll have problems with that customer). So, (for) our service provide, the service level agreement is very clear – this (maintaining a functional mobile banking platform) is a 24/7 service.''*

4.4.3 Big data-driven omni-channel customer engagement processes

As part of their innovative business practices, the study finds that almost all firms employ digital omni-channels for engaging with their customers. The mechanisms used include mobile money (especially MPESA), USSD, various social media channels (for instance, Facebook, Twitter, Youtube, WhatsApp, Instagram), mobile apps, mobile banking platforms, e-commerce platforms, SMS. For instance, Bonfire recognizes that as a consumer-facing service business, increased engagement with the customer base provides a basis for heterogeneity and differentiation. With consumer behavior shifting towards researching and booking travel destinations online, the company uses social media (Facebook, Youtube, WhatsApp) and mobile SMS as marketing tools to ignite interest in destination offers, sell travel packages, and concurrently listen to customers feedback about service delivery and product preferences. According to the firm's CEO, digital, online traffic impacts offline traffic*: ''They (SMS marketing messages) are effective, I cannot complain, yeah. Even walk-ins…they (clients) can see something on social media, and they walk into one of our offices''*; INSCER

combines social media, bots, and MPESA as stated by the interviewee: ‘’…*there is a lot of convergence (by customers) around social media. So, what you will find is that the bulk of our marketing activities and activations are happening on social media and pushed through the mobile either in form of an SMS; and now we are in the process of implementing a bot, a WhatsApp bot, and a Telegram bot, meaning a customer can access (us)…they can write a chat, (we) can respond, (we) can sell service on the WhatsApp bot. They (customer) can request for a quote, they can lodge a claim, they can make a payment through M-PESA, they can even buy insurance off the bot.’’;* Bluewave employs USSD, web, app, and MPESA; COSAC uses a mobile banking platform and POS, with instant SMS notifications to its members (synonym for customers) about their banking transactions and status. According to the firm's CEO, the SMS capability of ubiquitously informing members is important. It engenders trust and confidence, which he noted is especially crucial when dealing with clientele served. He stated, *‘’that (SMS notification) is important to our members because it also gives them confidence. So that is a 'plus'''.* This observation is consistent with Sebastian et al., (2020) study, which found that for USAA bank (coincidentally, just like COSAC, USAA also refers to its customers as 'members'), trust and loyalty-based customer relationships become a strong performance differentiator in digital environments.

4.5 Organizational learning

Case findings indicate that, in the dynamic environment, firms adapt via deliberate organizational learning processes that augment the potential for sensing market and technological developments, strategize on adaptability, leading to better firm performance (Easterby-Smith & Prieto, 2008; Harris et al., 2013). Organizational learning occurs at the firm level through organizational big data-based routines and processes, including BDA, discussed in previous sections. Additionally, the study shows that organizational learning occurs through two other processes, described below:

The study finds that firms are purposefully adapting to the evolving market dynamics by institutionalizing strategy, planning, research, and related mechanisms (SPRM). Such big data-actuated mechanisms and processes are indicative of dynamic capabilities as they essentially drive structured sensing and evaluation, to understand the purport of changes occurring in the customer and market environments, enable the firms to respond appropriately, operationally, and tactically (Wilden & Gudergan, 2014), buttressing sales performance. Examples include:

LICABO – Data and strategy unit, teaming: To 'sense' market and technological developments and strategize on adaptability, the bank employs learning processes that include a data and strategy unit, collaborative planning, and benchmarking with similar institutions. The interviewee said, '*''The bank is made up of very many teams that are focused to certain areas; we have a team that is specific, meant for strategic (issues), that actively thinks (about) where we want to go to next. But we do more than that…every quarter, the bank consolidates its people, its managers, (in) an active session; we do close to 2-3 days, thinking about where do we want to go*''.

mHK – Hackathons, technology research arm: As explained by the CEO, maintaining firm competitiveness is buttressed by enhancing technological capabilities, and research: *''we usually plan for hackathons if there is an urgent need for a technology enhancement that would otherwise take months or weeks. We use hackathons to bring the whole team together to work on one deliverable…this is the reason we have managed to develop systems within very short timelines''*. The CEO further stated that a key plank of the firm's strategic plan is to establish '*''a research arm, in partnership with universities and any research organization…we want to be known as an organization that is specializing in technology research… people like the IBMs of this world, Microsoft, anybody who has analytics, will be looking for us*".

TBC – Planning & strategy unit: To better grasp and exploit changes in the book retail market and technological environments, the firm effected top management changes and established a planning and strategy department. The department conducts structured market sensing, its learnings being used for decision making, allowing the business to seize the emerging opportunities through technological and other capabilities profitably. The interviewee explained as follows: *''…it (the department) was never there, it's a new concept to them… TBC, for the longest time, it's been a very laid back and reserved brand... besides being family-owned, it's also been family-run. But it got to a point where they (the family) realized that this is actually taking out everything (stifling growth, with no new ideas), so they decided to bring on board experts to do that (revitalize the business). Our current MD (managing director) is the first non-family member to occupy that seat. He's an expatriate, he's worked for some leading brands – Nike, he's worked at BCG (Boston Consulting Group), he's quite solid; he joined the company in June, he's been trying now to build a team for the future; that's why I also (came on board)… it's now our mandate to turn the TBC ship round in line with the current (technology-driven) market trends''.* As noted by Schoemaker et al. (2018), as part of adaptation to a rapidly changing market environment, firms often resort to fresh leadership and new business structures, allowing new cognitive perspectives to take hold and innovations to flourish.

Nouveta – Product development sessions: The bulk of the firm's revenue comes from futuristic product development endeavors, not merely meeting current, ad hoc client needs. The firm's strategists carry out research, envision future market and technology trends, then design products to fill the gaps identified. The CEO described the organizational and managerial routines for understanding current and future customer needs, followed by the development of prescient, innovative, big data-based digital solutions: *''our general approach is to build (with) what we call, 'future market' in our minds… I've got a team of six managers. We normally*

have quarterly product development sessions where we try to imagine how the future is going to look like, and then based on that, we try and design a product that can work in that picture we've designed. Once we've designed that future, we come back locally and ask ourselves, 'what is happening in that particular industry, and what are the current needs of the of the companies that operate in that industry or in that market?... I'm using quite a bit of my Deloitte experience in doing market analysis, market research, future projections, and strategic modeling to be able to come up with ideas of how to (build) the product effectively''.

INSCER – Digital & innovation department: The firm has established a digital innovations arm for spearheading purposeful, systematic, digital transformation across the enterprise. Its roles also include the inculcation of evidence-based decision-making culture by training managers in data analytics. The interviewee stated, *''We have a digital transformation department…and you know, like a good example we use when we are teaching our managers on how to consume the data …we do hold some courses of helping them (managers)... as a digital department, it is our responsibility to demystify what is data analytics…''.*

Crowe – Data training routines, COVID-adaptation learning: The turbulent market environment impels audit firms to invest in big data tools and processes as a means of adapting their businesses to the changed reality (Salijeni et al., 2018). Crowe concurrently seeks competitive advantage through systematized internal and external knowledge generation and learning routines that spruce up individual audit staff's competency, the drivers of corporate change (Brix, 2017; Teece, 2019). The interviewee stated, *''Our relationship with big data, and everything that happens around data, is actually hinged on the fact that, yes, that's where the world is going, or has gone during this COVID period… (just) last week, we were looking at the training timetable for staff… at what learning areas (do) we really need to train our staff on; And we have some interesting areas of training including psychological areas; where you need to train an employee on how they can work alone…And of course, in our case, we have*

an IT department that supports our employees wherever they are, any challenges they have. Other than the internal (trainings), we also have the Institute (of Certified Public Accountants) trainings on how people should go about dealing data during this COVID (period), now that data is online… We also have the (Crowe) network doing webinars on data protection''.

Tangazoletu - Agile methodology, Kaizen philosophy: Operating in a dynamic financial technology sector, the firm relies on purposeful managerial routines – including agile and Kaizen methodologies - to cultivate a change perspective, encourage staff innovativeness, and continuous improvement. Agile drives innovation, de-emphasizes routinization and accentuates innovations around new customer offerings and functional processes. Companies that adopt Agile churn out innovations faster in both categories (Rigby et al., 2016). On the other hand, the Kaizen management technique focuses on, among other things, incremental improvements to products/ services and business efficiency (Janjić et al., 2019). The CEO explained: '' *So, we've got internal processes of agile, (and) we've borrowed heavily from Kaizen… our internal process is alive to change; and every day, we are talking about how we must improve the things that we are doing. We've adopted a methodology called agile…it's just a methodology that believes in so much change. Every day is a learning process, and you have to have the right mindset to keep learning and improving, which means 'keep changing.' So, we believe in it so much that it is part of our core values… And that's what we do. So, every now and then we have sessions…twice a week, for an hour, we have training sessions where we just go through change, and look at what other things we need to adapt to… every day (before) everybody goes home, has to tell me what they have learnt… everybody has to learn something continuously. So, being a learning organization just opens up everybody's possibility to asking, 'what more can I do?', 'what more can I learn?', 'how much more I can I be of more impact?'. So, naturally, if (the) entire team is aligned towards that learning model, then, continuous improvement becomes a natural thing''*. As noted by Teece (2014b), the

entrepreneurialism and transformation leadership evinced by the firm's CEO indicates the existence of DC, which enables the firm to assess markets and technologies, conceive and deliver new demand-based solutions.

CHAGRO – external data surveys: For an enriched understanding of the market environment, the firm contracts external surveys to collect pertinent data. For instance, the interviewee stated, ‘*’…we have the agro dealer data - we commission Ipsos (a survey firm) to do a full agro dealer census….the main purpose of this was to know where our agro dealers are, we geo-tagged them, and they took a photo of each and every agro dealer, around 6,000 of them. We wanted to know the spread, and who is stocking what; and if they are not stocking, what is the problem, is the affordability a challenge, etc”*.

Strathmore – data analytics unit: The University has established a full-fledged data analytics unit to spearhead big data-related strategy and projects. The interviewee stated, ‘*’ I am a data scientist and the manager in charge of the data analytics unit. Our mandate is basically to be able to collect data from all data sources within the University, synthesize that data simplify it for management… it is the central data unit that does that…before we didn't have a data strategy, but now we are actually putting in place a data strategy.* The data unit researches, ‘brainstorms’ ideas about current technological trends, and pivots various solutions prior to adoption by the University. The interviewee explained, ‘’*…I do a lot of research about data. Am very passionate about data, so when I look at data and see all the possibilities that are there. But I don't do it all by myself; I have a team, …we have we have three back teams, we call them squads. So the squad for data integration…the squad for service and analysis,…and then we have the squad that is responsible for reporting and dashboarding…so we usually also sit down and brainstorm ideas - what do you think of this? why can't we add this? …we've seen this University doing this and all; And also, senior management plays a big role…we don't just come up with ideas, we look for solutions to their problems…we usually*

note (their problems), and as the year(progresses), we sit down with everyone, and they tell us the problems they are facing, and what they think will be an improvement. And then we…come back as a team, we figure out what are the different possibilities; then we go back to the manager, and we present three different solutions…then now we look at it (the solution) based on budget (and) on time (constraints), and they will now say, 'okay,… I like this, let's go for this, (in) three months, let's see what (results) we get' ''.

ADCOMS – Digital cum planning unit, specialist research firm: Being heavily reliant on data to drive its business model, the firm has an internal strategy and planning team and an affiliated specialist research firm, structures for inculcating requisite big data and related business competencies. The interviewee stated, *''…we have what we call a planning team…in charge of strategy and research. But for deep-dive research, where we require a lot of data, we have a (separate) company…, which is a research agency…''.*

Bluewave – Human-centered design, market surveys: The firm uses a human-centered approach, plus focus group market surveys, to understand market challenges and risks and as inputs for client-focused product development. The interviewee stated, *"…we use what is called human-centered design in product (development), whereby we start from the customer, before coming out to providing the (product). As compared to traditional insurance whereby, for instance, people sit in the boardroom, decide that this is best. But when you go to the market, the customers say, 'no, I want it to be like this.' So for us, we start from the customer; the customer tells us that, 'we need just a health insurance product where premium is, maybe only 20,000 shillings in a year, maybe the (cover) limit is only 100,000 shillings'… we conduct focus groups so that we get real information from them (customers)…''*

4.6. Managerial entrepreneurialism

This study finds that, in a dynamic big data technology-mediated environment where competitive advantage is often fleeting rather than sustained, continued firm adaptation rests

not only on formal processes and routines but, significantly, on individual entrepreneurial managers. By their actions and behaviors, entrepreneurial managers facilitate the assessment of market or industry conditions and trends, technological opportunities, they envision and articulate strategic direction, secure alignment, and commitment of the team to design and implement new products, processes, and business models (Augier & Teece, 2009; Teece, 2007). Conceptualizing how a firm should cope with marketplace changes is acknowledged as a source of competitive advantage, hence a dynamic capability (Lu et al., 2010). Several cases in the study – discussed below - suggest that entrepreneurial management is required for firms to perform their competitive-adaptive functions in the big data environment.

A24M: As the big data technologic environment is progressively catalyzing systemic changes in the media industry, the firm's CEO 'sensed' the implicit market opportunity which lay in digitizing the vast archive of VRIN strategic media assets accumulated since Mo Amin's pioneering days in the 1980s, augmenting with new content, designing a product and business model for going to market. He stated, *''my business is 50% media house, but we should be a technology company. We have materials which no one else has; he (Mo Amin) was a great visionary, putting all these materials together, preserving and labeling in VHS ('Video Home Systems') tapes. Who would have thought then that such content would become so valuable?...the Board has told me we need to disburse the content; the challenge now is how to do it''.* In response to the Board's strategy, the CEO orchestrated the shift from the previous B2B towards a B2C, Netflix-type VOD business model.

mHK: The onset of the COVID-19 pandemic saw a resurgence of big data-driven disease surveillance practices, with health authorities and companies partnering to 'digitally ring-fence suspected and 'positive' infections (Roberts, 2020; Zwitter & Gstrein, 2020). The mHK CEO assessed the Kenya government's response (coordinated through the National Emergency Operations Centre, EOC), noted the gaps, recognized the implicit technological

opportunity, designed a prototype big data-based digital solution, then sensitized the EOC on its value proposition. The outcome of the CEO's entrepreneurialism was the 'Jitenge' COVID-19 app (previously discussed).

Bonfire: The firm has a deliberate sense-making routine spearheaded by the CEO. Once marketing has collated internal sales data, plus external social media feeds, the directors participate in its analysis and subsequent decision making, based on the insights gained. The CEO stated, *''... He (the marketing manager) does the reports, and the directors analyze them…at some point, you have to analyze''*, indicative of the firm's ability to assign meaning to the data, the basis upon which requisite action is executed. As expressed by the CEO, the firm's insight generation process is reflective of a key idiosyncratic dynamic capability, being how corporate work is carried out to achieve the set objectives (March & Simon, 1958). Processes often have subtle but powerful effects on decisions, especially if team members, by their learning or experience, are hampered by their existing cognitive frameworks and are therefore unable to comprehend the significance of new technological tools of analysis or the strategic insights implicit in the data available to them (Henderson & Clark, 1990; Sharma et al., 2014). The CEO's further comment poignantly indicated that managerial cognition trumps analytics, making it possible for the firm to comprehend the data better. She stated, ''*….as in, it's good if you analyze, (but) as much as we have (analytical) tools, at some point, we need to reason (make sense of the data)''.* Such managerial cognition borne of data – not only the hindsight and insight afforded by customer analytics, but also foresight, a perception beyond the numbers, akin to 'seeing around the corners' to recognize and anticipate possible marketplace developments before they occur – is a critical dynamic capability, analogous to 'abduction,' a mode of inference where persuasive explanations are developed from data, with the potential of yielding anomalous phenomena. (Teece et al., 2016).

Nouveta: Right from inception, the firm's founding CEO conceptualized it as a 'born

digital' entity for driving digital business transformation with products whose design, production, and delivery are anchored in big data (Panetta, 2016; Vadana et al., 2019). He stated: *''...Nouveta means 'new life'. It's a mixture of French and Latin. In French, 'nouve' mean new, and in Latin, 'veta' means life. The reason why we took that (name) is because when I was setting up Nouveta in 2016, I could see a significant gap in the way people look at digital transformation because people think that having an M-PESA paybill is digital transformation…So I decided, let me build a business that can take the M-PESA pay bill and unpack it quite significantly, to enable businesses to leverage on digital money to be able to provide services much, much better and much, much faster''*. The CEO's managerial cognition – perception, attention to marketplace technological developments and trends - is a key underpinning of dynamic capabilities (Helfat & Peteraf, 2014).

Kentainers: The firm's CEO unequivocally articulated the underlying vision behind their investment in big data capabilities (the tools and processes) as a business enabler - to provide information and insights to salespeople for improved sales performance and to management for improved business performance. He stated, *''So, there is IT, or data, or whatever tool we use; eventually it's part of the same family. The objective… at the end of the day, all these tools, all the processes, (they) should help the performer. Let's say somebody is…a salesperson…these kinds of tools (is for) helping them to improve their performance. While this tool can (help) access information, data, in a quick time basis, (it) also can give them the information in the format they want to action, or to improve their performance…now, this is how at a management level we look at it…you can store, collect, information/data, then you should be able to process…and then give the important information to the (users), to improve performance; this is how we look at it''.* The mental frame that the CEO carries about their work (Mintzberg 1994), and the facilitative role of big data technologies, indicate a dynamic capability that makes for effective management, a contributor to firm performance.

Tangazoletu: Conceptualization of the firm's technological opportunities, plus strategic direction, significantly depends on the CEO's cognition, acumen, and transformational leadership, evidenced through the introduction of agile and Kaizen management philosophies, as well as his imprint in specific innovative outputs; for instance, one of the firm's early products, which he explained as follows: '*'So, like my first solution, I gave to a water utility company – which ideally was (that), people were getting their water disconnected, because they had not paid the bill. But the problem was not that they did not have (the) money (to pay), it's because they were not getting the bill in time. And therefore, you go home, you find your water is disconnected because of (a small debt) 500 shillings. So, I introduced a system where (the customer) would receive SMSes, to tell you that your water bill is 500, if you don't pay by this time, it will be disconnected…*''.

COSAC: The firm's CEO recognizes the emergent market and technological environment as the prime driver for refocusing the business model with big data-based technology capabilities, enabling the firm to grow its business through broader market reach and reduced overheads. Accordingly, the CEO initiated the 'POS-customer visits' model focusing on small business clients, an approach which he says recorded about 98% of overall business growth. The CEO stated:, ''…*As time goes by, and as new technological applications come on board, you find that (if) you still stick to what you were doing yesterday, you run the risk of being obsolete in terms of service delivery, and efficiency in how you are responding to your members' needs… From a business perspective, you are able to grow your business (with technology)… like now, since I joined, which was three years ago, that POS was not there. And numbers were growing at a snail's pace…(but) you see now where they are…and the bulk of it, about 98% are from these business people, because the (traditional market)…who are teachers, most of them are retiring, in huge number, and the government is not employing.''*

4.7 Facilitative elements of big data capabilities

The preceding research findings demonstrate how Kenyan firms adopt big data in their businesses through big data-based organizational/ managerial processes that allow firms to simultaneously and synergistically develop BDC. Based on the literature, this study characterized BDC as a composite capability of big data technology (in its multifaceted hardware and software dimensions), big data talent, big data strategy, and management. BDC buttresses the processes of sensing, seizing, and transformation by which firms seek to create competitive advantage in the dynamic market environment.

