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Exploring Innovation Performance and Big Data Analytics Capabilities in the Context of Culture for Potential Advancements

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Abstract

The era of abundant data is flourishing, primarily driven by the exponential generation of new data, facilitated by the widespread use of electronic devices and internet-connected networks. This reservoir of big data holds the potential to become a crucial source of competitive advantage. However, there is a noticeable gap in research regarding how organizations should adapt to extract value from this data. Recent studies are now delving into the structures and strategies that empower organizations to consistently foster innovation through dynamic capabilities, ultimately leading to the introduction of new products. The organization's resource-based perspective recognizes a firm's dynamic capabilities as the primary wellspring of sustainable competitive advantage. To promote innovation, the cultivation of a culture that actively encourages inventive endeavors across the organization becomes paramount. This study centers on examining how big data analytics capabilities impact organizational innovation, with a moderating influence from organizational culture. It draws upon the resource-based view and socio-materiality theory to pinpoint gaps in the current literature and propose actionable solutions.

Keywords: *Big Data Analytics (BDA) Capabilities, Big Data, Dynamic Capabilities Oriented Towards Processes (DCOP), Innovation, Company Culture (CC).*

Introduction

In today's dynamic corporate landscape, innovation stands as the cornerstone of success for all organizations (Shahzad, Xiu, & Shahbaz, 2017; Tidd & Bessant, 2018). The rapid evolution of technology, coupled with swift product development and shorter product life cycles, has accelerated innovation, reshaping economic progress (Shahzad et al., 2017). The integration of innovation into organizational strategies is pivotal for securing a lasting competitive advantage (Tidd & Bessant, 2018).

Researchers are currently immersed in the era of big data, characterized by an unprecedented influx of data originating from diverse sources, including organizations, industries, and public institutions (Mikalef, Boura, Lekakos, & Krogstie, 2019). The substantial growth in data volume has firmly established big data as a primary resource for gaining a competitive edge, enhancing business performance, and nurturing innovation (Mikalef et al., 2019). With over 3.2 billion people connected to the internet and a substantial shift of data traffic from fixed networks to wireless networks, organizations grapple with managing the projected surge in mobile data traffic (Clement, 2020).

Industries like healthcare are witnessing exponential data growth due to the proliferation of medical devices and technologies (Wynn & Pratt, 2014). The healthcare sector's digital data volume is projected to surge from 500 petabytes in 2012 to 25,000 petabytes by 2020 (Gardner, 2013). Analyzing both structured and unstructured data holds paramount importance in comprehending customer behavior and enhancing business performance (Haq, 2020; Mikalef et al., 2019; Alam, & Ali, 2017).

The pharmaceutical industry, renowned for its perpetual innovation, is poised for expansion with a compound annual growth rate of 3.1% from 2020 to 2025 (JohnsonFrench, 2020). Pakistan's pharmaceutical industry has exhibited remarkable growth, surpassing multinational corporations (MNCs) in sales growth (IQVIA, 2018). However, the sector grapples with challenges such as rising customer expectations, low scientific productivity, and cultural stagnation (PWC, 2020).

Despite substantial investment, empirical literature concerning the business value of big data analytics (BDA) is still evolving (Quantzig, 2019). The role of capabilities in BDA is gaining prominence, emphasizing the need for a fusion of resources to extract business value from big data (Mikalef, Pappas, Krogstie, & Giannakos, 2018). Dynamic capabilities oriented toward processes (DCOP) play a pivotal role in nurturing an innovation culture, especially in industries that demand technological advancement (Wamba et al., 2017).

In conclusion, the contemporary business landscape relies heavily on innovation and connecting the potential of big data across various industries. For instance, in the pharmaceutical sector, which faces unique challenges, fostering an innovative culture and leveraging BDA capabilities are essential strategies to drive value. The role of managerial accountants holds immense significance in bridging the gap between data and business perspectives in achieving innovation and growth.

The Potential of Big data in the Corporate Environment

The concept of big data has rapidly gained attention across diverse industries and fields, including information systems, computer sciences, social sciences and management (Constantiou & Kallinikos, 2015). The academic realm has witnessed a growing fascination with big data, spanning across various business domains (Chen et al., 2016). What stands out is the distinct theoretical orientation of these disciplines, shaped by varying viewpoints on how big data is understood and quantified (Cao & Duan, 2014). Given these differences, the development of central integrative concepts and precise definitions for each of these perspectives becomes crucial.

