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Abstract

This paper investigated the effect of big data analytics and its six sub-dimensions on the competitive advantage of healthcare service organisations. Big data analytics have six sub-dimensions: agility capability, data-driven decision making, business intelligence, information technology capability, Internet of Things (IoT) application software, and cloud computing. Big Data Analytics (BDA) refers to the advanced analytical techniques used to process and derive valuable knowledge from large datasets. While BDA has the potential to offer significant business insights and create immense value, many organisations struggle to fully capitalise on their BDA initiatives and gain a competitive advantage. Despite the opportunities presented by BDA, some firms face challenges in effectively leveraging and extracting value from their data analytics endeavours. The study adopted a survey research design. The population of the study comprised 3931 employees of accredited healthcare service firms in Lagos State. The study utilised mixed sampling techniques comprising purposive, proportionate, and random sampling techniques. A sample size of 676 participants was obtained using Cochran's sample size formula (1977). An adapted questionnaire was used, and an 83.3% response rate was achieved. The Cronbach's alpha reliability coefficients for various constructs ranged from 0.769 to 0.904. The data were analysed using inferential (regression) analysis. The findings revealed that big data analytics dimensions had a significant effect on competitive advantage ($\text{Adj.}R^2 = 0.937$; $F(6, 556) = 0.937$, $p < 0.05$). The study concluded that big data analytics affected the competitive advantage of healthcare firms in Lagos State, Nigeria. Based on the findings of the study, it was recommended that the management of healthcare service organisations in Lagos State invest in the combination of Big Data Analytics (BDA) dimensions in order to achieve a long-term competitive advantage. Also, management should use BDA to support the operational activities of the firm to increase cost efficiencies and develop firm-specific BDA knowledge.

Keywords: *Big data analytics, Healthcare organisation, Competitive advantage, Internet of things application, Information technology capability, Lagos State*

1.0 Introduction

In recent years, there has been a rapid growth of big data utilization by organizations worldwide. This trend has sparked the interest of both researchers and practitioners who seek to explore how big data can be leveraged to gain a competitive edge (Maroufkhani et al., 2019). Mikalef et al. (2019) have highlighted the increasing attention given to the use of big data in firm decision-making, with many companies investing in big data analytics to enhance their competitive advantage, performance, and value creation (Constantiou & Kallinikos, 2015). Davenport and Kudyba (2016) and Morabito (2015) further emphasized the potential for organizations to effectively harness the power of big data. By doing so, they can gain comprehensive insights, boost productivity, foster innovation, and ultimately outperform their peers, leveraging the appropriate organizational resources and tools. The underlying premise of big data is that by analyzing vast amounts of unstructured data from various sources, actionable insights can be generated, enabling companies to transform their businesses and outperform their competitors (Chen et al., 2012). This capability to derive data-driven insights is particularly valuable for organizations operating in dynamic and fast-paced business environments where informed decision-making is crucial (Wamba et al., 2017). Despite the increasing number of firms investing in big data initiatives, there remains a limited understanding of how these technologies translate into a tangible competitive advantage (Mikalef et al., 2019; Maroufkhani et al., 2019).

The majority of existing reports on the value of big data analytics (BDA) come from consulting firms, popular journalism, and individual case studies. Unfortunately, these sources do not provide empirical evidence from large-scale research and frequently do not provide theoretical insights (Gupta & George, 2016; Hussain et al., 2021). Recent research has revealed that a substantial proportion of businesses are still struggling to extract value from their big data investments (Hussain et al., 2021; Popovi et al., 2018; Wamba et al., 2017). Some experts even believe that big data may be harmful to businesses rather than beneficial (Kiron et al., 2017). As a result, there is a lack of understanding about how organisations should handle big data efforts, and there is a scarcity of empirical evidence to guide value generation from such investments (Mikalef et al., 2017).

Existing research indicates that big data analytics has a substantial impact on multiple industries and is not limited to a single industry. This study examines the impact of big data analytics on organisational sustainability, particularly in terms of competitive advantage, with a concentration on healthcare service firms in Nigeria. This objective is consistent with the findings of Maroufkhani et al. (2019). There are credible works that integrate social science and managerial issues within the context of big data analytics (Vidgen et al., 2017). While the majority of existing studies in this field are predominantly focused on business and management aspects, there are also studies that integrate social science and managerial issues (Vidgen et al., 2017). To advance the comprehension of big data analytics, Mikalef et al. (2019) recommend that future researchers conduct systematic and empirical studies across a variety of company types and sizes, including the health care industry. These studies can investigate additional factors that may influence the adoption and use of big data analytics to improve organisational performance. The present study thus attempts to bridge this gap by investigating effect of big data analytics on the competitive advantage of healthcare service firms in Nigeria.

Furthermore, previous studies (Dubey et al., 2018; Wamba et al., 2017; Mikalef et al., 2019) have extensively explored Big Data initiatives in organizations, focusing on topics such as Big Data predictive analytics and manufacturing performance, as well as the pathway of Big Data Analytics and artificial intelligence towards operational performance (Dubey et al., 2020). In various contexts, the use of Big Data in healthcare has already shown promising results in

enhancing patient care and generating value within healthcare organizations. However, it has been noted that many firms struggle to effectively leverage their Big Data Analytics (BDA) initiatives and gain a competitive advantage (Corte-Real et al., 2019). These reports emphasize the pressing need to gain a better understanding of how healthcare firms can derive competitive advantage from BDA. Therefore, this study aims to investigate the role of big data analytics in promoting competitive advantage for health service firms operating within the Nigerian health sector.

The inadequate domestic access to healthcare in Nigeria has resulted in significant outbound health tourism, leading to an annual loss of up to \$1 billion for the country, as highlighted in a recent PwC report. Wealthier Nigerians spend approximately \$1 billion each year on medical tourism, particularly in specialties such as oncology, orthopedics, neurology, and cardiology, which account for 60% of the expenditure. To put this into perspective, the published Federal Ministry of Health budget proposal for 2016 amounted to \$1.3 billion, while the total government expenditure for 2015 was \$5.85 billion. Consequently, the cost of medical tourism represents nearly 20% of the total public sector healthcare spending, which includes salaries of healthcare workers, funding for major care programs, and the operational costs of healthcare facilities nationwide. This substantial amount of money leaving the Nigerian healthcare market represents untapped potential resources for the industry and the overall economy. These challenges have impeded the ability of healthcare service firms in Lagos State to enhance their competitive advantage and deliver efficient and effective services. Therefore, this study aims to address these issues by examining the benefits of utilizing Big Data Analytics and its dimensions (agility capability, data-driven decision making, business intelligence, information technology capability, Internet of Things (IoT) application software, and cloud computing) in enhancing the competitive advantage of selected healthcare firms in Lagos State.