Albeit to varying degrees, the detailed facilitative elements of BDC observed across all firms in this study are: Social media (Soc), Mobile (Mob), Analytics (Alt), Cloud (Cld), Internet of Things (IoT), complementary information technology (IT), enterprise resource planning software (ERP) and its variants, big data talent (Bdtal), management (Mgt) and, big data strategy (Stgy). This finding is consistent with the literature (Gupta & George, 2016; Hassna & Lowry, 2016; Mikalef et al., 2019, 2020; Ross et al., 2019; Wamba et al., 2017; Zeng & Khan, 2019). Taken singly or in an unsystematized fashion, the facilitative elements of BDC could mirror lower-order big data capabilities (LO-BDC); systematically coalesced, they are akin to higher-order big data capabilities (HO-BDC) that generate higher performance benefits. LO-BDC is expected to partially mediate firm performance, while HO-BDC could mediate firm performance more (Fainshmidt et al., 2016). This concept of hierarchically ordered BDC is similar to recent big data studies such as Akter et al. (2016) and Mikalef et al. (2020).

To summarize, sections 4.2 through 4.7 (supra), Table 4 compares BDC across the studied firms and the associated sensing, seizing, and transformation schema (Teece, 2007, 2012, 2014a).

Table 4

Comparison of Big Data Adoption across Firms

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
C1	A24 Media	Media - Audiovisual	Mgt, Stgy, Soc, Alt, Cld, IoT, Bdtal	o BD combinative capabilities; o BD-based product & business model; o BD-based omnichannel customer engagement; o Managerial entrepreneurialism	Sense, seize	o 'Yebo' VOD platform
C2	LICABO	Financial services - bank	Mgt, Stgy, Soc, Mob, Alt, IoT, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize, transform	o Transaction outlets (Web, Mobile app, ATM's, POS's); o Capture transactional behavior and customer experience; o Use digital tools to capture customer engagement, recognize latent customer needs; o Design and approach customers with 'custom-fit' products; o Open API's; Strategy and planning meetings, benchmarking
C3	mHealth Kenya	ICT - Mobile health solutions	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, IT, Bdtal	o BD-based product & business model; o BD analytics; o BD-actuated strategy, planning, research & related mechanisms; o Managerial entrepreneurialism	Sense, seize	o Mobile health solutions/ products: mLab- reducing turnaround time for HIV test results; T4A - automated patient appointment defaulter tracing diary; EMR - enhancing clinical decision support systems; 'Jitenge' - COVID19 tracking and prevention; o Hackathons
C4	Bonfire Adventures	Tours, travel & events	Mgt, Soc, Mob, Alt, IoT, IT	o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement; o Managerial entrepreneurialism	Sense, seize	o Online traffic captured and converted to sales; o Feedback on popular and desirable destinations elicited; o Combining transactional and social media data for better insights;

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
						o Management decision making routine, anticipate future scenarios; o You tube channel providing value-add to customers, helps keep customers engaged with the 'Bonfire brand
C5	AGRICO	Agriculture - agricultural inputs	Mgt, Soc, Mob, Alt, IoT	o BD analytics; o BD-based business processes	Sense, seize	o WhatsApp enabling customer service, market intelligence; o Social media monitoring resulted in a new sales outlet o Internet banking procedures improving cashflow and sales
C6	HOTCHA	Hospitality - hotel chain	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement	Sense, seize, transform	o Efficiently enhance customer experience from booking to checkout; o Analyze local food prices, buy 'local'; o Modern F&B hub, AI technologies
C7	GALES	Legal services - legal firm	Mgt, Alt, IoT, Cld, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics; o BD-based business processes	Sense, seize	o e-files, efficiency of workflow, time and billing; o DMS - effective storage, retrieval efficiency; effectively navigate legal knowledge repository, increase quantity and quality of searchable facts and information held in Client files and legal documents
C8	Text Book Centre	Diversified bookseller	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD combinative capabilities**;** o BD-based business processes; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize, transform	o E-commerce platform established; Hire of e-commerce manager; o New ERP and CRM systems implemented; o New, non-family CEO hired; o Strategy and planning department established; o Technology-driven business strategy designed;

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
						o Collaborating with business ecosystem partners
C9	Nouveta	ICT - Digital solutions	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, IT, Bdtal	o BD-based product & business model; o BD-actuated strategy, planning, research & related mechanisms; o Managerial entrepreneurialism	Sense, seize	o Revenue & financial management products: *RevenueSure, Blink, Shule, SACCObenki* o Product planning sessions, research
C10	INVERE	Investments & real estate	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement	Sense, seize	o Central data warehouse established o Instant customer withdrawals and deposits via mobile money, bank; o Fraud detection routines in place, AI technologies for detecting fraudulent transactions; o Digital marketing, virtual market promotion trainings
C11	INSCER	Insurance - Underwriter	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize, transform	o Alleviating customer 'pain points; o Multiple, digital customer service touchpoints; o Analytics to mitigate fraud, identify cost reduction opportunities, improve operational efficiency; o Digital transformation department; o Training managers in data analytics
C12	REINS	Insurance - Insurance agency	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD analytics; o BD-based product & business model; o BD-based business processes; o BD-based omnichannel customer engagement	Sense, seize, transform	o Digital motor insurance product; o Digital payment options integrated with insurance underwriters; o Contracts that allow harnessing of primary client-owned data; o Selling bulk SMS services to other data users

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
						o Data mined for insights leading to expansion of revenue streams from core motor insurance to other insurances
C13	Kentainers	Manufacturing	Mgt, Stgy, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics; o BD-based business processes; o Managerial entrepreneurialism	Sense, seize	o Ebizframe ERP; o RFID time attendance systems; o Service process analytics to keep the customer updated; o Salesforce customer interaction process; o Customer feedback management system via customer analytics; o Internet-based ARIA tool for project management
C14	Absolute Adventures	Taxis, tours & courier	Mgt, Stgy, Mob, Alt, Cld, IoT, ERP	o BD combinative capabilities**;** o BD analytics; o BD-based business processes	Sense, seize, transform	o Trackers installed in cars; vehicle tracking, assignment, dispatch process o Booking portal; color-coded dashboard; o Customer notifications system o Server hosted by cloud provider in Canada; o Plans to interface internal analytics system with customers; End-to-end integration of the business process from booking, vehicle assignment and billing
C15	Crowe Erastus	Audit & advisory services	Mgt, Alt, Cld, IoT, IT	o BD-based business processes; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize	o Cloud-based audit; o Collaboration and meeting tools; o Complex data extraction and analysis tool; o Trainings on data management in COVID environment

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
C16	FURNT	Furniture Retail	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT	o BD combinative capabilities; o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement	Sense, seize	o Single database, cloud-based ERP that captures inventory, sales, financials, HR; o e-commerce website; MPESA payments functionality; o Digital marketing & Google Ads; o Customer feedback mechanisms - Google forms and Social media
C17	Tangazoletu	ICT - Fintech	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, IT, Bdtal	o BD-based product & business model; o BD-based business processes; o BD-actuated strategy, planning, research & related mechanisms; o Managerial entrepreneurialism	Sense, seize, transform	o Mobile banking for SACCO's; 'Lipa na MPESA' product o Ongoing market research routines; o Routines for learning from customers about their needs; o Creating an environment that fosters change and learning attitude and behaviors, staff innovativeness; o Modularization
C18	CHAGRO	Agriculture - Agrobusiness, chemicals	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, IT, Bdtal	o BD analytics; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize	o M&E tools; Salesforce.com; Satellite technology; o 10,000 hectares of farmland digitized o Proprietary farmer digital learning platform o Survey firm contracting
C19	AMOTORS	Automotive sales & service	Mgt, Stgy, Alt, Cld, IoT, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics	Sense, seize	o Automotive-centric CRM enabling better customer views, therefore insightful customer engagement; o Customer service complaints handling mechanism - ERP provides improved coordination between sales and service teams; o Process for tracking client vehicle service metrics, KPI's provided to the clients

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
C20	Strathmore	Education - Higher learning	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, Bdtal	o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize	o Full fledged data analytics unit; o BD strategy; o Student journey mapping; o AI for analyzing 'customer' footfalls; o Learning analytics processes to monitor student academics; o Researching and 'brainstorming' technological trends
C21	Vestergaard	Food Security and health	Mgt, Stgy, Alt, Cld, IoT, Bdtal	o BD-based business processes	Sense, seize	o Chombo' platform facilitating buying and selling of grain storage bags, grain aggregation and trading; o User fee to be levied on 'Chombo' entrepreneurs
C22	ADCOMS	Communications & *Advertising*	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD analytics; o BD-based business processes; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize	o Data collection tools and analytics routines employed; o Analytics driven marketing projects; o Using customer behavioral analytics for strategizing; o Internal strategy and planning team, an affiliated specialist research firm o Proprietary big data-based marketing platform
C23	Bluewave	Insurance - Insurance agency	Mgt, Stgy, Soc, Mob, Alt, Cld, IoT, ERP, IT, Bdtal	o BD combinative capabilities; o BD analytics; o BD-based product & business model; o BD-based omnichannel customer engagement; o BD-actuated strategy, planning, research & related mechanisms	Sense, seize, transform	o Converted business model from traditional insurance agency, to technology-based, focusing on microinsurance; o 'Imarisha Afya' product o Using AI and analytics in managing default risk, fraud, product design, pricing, effective marketing; o Uses various digital channels for customer engagement – web, app,

Case	Company	Industry	Main BDC facilitative elements	Main microfoundations of DC	DC in operation	Outcome examples, artifacts
						o USSD, as well as 'Lipa na MPESA' e-payment platform; o Invested in Cloud hosting and advanced data analytic tools
C24	COSAC	Financial services - SACCO	Mgt, Stgy, Mob, Alt, Cld, IoT, ERP, IT	o BD combinative capabilities; o BD-based business processes; o BD-based omnichannel customer engagement; o Managerial entrepreneurialism	Sense, seize, transform	o Point of Sale (POS) and customer visits, and m-banking; o Business model adjustment; o 98% of business growth arising from micro-businesses segment

4.8 Challenges impeding development of big data capabilities

Several key impediments to big data adoption, and consequent development of BDC, were identified by interviewees. These include 1. High big data infrastructural costs; 2. Availability of big data talent; 3. The rapid rate of technological change; 4. Cybersecurity. For instance, the interviewee from the legal firm, GALES, cited the high cost of acquiring hardware and licenses. He stated, '' *(Our) hardware investment is quite huge…about 150 computers In terms of licensing, it's a lot…the cost of running an office, besides buying the hardware, it's too expensive…and every couple of years you have to upgrade them (the hardware), so you have to buy new licenses*''. Similar sentiments were expressed by AGRICO, whose interviewee cited expensive hardware and software as a constraint: *''…the hardware, even locally, the software, can be very expensive. When you are trying to develop a market,…you don't really have the money for it.''.* She hinted at the paradox that small businesses face, needing data and information in the early stages of growth, but without the requisite resources to invest in acquiring such information, due to competing business demands: *''Some of these things like Tally (software), we really only started to do that (i.e., invested in the software)…only after we made some money. But when you are starting (out) - when it's probably when you really need this information (most) – you can't invest in technologies because they are much more expensive than other things that will grow your business.''*

The real estate-cum investments firm, INVERE, decried the perennial problem of cybersecurity, stating, '*'right now we are anticipating there are people who really want to come and play with our system to see whether they can be able to get money, peoples' wealth…that's the case everywhere, even in banks. So, we have several layers of security, but then that's not enough…the best way to address (the risk of financial)…would be to use fraud detection models, and that's what we have embarked on building*''. Bonfire's CEO interviewee similarly pointed out the risk faced by the firm due to potentiality of fraudulent online ticket

bookings via credit card: *"... the fraudsters come and book tickets, and then you find you have to pay for those tickets, because ''ikibukiwa'' (if booked) through your portal, you are the one responsible, and then the credit card people come and claim (from you)...so, that way, the fraudsters are challenging us, for us to put our products online.''*

mHK CEO pointed out the scarcity of skilled talent in the market as a challenge to big data adoption; therefore, the firm often has to develop the talent in-house. She stated, *''...the challenges are usually, you want someone, but the person you want is too expensive... so, some talents we grow, and some talents you just have to bite the bullet and hire.''* However, as observed by INVERE's interviewee, the big data talent availability conundrum is compounded by the fact that such talent is highly mobile and tends to be concentrated in the technology sector. To ameliorate the various challenges with big data talent, firms resort to various solutions such as outsourcing big data-related IT services, procuring Cloud resources, and developing big data talent. Big data talent, in particular, is crucial and can be seen at two levels - business leadership skills and technical skills. Effective business leadership arises from being sufficiently versed and experienced with the firm's business environment and strategies, assembling and directing a team with the right skills and resources to achieve business goals. The success of a firm's big data adaptation endeavors significantly depends on the ability to anticipate marketplace developments, assemble and direct a team with the requisite skills and resources. On the other hand, technical skills refer to knowledge and experience with state-of-the-art, business-focused, big data-based digital technologies and processes. Generally, big data talent forms part of the difficult-to-imitate BDC, with the potential of being a competitive differentiator.

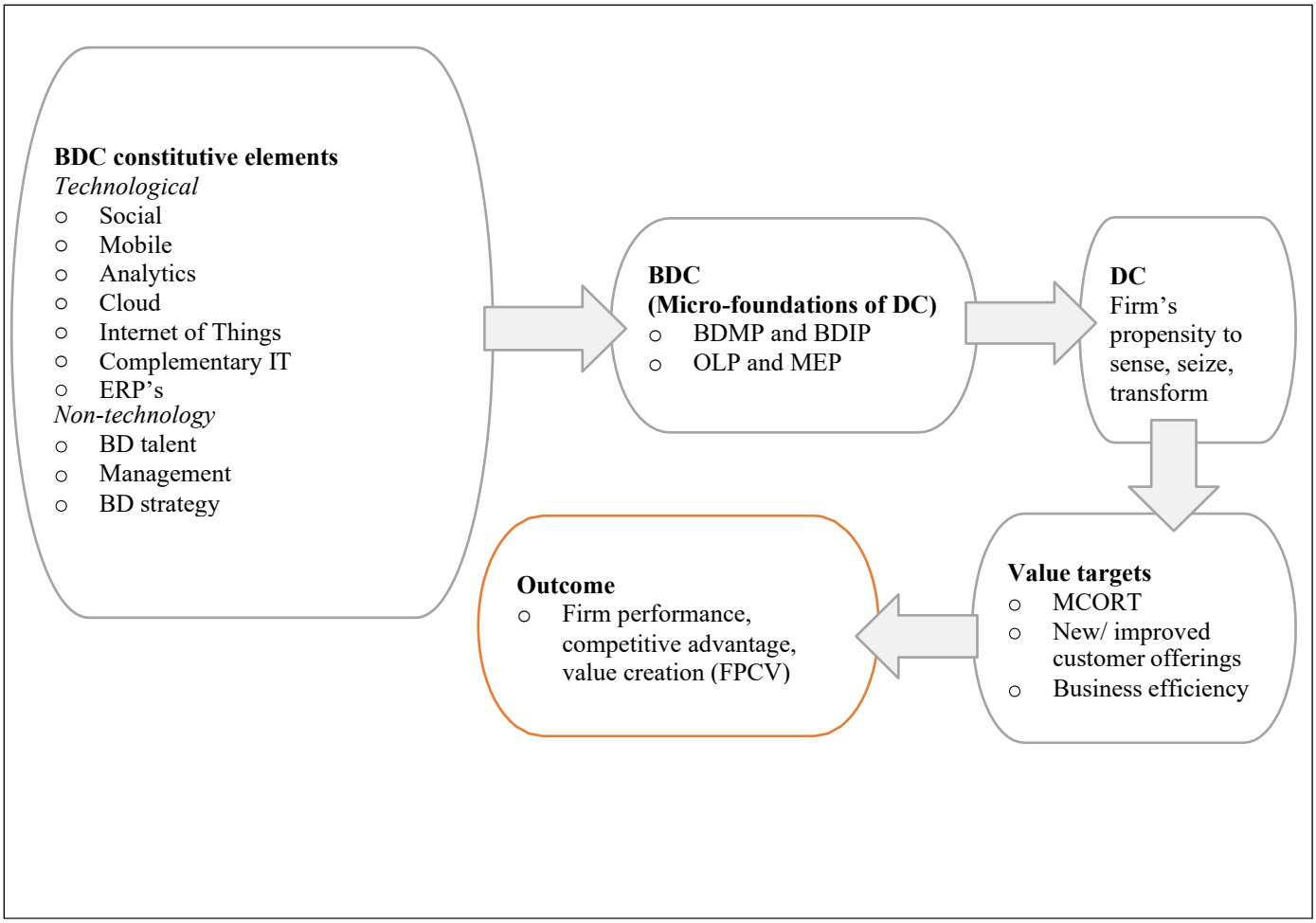
Chapter 5: Conceptual Model

5.1 Big data value framework

To enhance understanding of how big data impacts firm value creation, this study essentially explores Kenyan firms' use big data for business value creation and the underlying mechanisms. In formulating a response, this chapter proposes a conceptual model backed by theory and the qualitative findings from the preceding chapter. The mechanism by which big data delivers value is depicted in Figure 3. The relationships hypothesized by the model are explained in the sections following.

Figure 3

Big Data Value Framework based on the Study Findings



5.1.1 Big data composition

The constitutive elements of BDC found in this study are SMACIT, complementary information technology, enterprise resource planning software and its variants, big data talent, management and, big data strategy (Table 4). Thematically analyzed, the discrete BDC elements combine to form big data-based organizational/managerial processes, the micro-foundations of DC: 1. BDMP (combinative capabilities and big data analytics) and, 2. BDIP (innovations in customer offerings, business models; innovations in business practices/ processes; omnichannel customer engagement processes). As discussed in sections 4.2 through 4.6, BDMP and BDIP are undergirded by OLP and MEP. Consistent with the literature (Gupta & George, 2016; Hassna & Lowry, 2016; Mikalef et al., 2019, 2020; Ross et al., 2019; Wamba et al., 2017; Zeng & Khan, 2019), BDC among the case firms is therefore confirmed as a composite capability of big data technology (in its multifaceted hardware and software dimensions), big data talent, big data strategy, and management.

5.1.2 Big data as a dynamic capability

The BDMP and BDIP noted above embody many of the key defining characteristics of DC found in the literature; This is because such processes are embedded within the firm; they are either wholly developed within the firm or developed externally but customized to the firm; they are unique to each firm, and accumulated through path-dependent processes; they are intentional and deliberate in terms of business objectives served; they are stable and repeatable, albeit with the occasional improvisation; they evince managers' commitment (Adner & Helfat 2003; Ambrosini & Bowman 2009; Eisenhardt & Martin, 2000; Helfat et al. 2007; Makadok, 2001; Pavlou & El Sawy, 2011; Protogerou et al. 2012; Zahra et al. 2006; Zollo & Winter 2002).