Big Data Analytics

Certain definitions of big data focus merely on the characteristics and inherent qualities of the data itself (Abbasi, Sarker, & Chiang, 2016; Dubey et al., 2017; Dubey et al., 2019). Conversely, other definitions encompass not only the data but also the tools, techniques, and analytical methods utilized in the process (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). Moreover, there are experts who have highlighted the influence of analyzing and presenting big data on the overall value of a business (Beyer & Laney, 2012; Grover, Chiang, Liang, & Zhang, 2018; Popovič, Hackney, Tassabehji, & Castelli, 2018).

However, while the concept of Capabilities in Big Data Analytics (BDA) encompasses a broad spectrum of fundamentals crucial for the success of big data initiatives, these definitions often overlook the organizational resources needed to transform big data into actionable insights. Indeed, transitioning into a data-driven organization is a multifaceted and intricate endeavor that necessitates involvement from management across various hierarchical levels. To effectively address the paradigm, shift towards a data-driven era and provide practical guidance for implementing big data strategies, the term 'Capabilities in Big Data Analytics (BDA)' comes into play. This term refers to an organization's adeptness in leveraging big data to extract insights that hold both strategic and operational significance.

Big Data Capabilities

In a broad context, this term encompasses the organizational proficiency that leverages infrastructure, and human capabilities through data management to propel a business into a robust competitive position (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016). Present research in this realm has predominantly concentrated on the strategic capacities within Big Data Analytics (BDA) and the methodologies employed to attain competitive advantages and their associated benefits (Cao & Duan, 2014;Yap, 2019). Several scholars posit that BDA capabilities revolve around establishing processes necessary to unlock the benefits of utilizing big data (Cao & Duan, 2014).

However, empirical examinations of the concept of Capabilities in Big Data Analytics (BDA) are still limited. Much of the existing research consists of evidence that is often considered unreliable and anecdotal, particularly regarding the influence of organizational BDA capabilities on overall organizational performance (Almeida, S. D, Corso, D. Silva, R. D. & Veiga, D. 2019). Simultaneously, differing perspectives exist regarding the constituents of Capabilities in Big Data Analytics (BDA). This divergence arises from the incorporation of various theoretical standpoints.

Capabilities in Big Data Analytics Resources

The body of published research concerning Capabilities in Big Data Analytics (BDA) is constrained. Nonetheless, a number of studies have tackled the resources required for fostering this capability. These resources form the bedrock upon which an organization's broader Capabilities in Big Data Analytics (BDA) are built. Numerous extant investigations have explored the necessary resources and processes for effectively harnessing big data in a strategic manner. However, a substantial gap still exists in our comprehensive comprehension of how organizations truly establish robust Capabilities in Big Data Analytics (BDA) (Gupta, 2016).

Big Data Capability as a Tangible Capability

Wamba et al. (2017) underscored the significant importance of data availability and integration from diverse sources. Historically, achieving this objective has often depended on well-established Information Technology architectures. Mikalef and Pateli (2017) also pointed out concerns related to data availability, revealing that organizations frequently acquire data to enhance analytical outcomes and gain deeper insights into their operations and customer interactions. A recent report from MIT Sloan Management Review (Ransbotham & Kiron, 2017) echoes a similar trend, emphasizing that organizations engaged in data sharing and forming alliances based on these resources tend to exhibit higher levels of innovation.

Beyond the data itself, organizations require infrastructure capable of storing, sharing, and analyzing data. A fundamental characteristic of Big Data is its unstructured nature, necessitating investments in advanced infrastructure to extract meaningful and valuable insights (Dubey et al., 2019). Some scholars examine organizational big data infrastructure in the context of investments allocated to specific technology types (Kamioka & Tapanainen, 2014; Soares de Almeida et al., 2019), while a few directly focus on technological aspects (Akter et al., 2016; Wamba et al., 2017).

Big Data Analytics as an Intangible Capability

According to Ravichandran, Leytonstone, and Leytonstone (2005), the efficient maintenance of current knowledge, skills, and the effective coordination of activities, resources, and tasks heavily depend on the ability to establish and maintain networks, both within and outside the organization. Consequently, the significance of intangible resources becomes paramount, encompassing the structures, connections, and roles established for managing the diverse array of available resources. A commonly used term that encompasses all activities and decision-making mechanisms related to IT-based resources is governance.