2.0 Literature Review and Hypothesis Development

The detailed literature reviews presented the views and thoughts of diverse scholars on BDA and competitive. The review of literature that is considered relevant to the research topic is subdivided into various divisions: conceptual review, empirical review, and theoretical review.

2.1 Conceptual Review

The conceptual review of this study explores the concepts and their interconnections, as well as the advantages, disadvantages, and characteristics of the variables under investigation. The main focus of the study is Big Data Analytics (BDA), which encompasses several sub-variables, namely agility capability, data-driven decision making, business intelligence, information technology capability, Internet of Things (IoT) application software, and cloud computing, and competitive advantage. By analyzing these concepts, the study aims to gain a deeper understanding of the relationships and effects of BDA and its associated variables on organizations' competitive advantage.

Big Data Analytics

Big data refers to datasets that exceed the capacity of conventional database software tools in terms of capturing, storing, managing, and analyzing them, as defined by Manyika et al. (2011). The specific definition of big data varies across sectors and industries, depending on the capabilities of the organization handling the dataset and the applications employed for processing and analysis. For instance, what may be considered as big data in one organization could be hundreds of gigabytes, while in another organization, it could be tens or hundreds of terabytes. In the context of marketing, big data pertains to the ability to gather substantial volumes of data from various sources and utilize it to generate novel observations, measurements, and predictions about individual customers, as indicated by the Council of

Economic Advisors, USA (2015). According to Laney (2012), big data can also be defined based on its characteristics. Laney describes big data as information assets with high volume, high velocity, and/or high variety, which necessitate new methods of processing to facilitate improved decision-making, insight discovery, and process optimization. However, it is worth noting that some researchers view the term "big data" as ambiguous, as it can inadvertently imply a negative connotation by suggesting that "big" is synonymous with "bad" (Andrade et al., 2014).

Laney (2001), a Gartner analyst, is well-known for presenting the 3Vs definition of big data, which encompasses volume, velocity, and variety, along with the challenges posed by data size. This definition suggests that big data is characterized by its large size, rapid generation, and diverse types and sources. Building upon this, Gantz and Reinsel (2011) describe big data as a new generation of technologies and architectures that enable the extraction of value from massive volumes of diverse data through high-velocity capture, discovery, and analysis. In their perspective, they introduce the fourth V, value, thereby expanding the 3Vs model to 4Vs. Jacobs (2009) defines big data as data that requires advanced technologies for insights due to its size and density. Russom (2011) states that it refers to the quantity of information resources generated or acquired by an organization over time. Hemlata and Gulia (2016) emphasize that adding value to the 3Vs dimensions highlights the essential aspect of exploring new values from datasets. Additionally, Lomotey and Deters (2014) introduce the concept of veracity, extending Laney's (2001) work from 3Vs to 5Vs.

According to Boyd and Crawford (2012), big data can be understood as a multifaceted phenomenon encompassing cultural, technological, and scholarly aspects. They describe technology as the utilization of advanced computational power and precise algorithms to collect, analyze, link, and compare large datasets. The analysis involves extracting patterns from these datasets to make claims that have economic, social, technical, and legal implications. Additionally, the concept of mythology emerges, referring to the widespread belief that large datasets possess a superior form of intelligence and knowledge, enabling the generation of insights that were previously unattainable. This belief carries an aura of truth, objectivity, and accuracy. The TechAmerica Foundation's Federal Big Data Commission (2012) provides a comprehensive definition of big data as follows: "Big data refers to large volumes of high-velocity, complex, and variable data that require advanced techniques and technologies for capturing, storing, distributing, managing, and analyzing information. However, the true value of big data lies not only in its sheer quantity but, more importantly, in its divergence from traditional data. Big data has created a distinct and unprecedented environment for data generation and utilization, which cannot be achieved with a small-scale data approach." This perspective highlights the unique characteristics and potential of big data, emphasizing its transformative impact compared to conventional data practices (Tan & Zhan, 2016; George et al., 2014).

Analysing the definitions of big data reveals that its primary characteristics (quantity, variety, and speed) are technical attributes reliant on advances in computing, storage, and processing technology. This means that the importance of big data rests not in its sheer volume, velocity, or variety, but in how these characteristics may encourage innovation and add value to enterprises. In essence, it is not the number, speed, or diversity of data that is important, but rather its ability to drive innovation and give value to organisations.

Big data analytics (BDA) on the hand refers to the innovative techniques developed to extract valuable insights from large and diverse datasets, enabling their efficient capture and utilization (Villars et al., 2011). Emmanuel (2011) described it as tools and methodologies that are used to transform massive quantities of raw data (structured and unstructured) into "data about the

data” for analytical purposes. This definition encompasses the tools and procedures employed to make sense of extensive and scattered data, as emphasized by Sharma et al., (2013). Through the application of analytics, organizations can identify the various types of data they generate and derive meaningful insights from them, thereby enhancing decision-making processes. Chen et al., (2012) further affirm that big data analytics helps organizations understand the nature of their data and leverage datasets to improve their performance. This technology facilitates the acquisition and storage of data generated through digital processes, social media, sensors, and mobile devices, and employs analytics to derive valuable insights into customer behavior. The advancements in storage technology and computing power have made it viable to collect and retain such extensive data (Yan, 2013). Big Data Analytics also plays a pivotal role in shaping businesses' interactions with customers, enabling them to foster long-term relationships, unlock value, and effectively utilize data from various sources (United Business Media, 2013).