Overall, therefore, the BDC in the case firms serves the purposes enumerated in the literature, for instance, Barreto. (2010) - enhances the firms' propensity to sense opportunities

and threats, undertake timely, market-driven decision-making, and change its resource base. In similar but Teecian terms, the BDC enable the firms' ability to sense, seize, transform (Teece, 2007) and beget positive business outcomes along market, innovation, and operations dimensions; This, therefore, emerges as the path by which BD delivers competitive advantage and creates value in the dynamic market environment. The sections below discuss the specific business value engendered through BDC.

5.2 BDC, competitive advantage, value creation

The study shows that firms are employing big data to create competitive advantage in various ways, but which are categorizable into three broad and prominent targets of value creation: 1. Enhancing market capability and sales performance, or more generally, market/customer orientation (Abernathy & Clark, 1985; Borges et al., 2009); 2. Fostering innovations around new or improved customer offerings; 3. Driving operational efficiencies. The first two themes align with the extant literature, mainly describing market orientation and new product development as organizational abilities for adaptation to dynamic environments (Barrales-Molina et al., 2013), thereby directly contributing to the firm's long-run competitive advantage. On the other hand, operational efficiencies are necessary for maintaining parity with the market, and although sometimes seen as being insufficient for sustainable competitive advantage (Teece, 2007), it is arguable that the operations-augmenting capabilities do actually situate the firm for the long haul, and therefore qualify as micro-foundations for the firm's dynamic capabilities.

5.2.1 Market/ customer orientation

The study finds that market/ customer orientation (MCORT) is an overriding motivation for firms' investments in BDC. MCORT basically refers to how a firm understands, engages, and serves its customer base (Kohli & Jaworski, 1990; Morgan et al., 2009), plus firm/ brand reputation (Danneels, 2002). MCORT improves a firm's market performance and

competitiveness. The accent on MCORT by the case firms implies a recognition that customer expectations are the leading drivers for big data-based digital strategies and associated investments in today's technologically mediated business environment. Customers demand speed, transparency, and service convenience; they require instant, accurate, pleasant, informative exchanges with business firms. Accordingly, firms are impelled to adapt their capabilities to the changing customer expectations and behavior. BDC, therefore, reflects the firms adaptiveness to the dictates of the market. The leading overlapping indicators of MCORT noted in the data are discussed below.

Customer engagement. Case firms are using big data - Social media platforms, SMS, corporate websites, and related mechanisms - for a variety of marketing objectives that include: communicating sundry information about product/ service offerings, brand promotion, and differentiation, soliciting customer feedback about products/ services offered and customer service, capturing and resolving customer queries; monitoring consumer responses to deployments instituted by competitors. Social media, which all firms widely use, is especially pertinent for SMEs in developing economies, as little to zero financial investment is required and equally minimal technical expertise (Barnes et al., 2012). Dong & Wu (2015) have also argued that a firm's ability to use social media technologies strategically can foster competitiveness via digitally enabled innovation capabilities. From the various types of social media, based on existing knowledge, firms search and select, then leverage and gradually integrate the one deemed most appropriate for the business. Social media is fully integrated into the firm at the maturity stage, forming a new capability of social media-mediated commerce (Boateng, 2020; Hajli, 2014). Besides, customer engagement to drive increased customer identification with firms' brands is expected to stimulate more frequent product purchases and customer network referrals (Rather et al., 2018).

Market intelligence and exploitation of market opportunities. Case firms use BDA

to better understand customer needs, preferences, and behaviors. Through segmental analysis – grouping customers based on defined segmentation variables (Dolnicar et al., 2018) - firms achieve more granular insights of their customers and market conditions. The insights gained enable firms to seize the implicit opportunities for value by, for instance, managing each customer interaction via the right resources, in person or electronically.

Customer service business processes (CSBP). Case firms use big data and big data-based technologies to optimize existing customer service channels or design and develop new ones such as digital payment options, Chatbots, O2Os, DM's, and others. TBC and FURNT exemplify firms that have adopted O2O, while Vestergaard has a DM. According to the literature, firms adopt big data-based digital technologies like O2Os due to customer demands for quick and convenient shopping facility (Setia et al., 2013). O2O is an emerging phenomenon of big data that often requires significant business model realignment and coordination to fuse online and offline components successfully. O2O generates and uses vast amounts of data via technologies such as mobile and various other 'smart' objects and devices, all of which support location-based services that facilitate commercial transactions (Baesens et al., 2016; Hahn, 2017). Emerging markets businesses that effectively use e-commerce platforms, instead of traditional trading channels, are more likely to achieve greater returns through reduced transaction costs, simplified and efficient market channels that enable firms to retain a larger share of the final consumer price of products, scalability, and adaptability to business integration trends, dynamic pricing and, increased global visibility (Humphrey et al., 2003). For DM's, they are expected to generate increased business value as they grow bigger through network effects (Täuscher & Laudien, 2017).

5.2.2 New or improved customer offerings

Firms are using BDC to exploit market opportunities through new or improved customer offerings. This capability is seen mainly in start-up like and 'born-digital' firms –

A24M, mHK, REINS, Nouveta, Tangazoletu, Bluewave. Their ability to progressively learn and innovate is cited in the literature as a dynamic capability that improves current levels of performance and contributes to a firm's strategic positioning by providing the basis for radical innovations (Kodama, 2018). The use of big data as a sellable commodity for ancillary revenue streams was noted in REINS. Vestergaard is also geared for a similar business strategy. This ability to spot and seize new big data-based revenue opportunities indicates DC; It is consistent with Constantiou & Kallinikos's (2015) observation that big data is frequently agnostic, in the sense of being produced for a particular purpose but potentially applicable for other purposes. However, the scope for optimal utilization of big data still remains. For instance, in the monetization of data through the selling of bulk SMS, most firms concentrate on limited variables (location, cellphone number) but miss out on the richer socio-economic, demographic and other variables (for instance, occupation, age, sex, preferences, etc.), a situation which implies under-exploited business opportunities.

5.2.3 Improving business efficiency

In response to changing environments, case firms are purposefully deploying big data to harness their internal value chains, mitigate inefficiencies arising from incomplete information (conversely yield efficiencies) that potentially impact firms' market competitiveness and responsiveness. Big data makes possible management reporting capabilities, providing operational insights that aid day-to-day operational decisions and strategic decisions related to competitive positioning. Big data use to enhance internal efficiency is prominent in traditional industries firms, which could be investigated in future studies. Examples include: AMOTORS uses ERP data to drive better coordination between vehicle sales and service departments, thereby ensuring efficient servicing of customers vehicles; FURNT implemented a cloud-based ERP that captures and consolidates all business transactions - inventory, sales, and financials, human resources - in a single database, to present

a holistic view of the business, a precursor for better, data-based decision making; LICABO developed a central data warehouse that provides a single source of truth about the bank operations; INVERE's data warehouse collates different internal data systems, facilitates a 360° view of the organization, and analytics for decision making, with prospects for improved decision quality and organizational productivity; Absolute Adventures is pursuing end-to-end integration of business processes from vehicle booking, to assignment and billing; Kentainers has an internet-based, Accessible Rich Internet Application (ARIA) tool for coordinating strategy and work planning, an integrated and efficient RFID-based employee time monitoring system meant to enhance employee productivity; GALES has instituted an e-filing system that helps coordinate critical work and related accounting. The firm has also invested in a document management system for effective management of legal documents, records, and organizational knowledge; Crowe has processes for improving audit work efficiency and quality, collaboration, and meeting tools.

Business efficiency also includes integrating transaction data and big data (Shi & Wang, 2018) where two trends were observed: a level one integration where firms attempt to harness internal data from disparate business functions systems into a single data view (for instance, Kentainers, LICABO, INVERE); a second level where internal, ERP-generated business transactional data is integrated with big data streaming from social media platforms, mobile phones, IoT, to create a unified analytics system. In either case, the overriding objective is using big data to create a single source of truth for the firm.

5.3 Emerging business models driven by big data capabilities

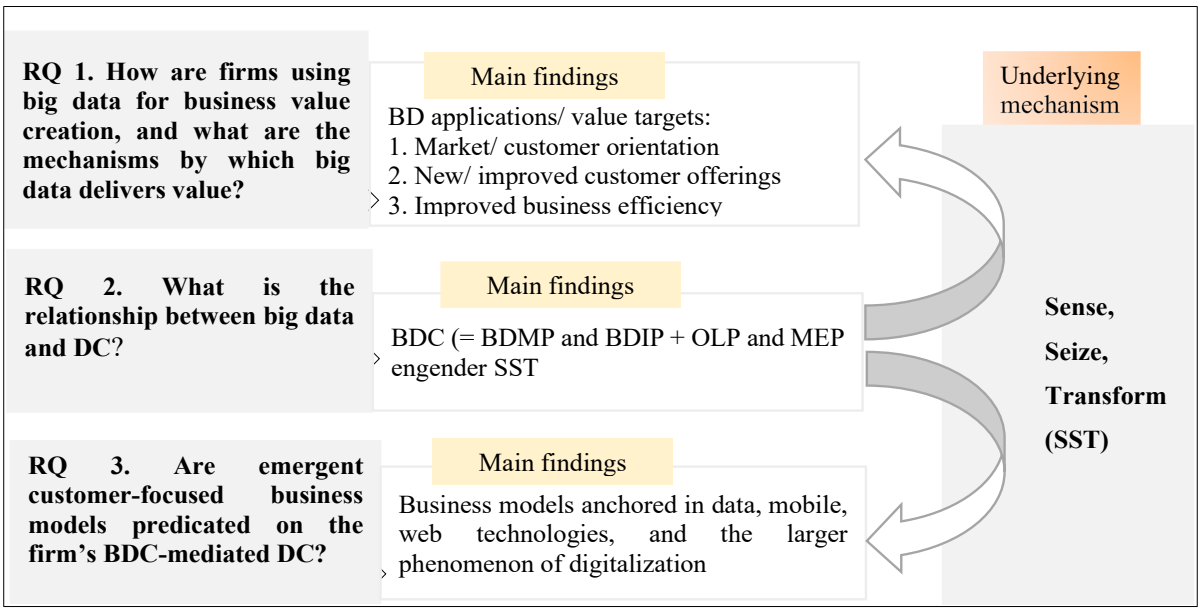
Case evidence shows that business models anchored in data, mobile, web technologies, and the larger digitalization phenomenon (Brouthers et al., 2016) occur across all industries. The firms demonstrate the ability to proactively scan the horizon for new technologies that could impact their operations and existing business models and evaluate such technologies for

business fit, which is a key aspect of dynamic capabilities (Baškarada & Koronios, 2018; Schoemaker et al., 2018). For instance, with A24M, Vestergaard, and COSAC, BDC facilitates sensing and seizing of market opportunities to create demand-driven business models that create value for the customer and the firm. It is also noted that for most firms, analytics capability is part of their business models – they are developing a unified analytics capability that generates insights for business optimization in aspects such as inventory placement (FURNT), assessing and managing fraud risks (INVERE, Bluewave), selecting efficient routing paths (Absolute Adventures), evaluating marketing effectiveness (Strathmore, ADCOMS), etc., tasks which support operations as well as firm strategic positioning, and value creation (Lavalle et al., 2011).

5.4 Propositions, Conclusion

In conclusion, the cases and the DC theory imply a positive link between big data (through BDC) and the firms' DC for value creation. BD is an integral part of the firm's business models and, BD's raison détre is to drive business strategies and derive value. Figure 4 identifies the key relationships addressing each of the research questions.

Figure 4



Key relationships addressing the research questions

Based on the study findings, BD, and the DC literature, a firm's BDC has two discernible 'facilitators' 1. BDMP and BDIP, and 2. OLP and MEP. The latter strengthens the former, but singly or unsystematized, each remains a sub-optimal or lower-order capability (LO-BDC) whose effect on FPCV is limited (Fainshmidt et al., 2016). However, when BDMP plus BDIP, and OLP plus MEP are combined in a firms' big data strategy (Agarwal & Brem, 2015; Schneider, 2018), the net effect is a higher-order big data capability (HO-BDC) that is unique, inimitable – BDC – which enables firm value creation along market, efficiency and innovation dimension (Akter et al., 2016; Ghasemaghaei & Calic, 2019; Lu & K. (Ram) Ramamurthy, 2011; Mathrani & Lai, 2021; Mikalef et al., 2019, 2020; Paiola & Gebauer, 2020; Ross et al., 2019; Sebastian et al., 2020; Wamba et al., 2017; Zeng & Khan, 2019).

Hence, the preceding findings give rise to the following propositions:

P1: BDMP and BDIP constitute a LO-BDC for the firm;

P2: OLP and MEP constitute a LO-BDC for the firm;

P3: BDMP plus BDIP, and OLP plus MEP form a HO-BDC for the firm;

P4: LO-BDC partially mediate firm performance and value creation;

P5: HO-BDC fully mediate firm performance and value creation

From Figure 4, it is evident that the research questions posed, pursuant to the primary goal of this study – to foster a better understanding of big data's value creation potential for Kenyan business firms in their eternal quest for FPCV, in a VUCA environment - have been answered by the main findings. The study, therefore, confirms the path from big data to impact and value creation for Kenyan firms through BDC-enhanced DC.

Chapter 6: Conclusions, Implications, and Limitations

6.1 Introduction

This chapter discusses conclusions arrived at from the study, and its implications, followed by an explication of the study's contribution to knowledge. Finally, the limitations of the study are highlighted, and ideas for further research are suggested.

6.2 Heterogeneity of big data capabilities, a competitive differentiator

The cases studied show that the success factors for BDC are uniformly characterized as BDMP, BDIP, OLP and, MEP. However, individual firm processes are idiosyncratic in their details, which provides a basis for competitive differential. For instance, concerning BDMP, whereas all firms use data collection, integration, and processing routines, inter-firm variations are noted in the nature and scale of data and the mechanism for its management. Some firm's data processes deal with only simple phenomena, for instance, historical sales logs. In other firms, we see a combination of streaming, high velocity, multidimensional data being collated and processed from numerous sources.

BDA is another area of disparity; even though widespread among firms, it remains challenging and underutilized, especially for firms that have not invested in the requisite talent. Some firms reported using simple Ms Excel-based routines for organizing and analyzing data, while firms with specialist talent use advanced analytics, including algorithmic processes and artificial intelligence.

The study notes, unsurprisingly, that some firms, especially the born-digital types (for instance, Nouveta, Tangazoletu, mHK, Bluewave, REINS), as well as the large entities (for instance LICABO, HOTCHA, TBC, INVERE, INSCER, Kentainers, Strathmore, CHAGRO, ADCOMS) evince higher capabilities - noticeably superior technologies and talent - in reorienting and exploiting big data for insights and innovations, compared to the others, which is consistent with similar findings by Manyika et al., (2015). These are big data proficient-type

firms that tend to have a preponderance of formal, systematized big data-facilitated processes, structures, systems, contrasted with adhocracies for the less proficient types (Felin & Powell, 2016), for instance, WhatsApp use at AGRICO. The disparity in technology capabilities could be a competitive differentiator, implying that firms should consider investing in such capabilities.

The heterogeneity in BDC creates a digital divide, with firms at the cutting edge of big data using their wide-ranging capabilities to experiment with solutions that they believe the market needs to solve current or projected business problems. This breed of companies seeks to shape the marketplace with somewhat novel ideas.

6.3 Talent, managerial acumen as competitive differentiator

Truly compelling big data transformative capabilities are predicated on systematized orchestration of all aspects of BDC, wisdom which is well borne out by Nouveta's CEO observation – he stated that firms mistakenly take one piece of technology, such as the popular M-PESA paybill, as being emblematic of big data transformation, instead of looking at the whole gamut of technologies. A similar point is noted by Ross (2016), that it is not the mere possession of discrete elements of big data technology that matters; the game-changer lies in the ability to strategize the business, harness and coherently integrate the disparate technologies to create a compelling and unique value proposition. Firms such as Kentainers, FURNT, LICABO, INVERE, in a sense, partly embody this wisdom as they all talked of attempts at continuously harnessing big data from their diverse systems to create an enterprise-wide 'single source of truth' for decision making.

6.4 Implications for theory

This study's goal was to examine big data's role in fostering FPCV in an emerging markets context, using the DCV lens; an apposite endeavor to assess big data as a strategic business capability, not merely a technological phenomenon. The BDC framework this study

is conceptualized in terms of SST (Barreto, 2010; Teece, 2007, 2012, 2014a, 2017, 2019). The study leveraged emerging and related efforts of BDC framework (Mikalef et al., 2020; Wamba et al., 2017) and theorized the firms' BDC that engender SST leading to FPCV. The study provides solid guidance of how big data drives a firm's competitive positioning in an EM context. Key implications for theory arise from the study.

First, the study conceptualizes BD as a business capability comprised in BDC; This highlights BD's strategic importance, helping debunk misconception on how BD generates value for the firm, an idea which academics have long grappled with. Besides, firms have struggled to understand how to align BD and related advanced technologies with business objectives. Framing the BD paradigm as a business capability can help firms conceive and develop their distinctive dynamic capabilities for competitive positioning (Elia et al., 2020). The BDC construct (Hassna & Lowry, 2016; Mikalef et al., 2019, 2020; Wamba et al., 2017;) as developed is rooted in the DC literature (Barreto, 2010; Teece, 2007, 2012, 2014a, 2017, 2019) but cognizant of big data's uniqueness as a multidimensional phenomenon by which firms avail data for strategic and operational ends. As the DC literature indicates, strong DCs buttresses FPCV.

A fundamental principle of BDC identified in this study is its external view, being concerned with sensing and collating pertinent data about the market – customers, competitors, and related market risks (Teece, 2007). Concurrently, there is a decidedly internal perspective - the intrafirm analysis of the data obtained, assessment of the insights arising, combining with extant knowledge, and implementation, as evidenced in new or improved big data-based customer offerings and business capabilities. The implication then is that the BDC observed in the case firms falls squarely within the ambit of and is therefore confirmed as a DC; this lends empirical support to emerging studies on BDC as DC (Fosso Wamba & Mishra, 2017; Rialti et al., 2019).

As the Kenyan environment is riven with dynamic big data-based technological competition and growth, DCs are expected to operate. Empirical results from the study bear out this expectation; it is shown that, among the case firms, big data impacts FPCV, and big data-enhanced DC mediates the impact. This finding aligns with similar studies' conclusions (for instance, Fosso et al., 2015; Singh & Del Giudice, 2019), implying that there might be no significant dichotomy between DCs operation in EMs and DMEs as would be supposed (Ramachandran & Gunta, 2007). This study, therefore, illumines the salience of DCs in emerging economies' firms, a subject that remains topical in academia (Battisti, 2021).