In the context of Big Data Analytics (BDA), governance relates to the rules and controls that every participant must adhere to when performing their individual tasks. The increasing focus on information governance in the realm of big data is largely driven by the strategic importance that big data holds for contemporary organizations. Likewise, numerous researchers have emphasized the importance of establishing governance frameworks tailored for the management of big data (Cao & Duan, 2014). Other scholars consider this a crucial element that significantly contributes to organizations' challenges in effectively harnessing their data resources (Posavec & Krajnović, 2016). A recurring theme in discussions about effective governance underscores the necessity of adopting a top-down approach, highlighting the enduring requirement for commitment from senior management to foster data-driven decision-making (Vidgen, Shaw, & Grant, 2017).

Big Data Analytics as a Human Skills and Knowledge Capability

The proficiency and depth of expertise within a company's Human Resources department play a central and pivotal role in effectively utilizing big data tools and technologies. This capability empowers the organization to make high-level strategic decisions by drawing insights from these advanced tools. These essential skills and knowledge can be broadly categorized into four domains: technical proficiency, business insight, relational skills, and business analytics acumen.

Technical proficiency encompasses a range of skills including adept database management, skillful data retrieval, proficient programming abilities, and efficient management of cloud services. Business insight entails a profound comprehension of organizational decision-making processes, the strategic application of insights for implementing big data solutions, and leveraging knowledge gained from these insights.

Relational skills involve cultivating effective collaboration and communication across diverse skill sets within the workforce. On the other hand, business analytics acumen encompasses mastery in mathematical and statistical modeling, proficiency in simulation techniques, the ability to construct scenarios, and adeptness in interactive data visualization methods.

While data analysis skills are foundational to the realm of data science, this skill set is not limited to data scientists alone; it's indispensable for employees across all levels of the organization (Prescott, 2014). Recognizing the significant role of data scientists in today's business landscape, some studies even advocate for a restructuring of Information Systems curricula to align with their critical contributions (Jacobi, Jahn, Krawatzeck, Dinter, & Lorenz, 2014).

Having a comprehensive understanding of the organization's objectives and strategic trajectory is essential. This awareness is crucial for acknowledging the need and capacity to evaluate and enhance the organization's key performance indicators (KPIs). This is particularly relevant as Big Data Analytics is intricately connected to resolving existing organizational challenges. In essence, the ability to identify issues and subsequently address them using insights gleaned from analyzing big data constitutes a crucial element of the knowledge anticipated from both business managers and data analysts (Gupta, 2016).

Areas of Big Data Analytics

Numerous research endeavors have precisely identified specific domains where the implementation of initiatives involving big data can yield significant advantages. These studies have also delineated areas in which organizations stand to achieve amplified gains in overall performance (Akter et al., 2016). The foundational assumption is that while the components of Capabilities in Big Data Analytics (BDA) inherently share common traits often studied in a decontextualized manner, the application of this capacity can manifest diversely.

For instance, a multitude of investigations have showcased how companies operating within the news media and its affiliated sectors harness their Capabilities in Big Data Analytics (BDA) to tailor content for their clientele. These capabilities are exploited to provide personalized recommendations and news content that precisely align with individual preferences and requirements. Similarly, within the gas and oil industry, numerous applications have been deployed for tasks like risk assessment and maintenance management (Mikalef, Framnes, Danielsen, Krogstie, & Olsen, 2017).

Concurrently, a wide spectrum of heterogeneous BDA applications is being adopted across various industries, yielding outcomes of varying magnitudes in terms of business value (Akter et al., 2016). Consequently, recent studies have prominently underscored the impact of BDA capabilities in facilitating diverse facets of organizational competencies (Mikalef et al., 2019; Surbakti, Wang, Indulska, & Sadiq, 2020; Yap, 2019).

Organization Innovation Performance

To evaluate the innovative performance of organizations, two interdependent variables are considered. Firstly, the count of successfully implemented product-related innovations by the organization within the recent years. Secondly, the determination of whether the organization has achieved radical innovations during the same timeframe. Within the spectrum of a product's novelty, incremental and radical innovations represent the two contrasting ends. Rather than opting for a more continuous distribution, survey participants generally gravitate towards one of these innovation output extremes.