In addition, George, et al., (2016) asserts that big data permeates modern life, transforming thinking and decision-making methods and becoming an important strategic resource for firms to achieve sustainable development. Researchers such as Alexandru et al., (2016); George et al., (2016); Mikalef et al., (2018) Chen et al., (2012) have discussed the value of big data for firms from different perspectives. First, big data is helpful for firms to understand market and demand information. It also provides new perspectives for problem solving and enables firms to recombine existing resources and elements to efficiently enhance firm innovation. Big data also provides a database of timely information to guide innovation activities, helping firms accurately predict market demand changes in a rapidly changing environment, enabling quick response to market demand, and suggesting new development directions and goals (Tan & Zhan, 2016; Johnson et al., (2017).

Big Data Analytics Dimensions

According to this paper, BDA encompasses various components, including agility capability, data-driven decision making, business intelligence, information technology capability, Internet of Things (IoT) application software, and cloud computing.

Agility Capability

Agility capability has been conceptualised as a capability that enable organisations to be more proactive in changing their organisational systems to gain advantages as part of intended strategy rather than only reacting to external changes. In a related approach, researchers such as Mavengere (2013) and Anggraini and Sudhartio (2019) defined organisations agility capability as the capability of the organisation to sense changes in dynamic, fast-paced environments, and to quickly respond to these changes by seizing market opportunities and maintaining competitiveness through building, combining, enhancing, mobilising and re-configuring its capabilities and in the process attaining and sustaining superior performance beyond its competitors. Tabe-Khoshnood and Nematizadeh (2017) highlight that organizational agility capability is composed of two key components: responsiveness and knowledge management. They further clarify that agility capability refers to an organization's capacity to identify changes arising from opportunities and threats in the business environment, and to swiftly respond through the recombination of resources, processes, and strategies. Meanwhile, Doz and Kosonen (2008), Doz and Kosonen (2010), and Anggraini and Sudhartio (2019) propose that organizational agility capability encompasses three distinct capabilities: strategic sensitivity, collective commitment, and resource fluidity. These capabilities are interdependent and must mutually reinforce each other for successful outcomes. Strategic sensitivity pertains to the organization's focus and the intensity with which it perceives and interprets market conditions. Collective commitment involves the ability of company

management to make prompt and informed decisions while disregarding organizational politics. Lastly, resource fluidity refers to the organization's adaptability in adjusting and renewing its business system, as well as swiftly reallocating resources in response to changing needs and circumstances.

Data-Driven Decision Making

According to Brynjolfsson and McElheran (2016), data-driven decision making is the process of making educated decisions based on data. As emphasised by Brynjolfsson et al. (2011), Divan (2018), Marques and Dhiman (2016), Thiess and Müller (2018), and Vohra (2016), it entails utilising data to arrive at conclusions rather than relying solely on intuition. In organizations, data-driven decision-making entails using data gathered from across the organization and throughout the supply chain to make predictions and inform decisions, as emphasized by Neethirajan (2020). Elgendy and Elragal (2016) developed the B-DAD (Big – Data, Analytics, and Decisions) framework, which links big data tools, architectures, and analytics to different phases of decision making, highlighting that the bigness refers not only to the data but also to the analytics and resulting decisions. Cao et al. (2015), Provost and Fawcett (2013), and Reijkumar et al. (2018) further describe data-driven decision making as the practice of basing decisions on verified data analysis rather than intuition or experience. It involves using historical data to generate new information upon which decisions are made. Jia et al. (2015) also define data-driven decision making as a continuous process involving data collection, transforming data into information and knowledge, decision making based on knowledge, monitoring decision implementation, and providing feedback for each stage of the process. According to Jia et al., (2015) data-driven decision-making capability framework is composed of data governance capability, data analytic capability, data management capability, insight exploitation capability, performance management capability, and integration capability. The researcher's base data-driven decision-making capability on the process-based conceptualisation approach and explained that process model reflects collecting data, processing data into information, transferring data or information into insight, applying insight to decision making, and acting based on performance management (Gürdür et al., 2019; Liberatore et al., 2017).

Business Intelligence

Business intelligence systems have become crucial tools for managing uncertain corporate operations in today's business landscape (Maleki & Sabet, 2022). Scholars have provided various definitions of business intelligence, encompassing its role as a process, a product, a set of technologies, or a combination of these elements, all centered around data, information, knowledge, decision-making, and supporting tools (Shollo & Kautz, 2010; Ahmad et al., 2020). Gurda et al. (2016) emphasize that business intelligence serves as a vital resource for successful businesses, requiring an understanding of both internal and external organizational environments. Chaudhuri et al. (2011) describes business intelligence as the transformation of data into information and knowledge, creating a conducive environment for effective decision-making. Tavera-Romero et al. (2021) define business intelligence as a decision-making process supported by the integration and analysis of an organization's data resources. Similarly, Mędrek and Tatarczak (2017) view modern business intelligence as the process of converting data into actionable information using a set of software tools, techniques, and applications.

Salisu et al. and Omar (2021) adopt the Technology Organisation Environment (TOE) framework to categorize dimensions of business intelligence adoption based on technology characteristics, organization characteristics, environmental characteristics, and owner-manager characteristics. Ranjan (2009) identifies components of business intelligence including online analytical processing, advanced analytics, corporate performance management (scorecards,

dashboards), real-time business intelligence (utilizing emails, messaging systems, and interactive displays), data warehousing, data marts, and data sources. Business intelligence significantly contributes to improving organizational performance by identifying opportunities, highlighting threats, revealing new insights, and enhancing decision-making processes, among many other benefits (Xia & Gong, 2014). Business intelligence system can also support the supply chain to innovate new product and service development ideas and also understand how diverse sub-firms can collaborate together to optimise the operation process in a cost-effective way (Tan et al., 2015; Rama et al., 2016).

Information Technology Capability

An Information Technology System (IT System) can be broadly defined as an information system, a communications system, or more specifically, a computer system that encompasses all the hardware, software, and peripheral equipment utilized by a specific group of information technology users (Gelinas et al., 2019). Information Technology capability refers to the utilization of technologies to fulfill the information requirements of organizations. Information technology involves the application of computers to store, retrieve, transmit, and manipulate data or information (Schwalbe, 2015). Osita-Ejikeme (2021) suggests that information technology capabilities encompass the organization's ability to establish a set of shared platforms (such as physical components, networks, databases, software, and social skills) and to determine the extent to which the organization excels in managing these shared platforms. In addition, Arokodare, (2019) identified information technology capability as one of the sub-constructs of the collective capabilities dimension of strategic agility which is the ability of the organisation to successfully exploit its information infrastructure and resources to derive value in order to improve its performance.