Finally, this study shows that, across all firms, the epicenter of big data is enhancing a firm's MCORT, implying that a customer or consumer-centric intent significantly impels business competitiveness and value creation. Such unequivocal customer orientation allows the firms to pursue big data-supported business strategies that synergistically enhance top-line value (Priem, 2007), also reflected in consumer-driven business models. The comment by COSAC's interviewee was particularly illuminating in this regard; he articulated that customer demands propel the firm's shift towards a big data technology-based business model: ''*the business models are really changing – you cannot continue going the conventional way, and expect to (succeed); you know this (technology adoption) is a demand, it's also coming from members. So we are also responding to demand from members. So in a way, we are also able to grow because we are availing this to (members).''* This viewpoint implies that firm value creation is significantly predicated on market demand or consumer considerations, therefore lends further empirical support to the emergent consumer-based value creation perspectives advanced in the literature by scholars such as Prahalad & Ramaswamy (2004), Priem (2007), Priem, et al., (2013).

6.5 Implications for practice

The present study brings to the fore several salient aspects for big data business value proposition, discussed next.

Big data availability and accessibility. Naturally, big data availability and accessibility is a key aspect of BDC. There is a presumption that big data is available and accessible for business purposes, but how available is the data? The study shows that firms collate internal data, readily available, and collect external data that is not readily available and whose probate value is sometimes questionable. Firms like AGRICO pointed out the tension faced, especially by small businesses, of not having financial resources for investing in big data technologies, yet they require market data and information for growth. Relatedly, although not mentioned as a major concern by interviewees, data privacy protection concerns may hinder accessibility to data, a subject that merits separate study. Kenya has recently enacted data protection legislation, which mirrors the European Union-led General Data Protection Regulations (GDPR). To align with the new context of a big data-driven, global economy, the GDPR enhances privacy principles around individuals' data security and extended rights. Legislation similar to that of Kenya is expected to obtain in other developing countries (Kazeem, 2019; Issaias & Syekei, 20199), and therefore becomes a significant consideration in business big data transformation efforts.

The implication of the foregoing is that the business value that a firm can garner from big data could be circumscribed by its ability to access sufficient, relevant and reliable data (Arunachalam et al., 2018; Brunsdon & Comber, 2020; Rawat & Yadav, 2021), and therefore, firms need to consider strategies for increasing the availability of data, some of which are outlined below.

Outsourcing big data capabilities. Although the imperativeness of digital operational capabilities which underpin the delivery of value-laden services to clients is a foregone

conclusion, such capabilities need not be owned directly; instead, they can be acquired competitively (where appropriate) through linkages with proficient service providers within the business ecosystem. Firms, therefore, need to consider outsourcing big data capabilities. For instance, firms could cultivate strategic business relationships to access computational resources via Cloud, a mechanism which is becoming increasingly viable as evidenced by cases such as Absolute Adventures, FURNT, INSCER. In a dynamic, fast-changing technological environment, strategic arrangements would also include the ability of firms to timeously learn of and take advantage of the latest value-laden big data digital products (Lynn et al., 2020; Vijai & Nivetha, 2020).

Complementary business relationships. Firms should pay attention to and leverage formal and informal business arrangements that facilitate access to big data resources (Jiang et al., 2019). Cases such as REINS demonstrate this capability; the firm relies on a strategic, contractually negotiated data-sharing arrangement with its primary client, giving REINS access to vast caches of customer data that would otherwise not have been available.

Open data initiatives. Another strategy for ensuring big data availability and accessibility is promoting open data (OD) initiatives. With the rise of the knowledge, big data-based digital economy, where firms' business models are built on collecting, organizing, analyzing, and transacting in data (Pollock, 2009), OD will assume increasing prominence as firms, for instance, seek efficiencies with business partners, including supply chain actors.

Definitionally, OD refers to publicly available, non-personal data or content, freely accessible for anyone to use and share, often free of charge (Verhulst, 2017). OD can foster innovation and competitive advantage as the firm uses such data to sense and seize opportunities for designing and offering new or improved products/services and identifying areas for potential cost-saving and improved operations. Firms can also expose proprietary data to the public, as in the case of LICABO, which voluntarily adopted API-based exposition of

its data. Open APIs are key business competencies (Zeleti & Ojo, 2017), illustrative of a firm's DC. On its part, the government should encourage more open and accessible data through government policy and subvention. Firms can repurpose big OD from governmental entities for market initiatives that beget competitive advantage. Firms such as REINS use mash-ups of their proprietary data and government-related OD to generate new revenue streams. It is noteworthy that in 2011, the Kenya government (GoK) became the first Sub-Saharan Africa country to launch an OD initiative (Berkowitz & Paradise, 2011). However, all GoK entities, outside of the core national government, including parastatals, county administration, and related state entities, should be encouraged to publicize their data via a shareable web platform for business firms' access and use. Still, OD is not a panacea for data availability and accessibility challenges. Capturing value from OD requires other capabilities such as talent, tools, and processes. OD may also be beset with interoperability issues. Besides, firms would have to balance OD benefits with possible privacy and confidentiality concerns.

Leveraging CSBP. Although big data-based technologies are increasingly integral to and often indistinguishable from the firms' CSBP, conceiving and achieving the optimal CSBP remains a continuously daunting task for firms, implying that it is a potential competitive differentiator. For instance, INVERE's interviewee highlighted the resource and time consuming exploratory process followed to verify and validate various mechanisms for facilitating instant funds access by retail customers before finally settling on the most promising mechanism; INSCER's interviewee also alluded to the vigilance required with CSBP, noting that, '*'with data, and with innovation, once you solve one pain (point) for the customer, there is another pain (point) awaiting you further down the road; (one) that you don't know, and the customer also doesn't know''.*

Leveraging mobile technology. The story of big data-based competition amongst Kenyan firms is never complete without juxtaposing it with the story of mobile phones (MP)

and mobile money (MM) growth in the country. Big data adoption in Kenya has proliferated, courtesy of growth, and ICT advancements, which constitute the enabling infrastructures, techniques, and processes widespread in everyday business and social practices such as mobile phones (smart and feature phones) and the internet (Kitchin, 2014). From around 2007-2008, the ICT sector in Kenya has grown to become a major contributor to the country's gross domestic product, enabling innovation, production, and efficiency gains across various business sectors (Akamanzi et al., 2016). MP technology, in particular, is now widespread in Kenya, and according to the International Finance Corporation (2018), the country's MM sector ranks as the largest and most successful in Africa, with the number of mobile wallets hitting 37.4 million by 2017, representing 133 percent penetration of the adult population. One prominent big data-based MM innovation has been MPESA, with offshoot innovations such as 'Lipa na MPESA' (Ngui & Kimuyu, 2018), developed by Tangazoletu - one of the case firms in this study - for the giant telecommunications service provider, Safaricom. MM has spurred a range of big data-based innovative financial services and e-commerce amongst Kenyan business firms. All the firms in this study have 'Lipa na MPESA' capabilities, plus a motley of other big data-based digital transactional mechanisms; This implies that MM promises to remain a key 'quick win' for firms seeking big data-based digital transformation. Still, the big data possibilities posited by MM and MP technology, in general, remains under-exploited. Specifically, although the volume and velocity aspect of big data is clearly at play in MM processes, the richness of data variety remains unexplored, therefore a potential area for future growth and competitiveness. For instance, the range of variables captured in a typical MM sales transaction is mainly limited to a phone number, amount transacted, date/time of the transaction, the general purpose of the transaction, and limited customer identifiers. Granularity is often suppressed, yet such is opportune for a more nuanced and insightful understanding of the transaction and the business in general. Thus, in addition to riding on the MM wave, firms

should explore the latent big data potential, subject, of course, to applicable GDPR-related exigencies.

Big data imperative as a business imperative. The study suggests that, in a turbulent market environment, there exists a big data imperative. By virtue of their existing, albeit varied big data technology investments, the case firms implicitly acknowledge this inexorable trend, and the statement by COSAC's CEO interviewee aptly sums up the matter. He stated, *''As time goes by, and as new technological applications come on board, you find that (if) you stick to what you were doing yesterday, you run the risk of being obsolete in terms of service delivery, and efficiency in how you are responding to your (customers).*'' In building BDC, it is incumbent upon firms to take stock of their existing capabilities, consider which ones they need to develop for effective response to the changing market environment. However, as with Barton and Court (2012), this study finds that success with big data is predicated on the ability first to articulate the business questions which need tackling, the opportunities that need to be exploited, then determining which data needs to be collected, the technologies to use, to improve the firm's position. This finding was universal, seeing that all the interviewees, being senior-level business managers, coherently described the specific business issues that big data endeavors to address in their respective firms. The implication here for managers is that the modern business enterprise faces an inescapable big data transformation imperative, a precursor for sustained FPCV, but with a rider that the investment in big data-based digital technologies should not be isolated endeavors but be based on identified business needs. Relatedly, this study brings out the strategic vision of big data in firms. For the case firms, three broad purposes/ objects of big data are identified as MCORT, new products/services and, business efficiency, which implies that, by and large, big data investments are primarily strategic. The conclusion then is that, in seeking big data adaptation for their businesses, firms should identify the critical big data focus areas that promise the best scope for differentiation.

Big data talent development. Many firms cited the shortage of skilled big data talent as a continuing challenge to their big data transformation efforts. Big data talent shortage, and concomitant high demand, mean increased cost for firms. However, such talent forms part of the difficult-to- imitate BDC, implying that firms should rethink and improve big data skills for value delivery.

6.6 Key contributions of the research

This study set out to achieve several inter-linked objectives: enhance understanding of how ubiquitous big data can enhance FPCV and the underlying mechanism. More specifically, the study sought to examine the role of dynamic capabilities and BDC on the firm's value targets, thereby enhancing theoretical understanding of big data impact on business, increasing systematic knowledge about big data, and offering practical guidance to firms that wish to exploit big data for business value. Furthermore, the study aimed to augment nascent research about BDC as a multi-dimensional construct and advance scholarship on big data adoption and adaptation in emerging markets. Additionally, the study aimed to examine the nexus of big data and consumer-focused business strategies, thereby enrich the growing body of knowledge around emerging, demand-side perspectives of value creation, as contrasted with the more popular supply-side, resource-based perspectives. Against the stated objectives, this research makes key contributions to knowledge.

The first set of contributions relate to big data and DC research gaps in EMs. BD is heralded as one of the newish technologies that is fundamentally changing and could potentially alter the business landscape, a proposition affirmed in this study by Kenyan firms that continue to invest in big data and related technologies with varying capabilities – tools, processes, knowledge base, talent - therefore posting mixed, divergent results. The potential for enhanced use of BD for business purposes still exists; This is seen, for instance, in that even popular capabilities (for instance, social media analytics and ERPs) are not optimally used, and

in some cases, still in nascent stages of adoption. Amidst the growing interest in BD, the literature lacked sufficient empirical data on how big data delivers FPCV. More particularly, there is a dearth of empirical studies on big data business impact in EMs. This study addresses the literature gap and enriches scholarship by using primary data from Kenyan firms, a proxy for EMs, to explore and elucidate BD's business impact through a DCs lens.

From the literature, DCs present an apt explanation for heterogeneity in FPCV; various theoretical efforts have sought to understand the organizational and managerial processes that underpin DC (Teece et al., 1997; Teece, 2007). Although literature exists regarding big data and DC, studies that integrate the two constructs through BDC are rare, as is the mediating role of BDC on FPCV. Therefore, this study fills a significant research gap by providing theoretical and empirical support for the connection among big data, DC, and FPCV in a single integrated framework (Figure 3). According to the framework, firms develop big data-based capabilities (i.e., BDC), strengthening a firm's DC, enhancing three key pillars of firm competitiveness: market capability and sales performance, innovations around new or improved customer offerings and, operational efficiencies. The big data value framework enunciated in this study brings scientific rigor to the challenges firms are likely to encounter in adopting and adapting big data to solve business questions and create value, challenges borne of likely atheoretical misconception of big data.

Additionally, this study enriches understanding of DCs in EMs; Showing that in a dynamic EM environment, DC, amplified by BDC, operate similarly to what would be expected in developed market economies - primarily that DC enhances the potential of EM firms to deal with the changes occurring in the external environment, availing opportunities when they manifest, and aligning operational processes accordingly.

The second set of contributions relate to better analytical understanding of BDCs in EM contexts. First, by decomposing BDC into four broad constructs (BDMP and BDIP, OLP, and

MEP) as shown in the value framework, this study helps clarify understanding of the linkage between big data and FPCV in a novel way for Kenyan, and by extrapolation, EM firms. We see that investment in BDMP and BDIP is necessary, though not a sufficient condition for achieving FPCV; For sufficiency, competencies around OLP and MEP are necessary for firms' to develop an effective business capability synergistically. Thus, whereas the study findings show that Kenyan business managers are "plugging" into the big data world, there is a need for them to engage more with the strategic implications of the big data revolution by accentuating OLP and MEP dimensions; essentially fusing LO-BDC and HO-BDC to secure alignment of BD with businesses' strategic imperatives for superior performance.

Postulation about the constructs of lower-order versus higher-order big data capabilities (LO-BDC and HO-BDC) is a unique contribution which this study brings to the fore, and which merits further research. Extant studies have argued, and rightly so, about BDC being a composite construct. However, none to the researcher's knowledge have specifically addressed the likely existence of LO-BDC and HO-BDC as distinct from the widely accepted DCs hierarchical construction. This study also finds that the primary motivation for big data adoption among Kenyan firms is MCORT. The researcher believes this to be an additional unique contribution to our understanding of the big data imperative in EMs; if market leverage is the primary driver for BD transformation, this could explain the famed IT productivity paradox (Hajli et al., 2015) through subsequent studies.

The current study also brings out the BDC technological components that firms invest in – Social, Mobile, Analytics, Cloud, Internet of Things, complementary information technology, and various enterprise resource planning software. This delineation is important as it helps to systematically capture the underpinning factors that facilitate effective and efficient use of big data as a competitiveness differentiator. However, big data technology really represents the firm's *potential* to tackle business problems systematically; apart from big data

technological investments, there are other salient aspects of BDC that enhance the firm's ''propensity to detect opportunities and threats, make timely and market-oriented decisions, modify its resource base, and effectively implement strategic decisions and changes'' (Medeiros et al., 2020, p.11) in order to generate optimal value. These include: retaining a mix of business and big data proficient personnel, cultivating organizational learning, plus data-driven inquiry and decision-making culture. Therefore, the study lends plausibility to the construal of BDC as a composite capability with technologic and human talent dimensions that require effective management for firms to compete and deliver value sustainably.

6.7 Limitations of the study and future research directions

This study has several limitations, which also present opportunities for future research. First, it was noted that BDC impacts FPCV through market, innovation, and business efficiency dimensions (Figure 4). However, the instant study did not explore whether the impact on FPCV is wholly or partly mediated as a result. Future studies may therefore examine the extent to which FPCV accrues from market, innovation, and business efficiency outcomes while also considering pertinent factors such as firm context and its environment.

The study found that big data is not applied uniformly across all the business functions, but rather, big data is predominantly used in MCORT. There is a need to explore the factors contributing to this trend, which this research did not do. The insights arising could indicate if such underlying factors contribute to variability in FPCV. The key role of managerial entrepreneurism, especially CEOs in driving big data transformation, has been noted in this study; This area merits further inquiry, for instance, the CEO cognitive capabilities underlying the development process of BDC, and BDC-based business models. The study also inferred potentially interesting LO-BDC versus HO-BDC and their relationship with FPCV. These concepts could be studied further in future research endeavors. Table 5 summarizes the potential future research possibilities based on the study's RQ's and findings.

Table 5

Future Research avenues based on Study's RQs and Findings

Study's Research questions	Study's main findings	Suggested future research avenues
RQ 1. How are firms using big data for business value creation, and what are the mechanisms by which big data delivers value?	BD applications/value targets are: 1. Market/customer orientation 2. New or improved customer offerings 3. Improved business efficiency	✓ Examine the variability of FPCV from a firm's market, innovation and business efficiency outcomes ✓ As big data is predominantly used for MCORT, what are the underlying factors for this predisposition? How do such factors contribute to variability in FPCV
RQ 2. What is the relationship between big data and DC	BDC (=BDMP and BDIP + OLP and MEP engender SST	✓ Explore the CEO's cognitive capabilities that influence the process of BDC and BDC-mediated business models ✓ Explore the relationship between FPCV and LO-BDC and HO-BDC
RQ 3. Are emergent customer-focused business models predicated on the firm's BDC-mediated DC?	Firms' business models anchored in data, mobile, web technologies, and the larger phenomenon of digitalization	✓ Explore the relationship business models and FPCV, and the mediating role of BDC

Other future research opportunities emanate from the study design. First, the use of Kenya-domiciled firms as a proxy for EMs potentially limits generalizability of the findings to other EMs economies. Besides, the firms studied may not reflect the entire Kenyan economy, implying that the findings may not be linearly applied to the Kenyan context. Future studies may find it advantageous to expand the scope to test BDC sensitivity to differing firm, industry, and country contexts. Second, the current study was qualitative, exploring the nature and extent

of BD usage among Kenyan firms. Therefore, descriptive analyses of data were used. A limitation of this design is that the study mainly entailed self-reported data by the business managers interviewed; they offered their experiences and perspectives of big data use in their organizations, which may or may not reflect the actual position. Participants may underplay or exaggerate reality out of enthusiasm or misunderstanding arising from the likely misperception of big data being largely an 'IT thing' that stands distinct from the firm's core business. Future studies would be useful to juxtapose, therefore confirming or disconfirming the qualitative findings with quantitively obtained data.

References

Abernathy, W. J., & Clark, K. B. (1985). Innovation: Mapping the winds of creative destruction. *Research policy*, *14*(1), 3-22.

Ackoff, R. L., Magidson, J., & Addison, H. J. (2006). *Idealized design: Creating an organization's future*. Ft Press.

Adams, W. C. (2015). Conducting semi-structured interviews. In K. E. Newcomer, H. P. Hatry, & J. S. Wholey (Eds.), *Handbook of practical program evaluation* (pp. 492-505). John Wiley & Sons. https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119171386.ch19

Adler, P. S., & Shenbar, A. (1990). Adapting your technological base: The organizational challenge. *Sloan Management Review, 25*, 25–37

Adner, R., & Helfat, C. E. (2003). Corporate effects and dynamic managerial capabilities. *Strategic management journal*, *24*(10), 1011-1025.

Africa's leading travel agency 2018. (n.d.). World Travel Awards. Retrieved July 17, 2020, from https://www.worldtravelawards.com/award-africas-leading-travel- agency-2018

Agarwal N., & Brem A. (2015). Strategic business transformation through technology convergence: implications from General Electric's industrial internet initiative. *Int J Technol Manag 67*(2–4):196–214. https://doi.org/10.1504/IJTM.2015.068224

Akamanzi, C., Deutscher, P., Guerich, B., Lobelle, A., & Ooko-Ombaka, A. (2016). Silicon Savannah: the Kenya ICT services cluster. *Microeconomics of Competitiveness*. Retrieved August 1, 2020, from https://www.isc.hbs.edu/Documents/resources/courses/moc-course- at-harvard/pdf/student-projects/Kenya%20ITC%20Services%202016.pdf

Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., & Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment? *International Journal of Production Economics*, *182*, 113-131. https://doi.org/10.1016/j.ijpe.2016.08.018

Alalawneh, A. A., & Alkhatib, S. F. (2020). The barriers to big data adoption in developing economies. *The Electronic Journal of Information Systems in Developing Countries*, *87*(1). https://doi.org/10.1002/isd2.12151

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management?. *International journal of management reviews*, *11*(1), 29-49.