In a study by Henderson and Clark (1990) that delved into architectural innovation, the researchers sought to uncover the elements situated between the aforementioned extremes. Their findings indicated that even minor modifications can occasionally wield a significant influence on competitive positioning. It's essential to grasp that incremental innovations result in marginal enhancements to existing products, rendering them familiar to the market. In contrast, radical innovations introduce entirely new products to the market, creating a distinct departure from the norm.

The Future Landscape of Innovation: Big Data's Evolution

The industries are flourishing by capturing huge amounts of data that exist today. In each sector there are millions upon trillions of data and this volume is increasing at considerable rate. One of the main drivers of this exponential growth in data is the ever increasing usage of social media (Chaudhary, Pandey, & Pandey, 2015). Although data has been generated for hundreds of years but more recently, due to the exponential surge in data generation, new definitions of data availability strength can be considered (Ibid). Data had always been considered as every organization's integral part, regardless of the size of the organization. Previously it was primarily the standardized and structured data which was being managed by the different industries. However due to the exponential increase in the data volume, variety and velocity, a big question had been put in front of the different industries. Previously the data size had been in terabytes or more depending upon the nature of the business. According to Chaudhary et al. (2015) data exceeding these conventional limits had started to be considered part of the big data concept.

Organizational Cultural influence on Performance in Innovation

Amabile, Conti, Coon, Lazenby, and Herron (1996) define innovation as the effective implementation of creative ideas within an organization. This highlights a pivotal aspect of innovation – the ability to practically execute creative concepts, sustaining the flow of inventive ideas that contribute to both the innovation process and its realization. Drucker (1985) emphasizes that innovation is the most potent avenue for achieving, sustaining, and heightening competitive advantage, thus bolstering organizational performance and business growth. Cultivating innovation equips companies with enhanced adaptability and flexibility in the face of market shifts and technological progress.

Market-based innovation involves novel marketing strategies for existing products or exploring new markets for both existing and new products. Multiple studies underscore a robust correlation between organizational culture and innovation (De Clercq, Thongpapanl, & Dimov, 2010; Hislop, Bosua, & Helms, 2018; Sjusdal & Lunde, 2019), encompass modern management and production techniques, the adoption of innovative technologies, and improved product-related management systems. Organizations foster cultures that motivate employees to generate innovative ideas and actively participate in managerial decisions and strategies aimed at fostering innovation. Such an environment nurtures creativity in an informal and relaxed context, thereby cultivating a collective focus on creativity and innovation throughout the organization.

Aligned with the Knowledge-Based View theory of organizational culture, ideas originating from individuals are seen as intangible assets, playing a pivotal role in organizational development. Organizational culture encapsulates shared beliefs and values among employees at all levels, reflecting distinct organizational attributes (Schein, 1984). While creativity is often attributed to individuals or teams, organizational transformations stem from these creative endeavors. An organization's culture facilitates knowledge exchange among innovative minds within the organization, a critical factor for organizational success (De Long & Fahey, 2000).

Organizational culture significantly impacts outcomes considered risky, such as innovation, productivity, and financial aspects of organizational performance. Organizational culture directs and motivates employees to identify solutions, coordinating efforts through knowledge sharing and cultural values (Shivers-Blackwell, 2006). A robust organizational culture substantially enhances creativity and innovative behavior among employees, nurturing the development of creative ideas and elevating innovation as a crucial organizational facet (Hartmann, 2006). In light of the nature of innovation, a minimal level of formal rules and regulations fosters an open and welcoming environment for creative ideas to flourish (Ibid).

Dynamic Capabilities and Processes

Dynamic capabilities encompass a complex amalgamation of intricate routines, as highlighted by Zollo (2002), encompassing a diverse spectrum of management and organizational processes, as discussed by Helfat and Peteraf (2015). To gain a deeper comprehension of dynamic capabilities, it is crucial to direct attention towards the underlying processes. Teece (2016) concentrated on three core processes: learning, coordination and integration, and reconfiguration. These processes formed the basis for a literature review aimed at identifying similar processes, assessing the need for inclusion or removal, and ultimately confirming the validity of the processes proposed by Teece, Pisano, and Shuen (1997). This process aided in pinpointing activities related to the core dynamic capabilities processes and reconciling disparities in process meanings within existing literature, while also categorizing them to elucidate the original concepts and new research areas.