In the view of Pebrianto, and Djamhu (2013) information technology capability is the extent to which an organisation is well-informed about and effectively utilises information technology to achieve information within the organisation in the same vein, Huang et al., (2012); Mao et al., (2015) defined information technology capability the ability of an organisation to acquire, position, combine, and reconfigure information capability resources to support and enhance business strategies and work processes. It is therefore not surprising that Chu et al., (2019) emphasise that enabling information technology into businesses addresses the organisation know-how of what is trendy in the external environment, and it defines how to process the incoming data for improving the external environment.

Internet of Things (IoT) Application Software

The Internet of Things (IoT) is a prominent component of the fourth industrial revolution (Industry 4.0) and has gained recognition due to the proliferation of connected devices (Marr, 2019). It encompasses a wide-ranging subject of technical, social, and economic significance. The integration of internet connectivity and data analysis capabilities into consumer products, durable goods, home appliances, medical devices, security systems, vehicles, industrial components, sensors, and everyday objects has the potential to revolutionize our lifestyles and work environments (Mouha, 2021). In the studies conducted by Yusof et al. (2020) and Sengupta et al. (2020), the term "Internet of Things" is used to encompass various aspects of the internet and web expansion into the physical world, facilitated by the widespread deployment of distributed devices with embedded identification, sensing, and actuation capabilities.

Similarly, according to Feng et al., (2017) and Nord et al. (2019), IoT essentially refers to the connection of any device with an on/off switch to the internet, enabling the generation of data for performance analysis and supporting new technologies. Luthra et al. (2018) extend the

definition of IoT to include a wide range of devices, such as cell phones, coffee makers, washing machines, skylights, mirrors, wearables, home appliances, and even machine components like aircraft jet engines or industrial plant equipment. They define IoT as a system that encompasses various functions, including device modeling, device control, data publishing, data analysis, and device detection. IoT offers advantages that extend to various aspects of lifestyle and business, and its benefits are not limited to improved customer engagement, as highlighted by Asghari et al. (2019). The same technologies and data that enhance the customer experience also contribute to improved device usage and enable more significant advancements in technology. By leveraging IoT, a wealth of critical functional and field data becomes accessible, as emphasized by Alesetal (2016). IoT plays a crucial role in reducing waste and highlighting areas for improvement. While current analytics provide only surface-level insights, IoT empowers us with real-world information, enabling more effective resource management, as emphasized by Nord et al. (2019).

Cloud Computing

Cloud computing has emerged as a significant technology in the mainstream IT industry in recent years. According to the National Institute of Standards and Technology (NIST, 2011), cloud computing refers to a model that enables convenient, on-demand network access to a shared pool of configurable computing resources. These resources encompass networks, servers, storage, applications, and services, which can be rapidly provisioned and released with minimal management effort or interaction with service providers. While there is no universal definition, Ubaid-Ullah et al. (2019) define cloud computing as a computing standard where computing resources are distributed to different customers over a network. In a similar vein, Rashid and Chaturvedi (2019) describe cloud computing as the storage and access of data and programs over the cloud instead of a local computer's hard drive. They emphasize that users can access files and utilize applications from any internet-connected device, with the cloud serving as a metaphor for the Internet. Cloud computing and Big Data Analytics are two of the most essential new IT technologies. The two technologies are surprising corporations with powerful effects. Cloud computing is transforming how cloud companies deliver IT services and how businesses and customers use IT resources. Because there is a lot of data and only cloud computing can process it, big data and cloud computing go well together.

In Thakur and Bhardwaj's (2019) classification, cloud computing is categorized into different groups. Private cloud refers to a cloud infrastructure that is tailored for a specific organization or business, serving as a dedicated cloud for that entity. Public cloud, on the other hand, is easily accessible to the general public or any organization and is typically provided by major providers like Google, Amazon, and Microsoft, offering infrastructure and services to users. Community cloud involves the provision of services and infrastructure to organizations with similar interests, fostering collaboration within a specific community. Hybrid cloud, as another category, combines elements of both private and public cloud, allowing for diverse deployments while maintaining the individual identity of each cloud type.

Similarly, Rashid and Chaturvedi (2019) classified cloud computing into four groups, which they referred to as the cloud service model. The cloud service model includes Infrastructure as a Service (IaaS), where the cloud provides infrastructure resources; Platform as a Service (PaaS), which offers a platform for developing and deploying applications; Software as a Service (SaaS), where cloud provides software applications accessible by users; and Network as a Service (NaaS), which provides network-related services in the cloud. These classifications by Thakur and Bhardwaj (2019) and Rashid and Chaturvedi (2019) provide different perspectives on cloud computing, with the former focusing on deployment models and the

latter emphasizing the service models within the cloud computing landscape (Balachandran & Prasad, 2017).

Competitive Advantage

Competitive advantage can be defined as the driving force behind a business's ability to achieve higher profit margins and maintain superior customer and staff retention compared to its competitors (Othman et al., 2015). It encompasses the strengths and assets that an organization possesses, enabling it to differentiate itself from rivals (Davis & Simpson, 2017). Furthermore, competitive advantage involves the continuous achievement of profits that surpass those of competitors. These advantages may consist of unique organizational assets, attributes, or capabilities that are challenging to replicate or outperform, thus providing a sustainable and advantageous position in the long term (Muhammad et al., 2020).

The concept of competitive advantage also entails the formulation and execution of strategies that enable a company to outperform its competitors by effectively utilizing its technical, physical, financial, and organizational capabilities and resources (Alamri et al., 2019). By leveraging these resources and capabilities, the organization gains a superior position in the market, which contributes to its competitive edge.