Amit, R., & Schoemaker, P. J. (1993). Strategic assets and organizational rent. *Strategic Management Journal*, *14*(1), 33-46. https://doi.org/10.1002/smj.4250140105

Amit, R., & Zott, C. (2001). Value creation in e-business. Strategic Management Journal, 22,(6/7), 493-520. https://onlinelibrary.wiley.com/doi/abs/10.1002/smj.187

Anwar, M., Khan, S. Z., & Shah, S. Z. (2018). Big data capabilities and firm's performance: A mediating role of competitive advantage. *Journal of Information & Knowledge Management*, *17*(04), 1850045. https://doi.org/10.1142/s0219649218500454

Arunachalam, D., Kumar, N., & Kawalek, J. P. (2018). Understanding big data analytics capabilities in supply chain management: Unravelling the issues, challenges and implications for practice. *Transportation Research Part E: Logistics and Transportation Review*, *114*, 416-436. https://doi.org/10.1016/j.tre.2017.04.001

Augier, M., & Teece, D. J. (2009). Dynamic capabilities and the role of managers in business strategy and economic performance. *Organization science*, *20*(2), 410-421.

Aydiner, A. S., Tatoglu, E., Bayraktar, E., Zaim, S., & Delen, D. (2019). Business analytics and firm performance: The mediating role of business process performance. *Journal of Business Research*, *96*, 228-237.

Aziz, F., Chalup, S. K., & Juniper, J. (2019). Big Data in IoT Systems. *Internet of Things (IoT): Systems and Applications*.

Baesens, B., Bapna, R., Marsden, J. R., Vanthienen, J., & Zhao, J. L. (2016). Transformational issues of big data and analytics in networked business. *MIS quarterly*, *40*(4).

Barnes, D., Clear, F., Dyerson, R., Harindranath, G., Harris, L., & Rae, A. (2012). Web 2.0 and micro-businesses: An exploratory investigation. *Journal of Small Business and Enterprise Development*, *19*(4), 687-711. https://doi.org/10.1108/14626001211277479

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management,* 17: 99-120.

Barrales-Molina, V., Martínez-López, F. J., & Gázquez-Abad, J. C. (2013). Dynamic marketing capabilities: Toward an integrative framework. *International Journal of Management Reviews*, *16*(4), 397- 416. https://doi.org/10.1111/ijmr.12026

Barreto, I. (2010). Dynamic capabilities: A review of past research and an agenda for the future. *Journal of Management*, *36*(1), 256-280. https://doi.org/10.1177/0149206309350776

Barton, D., & Court, D. (2012). Making advanced analytics work for you. *Harvard business review*, *90*(10), 78-83.

Barzilai-Nahon, K. (2006). Gaps and bits: Conceptualizing measurements for digital divide/s. *The information society*, *22*(5), 269-278.

Baškarada, S., & Koronios, A. (2018). The 5S organizational agility framework: A dynamic capabilities perspective. *International Journal of Organizational Analysis*, *26*(2), 331-342. https://doi.org/10.1108/ijoa-05-2017-1163

Baskerville R, Mathiassen, L, & Pries-Heje, J. (2005) *Business Agility and Information Technology Diffusion*. Springer Verlag: New York, New York

Battisti, E. (2021, April 1). *Dynamic capabilities and international business research*. Emerald Publishing. Retrieved April 8, 2021, from https://www.emeraldgrouppublishing.com/journal/ribs/dynamic-capabilities-and-international-business-research

Baum, J. A., & Rowley, T. J. (2002). Companion to organizations: An introduction. *The Blackwell companion to organizations*, 1-34.

Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report, 13*(4), 544-556.

Bean, R. (2017, April 28). *How companies say they're using big data*. Harvard Business Review. https://hbr.org/2017/04/how-companies-say-theyre- using-big-data

Beheshti, H. M. (2006). What managers should know about erp/Erp II. *Management Research News, 29*(4), 184- 193. https://doi.org/10.1108/01409170610665040

Benbasat, I., Goldstein, D. K., & Mead, M. (1987). The case research strategy in studies of information systems. *MIS Quarterly*, *11*(3), 369. https://doi.org/10.2307/248684

Berkowitz, E., & Paradise, R. (2011, September 1). *Innovation in government: Kenya and Georgia*. McKinsey & Company. Retrieved August 2, 2020, from https://www.mckinsey.com/industries/public-and-social-sector/our-insights/innovation-in-government-kenya-and-georgia#

Berman, J. J. (2013). *Principles of big data: Preparing, sharing, and analyzing complex information*. Waltham, MA, United States: Morgan Kaufmann Publishers Inc.

Bits and bytes. (n.d.). Retrieved July 1, 2020, from Stanford University. https://web.stanford.edu/class/cs101/bits-bytes.html

Boateng, R. (2020). *Handbook of research on managing information systems in developing economies*. IGI Global.

Borges, M., Hoppen, N., Luce, F.B., 2009. Information technology impact on market orientation in e-business. *Journal of Business Research, 62,* 883- 890.

Braganza, A., Brooks, L., Nepelski, D., Ali, M., & Moro, R. (2017). Resource management in big data initiatives: Processes and dynamic capabilities. *Journal of Business Research, 70*, 328-337. doi:10.1016/j.jbusres.2016.08.006

Brandenburger, A. M., & Nalebuff, B. J. (1996). *Co-opetition*. New York: Doubleday Currency.

Braun, V., and Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners.* London: Sage

Brix, J. (2017). Exploring knowledge creation processes as a source of organizational learning: A longitudinal case study of a public innovation project. *Scandinavian Journal of Management, 33*(2), 113- 127. https://doi.org/10.1016/j.scaman.2017.05.001

Bromiley, P. (2005). *The behavioral foundations of strategic management*. Blackwell Publishing.

Brouthers, K. D., Geisser, K. D., & Rothlauf, F. (2016). Explaining the internationalization of ibusiness firms. *Journal of International Business Studies, 47*(5), 513–534

Brunsdon, C., & Comber, A. (2020). Big issues for big data: Challenges for critical spatial data analytics. *Journal of Spatial Information Science, 2020*(21), 89-98. https://doi.org/10.5311/JOSIS.2020.21.625

Bryman, A., & Bell, E. (2011). *Business Research Methods* (3rd ed). Oxford University Press: Oxford.

Bulawa, P. (2014). Adapting grounded theory in qualitative research: Reflections from personal experience. *International Research in Education*, *2*(1), 145. https://doi.org/10.5296/ire.v2i1.4921

Bulkley, N., & Van Alstyne, M. W. (2004). Why information should influence productivity. M. Castells, ed. *A Cross Cultural Perspective*. Edward Elgar, Northampton, United Kingdom, 145–173.

Cao, G. & Duan, Y.. (2014). A path model linking business analytics, data-driven culture, and competitive advantage. *ECIS 2014 Proceedings - 22nd European Conference on Information Systems*.

Casula, M., Rangarajan, N., & Shields, P. (2020). The potential of working hypotheses for deductive exploratory research. *Quality & Quantity*. https://doi.org/10.1007/s11135-020-01072-9

Cavaye, A. L. M. (1996). Case study research: A multi-faceted research approach for IS. *Information Systems Journal, 6*(3), 227–242.

Chandy, R., Hassan, M., & Mukherji, P. (2017). Big data for good: Insights from emerging markets*. *Journal of Product Innovation Management*, *34*(5), 703-713. https://doi.org/10.1111/jpim.12406

Charmaz, K. (2000). Grounded theory: objectivist and constructivist methods. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research.* Thousand Oaks, CA: Sage.

Charmaz, K. (2008). Grounded theory as an emergent method. In S. N. Hesse- Biber & P. Leavy (Eds.), *Handbook of emergent methods* (pp. 155-172). Guilford Press.

Chen, C. P. & Zhang, C-Y. (2014). Data-intensive applications, challenges, techniques and technologies: A survey on Big Data. *Information Sciences*. 314-347.

Chen, D. Q., Preston, D. S., & Swink, M. (2015). How the Use of Big Data Analytics Affects Value Creation in Supply Chain Management. *Journal of Management Information Systems, 32*(4), 4-39.

Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS quarterly*, 1165-1188.

Chen, M., Mao, S., Zhang, Y., & Leung, V. C. (2014). *Big data: Related technologies, challenges and future prospects*. Springer.

Chisholm, R.M. (1989). *Theory of Knowledge*, 3rd edition. Englewood Cliffs, NJ: Prentice-Hall.

Čirjevskis, A. (2019). The role of dynamic capabilities as drivers of business model innovation in mergers and acquisitions of technology-advanced firms. *Journal of Open Innovation: Technology, Market, and Complexity*, *5*(1), 12.

Collins, G., & Sisk, D. (2015). *API economy: From systems to business services*. Retrieved from http://dupress.com/articles/tech-trends-2015- what-is-api-economy/

Constantiou, I. D., & Kallinikos, J. (2015). New games, new rules: big data and the changing context of strategy. *Journal of Information Technology*, *30*(1), 44-57.

Coram, R. "John Boyd USAF: The Fighter Pilot Who Changed the Art of Air Warfare." Aviation History, 2002, www.aviation- history.com/airmen/boyd.htm. Accessed 15 November, 2019.

Côrte-Real, N., Oliveira, T., & Ruivo, P. (2017). Assessing business value of big data analytics in European firms. *Journal of Business Research*, *70*, 379-390. https://doi.org/10.1016/j.jbusres.2016.08.011

Coveney, P. V., Dougherty, E. R., & Highfield, R. R. (2016). Big data need big theory too. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *374*(2080), 20160153.

Creswell, J. (1994). Research Design Qualitative & Quantitative Approaches. Thousand Oaks: Sage.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. SAGE Publications.

Creswell, J. W. (2007). *Qualitative Enquiry and Research Design: Choosing Among Five Approaches*, Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. SAGE.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.

Cullen, R. (2001). Addressing the digital divide. *Online Information Review*, *25*(5), 311-320. https://doi.org/10.1108/14684520110410517

Danneels, E., 2002. The dynamics of product innovation and firm competences. Strategic Management Journal, 23, 1095-1121.

Darke, P., Shanks, G., &Broadbent, M. (1998). Successfully completing case study research: combining rigour, relevance and pragmatism. *Information Systems Journal, 8*(4), 273–289.

Dash, S., Shakyawar, S. K., Sharma, M., & Kaushik, S. (2019). Big data in healthcare: Management, analysis and future prospects. *Journal of Big Data*, *6*(1). https://doi.org/10.1186/s40537-019-0217-0

Data, data everywhere. (2010, February 27). Retrieved November 30, 2017, from http://www.economist.com/node/15557443

Davenport, T. (2014). *Big data at work: dispelling the myths, uncovering the opportunities*. Harvard Business Review Press.

Davern, M. J., & Kauffman, R. J. (2000). Discovering potential and realizing value from information technology investments. *Journal of Management Information Systems*, *16*(4), 121-143.

Davidson, L. (1990). Keynes's finance motive. In *Money and Employment* (pp.11-31). Palgrave Macmillan, London.

De Mauro A, Greco M, Grimaldi M. (2015). What is big data? A consensual definition and a review of key research topics. In *AIP Conference Proceedings 1644*. AIP Publishing: Madrid, Spain; 97–104.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2005). *The Sage handbook of qualitative research* (3rd ed.). Sage Publications Ltd.

Dijks, J. (2012). Big Data for the Enterprise: Oracle White Paper. *Oracle Corporation, USA*. Retrieved from http://www.oracle.com/us/products/database/big-data-for-enterprise-519135.pdf

Dolnicar, S., Grün, B., & Leisch, F. (2018). *Market segmentation analysis: Understanding it, doing it, and making it useful*. Springer. https://doi.org/10.1007/978-981-10-8818-6_2

Dong, J. Q., & Wu, W. (2015). Business value of social media technologies: Evidence from online user innovation communities. *The Journal of Strategic Information Systems*, *24*(2), 113-127.

Du, J., & Chen, Z. (2018). Applying organizational ambidexterity in strategic management under a "VUCA" environment: Evidence from high tech companies in China. *International Journal of Innovation Studies*, *2*(1), 42-52. https://doi.org/10.1016/j.ijis.2018.03.003

Dunaway, M., Sullivan, Y. W., & Wamba, S. F. (2019). *Building dynamic capabilities with the internet of things* [Paper presentation]. Proceedings of the 52nd Hawaii International Conference on System Sciences, Hawaii. https://scholarspace.manoa.hawaii.edu/handle/10125/60026

Easterby-Smith, M., & Prieto, I. M. (2008). Dynamic capabilities and knowledge management: An integrative role for learning?. *British Journal of Management*, *19*(3), 235-249. https://doi.org/10.1111/j.1467- 8551.2007.00543.x

Eaves, Y. D. (2001). A synthesis technique for grounded theory data analysis. *Journal of Advanced Nursing*, *35*(5), 654-663. https://doi.org/10.1046/j.1365-2648.2001.01897.x

Edmondson, A. C., & McManus, S. E. (2007). Methodological fit in management field research. *Academy of management review*, *32*(4), 1246-1264.

Edwards, J. S. (2011). A process view of knowledge management: it ain't want you do, it's the way that you do it. *Electronic journal of knowledge management*, *9*(4), 297-306.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, *14*(4), 532-550.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, *50*(1), 25-32. https://doi.org/10.5465/amj.2007.24160888

Eisenhardt, K.M, & Martin, J.A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal* 21: 1105-1121.

Elia, G., Polimeno, G., Solazzo, G., & Passiante, G. (2020). A multi-dimension framework for value creation through big data. *Industrial Marketing Management*, *90*, 617-632. https://doi.org/10.1016/j.indmarman.2020.03.015

Emani, C. K., Cullot, N., & Nicolle, C. (2015). Understandable Big Data: A survey. *Computer Science Review*, *17*, 70-81.

Estes, B. (2016). Geolocation—The risk and benefits of a trending technology. *ISACA Journal*, *5*, 1-6. https://www.isaca.org/resources/isaca-journal/issues/2016/volume-5/geolocationthe-risk-and-benefits-of-a-trending-technology

Executive Office of the President. (2014). *Big data: Seizing opportunities, preserving values*. CreateSpace.

Fainshmidt, S., Pezeshkan, A., Lance Frazier, M., Nair, A., & Markowski, E. (2016). Dynamic capabilities and organizational performance: A meta- analytic evaluation and extension. *Journal of Management Studies*, *53*(8), 1348-1380. https://doi.org/10.1111/joms.12213

Felin, T., & Powell, T. C. (2016). Designing organizations for dynamic capabilities. *California Management Review*, *58*(4), 78-96. https://doi.org/10.1525/cmr.2016.58.4.78

Fernández-Manzano, E., Neira, E., & Clares-Gavilán, J. (2016). Data management in audiovisual business: Netflix as a case study. *El Profesional de la Información*, *25*(4), 568. https://doi.org/10.3145/epi.2016.jul.06

Ferraris, A., Monge, F., & Mueller, J. (2018). Ambidextrous IT capabilities and business process performance: an empirical analysis. *Business Process Management Journal*.

Finlay, L. (2006). 'Rigour', 'Ethical Integrity' or 'Artistry'? Reflexively Reviewing Criteria for Evaluating Qualitative Research. *British Journal of Occupational Therapy, 69*(7), 319–326. https://doi.org/10.1177/030802260606900704

Fisher, O. J., Watson, N. J., Escrig, J. E., Witt, R., Porcu, L., Bacon, D., Rigley, M., & Gomes, R. L. (2020). Considerations, challenges and opportunities when developing data-driven models for process manufacturing systems. *Computers & Chemical Engineering, 140*, 106881. https://doi.org/10.1016/j.compchemeng.2020.106881

Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2013, October 7). *Embracing digital technology, a new strategic imperative*. MIT Sloan Management Review. Retrieved July 8, 2020, from https://sloanreview.mit.edu/projects/embracing-digital-technology/

Flick, U. (2009). *An introduction to qualitative research*. SAGE.

Fosso Wamba, S., & Mishra, D. (2017). Big data integration with business processes: A literature review. *Business Process Management Journal*, *23*(3), 477-492. https://doi.org/10.1108/bpmj-02-2017-0047

Fosso Wamba, S., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics*, *165*, 234-246. https://doi.org/10.1016/j.ijpe.2014.12.031

Fraj, E., Matute, J., & Melero, I. (2015). Environmental strategies and organizational competitiveness in the hotel industry: The role of learning and innovation as determinants of environmental success. *Tourism Management*, *46*, 30-42.

Friend Wise, A., & Williamson Schaffer, D. (2015). Why theory matters more than ever in the age of big data. *Journal of Learning Analytics*, *2*(2), 5- 13. https://doi.org/10.18608/jla.2015.22.2

Galbraith, J. R., Downey, D., & Kates, A. (2002). *Designing dynamic organizations: A hands-on guide for leaders at all levels*. Amacom Books.

Galletta, A., & Cross, W. E. (2013). The semi-structured interview as a repertoire of possibilities. *Mastering the Semi-Structured Interview and Beyond*, 45-72. https://doi.org/10.18574/nyu/9780814732939.003.0003

Gandomi, A., & Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International Journal of Information Management*, *35*(2), 137-144.

Gantz, J., & Reinsel, D. (2012). The digital universe in 2020: Big data, bigger digital shadows, and biggest growth in the far east. *IDC iView: IDC Analyze the future*, *2007*, 1-16. Retrieved from https://www.emc.com/collateral/analyst-reports/idc-the-digital-universe- in-2020.pdf.

Garmaki, M., Boughzala, I., & Wamba, S. F. (2016, June). The effect of Big Data Analytics Capability on Firm Performance. In *PACIS* (p. 301).

Gelinas, L., Pierce, R., Winkler, S., Cohen, I. G., Lynch, H. F., & Bierer, B. E. (2017). Using social media as a research recruitment tool: Ethical issues and recommendations. *The American Journal of Bioethics*, *17*(3), 3-14. https://doi.org/10.1080/15265161.2016.1276644

Geoffrey, W. (2013). Big data needs a big theory to go with it. *Scientific American, 308*(5)

George, G., Haas, M.R., & Pentland, A. (2014). Big data and management. *Academy of Management Journal, 57(2)*, 321-326

Gephart, R. P. (2004). Qualitative research and the Academy of Management Journal. *Academy of Management Journal, 47*(4), pp. 457-62.

Ghasemaghaei, M., & Calic, G. (2019). Does big data enhance firm innovation competency? The mediating role of data-driven insights. *Journal of Business Research*, *104*, 69-84. https://doi.org/10.1016/j.jbusres.2019.07.006

Ghauri, P. (2004). Designing and conducting case studies in international business research. *Handbook of qualitative research methods for international business*, *1*(1), 109-124.

Gil, D., Johnsson, M., Mora, H., & Szymański, J. (2019). Review of the complexity of managing big data of the Internet of Things. *Complexity*, *2019*.

Given, L. M. (2008). *The sage encyclopedia of qualitative research methods: A- L ; Vol. 2, M-Z index*. SAGE.

Glaser, B. G. (1978). *Theoretical Sensitivity: Advances in the Methodology of Grounded Theory*. Mill Valley, Ca.: Sociology Press.

Glaser, B. G. (1992). *Basics of grounded theory analysis: Emergence vs forcing*. Mill Valley, CA: Sociology Press.