The coordination and integration process delves into an organization's capacity to assess the value of existing resources and seamlessly integrate them to foster new capabilities (Iansiti & Clark, 1994). Deploying novel operational configurations demands heightened coordination of diverse resources, tasks,

and activities synchronization (C. E. Helfat & Raubitschek, 2000). Such capabilities empower organizations to identify and cultivate strategically vital assets and capabilities within a dynamic competitive landscape. Coordinating organizational capabilities involves developing processes for data gathering and interpretation, task and resource allocation and reconfiguration, and effective communication of information and decisions (Sanchez, Heene, & Thomas, 1996). The coordination and integration of an organization's non-tradable assets give rise to unique combinations that amplify value. This stems from the fact that these intricate combinations are not easily replicable by competitors (Teece, 2007). Poorly organized or inefficient coordination and combination of resources can leave organizations vulnerable to significant shifts in the technological landscape, as illustrated by Henderson and Clark (1990) in the photolithographic industry. Seemingly minor innovations led to profound consequences, altering systems' configurations.

Learning capability constitutes the second process, acting as the primary avenue for strategic renewal. It involves organizations simultaneously exploring new avenues and leveraging existing knowledge and experience (March, 1991). Learning processes are dynamic and multilevel in nature. Individual insights and innovative ideas, although originating from individuals, are shared within the organization, becoming embedded as organizational artifacts.

The third process, capability for strategic competitive responses, draws from the extensive definitions proposed by Eisenhardt and Martin (2000) regarding dynamic capabilities. This process pertains to an organization's ability to create market change and respond to externally driven shifts (Helfat & Peteraf, 2015). Essentially, it entails an organizational knack for scanning the environment, identifying emerging opportunities, evaluating competitive standing, and strategically responding to competitive moves. Despite established organizations acknowledging the need to adapt to environmental changes, effecting meaningful responses is often challenging. Empirical research demonstrates that responding effectively to even minor technological changes can be arduous (Henderson & Clark, 1990; Tushman & Anderson, 1986). The capability to identify and strategically address challenges within the business environment is of utmost importance, as it allows organizations to realign capabilities before they become rigid and resistant to change (Eisenhardt & Martin, 2000); Teece et al., 1997).

Organizational Culture as an Enabler

The definition of culture has varied over the years. As an example, over 40 years ago, Herskovits (1995) (1995 p.356) suggested a broader definition of culture in that culture was a “human-made part of the environment.” This definition can be interpreted as being about “objective culture” (e.g., tables, computers, trains) and “subjective culture” (e.g., norms, roles, values) (Treven, Mulej, & Lynn, 2008).

Recently an article in Harvard Business Review defined organizational culture as being the collective effect of the common beliefs, behaviors and values of the people within an organization. Such norms within an organization regulate the performance of the employees and how they serve customers, how they co-operate amongst each other, whether they are motivated enough to meet goals and if they are sincere towards the company's overall mission. How well are employees getting their work done? Whether they are able to function independently or whether they collaborate with each other? Are they getting inspiration, commitment and participating behavior at workplace (Groysberg, Lee, Price, & Cheng, 2018)?

Organizational culture acts as a filter through which everything else takes place. Although it is a universal goal to create a positive employee experience, there are a number of ways to achieve that. On top of that the distinction between functions and duties is quite vague sometimes (Brown, Melian, Solow, Chheng, & Parker, 2015). To overcome this blur between functions and duties, four filters need to consider defining organizational culture. The first filter is that each culture has its own uniqueness and there is no one correct answer. Although similar goals exist in different organizations in terms of having happy employees, they can try to achieve that in quite different manners.

The Second filter is that cultures provide us a well-defined guidance for finding all the possible members of the workforce who are a good fit for the organization. At the time of hiring of people, who are likely to succeed in environments which are likely to be challenging, they are can significantly improve their success' chances.

The third filter is that cultures tend to be dynamic and organic. Cultures have to be developed just like any other relationship. There are times when cultures evolve due to changes in external factors and at other times, when the company simply grows and expands. If there is a change in the mission, culture may need to adjust to be aligned to the change in the mission as well. On other occasions, companies have to work hard to ensure that their cultures do not drift away from the organizations' core values. The crux of the matter is that organizations have to focus on their cultures and focus on controlling them, as and when there are changes in them, instead of leaving that to chance.