Ovidijus (2013) asserted that competitive advantage means superior performance relative to other competitors in the same industry or superior performance relative to the industry average. The term competitive advantage refers to the ability gained through attributes and resources to perform at a higher level than others in the same industry or market (Orga et al., 2018). Sustainable competitive advantage is the key to organisation success. An Organisation is able to gain a competitive advantage over its competitors by understanding its market, customers. It is a situation whereby an organisation is able to deliver the same benefits as competitors but at a lower cost (cost advantage), delivers benefits that exceed those of its competitors' products (differentiation advantage) and creates superior value for its customers (Porter, 2010).

Competitive advantage encompasses three key characteristics, as identified by Meutia and Ismail (2012): long survival, difficulty to imitate, and difficulty to identify. According to Ardianus and Petrus (2016), an organization possesses a competitive advantage when it offers something that cannot be replicated by competitors or possesses desirable qualities that set it apart. Naliaka and Namusonge (2015) view competitive advantage as a tool for discovering innovative and creative approaches to producing and delivering goods and services more effectively than competitors in the market.

Ranjith (2016) believes that competitive advantage is a strategic approach that enhances a company's business model, promotes growth and development, and enables the delivery of superior products, services, and benefits to customers, thus surpassing competitors and enhancing the company's reputation in the market. Owusu and Duah (2018) suggest that every organization has at least one advantage that allows it to successfully compete. They further emphasize that a company achieving superiority in cost or differentiation can offer products at lower costs or with a higher degree of differentiation, thereby effectively competing with rivals. Additionally, Orga et al. (2018) state that a firm possesses a competitive advantage when it implements a value-creating strategy that is not currently being pursued by any existing or potential player in the market. These various perspectives highlight the importance of differentiation, innovation, and unique capabilities in establishing and sustaining a competitive advantage.

2.2 Empirical Review

Kubina et al., (2015) investigated the use of big data for competitive advantage of company. The study found that effective integration of Big Data brings several competitive advantages

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to companies. The study of Kubina, et al., (2015) found that Big Data brings several advantages to companies. It allows higher transparency of information inside organisations, enables broader, deeper and more accurate insight, therefore improves decision - making as well. It gives companies the possibility to create more complex and complete image about their customers and therefore offer more accurately tailored products and services. Also, findings from Popovič et al., (2018) indicated that BDA capability (in terms of data sourcing, access, integration, and delivery, analytical capabilities, and people's expertise) along with organisational readiness and design factors (such as BDA strategy, top management support, financial resources, and employee engagement) facilitated better utilisation of BDA in manufacturing decision making, and thus enhanced high value business performance. Shan et al; (2018) found that all dimensions of resources are found to affect competitive advantage indirectly through dynamic capabilities. Idle resources are the main influencing factors for strategy flexibility.

Ranjan and Foropon (2021) examined Big Data Analytics in building the competitive intelligence of organisations. The findings indicated a preference for a rather centralised informal process as opposed to a clear formal structure for competitive intelligence CI; The second findings indicated the use of basic tools for queries, as opposed to reliance on dedicated methods such as advanced machine learning. Shan, et al., (2018) investigated big data analysis adaptation and enterprises' competitive advantages: The perspective of dynamic capability and resource-based theories. The results of the findings revealed several important findings. 1) Different dimensions of dynamic capabilities all have effects on competitive advantage, but they have different paths to influence these. 2) Two dimensions of dynamic capabilities have direct effects on the competitive advantages, and strategy flexibility has indirect effects on these. 3) Three dimensions of resources all indirectly and positively influence competitive advantages by affecting dynamic capabilities.

Meanwhile, Riahi and Riahi (2018), investigated big data and Big Data Analytics: concepts, types and technologies. Results of the regression analysis revealed that implementing diversity management in the form of equality-based HR practices i.e., recruitment and selection, training and development, performance appraisal, and compensation practices leads to increased organisational commitment among employees working in firms operating in India. practices and employees' organisational commitment. The findings have also highlighted that age, gender, and employees' experience are not significantly related to employees' organisational commitment. Cech, et al., (2018) investigated data competence maturity: developing data-driven decision making. The conceptual model reveals significant opportunities to improve data-driven decision making in schools and local education agencies (LEAs). Moving past the first and second stages of the data competency maturity model should allow educators to better incorporate data into the regular decision-making process. The findings also revealed that one of the most difficult challenges to full implementation of data analytics is that many organisations do not have the necessary training and skill sets to use the analyses produced.

In a related study, Polese, et al., (2019) examined A big data-oriented approach to decision-making: a systematic literature review. The findings showed that the implementation of a big data architecture can benefit from the adoption of a data-oriented mind-set that should be translated into the activation of hard and soft skills that can extract relevant knowledge to generate multiple advantages throughout the entire supply chain, from service and product improvement to the enhancement of internal and external relationships. Moreover, Kamau and Aosa (2018) explored exploring e-commerce big data and customer-perceived value: An empirical study on Chinese online customers. The study re-identified the dimensions of customer-perceived value to include four key dimensions and corresponding subdivisions.

Both the rationality and operability of the dimension model of customer-perceived value were validated and applied. Popovič et al., (2018) examined the impact of Big Data Analytics on firms' high value business performance. The findings illustrated that the introduction and utilisation of BDA leveraged better insights in fundamental aspects of manufacturing operations, resulting in added benefits for all the case firms.

Likewise, Obitade (2019) conducted a study titled "Big Data Analytics: a link between knowledge management capabilities and superior cyber protection" The primary results suggest that Big Data Analytics capability enhances knowledge management process, and together they enable both pre- and post-incidence cyber agility. The findings also reveal that organisations can leverage the combination of knowledge management and agility to better and quickly respond to changes in a global threat landscape. In particular, the findings suggest that Big Data Analytics functionalities appear to be instrumental to the improvement in KM capabilities in an organisation, which in turn, enhances cyber ability, ultimately contributing to stronger overall asset protection.

However, there are arguments suggesting that the process of resource and dynamic capability interaction is complex and influences competitive advantages (Wade & Hulland, 2004). Research has shown that resources not only directly impact competitive advantage but also need to be transformed into capabilities in order to create a competitive advantage (Teece et al.,1997). Transforming resources into capabilities is crucial for generating competitive advantage (Sirmon et al., 2007; Sirmon et al., 2008). Additionally, a flexible business strategy can positively impact compatibility, enabling more organizations to achieve advantages. It has been argued that organizations cannot rely solely on the open market as a source of sustainable competitive advantage (Barney, 1986, 1991). However, previous studies suggest that if organizations neglect the sustainability of Big Data Analytics and Capabilities (BDAC), the social impact will be temporary (Lytras & Visvizi, 2019). Instead, according to the resource-based view, organizations must create such an advantage from their resources, which should be rare, imperfectly imitable, and non-substitutable.