Glazer, R. (1991). Marketing in an information-intensive environment: Strategic implications of knowledge as an asset. *Journal of Marketing*, *55*(4),1. https://doi.org/10.2307/1251953

Gobble, M., 2013. A.(2013) Big Data: The Next Big Thing in Innovation. *Research and Technology Management, 56*(1), pp.64–66.

Google (n.d.). How Search Works, from algorithms to answers. Retrieved July 7, 2020, from http://www.google.com/insidesearch/howsearchworks/thestory/index.ht ml

Gould, P. (1981). Letting the data speak for themselves. *Annals of the Association of American Geographers*, *71*(2), 166-176.

Gräbner, C., Heinrich, T., & Schwardt, H. (2016). *Policy implications of recent advances in evolutionary and institutional economics*. Routledge.

Grampp, W. (2000). What did Smith mean by the invisible hand? *Journal of Political Economy*, *108*(3), 441-465. https://doi.org/10.1086/262125

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic management journal*, *17*(S2), 109-122.

Grover, V., Chiang, R. H., Liang, T. P., & Zhang, D. (2018). Creating strategic business value from big data analytics: A research framework. *Journal of Management Information Systems*, *35*(2), 388-423.

Guba, E. G. & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In Denzin, N.K. & Lincoln, Y.S. *Handbook of qualitative research*, 3rd Edn. (pp. 105 – 117). California: Sage.

Guirguis, K. (2020). From big data to big performance – Exploring the potential of big data for enhancing public organizations' performance. A systematic literature review. *Swiss Yearbook of Administrative Sciences*, *11*(1), 55-65. https://doi.org/10.5334/ssas.140

Günther, W. A., Mehrizi, M. H. R., Huysman, M., & Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. *The Journal of Strategic Information Systems*, *26*(3), 191-209.

Gupta, M., & George, J. F. (2016). Toward the development of a big data analytics capability. *Information & Management*, *53*(8), 1049-1064. https://doi.org/10.1016/j.im.2016.07.004

Gupta, S., Drave, V. A., Dwivedi, Y. K., Baabdullah, A. M., & Ismagilova, E. (2020). Achieving superior organizational performance via big data predictive analytics: A dynamic capability view. *Industrial Marketing Management*, *90*, 581-592. https://doi.org/10.1016/j.indmarman.2019.11.009

Hahn, J. (2017). The Internet of Things: mobile technology and location services in libraries. *Library technology reports*, *53*(1), 1-27.

Hajli, M. N. (2014). A study of the impact of social media on consumers. *International Journal of Market Research*, *56*(3), 387-404.

Hajli, M., Sims, J. M., & Ibragimov, V. (2015). Information technology (IT) productivity paradox in the 21st century. *International Journal of Productivity and Performance Management*, *64*(4), 457-478. https://doi.org/10.1108/ijppm-12-2012-0129

Hamaker, C. (2019). An "Internet Minute" Gets an Update. Rural Telecom, 38(3), 38.

Handley, A. (2019). *Business and social crisis in Africa*. Cambridge University Press.

Harris, D. A., Kaefer, F., & Salchenberger, L. M. (2013). The development of dynamic capabilities through organisational and managerial processes. *International Journal of Business Environment*, *5*(4), 398. https://doi.org/10.1504/ijbe.2013.052087

Haskel, J., & Westlake, S. (2018). *Capitalism without capital: The rise of the intangible economy*. Princeton: Princeton University Press.

Hassna, G., & Lowry, P. (2018). Big Data Capability, Customer Agility, and Organization Performance: A Dynamic Capability Perspective. In *JAIS Theory Development Workshop, International Conference on Information Systems (ICIS 2016), Dublin, The Republic of Ireland, December* (Vol. 10). https://www.researchgate.net/publication/324975584_Big_Data_Capability_Customer_Agility_and_Organization_Performance_A_Dynamic_Capability_Perspective

He, X. J. (2014). Business intelligence and big data analytics: An overview. *Communications of the IIMA, 14*(3), 1-11.

Helfat, C. E. (1997). Know-how and asset complementarity and dynamic capability accumulation: The case of r&d. *Strategic Management Journal*, *18*(5), 339-360. https://doi.org/10.1002/(sici)1097-0266(199705)18:5<339::aid-smj883>3.0.co;2-7

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell Publishing.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M., Singh, H., Teece, D., & Winter, S. G. (2009). *Dynamic capabilities: Understanding strategic change in organizations*. John Wiley & Sons.

Helfat, C. E., & Peteraf, M. A. (2009). Understanding dynamic capabilities: Progress along a developmental path. *Strategic Organization*, *7*(1), 91- 102. https://doi.org/10.1177/1476127008100133

Helfat, C. E., & Peteraf, M. A. (2014). Managerial cognitive capabilities and the microfoundations of dynamic capabilities. *Strategic Management Journal*, *36*(6), 831-850. https://doi.org/10.1002/smj.2247

Helfat, C. E., & Winter, S. G. (2011). Untangling dynamic and operational capabilities: Strategy for the (N) ever-changing world. *Strategic management journal*, *32*(11), 1243-1250.

Henderson, R. M., & Clark, K. B. (1990). Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly*, *35*(1), 9. https://doi.org/10.2307/2393549

Hua, D., Weiland, A., & Drummond, S. (2014). Bits, Bytes, and Binary: The Mathematics of Computers. *Tech Directions, 73*(7), 18.

Humphrey, J., Mansell, R., Pare, D., & Schmitz, H. (2003). *The Reality of e- Commerce With Developing Countries*. Institute for Development Studies, University of Sussex, Brighton.

Hurwitz, J. S., Nugent, A., Halper, F., & Kaufman, M. (2013). *Big data for dummies*. John Wiley & Sons.

Huy, Q. (2019, December 11). *For Alibaba, singles day is about more than huge sales*. Harvard Business Review. Retrieved July 5, 2020, from https://hbr.org/2019/12/for-alibaba-singles-day-is-about-more-than- huge-sales

Iansiti, M. & Clark, K. B. (1994). Integration and dynamic capability: evidence from product development in automobiles and mainframe computers. *Industry and Corporate Change, 3*, 557–564.

Indiana University. (2018, January 18). *What are bits, bytes, and other units of measure for digital information?* Indiana University Knowledge Base. Retrieved July 3, 2020, from https://kb.iu.edu/d/ackw

International Finance Corporation. (2018, May). *Digital Access: The future of financial inclusion in Africa*. Retrieved August 1, 2020, from https://www.ifc.org/wps/wcm/connect/region_ext_content/ifc_external_corporate_site /sub- saharan+africa/resources/201805_report_digital-access-africa

Issaias, A., & Syekei, J. (2019, December 17). *Analysis of the data protection act 2019 in Kenya*. Bowmans. Retrieved August 2, 2020, from https://www.bowmanslaw.com/insights/intellectual- property/snapshot-analysis-of-the-data-protection-act-2019/

J. Mazzei, M., & Noble, D. (2020). Big data and strategy: Theoretical foundations and new opportunities. *Strategy and Behaviors in the Digital Economy*. https://doi.org/10.5772/intechopen.84819

Jackson, E. (2019, June 24). *Seedstars announces finalists for its Kenyan startup competition*. Seedstars Announces Finalists for its Kenyan Startup Competition. Retrieved July 20, 2020, from https://kenyanwallstreet.com/seedstars-announces-finalists-for-the-kenyan-startup-competition/

Jacobson, D., Woods, D., & Brail, G. (2011). *APIs: A strategy guide*. O'Reilly Media.

Janjić, V., Bogićević, J., & Krstić, B. (2019). Kaizen as a global business philosophy for continuous improvement of business performance. *Ekonomika*, *65*(2), 13-25. https://doi.org/10.5937/ekonomika1902013j

Janssen, M., Van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, *70*, 338-345. https://doi.org/10.1016/j.jbusres.2016.08.007

Jiang, W., Mavondo, F., & Zhao, W. (2019). The impact of business networks on dynamic capabilities and product innovation: The moderating role of strategic orientation. *Asia Pacific Journal of Management*, *37*(4), 1239-1266. https://doi.org/10.1007/s10490-018-9628-2Mikalef

Ji-fan Ren, S., Fosso Wamba, S., Akter, S., Dubey, R., & Childe, S. J. (2016). Modelling quality dynamics, business value and firm performance in a big data analytics environment. *International Journal of Production Research*, *55*(17), 5011-5026. https://doi.org/10.1080/00207543.2016.1154209

Jonker, J. & Pennink, B. (2010), *The Essence of Research Methodology: A Concise Guide for Master and PhD Students in Management Science*, Springer, Heidelberg.

Joubert A., Murawski M, & Bick M. (2019). Big Data Readiness Index – Africa in the Age of Analytics. *18th Conference on e-Business, e-Services and e-Society (I3E)*, Sep 2019, Trondheim, Norway. pp.101-112, ⟨10.1007/978-3-030-29374-1_9⟩. ⟨hal-02510093⟩

Kamoche, K., & Newenham-Kahindi, A. (2012). Knowledge appropriation and HRM: The MNC experience in Tanzania. *The International Journal of Human Resource Management*, *23*(14), 2854-2873. https://doi.org/10.1080/09585192.2012.671507

Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences*, *8*(9),255. https://doi.org/10.3390/socsci8090255

Kazeem, Y. (2019, November 12). *Kenya is stepping up its citizens' digital security with a new EU-inspired data protection law*. Quartz Africa. Retrieved August 2, 2020, from https://qz.com/africa/1746202/kenya- has-passed-new-data-protection-laws-in-compliance-with-gdpr/

Kelp, C. Understanding phenomena. *Synthese* 192**,** 3799–3816 (2015). https://doi.org/10.1007/s11229-014-0616-x

Kijima, K., & Arai, Y. (2016). Value Co-creation process and value orchestration platform. *Global Perspectives on Service Science: Japan*, 137-154. https://doi.org/10.1007/978-1-4939-3594-9_10

Killen, C. P., Hunt, R. A., & Kleinschmidt, E. J. (2008). Learning investments and organizational capabilities: case studies on the development of project portfolio management capabilities. *International Journal of Managing Projects in Business*, *1*(3), 334-351. https://doi.org/10.1108/17538370810883800

Kiron, D., Prentice, P.K., Ferguson, R.B., 2014. The analytics mandate. *MIT Sloan management review 55*, 1-25.

Kitchin, R. (2014). *The data revolution : Big data, open data, data infrastructures and their consequences*. ProQuest Ebook Central https://ebookcentral-proquest-com.ezproxy.newcastle.edu.au

Kitchin, R., & McArdle, G. (2016). What makes Big Data, Big Data? Exploring the ontological characteristics of 26 datasets. *Big Data & Society*, *3*(1)

Kivunja, C., & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*, *6*(5), 26-41.

Koch, T., & Windsperger, J. (2017). Seeing through the network: Competitive advantage in the digital economy. *Journal of Organization Design*, *6*(1), 6.

Kodama, M. (2018). *Sustainable Growth Through Strategic Innovation: Driving Congruence in Capabilities*. Edward Elgar Publishing.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization science*, *3*(3), 383-397.

Kohli, A. K., & Jaworski, B. J. (1990). Market orientation: the construct, research propositions, and managerial implications. *Journal of marketing*, *54*(2), 1-18.

Kohli, R., & Melville, N. P. (2019). Digital innovation: A review and synthesis. *Information Systems Journal*, *29*(1), 200-223.

Korstjens, I., & Moser, A. (2017). Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. *European Journal of General Practice*, *24*(1), 120-124. https://doi.org/10.1080/13814788.2017.1375092

Kowalczyk, M., & Buxmann, P. (2014). Big data and information processing in organizational decision processes. *Business & Information Systems Engineering*, *6*(5), 267-278. https://doi.org/10.1007/s12599-014-0341-5

Kuhlmann, A. (2010, June). *Reinventing Innovation*. iveybusinessjournal.com. https://iveybusinessjournal.com/publication/reinventing-innovation/

Kurland, N. B., McCaffrey, S. J., & Hill, D. H. (2012). The localism movement: Shared and emergent values. *Journal of Environmental Sustainability*, *2*(1), 1-14. https://doi.org/10.14448/jes.02.0006

Lai, R. (2012). Enterprise Application Development Using Oracle NoSQL Database. Retrieved from http://www.oracle.com/technetwork/articles/bigdata/oracle-nosqldb- appdev-1891870.html

Laney, D. (2001, February 6). *3-D data management: Controlling data volume, velocity and variety*. Gartner Blog Network. Retrieved July 3, 2020, from https://blogs.gartner.com/doug-laney/files/2012/01/ad949-3D-Data- Management-Controlling-Data-Volume-Velocity-and-Variety.pdf

Langley, A., & Abdallah, C. (2011) Templates and turns in qualitative studies of strategy and management. *Research Methodology in Strategy and Management 6*: 201–235.

Lavalle, S., Lesser, E., Shockley, R., Hopkins, M.S., & Kruschwitz, N. (2011). Big data, analytics and the path from insights to value. *MIT Sloan Management Review, 52*, 21-32.

Lepak, D. P., Smith, K. G., & Taylor, M. S. (2007). Value creation and value capture: A multilevel perspective. *Academy of Management Review*, *32*(1), 180-194. https://doi.org/10.5465/amr.2007.23464011

Lewis, K. (2015). Three fallacies of digital footprints. *Big Data & Society* 2, (2)

L'Hoest, R. (2001). The European dimension of the digital economy. *Intereconomics* 36.1 (Jan/Feb 2001): 44-50.

Li, D., & Liu, J. (2014). Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China. *Journal of Business Research*, *67*(1), 2793-2799. https://doi.org/10.1016/j.jbusres.2012.08.007

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. SAGE.

Lozada, N., Arias-Pérez, J., & Perdomo-Charry, G. (2019). Big data analytics capability and Co-innovation: An empirical study. *Heliyon*, *5*(10), e02541. https://doi.org/10.1016/j.heliyon.2019.e02541

Lu, & K. (Ram) Ramamurthy. (2011). Understanding the link between information technology capability and organizational agility: An empirical examination. *MIS Quarterly*, *35*(4), 931. https://doi.org/10.2307/41409967

Lu, Y., Zhou, L., Bruton, G., & Li, W. (2010). Capabilities as a mediator linking resources and the international performance of entrepreneurial firms in an emerging economy. *Journal of International Business Studies*, *41*(3), 419-436.

Lynn T., Rosati P., Fox G. (2020) Measuring the Business Value of Cloud Computing: Emerging Paradigms and Future Directions for Research. In: Lynn T., Mooney J., Rosati P., Fox G. (eds) *Measuring the Business Value of Cloud Computing*. Palgrave Studies in Digital Business & Enabling Technologies. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-43198-3_7

MIT Technology Review Insights. (2016, April 7). *Data's identity in today's economy*. MIT Technology Review. https://www.technologyreview.com/s/601207/datas-identity-in-todays-economy

Ma, Z. (2016). *Managing big data in cloud computing environments*. IGI Global.

Mackinnon, A., & Powell, B. (2008). Paradigms and Worldviews. In *China Calling* (pp. 23-25). Palgrave Macmillan, London.

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic management journal*, *22*(5), 387-401.

Management Association; Information Resources. (2017). *Decision management: Concepts, methodologies, tools, and applications: Concepts, methodologies, tools, and applications*. IGI Global.

Mandlik, M. A., & Kadirov, D. (2018). Big data approaches and outcome of information asymmetry: Opportunities for future research. *International Journal of Business Continuity and Risk Management*, *8*(4), 303. https://doi.org/10.1504/ijbcrm.2018.10015682

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C., Byers, A.H., (2011). Big Data: the Next Frontier for Innovation, Competition and Productivity. McKinsey Global Institute. Retrieved from http://www.mckinsey.com/business-functions/business-technology/our- insights/big-data-the-next-frontier-for-innovation

Manyika, J., Chui, M., Bisson, P., Woetzel, J., Dobbs, R., Bughin, J., & Aharon, D. (2015). The Internet of Things: Mapping the value beyond the hype.

March, J. G., & Simon, H. (1958). *Organizations*. New York: Wiley. Marr, B. (2015). *Big Data: Using Smart Big Data Analytics and Metrics to Make Better Decisions and Improve Performance.* Sussex, UK: John Wiley & Sons.

Marr, B. (2015). *Big data: Using SMART big data, analytics and metrics to make better decisions and improve performance*. John Wiley & Sons.

Marr, B. (2016). *Big Data in Practice: How 45 Successful Companies Used Big Data Analytics to Deliver Extraordinary Results*. Sussex, UK: John Wiley & Sons.

Marr, B. (2017, January 23). Really big data at Walmart: Real-time insights from their 40+ petabyte data cloud. *Forbes Media LLC*. https://www.forbes.com/sites/bernardmarr/2017/01/23/really-big- data-at-walmart-real-time-insights-from-their-40-petabyte-data- cloud/#16e89bb6c105

Marques, R., Santos, C., & Inácio, H. (2019). *Organizational auditing and assurance in the digital age*. IGI Global.

Mason, J. (2002). *Qualitative researching*. SAGE.

Mathrani, S., & Lai, X. (2021). Big data analytic framework for organizational leverage. *Applied Sciences, 11*(5), 2340. https://doi.org/10.3390/app11052340

Mayer-Schönberger, V., & Cukier, K. (2013). *Big data: A revolution that will transform how we live, work, and think*. New York, NY: Houghton Mifflin Harcourt.

Mayer-Schönberger, V., & Ramge, T. (2018). *Reinventing Capitalism in the Age of Big Data*. Basic Books.

McAfee, A., Brynjolfsson, E., Davenport, T. H., Patil, D. J., & Barton, D. (2012). Big data: the management revolution. *Harvard business review*, *90*(10), 60-68.

McGuire, T., Manyika, J., & Chui, M. (2012). Why Big Data is the new competitive advantage. *Ivey Business Journal*, *76*(4), 1-4.

McKendrick, J. (2010). The year ahead in information management: Big Data, Big Issues. *Database Trends and Applications, 24*(4), 6-9.

Medeiros, S. A., Christino, J. M., Gonçalves, C. A., & Gonçalves, M. A. (2020). Relationships among dynamic capabilities dimensions in building competitive advantage: A conceptual model. *Gestão & Produção*, *27*(1). https://doi.org/10.1590/0104-530x3680-20

Merriam, S. B. (2002). Introduction to qualitative research. *Qualitative research in practice: Examples for discussion and analysis*, *1*(1), 1-17.

Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J. (2019). Big data analytics capabilities and innovation: The mediating role of dynamic capabilities and moderating effect of the environment. *British Journal of Management*, *30*(2), 272-298. https://doi.org/10.1111/1467-8551.12343

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. *Information & Management*, *57*(2), 103169. https://doi.org/10.1016/j.im.2019.05.004

Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. (2018). Big data analytics capabilities: a systematic literature review and research agenda. *Information Systems and e-Business Management*, *16*(3), 547- 578.

Miles, M.B., & Huberman, A.M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks, CA: SAGE

Mills, S., Lucas, S., Irakliotis, L., Rappa, M., Carlson, T., & Perlowitz, B. (2012). Demystifying big data: a practical guide to transforming the business of government. Technical report. Retrieved from http://www. ibm. com/software/data/demystifying-big-data.