The Fourth filter relates to what organizations usually do to develop their organizational cultures so that such cultures become part of their identity in order to distinguish them from others. Companies such as Google and Facebook are the brands which reflect the energy and the spirit found within the organization. Their cultures differentiate such organizations and hence play an important role in financial success of these organizations.

All of these four qualities can therefore be considered to be making up the organizational culture. These reflect the experiences of their employees and usually determine whether such companies succeed or not (Osetrova, Prykhodko, Glazunov, Borysova, & Pisna, 2019).

Why Organizational Culture is important?

Organizational culture matters a lot when it comes to winning or losing. A research study was carried about organisational performance and culture and involved different scientists taking into account, operational data from 207 large US companies within 22 different industries over a period of 11 years and comparing the results of those companies which managed their cultures as compared to those which did not manage it properly (Morcos, 2018). Such companies which had managed their cultures quite well were able to enhance their share prices by 901% compared to a mere 74% for such companies which had not (Ibid). Such companies which had focused considerably on their cultures managed to increase their incomes over the said period by 682% compared to only 166%for the others (Ibid). Net revenue also increased 756% for such culture-focused companies versus 1% for the companies which did not (Ibid). The companies which had considerably aligned their cultures, when compared with those which had not properly aligned theirs, had their organizational value increase 12 per cent per annum faster over a period of five years and their gross profit increase 7 per cent per annum faster. So, for the organizations to succeed, it is important to know how to adjust to the changes occurring in the environment and to develop their approach accordingly.

Competing Values Model (CVM)

Organizational culture pertains to a framework of shared beliefs, values and assumptions that permeate throughout an organization. This collective culture aids individuals and groups in functioning efficiently within the organizational context (Lee & Kim, 2017). Through managerial values and rituals, an organization's culture can shape employee behavior and exert an impact on the organization's decisions regarding investment and resource allocation (Chan, Shaffer, & Snape, 2004).

Various scholars have put forth several alternative methods for categorizing organizational culture, including approaches like relationship-oriented and transaction-oriented culture (McAfee, Glassman, & Honeycutt Jr, 2002) and focus-oriented and control-oriented culture (Khazanchi, Lewis, & Boyer, 2007)) which facilitates the exploration of the role of organizational culture in enhancing innovation performance. In a specific research instance, the Competing Values Model (CVM) framework proposed by Cameron and

Quinn (Cameron & Quinn, 2011) was employed to investigate an organization's culture. The rationale for selecting the Competing Values Model to study organizational culture is outlined as follows.

Firstly, the measures of organizational culture that evaluate the Competing Values Model have been employed in over 10,000 organizations globally. These measures have been utilized across various academic disciplines including accounting and finance, management, marketing, supply-chain management, healthcare, hospitality social services (Hartnell, Ou, & Kinicki, 2011). Secondly, the Competing Values Model concentrates on issues related to organizational change, which are highly pertinent for comprehending innovation. Thirdly, the Competing Values Model has unveiled the intricacies of value orientations and enabled comparisons of organizations' value orientations (Valencia, -N., Jiménez, -J & Valle, -S., 2011).

Previous Studies on BDA Capabilities

Numerous research investigations have unveiled domains where the application of big data initiatives can be harnessed effectively (Adrian, Abdullah, Atan, & Jusoh, 2018; Khan, Khan, Alam, & Ali, 2018). These studies have additionally identified sectors where significant enhancements in overall organizational performance can be realized (Akter et al., 2016). The fundamental premise here is that while big data analytics (BDA) encompass several generally analogous elements typically viewed in isolation from the specific context, this capacity can exhibit substantial versatility. Illustratively, various investigations have indicated that businesses within the media, news and telecommunications sectors harness their BDA capabilities to tailor content for their clientele and offer uniform news and products (Mikalef & Pateli, 2017). Simultaneously, there has been observed a widespread adoption of diverse big data analytics (BDA) applications across various business domains. This diverse usage pattern can consequently result in outcomes characterized by distinct business advantages and added value (Akter et al., 2016) . Numerous recently conducted studies have demonstrated the impact of BDA capabilities in facilitating various capacities across different types of firms (Mikalef, Pappas, Giannakos, Krogstie, & Lekakos, 2016; Wamba, Akter, Edwards, Chopin, & Gnanzou, 2015; Xu & Kim, 2014).