Building upon the resource-based view, scholars have developed several other arguments, including the Knowledge-Based View (KBV), which emphasizes knowledge as the most essential resource for competitive advantage (Conner and Prahalad, 1996; Grant, 1996a, b). The KBV highlights the strategic value of knowledge in organizations (Teece, 1981; Kogut and Zander, 1992) and differentiates organizational performance through asymmetries in knowledge (Conner and Prahalad, 1996). In the KBV, the role of individuals is emphasized, as organizational members possess, generate, and preserve knowledge, while managers govern the integration of knowledge for its application. Neither holding knowledge without integration nor attempting to integrate non-existent knowledge can be a source of competitive advantage (Grant, 1996b). Therefore, the KBV also addresses issues of organizational coordination and structure (Grant, 1996a). Based on the findings revealed in the literature, this study hypothesizes that:

H₀₁: Big Data Analytics dimensions have no significant effect on competitive advantage on healthcare services firms in Lagos State, Nigeria.

2.3 Theoretical Framework

This study is grounded in the Dynamic Capabilities Theory (DCT), which emphasizes a firm's ability to integrate, build, and reconfigure internal and external competences to effectively navigate rapidly changing environments. The DCT is an extension of the Resource-Based View (RBV) of the firm proposed by Teece and Pisano (1994), building upon the idea that firms in the same industry exhibit different performance levels due to their distinct resources and

capabilities (Barney, 1986, 1991; Peretaf, 1993). However, the RBV is considered static in nature and insufficient for explaining competitive advantage in evolving market conditions (Priem & Butler, 2001).

According to Teece et al. (1997), dynamic capabilities are defined as a firm's capacity to integrate, develop, and reconfigure both internal and external competences in response to rapidly changing environments. Certain organizational characteristics may limit the development of dynamic capabilities, as choices available to managers are influenced by path dependencies. The theory assumes that in complex and dynamic hypercompetitive situations prevalent in high-velocity markets, simple, experiential, and iterative measures are more suitable than those employed in stable markets. These high-velocity markets are characterized by non-linear and unpredictable changes, rendering existing knowledge less relevant and necessitating the creation of innovative, situation-specific knowledge.

Dynamic capabilities are characterized by their effectiveness in facilitating various processes (Eisenhardt & Martin, 2000). Among the commonly observed dynamic capabilities are product development processes, resource allocation processes, and knowledge creation processes. These processes establish networks of collaborations with both internal and external stakeholders, aiming to generate resource combinations that meet or surpass stakeholders' expectations (Hill & Jones, 1995). Through the integration of skills, data, technologies, and expertise, organizations are able to create revenue-generating products and services, as well as reconfigure their operations to achieve greater efficiency.

In general, dynamic capabilities support an innovative and forward-looking culture within organisations. In order to better understand how organisations might use big data analytics to increase their competitive advantage in the face of quickly changing market conditions, this study focuses on the effect of big data analytics on competitive advantage.

3.0 Methodology

This study used a survey research design, which is consistent with prior research on Big Data Analytics (Olugbohunge & Awodele, 2021). This study's target population consisted of 3,931 employees of selected accredited healthcare service firms in Lagos State. The selection criteria for these healthcare service providers included their provision of high-quality and cost-effective Medicare and healthcare services to individuals and businesses, as well as their use of modern IT equipment for service delivery. This study's sampling units included ICT personnel, data analysts, Chief Information Officers (CIO), Chief Medical Directors (CMD), chief chemists, chief lab technicians and front desk staff. These individuals were responsible for data custody and administration, information technology within the organisation, and policy-making regarding the adoption of Big Data Analytics in the chosen healthcare service firms.

The sample size was determined using Cochran's sample size formula (1977), which resulted in 676 participants. The research employed a combined sampling techniques that included purposive, proportional, and random sampling methods. Purposive sampling was used to select eligible healthcare service firms and specific departments to be included in the study. This approach ensured that individuals with practical knowledge in both Big Data Analytics and disease management were included in the sample. Prior to the main data collection, a pilot study was conducted using 10% of the determined sample size to assess the clarity and effectiveness of the research instruments and procedures. The constructs' Cronbach's Alpha reliability coefficients are as follows: Agility Capability (0.934), Data Driven Decision Making (0.769), Business Intelligence (0.829), Information Technology Capability (0.84), IoT Application Software (0.866), Cloud Computing (0.877), and Competitive Advantage (0.896).

The study employed a well-structured questionnaire designed by the researcher in accordance with the objectives and research questions of the study. The questionnaire utilised a 6-point Likert scale, extending from "very high" to "very low," to evaluate responses. To ensure the validity and clarification of the questionnaire, a pilot test was conducted with 10% of the sample size and respondents who shared similar characteristics with the study population, as suggested by Connelly (2008). This enabled the respondents' assessment of the questionnaire's relevance and understandability. The data collected were analysed using descriptive and inferential statistical methods. Specifically, multiple linear regression analysis (MLRA) was used to test the hypothesis and determine the impact of the independent variables (BDA) on the dependent variable (competitive advantage). Statistical Package for Social Science (SPSS) version 27 statistical software was used to process the data. The regression equation to test the hypotheses formulated are:

$$CA = \beta_0 + \beta_1 AC + \beta_2 DDDM + \beta_3 BI + \beta_4 ITC + \beta_5 IAS + \beta_6 CC + e_i \text{ ----- Eqn. 3.1}$$

Where:

AC = Agility Capability; DDDM = Data Driven Decision Making; BI = Business Intelligence; ITC = Information Technology Capability; IAS = IoT Application Software; CC = Cloud Computing; CAD = Competitive Advantage

4.0 Results and Discussion

In the paper, inferential statistics using multiple linear regression analysis was used to test the hypothesis. The two main variables are competitive advantage being the dependent variable, whereas big data analytics dimensions (data-driven decision making, business intelligence, IT competence, IoT application software, and cloud computing) represent the independent variables. Independent scores for each big data analytics dimensions were calculated by aggregating the responses of all items classified under the various sub-variables in the analysis. All of the items' responses to the variable were totaled up to form an operational value index, which was then used to generate operational value data. Table 1 presents the obtained results of the analysis and parameter estimates.