Miner, J. B. (2007). *Organizational behavior 4: From theory to practice*. M.E. Sharpe.

Mintzberg, H. (1990). The design school: Reconsidering the basic premises of strategic management. *Strategic Management Journal*, *11*(3), 171-195. https://doi.org/10.1002/smj.4250110302

Mintzberg, Henry (1994) "Rounding Out the Manager's Job." Sloan Management Review 36(1): 11-26.

Mo Amin commemorated. (n.d.). AIB | the trade association for international broadcasters. Retrieved 7 June, 2020, from https://aib.org.uk/mo-amin- commemorated/

Mohanty, S., Jagadeesh, M., & Srivatsa, H. (2013). *Big Data Imperatives Enterprise Big Data Warehouse, BI Implementations and Analytics*. Berkeley, CA: Apress.

Moniruzzaman, A. B., & Hossain, S. A. (2013). NoSQL Database: New Era of Databases for Big data Analytics - Classification, Characteristics and Comparison. *International Journal of Database Theory and Application, 6*(4), 1-14.

Monzon, L. (2020, April 20). *Interview: Yebo – Africa's first all-factual VOD platform*. https://www.itnewsafrica.com/2020/04/interview-yebo-africas- first-all-factual-vod-platform/

Morgan, N. A., Vorhies, D. W., & Mason, C. H. (2009). Market orientation, marketing capabilities, and firm performance. *Strategic management journal*, *30*(8), 909-920.

Muhic, M., & Bengtsson, L. (2019). Dynamic capabilities triggered by cloud sourcing: a stage-based model of business model innovation. *Review of Managerial Science*, 1-22.

Müller, O., Fay, M., & Vom Brocke, J. (2018). The effect of big data and analytics on firm performance: An econometric analysis considering industry characteristics. *Journal of Management Information Systems*, *35*(2), 488-509. https://doi.org/10.1080/07421222.2018.1451955

Myers, M. D. (2013). *Qualitative research in business and management*. SAGE.

Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital innovation management: Reinventing innovation management research in a digital world. *MIS Quarterly*, *41*(1), 223-238. https://doi.org/10.25300/misq/2017/41:1.03

Needham, Jeffrey (2013). *Disruptive possibilities: how big data changes everything*. CA, United States: O'Reilly Media, Inc.

Ngui, D., & Kimuyu, P. (2018). Prospects for information and communications technology-enabled services in Kenya. In R. Newfarmer, F. Tarp, & J. Page (Eds.), *Industries without smokestacks: Industrialization in Africa reconsidered*. Oxford University Press. https://doi-org.ezproxy.newcastle.edu.au/10.1093/oso/9780198821885.003.0011

Niebel, T., Rasel, F., & Viete, S. (2018). BIG data – BIG gains? Understanding the link between big data analytics and innovation. *Economics of Innovation and New Technology*, *28*(3), 296-316. https://doi.org/10.1080/10438599.2018.1493075

Nisula, A. M., & Kianto, A. (2013). Evaluating and developing innovation capabilities with a structured method. *Interdisciplinary Journal of Information, Knowledge, and Management*, *8*, 59-82.

Njanja, A. (2017, February 23). *Uber taxi drivers take fares row with US tech firm to Parliament*. Business Daily. https://www.businessdailyafrica.com/corporate/Uber-taxi-drivers- take-fares-Parliament/539550-3825338-6dmncgz/index.html

OECD, & Eurostat. (2019). *The measurement of scientific, technological and innovation activities Oslo manual 2018 guidelines for collecting, reporting and using data on innovation: Guidelines for collecting, reporting and using data on innovation, 4th edition* (4th ed.). OECD Publishing.

Ohlhorst, F. J. (2012). *Big data analytics: turning big data into big money*. New Jersey: John Wiley & Sons.

O'Leary, D. E., & Markus, M. L. (2006). Microsoft's management reporting: SAP, data warehousing, and reporting tools. *Journal of Emerging Technologies in Accounting*,*3*(1), 129-141. https://doi.org/10.2308/jeta.2006.3.1.129

Ondieki, E. (2017, July 29). *He helped create Lipa Na M-pesa, SpotCash — and many more*. Daily Nation. Retrieved July 19, 2020, from https://www.nation.co.ke/kenya/life-and-style/lifestyle/he-helped- create-lipa-na-m-pesa-spotcash-and-many-more--431232

Paiola, M., & Gebauer, H. (2020). Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms. *Industrial Marketing Management*, *89*, 245-264. https://doi.org/10.1016/j.indmarman.2020.03.009

Panetta, K. (2016, November 7). *10 management techniques from born-digital companies*. Gartner. Retrieved June 8, 2020, from https://www.gartner.com/smarterwithgartner/10-management- techniques-from-born-digital-companies/

Parsons, S. G. (2016). Cost of information services and information systems: their implications for investments, pricing and market-based business decisions. In Information Resources Management Association (Ed.), *Big data: Concepts, methodologies, tools, and applications: Concepts, methodologies, tools, and applications*. IGI Global.

Patton, M.Q. (1990), Qualitative Evaluation and Research Methods, Sage, Newbury Park, CA

Pavlou, P. A., & El Sawy, O. A. (2011). Understanding the elusive black box of dynamic capabilities. *Decision sciences*, *42*(1), 239-273.

Perry, C. (1998). Processes of a case study methodology for postgraduate research in marketing. *European Journal of Marketing*, *32*(9/10), 785- 802. https://doi.org/10.1108/03090569810232237

Peteraf, M. A. (1993) 'The Cornerstones of Competitive Advantage: A Resource-Based View', *Strategic Management Journal* 14(3): 179–91.

Pettigrew, A. M. (2012). Context and action in the transformation of the firm: A reprise. *Journal of Management studies*, *49*(7), 1304-1328.

Pollock, R. (2009, May). *The economics of public sector information*. Economics and Finance Research | IDEAS/RePEc. Retrieved August 2, 2020, from https://ideas.repec.org/p/cam/camdae/0920.html

Ponniah, P. (2010). *Data Warehousing: a Comprehensive Guide for IT Professional* (2nd ed.). New York: McGraw-Hill.

Popovič, A., Hackney, R., Tassabehji, R., & Castelli, M. (2016). The impact of big data analytics on firms' high value business performance. *Information Systems Frontiers*, *20*(2), 209-222. https://doi.org/10.1007/s10796-016-9720-4

Porter, M. E. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* New York: Free Press.

Porter, M.E. & Millar, V.E. (1985). How information gives you competitive advantage. *Harvard Business Review 63(4)*: 149–160.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of interactive marketing*, *18*(3), 5-14.

Prasad, P. (1993). Symbolic processes in the implementation of technological change: A symbolic interactionist study of work computerization. *Academy of Management Journal*, *36*(6), 1400- 1429. https://doi.org/10.5465/256817

Priem, R. L. (2007). A consumer perspective on value creation. *Academy of Management Review*, 32: 219–235.

Priem, R. L., & Butler, J. E. (2001). Is the resource-based "View" a useful perspective for strategic management research? *The Academy of Management Review*, *26*(1), 22. https://doi.org/10.2307/259392

Priem, R. L., Butler, J. E., & Li, S. (2013). Toward Reimagining strategy research: Retrospection and prospection on the 2011AMRDecade award article. *Academy of Management Review*, *38*(4), 471- 489. https://doi.org/10.5465/amr.2013.0097

Protogerou, A., Caloghirou, Y., & Lioukas, S. (2012). Dynamic capabilities and their indirect impact on firm performance. *Industrial and Corporate Change*, *21*(3), 615-647.

Provost, F., & Fawcett, T. (2013). *Data Science for Business Fundamental principles of data mining and data-analytic thinking*. Sebastopol, CA: O'Reilly.

Punch, K. (2016). *Developing effective research proposals*. Sage.

Raguseo, E. (2018). Big data technologies: An empirical investigation on their adoption, benefits and risks for companies. *International Journal of Information Management, 38*(1), 187-195. doi:10.1016/j.ijinfomgt.2017.07.008

Raguseo, E., & Vitari, C. (2018). Investments in big data analytics and firm performance: An empirical investigation of direct and mediating effects. *International Journal of Production Research*, *56*(15), 5206-5221. https://doi.org/10.1080/00207543.2018.1427900

Ramachandran, J., & Gunta, S. (2007). Dynamic capabilities: An emerging economy perspective. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2145843

Ramadan, M., Shuqqo, H., Qtaishat, L., Asmar, H., & Salah, B. (2020). Sustainable competitive advantage driven by big data analytics and innovation. *Applied Sciences*, *10*(19), 6784. https://doi.org/10.3390/app10196784

Randewich, N. (2020, January 8). *Tesla's market value zooms past that of GM and Ford - combined*. www.reuters.com. https://www.reuters.com/article/us-usa-stocks-tesla/teslas-market-value-zooms-past-that-of-gm-and-ford-combined-idUSKBN1Z72MU

Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case study method: A step-by-step guide for business researchers. *International Journal of Qualitative Methods*, *18*, 160940691986242. https://doi.org/10.1177/1609406919862424

Rather, R. A., Tehseen, S., & Parrey, S. H. (2018). Promoting customer brand engagement and brand loyalty through customer brand identification and value congruity. *Spanish Journal of Marketing-ESIC*.

Rawat, R., & Yadav, R. (2021). Big data: Big data analysis, issues and challenges and technologies. *IOP Conference Series. Materials Science and Engineering, 1022*(1) https://doi.org/10.1088/1757-899X/1022/1/012014

Reddy, G. S., Srinivasu, R., Rao, M. P. C., & Rikkula, S. R. (2010). Data Warehousing, Data Mining, OLAP and OLTP Technologies are essential elements to support decision-making process in industries. *International Journal on Computer Science and Engineering,2*(9), 2865-2873.

Redman, T. C. (2008). *Data driven: Profiting from your most important business asset*. Boston, MA: Harvard Business Press.

Reinsel, D., Gantz, J., & Rydning, J. (2018, November). *The digitization of the world from edge to core* [White Paper]. *IDC.* https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf

Remenyi, D., Williams, B., Money, A., & Swartz, E. (1998). *Doing research in business and management: An introduction to process and method*. SAGE.

Rialti, R., Marzi, G., Ciappei, C., & Busso, D. (2019). Big data and dynamic capabilities: A bibliometric analysis and systematic literature review. *Management Decision*, *57*(8), 2052-2068. https://doi.org/10.1108/md-07-2018-0821

Rigby, D. K., Sutherland, J., & Takeuchi, H. (2016, May). *Embracing Agile*. Harvard Business Review. Retrieved July 11, 2020, from https://hbr.org/2016/05/embracing-agile

Roberts, S. L. (2020, April 20). *Tracking COVID-19 using big data and big tech: A digital Pandora's box*. LSE. Retrieved July 20, 2020, from https://blogs.lse.ac.uk/politicsandpolicy/tracking-covid-19/

Rogers, E. (1995), *Diffusion of Innovations*, 4th ed., Free Press, New York, NY.

Rognerud, J. (2008). *Ultimate guide to search engine optimization: Drive traffic, boost conversion rates and make lots of money*. Jon Rognerud SEO.

Ross, J. (2016, February, 4). *Digital Disruption: Transforming Your Company for the Digital Economy with Jeanne Ross* [Video]. MIT Sloan Executive Education. Retrieved from https://www.youtube.com/user/MITSloanExecEd

Ross, J. W., Beath, C. M., & Mocker, M. (2019). *Designed for digital: How to architect your business for sustained success*. MIT Press.

Rumelt, R. P., Schendel, D., & Teece, D. J. (Eds.). (1995). *Fundamental issues in strategy: A research agenda*. Rutgers University Press.

Russom, P. (2011). The Three Vs of Big Data Analytics: TDWI. Retrieved from http://www.tableau.com/sites/default/files/whitepapers/tdwi_bpreport_q4 11_big_data_analytics_tableau.pdf

Safaricom partners with Flytxt to improve customer experience. (2016, February 24). *Telecomworldwire (M2)*.

Salijeni, G., Samsonova-Taddei, A., & Turley, S. (2018). Big data and changes in audit technology: Contemplating a research agenda. *Accounting and Business Research*, *49*(1), 95-119. https://doi.org/10.1080/00014788.2018.1459458

Santos, M.Y., Costa, C., Galvão, J., Andrade, C., Pastor, O., & Marcén, A.C. (2019) Enhancing Big Data Warehousing for Efficient, Integrated and Advanced Analytics. In: Cappiello C., Ruiz M. (eds) *Information Systems Engineering in Responsible Information Systems*. CAiSE 2019. Lecture Notes in Business Information Processing, vol 350. Springer, Cham. https://doi.org/10.1007/978-3-030-21297-1_19

Santos, J.D. & Singer, J. (2012). *Looking for the Right Answers in the Clouds, AFCEA International Cyber Committee: Cloud and Big Data Sub- committee* [White paper] https://www.afcea.org/committees/cyber/documents/LookingfortheRight AnswersintheCloudsWhite Paper_000.pdf (accessed 27 March 2020).

Sarbah, A., & Otu-Nyarko, D. (2014). An overview of the design School of strategic management (Strategy formulation as a process of conception). *Open Journal of Business and Management*, *02*(03), 231-249. https://doi.org/10.4236/ojbm.2014.23029

Schneider, P. (2018). Managerial challenges of industry 4.0: An empirically backed research agenda for a nascent field. *Review of Managerial Science*, *12*(3), 803-848. https://doi.org/10.1007/s11846-018-0283-2

Schoemaker, P. J., Heaton, S., & Teece, D. (2018). Innovation, dynamic capabilities, and leadership. *California Management Review*, *61*(1), 15- 42.

Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O. (2020). How big old companies navigate digital transformation. *Strategic Information Management*, 133-150. https://doi.org/10.4324/9780429286797-6

Sena, V., Bhaumik, S., Sengupta, A., & Demirbag, M. (2019). Big data and performance: What can management research tell us? *British Journal of Management*, *30*(2), 219-228. https://doi.org/10.1111/1467-8551.12362

Sena, V., Demirbag, M., Bhaumik, S. & Sengupta, A. (2017). Special Issue 2019: Call for Papers Big Data and Performance. *British Journal of Management, 28*: 551–553.

Setia, P., Venkatesh, V., & Joglekar, S. (2013). Leveraging digital technologies: How information quality leads to localized capabilities and customer service performance. *MIS Quarterly*, *37*(2), 565-590. https://doi.org/10.25300/misq/2013/37.2.11

Shabbir, M. Q., & Gardezi, S. B. (2020). Application of big data analytics and organizational performance: The mediating role of knowledge management practices. *Journal of Big Data*, *7*(1). https://doi.org/10.1186/s40537-020-00317-6

Shapiro, C. (1989). The theory of business strategy. *The Rand Journal of Economics*, *20*(1), 125-137.

Sharma R., Mithas S., Kankanhalli A. (2014). Transforming decision-making processes: A research agenda for understanding the impact of business analytics on organisations. *European Journal of Information Systems, 23 (4)* (2014), 433-441

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects, Education for information, 22(2004), 63-75

Shi, Z., & Wang, G. (2018). Integration of big-data ERP and business analytics (BA). *The Journal of High Technology Management Research*, *29*(2), 141-150. https://doi.org/10.1016/j.hitech.2018.09.004

Siddiqa, A., Hashem, I. A. T., Yaqoob, I., Marjani, M., Shamshirband, S., Gani, A., & Nasaruddin, F. (2016). A survey of big data management: Taxonomy and state-of-the-art. *Journal of Network and Computer Applications*, *71*, 151-166.

Simons, H. (2009). Case study research in practice. London: SAGE.

Singh, S. K., & Del Giudice, M. (2019). Big data analytics, dynamic capabilities and firm performance. *Management Decision*, *57*(8), 1729- 1733. https://doi.org/10.1108/md-08-2019-020

Statista. (2019, July). *User-generated internet content per minute 2019*. Retrieved July 5, 2020, from https://www.statista.com/statistics/195140/new-user-generated- content-uploaded-by-users-per-minute/

Stewart, M. (2014). Big data's big mistake: Quantity over quality. Retrieved from http://data-informed.com/big-datas-big-mistake-quantity-quality/

Strauss, A., & Corbin, J. M. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. SAGE Publications.

Strauss, A., & Corbin, J. (1998). Basics of Qualitative Research Techniques and Procedures for Developing Grounded Theory. Thousand Oaks, CA: Sage.

Stringham, E. P., Miller, J. K., & Clark, J. R. (2015). Overcoming barriers to entry in an established industry: Tesla Motors. *California Management Review*, *57*(4), 85-103.

Sutton, S. G., Reinking, J., & Arnold, V. (2011). On the use of grounded theory as a basis for research on strategic and emerging technologies in accounting. *Journal of Emerging Technologies in Accounting*, *8*(1), 45- 63. https://doi.org/10.2308/jeta-10207

Swaminathan, A., & Meffert, J. (2017). *Digital @ Scale: The Playbook You Need to Transform Your Company*. Wiley.

Tabesh, P., Mousavidin, E., & Hasani, S. (2019). Implementing big data strategies: A managerial perspective. *Business Horizons*, *62*(3), 347-358. https://doi.org/10.1016/j.bushor.2019.02.001

Tai, J. C., Wang, E. T., & Wang, K. (2017). Investigating the Impact of IT Ambidexterity on Digital Innovation Capability. *Proceedings of the 21st Pacific Asia Conference on Information Systems*, Langkawi, Malaysia.

Täuscher, K., & Laudien, S. M. (2017). Uncovering the nature of platform- based business models: An empirical taxonomy. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.

Taylor, L. (2016). The ethics of big data as a public good: which public? Whose good? *Philosophical Transactions. Series A, Mathematical, Physical, and Engineering Sciences*, *374*(2083), 20160126. http://doi.org/10.1098/rsta.2016.0126

TechAmerica Foundation. (2012). *Demystifying big data: A practical guide to transforming the business of government*. https://statswiki.unece.org/display/hlgbas. Retrieved July 1, 2020, from https://www1.unece.org/stat/platform/pages/viewpage.action?pageId=80053387

Teece, D. J. (1980). The diffusion of an administrative innovation. *Management Science*, *26*(5), 464-470. https://doi.org/10.1287/mnsc.26.5.464

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*(13), 1319-1350. https://doi.org/10.1002/smj.640

Teece, D. J. (2012). Dynamic capabilities: Routines versus entrepreneurial action. *Journal of Management Studies*, *49*(8), 1395-1401. https://doi.org/10.1111/j.1467-6486.2012.01080.x

Teece, D. J. (2014a). The foundations of enterprise performance: Dynamic and ordinary capabilities in an (Economic) theory of firms. *Academy of Management Perspectives*, *28*(4), 328-352. https://doi.org/10.5465/amp.2013.0116

Teece, D. J. (2014b). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies*, *45*(1), 8-37. https://doi.org/10.1057/jibs.2013.54

Teece, D. J. (2017). Towards a capability theory of (innovating) firms: Implications for management and policy. *Cambridge Journal of Economics*, *41*(3), 693-720. https://doi.org/10.1093/cje/bew063

Teece, D. J. (2019). A capability theory of the firm: An economics and (Strategic) management perspective. *New Zealand Economic Papers*, *53*(1), 1-43. https://doi.org/10.1080/00779954.2017.1371208

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509-533. https://doi.org/10.1002/(sici)1097-0266(199708)18:73.0.co;2-z

Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. *California Management Review*, *58*(4), 13-35. https://doi.org/10.1525/cmr.2016.58.4.13

Teece, J. D. (2010). Technological innovation and the theory of the firm: the role of enterprise level knowledge, complementarities, and (dynamic) capabilities. In B. H. Hall & N. Rosenberg (Eds.), *Handbook of the economics of innovation* (pp. 679-730). Elsevier. https://doi.org/10.1016/S0169-7218(10)01016-6

Teich, D.A. (2016). SQL vs. NoSQL database design debate isn't even a real fight. Retrieved from http://searchdatamanagement.techtarget.com/tip/SQL-vs-NoSQL- database-design-debate-isnt-even-a-real-fight/

Tempini, N. and Aaltonen, A. (2014). Everything counts in large amounts: a critical realist case study on data-based production. *Journal of Information Technology (29)*: 97–110. doi:10.1057/jit.2013.29; published online 7 January 2014.

Thirathon, U., Wieder, B., & Ossimitz, M. L. (2018). Determinants of analytics- based managerial decision-making. *International Journal of Information Systems and Project Management*.

Tracy, S. J. (2010). Qualitative quality: Eight “big-tent” criteria for excellent qualitative research. *Qualitative inquiry*, *16*(10), 837-851.

Truncellito, D. (2019). *Epistemology | Internet Encyclopedia of Philosophy*. [online] Iep.utm.edu. Available at: https://www.iep.utm.edu/epistemo/ [Accessed 6 Apr. 2019].

Vadana, I. I., Torkkeli, L., Kuivalainen, O., & Saarenketo, S. (2019). The Internationalization of Born-Digital Companies. In *The Changing Strategies of International Business* (pp. 199-220). Palgrave Macmillan, Cham.

Vannoni, M. (2015). What are case studies good for? Nesting comparative case study research into the lakatosian research program. *CrossCultural Research, 49*(4), 331-357.

Varian, H. (2016). Intelligent Technology, *Finance & Development, a quarterly publication of The International Monetary Fund, Sept 2016, 53(3).*

Verhulst, S. (2017). *Open data in developing economies: Toward building an evidence base on what works and how*. African Minds. http://www.africanminds.co.za/wp-content/uploads/2017/10/AM- OD-in-Developing-Economies-COMPLETE-R-WEB-10Nov2017.pdf

Vidgen, R., Shaw, S., & Grant, D. B. (2017). Management challenges in creating value from business analytics. European Journal of Operational Research, 261(2), 626-639. https://doi.org/10.1016/j.ejor.2017.02.023

Vijai, C., & Nivetha, P. (2020). E-commerce on cloud: Opportunities and challenges. *Advances in Management (Indore, India), 13*(3), 14-21.

Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems, 4*(2), 74–81.

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, *70*, 356-365. https://doi.org/10.1016/j.jbusres.2016.08.009

Wan, F., Williamson, P., & Yin, E. (2019). Enabling cost innovation by non- traditional organizational processes: The case of Chinese firms. *Technological Forecasting and Social Change*, *139*, 352- 361. https://doi.org/10.1016/j.techfore.2018.12.003

Wang, Y., & Byrd, T. A. (2017). Business analytics-enabled decision-making effectiveness through knowledge absorptive capacity in health care. *Journal of Knowledge Management*, *21*(3), 517-539. https://doi.org/10.1108/jkm-08-2015-0301

Wang, Y., & Hajli, N. (2017). Exploring the path to big data analytics success in healthcare. *Journal of Business Research*, *70*, 287-299. https://doi.org/10.1016/j.jbusres.2016.08.002

Weill, P., & Woerner, S. L. (2015). Thriving in an increasingly digital ecosystem. *MIT Sloan Management Review*, *56*(4), 27.

Wernerfelt, B. (1984) 'A Resource-Based View of the Firm', *Strategic Management Journal* 5:171–80.

West, G. (2013). Wisdom in numbers. *Scientific American*, *308*(5), 14-14. https://doi.org/10.1038/scientificamerican0513-14

West, S. M. (2017). Data capitalism: Redefining the logics of surveillance and privacy. *Business & Society*, 0007650317718185.

Wiesböck, F. (2018). *Thinking Outside of the IT Capability Box*. In *24th Americas conference on information systems (AMCIS 2018): New Orleans, Louisiana, USA, 16-18 August 2018*.

Williamson, B. (2017). *Big data in education: The digital future of learning, policy and practice*. SAGE.

Wilden, R., & Gudergan, S. P. (2014). The impact of dynamic capabilities on operational marketing and technological capabilities: Investigating the role of environmental turbulence. *Journal of the Academy of Marketing Science*, *43*(2), 181-199. https://doi.org/10.1007/s11747-014-0380-y

Winter, S.G. (2003). Understanding dynamic capabilities. *Strategic Management Journal* 24: 991-995.

Wong, A. (2016). The Key to Keeping Up: Dynamic Capabilities. Retrieved 31 March 2020, from https://cmr.berkeley.edu/2016/08/dynamic- capabilities/

Yang, C., Huang, Q., Li, Z., Liu, K., & Hu, F. (2017). Big Data and cloud computing: innovation opportunities and challenges. *International Journal of Digital Earth*, *10*(1), 13-53.

Yin, R. K. (2003). *Case study research: Design and methods*. SAGE.

Yin, R. K. (2009). *Case study research: Design and methods*. SAGE.

Yin, R.K. (2013), Case Study Research: Design and Methods, SAGE Publications Inc., Thousand Oaks, CA.

Ylijoki, O., & Porras, J. (2016). Conceptualizing big data: Analysis of case studies. *Intelligent Systems in Accounting, Finance and Management*, *23*(4), 295-310. https://doi.org/10.1002/isaf.1393

Ylijoki, O., Sirkiä, J., Porras, J., & Harmaakorpi, V. (2019). Innovation capabilities as a mediator between big data and business model. *Journal of Enterprise Transformation*, 1-18.https://doi.org/10.1080/19488289.2018.1548396

Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010) The new organizing logic of digital innovation: An agenda for information systems research. *Inform. Systems Res. 21*(4):724–735

Younas, M. (2019). Research challenges of big data. SOCA 13, 105–107. https://doi.org/10.1007/s11761-019-00265-x

Zachariadis, M., & Ozcan, P. (2016). The API economy and digital transformation in financial services: The case of open banking. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2975199

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda*. *Journal of Management Studies*, *43*(4), 917-955. https://doi.org/10.1111/j.1467- 6486.2006.00616.x

Zawislak, P. A., Zen, A. C., Fracasso, E. M., Reichert, F. M., & Pufal, N. A. (2013). Types of Innovation in low-technology firms of emerging markets: an empirical study in Brazilian industry. *Revista de Administração e Inovação*, *10*(1), 4-27

Zeleti, F.A., & Ojo, A. (2017). Open data value capability architecture. *Information Systems Frontiers*, *19* (2), 337–360. https://doi.org/10.1007/s10796-016-9711-5.

Zeng, J., & Khan, Z. (2019). Value creation through big data in emerging economies. *Management Decision*, *57*(8), 1818-1838. https://doi.org/10.1108/md-05-2018-0572

Zhang, D., & Yue, W. T. (2013). Big data and social media use in commerce, work, and social life: Special issue of *Decision Support Systems* for the 10th Workshop on E-Business. Decision Support Systems.

Zheng, Z., Zhu, J., & Lyu, M. R. (2013, June). Service-generated big data and big data-as-a-service: an overview. In *2013 IEEE international congress on Big Data* (pp. 403-410).

Zollo, M., & Winter, S. G. (2002). Deliberate learning and the evolution of dynamic capabilities. *Organization science*, *13*(3), 339-351.

Zwitter, A., & Gstrein, O. J. (2020). Big data, privacy and COVID-19 – learning from humanitarian expertise in data protection. *Journal of International Humanitarian Action*, *5*(1). https://doi.org/10.1186/s41018-020-00072-6

Zwolenski, M. & Weatherill, L. (2014). The digital universe: Rich data and the increasing value of the internet of things. *Australian Journal of Telecommunications and the Digital Economy, 2*(3), 47.1-47.9

Appendix A: Participant Information Statement

Date:

Addressee:

Information Statement for Senior Level Managers/Decision-Makers, for the Research Project: Leveraging big data for value creation in emerging markets: a dynamic capabilities perspective

You are invited to participate in the research project identified above which is being conducted by Andrew Gathecha Mwatha, as part of his study towards a Doctor of Business Administration (DBA) degree at the University of Newcastle, supervised by Professor Ken Kamoche from the Nottingham University Business School.

Why is the research being done?

In today's increasingly global, digital economy, big data – large, varied, complex, real-time or near real-time datasets - is disrupting business firms, forcing a reassessment of traditional competitiveness frameworks and models. A study by Capgemini and EMC Corporation showed that, amid the market disruption wrought by big data, 65% of the organizations acknowledged that they risked becoming uncompetitive unless they embraced new, big data-based solutions ("Big & Fast Data: The Rise of Insight-Driven Business", 2015). As such, there is increased interest and investments by companies, in big data-based analytic capabilities (BDC), defined as the "firm's ability to assemble, integrate, and deploy its big data-based resources" (Gupta & George, 2016:1054) for competitive positioning. However, the pathway to sustained competitiveness and value creation through big data remains unclear and under-researched.

The main objective of this research is to examine organizational use of big data-based dynamic capabilities, to better understand how big data may enhance firm competitiveness, and create value propositions. In particular, the study will examine how, in turbulent environments, BDC hones the firm's ability to sense, seize and transform market opportunities into consumer-focused business models which create value for the customer and the firm (Teece, 2007 & 2017).

Case studies will be conducted with Kenyan firms (anonymity and utmost confidentiality will be maintained) across diverse sectors. It is expected that the study's findings will show relationships between BDC and a firm's dynamic capabilities and also offer practical guidance to firms wishing to invest in and exploit big data, for competitive advantage.

Who can participate in the research?

The study requires participants from companies that exemplify big data-based, digital applications in their operations. Your firm was selected through a review of publicly available information about its innovative big data-based initiatives and the researcher's professional networks. Targeted individuals include senior level managers or decision makers who are knowledgeable and experienced about their firm's big data programs and business strategy.

What would you be asked to do?

First, the researcher will request your voluntary and informed consent for participating in this study. Following your consent, the researcher will request a physical interview with you (or if you prefer, teleconference or other mechanism

convenient to you). The debut interview, to be held at your normal place of work, will last approximately one hour.

Data required from you: The researcher will not collect any existing data from your organization. Instead, the researcher will conduct interviews with you (in-depth, semi-structured, open-ended in nature), ask questions touching on your firm's big data capabilities (technology, human and organizational facets), and how such capabilities contribute to business strategy at an operational and strategic level. In particular, you will be asked to describe how, if at all, big data capabilities are shaping new, innovative business models that accurately meet the needs of the firm's customers. You will be requested to allow tape-recording of interviews, to ensure that responses are accurately captured.

Clarificatory discussions: Based on the analysis of the debut interview, you may be requested to attend a follow-on interview, for purpose of seeking necessary clarifications or further information. Such interview will take a shorter time than the initial one, approximately 20-30 minutes, and may be held either at your workplace, or other mutually convenient location. Cognizant of the likely busy schedule and differing circumstances of participants, the follow-on interview may be substituted with email correspondence, or a telephone/Skype call. You will be requested to allow tape-recording of any follow-on interviews, to ensure that responses are accurately captured.

Aside from the interviews, and clarificatory discussions, you may be requested to fill in a form that provides basic data about your organization – establishment, business lines, etc.

What choice do you have?
Participation in this research is entirely voluntary. Only senior executives and their respective employees who give their informed consent will be included in the study. Whether or not you choose to participate, the decision will not disadvantage you or your business. If you do decide to participate, you may withdraw from the project before, during or after the interview/s and prior to the publication of findings without giving a reason.

How much time will it take?
The debut interview, to be held at your normal place of work, will last approximately one hour. Where necessary, follow-on interviews, either in person or via telephone/Skype will be held, each lasting for about 20-30 minutes. The alternative procedure will be email correspondence, with very specific enquiries, to minimize time encumbrance on your part.

***What are the risks and benefits of participating*?**
The researcher acknowledges that any data related to a business, is business sensitive; however, no risk is likely to incurred by your company, or any of your officers, for taking part in this research, because the researcher will not collect such data, and in addition, the researcher is committed act in the best interest of the participants, by ensuring confidentiality of any other data obtained from both individuals and their companies throughout the study.

- The researcher will discuss confidentiality with the participants during the informed consent process.
- Unless expressly approved by the participant, identifying characteristics such as interviewee name, job title, company name, will be changed. In addition, data obtained from one participant will not be discussed with another participant.

- Conversations with participants about confidentiality will extend beyond data collection stage, to data analysis and report writing, giving participants an opportunity to discuss any sensitive areas, state which aspects of the data they would wish to remain confidential, or withdraw their consent altogether.
- Where the participant and/or participant company requires a confidentiality or non-disclosure agreement, the researcher will sign the document as a sign of good faith in the handling of research data obtained.
- There are no costs that participants would have to bear in order to participate in the study. The amount of time that participants will take away from their employment is minimal.

The benefit of participating in this research is that, its findings will help inculcate systemized understanding of how businesses can profit from their strategic investments in big data, which are of paramount importance due to the seemingly inexorable trend of data and technology-mediated global business environment.

How will your privacy be protected?
In view of the sample size of this study, and the specialized nature of work done by the companies involved in the study, the researcher will carefully consider protection of the privacy of study participants.

During the consent process, the researcher will discuss and agree with the study participants on what may and may not be recorded or transcribed, for instance interviewee name or other data that may identify the participant directly or indirectly.

Unless the study participant expressly consents, all data and information available to the researcher, including but not limited to the scripted and/or recorded interviews, emails and other correspondence, will be kept confidential. Any identifying data in transcribed interviews will be anonymized through strategies that include but are not limited to: use of pseudonyms, generic descriptors, aggregation, substitution, redaction, removal of contextual identifiers.

Besides, all the research data will be securely stored electronically, with use restricted to the researcher only and his supervisor. Data retention beyond the period of study will be strictly in accordance with the University of Newcastle data integrity policy, or as required by law.

To further enhance privacy, for interviews held at the participant's normal place of work, the researcher will request that the interview space allows for unobtrusive, quiet, uninterrupted, one-on-one discussions with only the participant in attendance; the ideal meeting space could be the individual participants office, or where the office is unsuitable for the purpose, the participant will be requested to arrange for a similar separate meeting room.

How will the information collected be used?
The data collected from participants, and the consequential research findings will be published in a thesis to be submitted for Mr. Mwatha's DBA degree. Additionally, the material may be published in academic journals or as part conference proceedings. Non-identifiable data may also be shared with other parties to encourage scientific scrutiny, and contribute to further research and public knowledge, or as required by law.

In all cases, the anonymity principle will be observed – individual participants will not be identified in any reports arising from the project. As necessary, participants will be given an opportunity to review recording and/or transcripts of own interviews, to ensure faithful representation of their contributions.

Participants will be offered a summary of the results of the study in non-academic format. A participant desirous of receiving a copy of the summary to please email the researcher, andrew.mwatha@uon.edu.au, after 31 March, 2020 when it is expected to be available.

***What do you need to do to participate*?**
Please read this Information Statement and be sure you understand its contents before you consent to participate. If there is anything you do not understand, or you have questions, contact the researcher.

If you would like to participate, please complete the attached Consent Form and email it to the researcher, who will then contact you to arrange a time convenient to you for the initial interview.

Further information
If you would like further information or clarifications about the project, please contact the student researcher whose details are shown below, or the study supervisor, Professor Ken Kamoche, Nottingham University Business School, Jubilee Campus, Nottingham NG8 1BB, tel +44 (0) 115 8466533, email: Ken.kamoche@nottingham.ac.uk

Thank you for considering this invitation.

_____

Andrew Mwatha
Student Researcher/ Candidate for Doctor of Business Administration Newcastle Business School
The University of Newcastle, Australia.
Mobile: +254 724148750; +254 737148750 | andrew.mwatha@uon.edu.au
| Skype: andrewgathecha

Complaints about this research
This project has been approved by the University's Human Research Ethics Committee, Approval No. H-2018-0479. Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Services, NIER Precinct, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, telephone (2) 4921 6333, email Human-Ethics@newcastle.edu.au.

A Research licence for this study, ref NACOSTI/P/19/21381/28654, has been granted by The National Commission for Science, Technology and Innovation (NACOSTI), pursuant to Section 17 (1) of the Science, Technology and Innovation Act, 2013. In addition to the Complaints procedure aforementioned, the participant may refer questions or complaints about the conduct of this study to: The Director General, National Commission for Science Technology and Innovation; PO Box 30623, 00100, Nairobi, Kenya; Tel +254 713 788 787 OR +254 735 404 245; Emails:
customercare@nacosti.go.ke / info@nacosti.go.ke

Appendix B: Participant Consent Form

FACULTY OF BUSINESS AND LAW

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

To: Student Researcher/ DBA Candidate
Newcastle Business School, Univ. of Newcastle, AU
Tel +254 724 148750; +254 737 148750
andrew.mwatha@uon.edu.au

Consent Form for participants in the Research Project:
Leveraging big data for value creation in emerging markets: a dynamic capabilities perspective

I agree to participate in the above research project and give my consent freely.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have retained. Further, I understand I can withdraw from the project at any time, without having to give any reason for withdrawing.

I consent to participating in a semi-structured, open-ended interview, and having it audio recorded; providing any clarifications requested via email or other communication.

I understand that my personal information and that of my organization will remain private and confidential to the researchers.

I have had the opportunity to have questions answered to my satisfaction.

I understand that after 4 August 2020, I may email the researcher (andrew.mwatha@uon.edu.au) to request, and will be provided with, a summary of the results of the study in non-academic format.

Kindly fill in the spaces below, then print, append signature, and email completed form to the researcher, andrew.mwatha@uon.edu.au (or retain for collection during interview). Thank you.

Name:_____

Organization name: _____

Position/Title:_____

Email & tel contact:_____

Signature:_____ **Dated on:** _____

Appendix C: Interview Discussion Guide

Interview guide for the Research Project: Leveraging big data for value creation in emerging markets: a dynamic capabilities perspective

Topics:

- Big data usage, business benefits, success conditions, constraints faced;
- Big data interplay with dynamic capabilities (sense, seize, transform activities) that beget positive business outcomes, including new business models

Questions/ discussion points:

1) Which types of big data technologies do you use in your business?
2) In which business functions/ processes are these big data technologies used?
3) What benefit(s) arise from the use of big data technologies?
4) How do you capture, store, and analyze big data?
5) What sorts of management and other analytical reports are generated from big data? How are such reports used?
6) Would you say that big data digital technology investments are crucially useful for the business? Why or why not?
7) What do you see as the key success factors for effective use of big data technologies in your organization? (effective means that the big data technologies abet efficiencies, superior customer service, innovation, etc; 'Success indicated by factors such as technology, big data proficient personnel, top management support).
8) What are the biggest challenges in using big data effectively in your business?