Table 1: Summary of results of linear multiple regression analysis for effects of Big Data Analytics dimensions on the competitive advantage

Model	<i>B</i>	Beta	T-test	Sig.	R	Adjusted R ²	F(6, 556)	Sig.
(Constant)	0.326		1.447	0.148	0.968	0.937	1388.12	0.000
Agility Capability	0.190	0.191	5.416	0.000				
Data Driven Decision Making	0.160	0.162	3.865	0.000				
Business Intelligence	0.070	0.069	1.747	0.081				
Information Technology Capability	0.225	0.221	5.358	0.000				
IoT Application Software	0.124	0.125	3.107	0.002				
Cloud Computing	0.230	0.227	5.840	0.000				

Predictors: (Constant), Cloud Computing, Agility Capability, Information Technology Capability, IoT Application Software, Business Intelligence, Data Driven Decision Making
 Dependent Variable: competitive advantage

Source: Researchers’ findings 2023

Interpretation

Table 1 presents the results of multiple linear regression for the effect of Big Data Analytics dimensions on competitive advantage. The results in Table 4.1 revealed that the correlation coefficient (*R*) was 0.968 which indicates that there was a strong, positive and significant relationship between big data analytic dimensions and the competitive advantage of selected healthcare service firms in Lagos State, Nigeria. At the same time the results showed that the coefficient of determination, which measures the percentage of the changes in the dependent variable that can be associated by variations in the independent variable, as shown by the Adjusted R-squared (*R*²) was 0.937 meaning that 93.7% of the variation in competitive advantage of selected healthcare service firms in Lagos State can be explained by the model’s significant predictor variables (Big Data Analytics dimensions), while the remaining 6.3% variation are attributed to other external factors or variables other than cloud computing, agility capability, information technology capability, IoT application software, business intelligence, and data driven decision making.

To establish the fitness of the model in predicting competitive advantage, the study conducted an Analysis of Variance (ANOVA) and the findings are as presented in Table 4.1. The overall result of the Analysis of Variance (ANOVA) for the regression coefficient was 1388.12 ($F(6, 556) = 1388.12, p\text{-value} = 0.001$). The results indicate that the significance of the p-value of 0.000 which is less than 0.05, this, therefore, infers that the Big Data Analytics dimensions significantly predict the competitive advantage of selected healthcare service firms. Hence, the regression model is reliable, suitable, and adequate estimation model for detailing effect of Big Data Analytics dimensions on the competitive advantage of selected healthcare service firms. This confirms the statistical fitness of the model linking Big Data Analytics dimensions and sustainability of the selected healthcare service firms expressed as competitive advantage in this model

Table 4.1 also showed the model coefficients for the effect of Big Data Analytics dimensions on the competitive advantage of selected healthcare service firms in Lagos State, Nigeria. According to the model coefficients, agility capability ($\beta = 0.190, t = 5.416, p < 0.05$), data-driven decision-making ($\beta = 0.160, t = 3.865, p < 0.05$), information technology capability ($\beta = 0.225, t = 5.358, p < 0.05$), IoT application software ($\beta = 0.124, t = 3.107, p < 0.05$), and cloud computing ($\beta = 0.230, t = 5.840, p < 0.05$) all have a positive and significant effect on the competitive advantage of selected healthcare service firms in Lagos State, Nigeria. While business intelligence ($\beta = 0.070, t = 1.747, p > 0.05$) has a positive and insignificant effect on market growth. Therefore, it is critical for the selected healthcare service firms to set clear business intelligence objectives which must be aligned to firms' objectives to boost their competitiveness. In addition, they should make more efforts and invest in data integration across all services units and partners and analytics capabilities to increase the level of competitive advantage such as quality, flexibility, time, and cost. The results showed that all the Big Data Analytics dimensions except business intelligence have an insignificant effect on competitive advantage. Taking into account the regression coefficients, the established predictive and prescriptive regression equations for the direct effect of Big Data Analytics dimensions on competitive advantage are formulated as follow;

$$CA = 0.326 + 0.190AC + 0.160DDDM + 0.070BI + 0.225ITC + 0.124IAS + 0.230CC \text{ -----}$$

Eqn. 4.2 (Predictive Model)

$$CA = 0.326 + 0.190AC + 0.160DDDM + 0.225ITC + 0.124IAS + 0.230CC \text{ Eqn. 4.2 -----}$$

-- (Prescriptive Model)

Where:

CA = Competitive Advantage

AC = Agility Capability

DDDM = Data-Driven Decision Making

BI = Business Intelligence

ITC = Information Technology Capability

IAS = IoT Application Software

CC = Cloud Computing

The regression equations formulated show that holding Big Data Analytics dimensions to a constant zero, competitive advantage of selected healthcare service firms would be 0.326 which is positive. From the predictive model, all the variables, except business Intelligence has an insignificant effect on competitive, hence it was omitted from the prescriptive model. This implies that the selected healthcare service firms as evidence by the results should focus more

importantly on agility capability, data-driven decision making, information technology capability, IoT application software, and cloud computing, and further improve the application of Business Intelligence directly. The prescriptive model further revealed that an improvement (increase) in agility capability, data-driven decision making, information technology capability, IoT application software, and cloud computing will lead to 0.190, 0.160, 0.225, 0.124, and 0.230 units increase in competitive advantage of selected healthcare service firms in Lagos State, Nigeria. Comparing the beta coefficient of each independent variables, cloud computing has the highest effect on competitive advantage while IoT application software has the least effect competitive advantage of selected healthcare service firms. Based on these results, the null hypothesis (H_0) which states that Big Data Analytics dimensions have no significant effect on the competitive advantage of selected healthcare service firms in Lagos State, Nigeria was rejected.

5.0 Discussion of Findings

The findings of multiple regression analysis for hypothesis two revealed that big data analytic dimensions of cloud computing, agility capability, information technology capability, IoT application software, data driven decision making had a positive significant effect on competitive advantage of selected healthcare service firms in Lagos State, Nigeria ($F(6, 556) = 1388.12$, $p\text{-value} = 0.001$). The combination of the independent sub variables was significant in predicting the big data analytic in Nigeria. In other words, big data analytic, cloud computing, agility capability, information technology capability, IoT application software, data driven decision making jointly have statistically significant effect on capability divestiture of selected oil and gas upstream companies in Nigeria.

The findings were consistent with those of those of Kubina, et al. (2015), who found that Big Data brings several advantages to companies. It allows higher transparency of information inside organisations, enables broader, deeper and more accurate insight, therefore improves decision - making as well. It gives companies the possibility to create more complex and complete image about their customers and therefore offer more accurately tailored products and services. Popovič et al; (2018)'s study also agrees with the findings that BDA capability (in terms of data sourcing, access, integration, and delivery, analytical capabilities, and people's expertise) along with organisational readiness and design factors (such as BDA strategy, top management support, financial resources, and employee engagement) facilitated better utilisation of BDA in manufacturing decision making, and thus enhanced high value business performance share agreement with these findings.

The findings were further credited by Shan et al. (2018), whose study reported that all dimensions of resources are found to affect competitive advantage indirectly through dynamic capabilities. Idle resources are the main influencing factors for strategy flexibility. The findings of Ranjan and Foropon (2021) which showed a preference for a rather centralised informal process as opposed to a clear formal structure for competitive intelligence CI; The second findings indicated the use of basic tools for queries, as opposed to reliance on dedicated methods such as advanced machine learning are in consonance with the discoveries of this study.

Also in agreement are the following: Shan, et al; (2018), investigated big data analysis adaptation and enterprises' competitive advantages: The perspective of dynamic capability and resource-based theories. The results of the findings revealed several important findings. 1) Different dimensions of dynamic capabilities all have effects on competitive advantage, but they have different paths to influence these. 2) Two dimensions of dynamic capabilities have direct effects on the competitive advantages, and strategy flexibility has indirect effects on these. 3) Three dimensions of resources all indirectly and positively influence competitive

advantages by affecting dynamic capabilities. Prescott (2016), demonstrated that: i) A Digital Data Genesis Capability is also a dynamic capability and helps negate the effects of environmental turbulence. ii) A Digital Data Genesis Capability and its Outputs have a positive effect upon Competitive Advantage. Research by Ramadan et al. (2020), indicated that BDAC relies significantly on the degree of DA and has a significant role in increasing IC.

Furthermore, the analysis confirms that IC has a significant and direct effect on a firm's SCA, while BDAC has no direct effect on SCA. Anyika (2014) investigated challenges of implementing sustainable health care delivery in Nigeria under environmental uncertainty. The findings reveal that environmental uncertainty has a multiplicity of interactions with different aspects of health care system, resulting in poor infrastructural development, inadequate government funding, absence of integrated system for disease prevention and surveillance, policy reversals, security challenges, and unimpressive health indicators in Nigeria. Wogwu and Hamilton (2018), examined reconfiguration capability and competitive advantage: a study of Port Harcourt public health sector. Based on the findings, there is a relationship between invention capability and competitive advantage as well as consolidation capability and competitive advantage in the Nigeria public health sector. This study reveals some of the critical challenges faced in the public health sector in Nigeria that led to poor health care delivery and high mortality rate.

Theoretically, the findings of this study are consistent with the dynamic capability theory that underpins it. Dynamic capacities display characteristics linked with efficient operations (Eisenhardt & Martin, 2000). Product development processes, resource allocation procedures, and knowledge generation processes are examples of common dynamic capabilities. These procedures develop webs of collaborations among diverse internal and external contacts in order to generate resource combinations that meet or surpass the expectations of stakeholders (Hill & Jones, 1995). Organisations bring together skills, data, technologies, and knowledge to create revenue-generating goods and services or to increase efficiency. Ultimately, dynamic capacities generate innovative thinking inside enterprises.

In summary, the findings of this study indicate that big data analytic dimensions of cloud computing, agility capability, information technology capability, IoT application software, and data driven decision making have a positive and significant effect on the competitive advantage of healthcare service firms in Lagos State, Nigeria. These findings are consistent with earlier research highlighting the importance of dynamic capabilities and resource-based theories in increasing corporate performance. According to the study's theoretical implications, dynamic capacities are critical in fostering innovative thinking within businesses, which leads to the creation of revenue-producing items and services or better efficiency. Finally, this study emphasises the vital role of Big Data Analytics in boosting competitive advantage in Nigeria's healthcare industry and gives valuable insights for managers and policymakers wanting to improve business performance.

6.0 Conclusion and Recommendations

This study examined the effect of big data analytics dimensions on the competitive advantage of healthcare service companies in Lagos State, Nigeria. The study specifically examined the effect of agility capability, data-driven decision making, business intelligence, information technology capability, internet of things (IoT) application software, and cloud computing on the competitive advantage of healthcare service firms in Lagos State, Nigeria. The findings of this study provide conclusive evidence that the dimensions of Big Data Analytics (BDA) have a positive and significant effect on the competitive advantage of selected healthcare service firms in Lagos State, Nigeria. In addition, the study demonstrates that the application of BDA can be observed in these healthcare service providers' competitive advantage. On the basis of

these findings, it is suggested that healthcare service providers in Lagos State invest in enhancing their technological capabilities in order to effectively utilise Internet of Things (IoT) applications and leverage the potential of Big Data Analytics in order to obtain a competitive advantage. In addition, leveraging cloud computing technologies for enhanced data storage, processing, and accessibility is essential for achieving a superior competitive edge. Furthermore, The management of healthcare service organisations in Lagos State should invest in the combination of Big Data Analytics (BDA) dimensions in order to achieve long-term competitive advantage. By prioritising the identified dimensions and strategically enhancing their BDA initiatives, managers can maximise the benefits of BDA, thereby advancing the success of their firms in Lagos State, Nigeria's dynamic healthcare industry.

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