Multiple studies suggest that Big Data Analytics (BDA) can be targeted to cultivate strengths in operational aspects (Chae, Yang, Olson, & Sheu, 2014) and the dynamical (Erevelles, Fukawa, & Swayne, 2016) capabilities of a company. It has been demonstrated that such gains generated by big data initiatives can be categorized into the promotion of transparency, centering around the necessity to experiment with requirement discovery and performance enhancement. This involves resource segmentation, upgrading or substitution, management decision-making transformation, as well as innovations in new business procedures, services and products (Jelinek & Bergey, 2013).

Enterprises can tap into the extensive datasets amassed by companies, uncovering concealed insights and patterns within the data, thereby augmenting business value (Ghasemaghaei & Calic, 2020). Numerous studies have corroborated the necessity for enhancing communication systems within the healthcare sector to enhance the well-being of patients (Alalwan, Dwivedi, & Rana, 2017; Ismagilova, Hughes, Dwivedi, & Raman, 2019). In the realm of healthcare, rapid and optimal decision-making relies on crucial data and Big Data Analytics (BDA) is assuming a pivotal role in facilitating this process (Rajabion, Shaltooki, Taghikhah, Ghasemi, & Badfar, 2019). Seamless access to this information and big data is of paramount importance, enabling the delivery of top-tier services to both patients and healthcare facilities, regardless of location and time (Nouri, Khodaei, Darvishan, Sharifian, & Ghadimi, 2018; Pizzolante et al., 2018). Recent research indicates that investments in Big Data Analytics (BDA) lead to enhancements in overall firm performance (Akter et al., 2016; Ghasemaghaei, 2020; Wamba et al., 2017). Nevertheless, solely relying on Big Data Analytics (BDA) might not directly result in improved performance. There could exist intermediate variables that mediate the impact of big data on firm performance (Ghasemaghaei & Calic, 2019; Mikalef et al., 2019).

Significant Contribution in Industry and Literature

This study makes a significant contribution to the field of Big Data Analytics (BDA) and its impact on innovation performance, offering both theoretical insights and practical applications. Furthermore, its methodology enhances the existing knowledge base. The study introduces several notable theoretical contributions. Firstly, it goes beyond a mere exploration of the potential influence of BDA on an organization's innovation performance by examining the effects of specific BDA components on innovation performance. These components encompass BDA Tangible Capability, BDA Intangible Capability, and BDA Human Skills and Knowledge Capability. While previous studies have investigated the impact of BDA and its elements on organizational performance, the specific influence on innovation performance remains relatively unexplored. Secondly, this study delves deeper into the impact of BDA on an organization's innovation performance while considering the mediating role of process-oriented dynamic capabilities. The previous research has not thoroughly examined this mediating function of process-oriented dynamic capabilities. Therefore, this study aims to analyze both the direct effect of BDA on innovation performance and the mediating influence of process-oriented dynamic capabilities on this relationship.

Promoting innovation within an organization relies heavily on the pivotal role of organizational culture. An actively innovative culture holds paramount importance for organizations striving for innovation. Encouraging employees to think innovatively is essential for achieving tangible innovation outcomes. As the third aspect of this study, organizational culture assumes a moderating role in the relationship between BDA and an organization's innovation performance. This addition acknowledges that the impact of BDA on innovation can be shaped and enhanced by the prevailing organizational culture.

The practical implications of this study extend to offering valuable guidance to industry professionals, top-level management, and decision-makers in relevant organizations, particularly within Pakistan's industrial sector and high-innovation sectors like the pharmaceutical industry. It also serves as a roadmap for innovative organizations, illuminating how they can harness big data to enhance their innovative capabilities and thus enhance their business value.

By exploring the impact of Big Data and its constituents—BDA Tangible Capability, BDA Intangible Capability, and BDA Human Skills and Knowledge Capability—related organizations can gain insights into resource reconfiguration strategies. These insights can help strengthen their dynamic capabilities, especially process-oriented dynamic capabilities. By reshaping resources to reinforce process-oriented dynamic capabilities, these organizations can effectively enhance their innovation performance, ultimately achieving the art of value creation and sustainable competitive advantages.

Furthermore, the study underscores the significance of organizational culture in implementing the aforementioned approach, offering more clear practical applications. This understanding empowers organizations to more effectively implement and sustain the outcomes of big data and its impact on organizational innovation performance.

In conclusion, the study's data will undergo analysis using latent variable structural modeling, employing the Partial Least Squares (PLS) path analysis technique. This method, innovative in the context of BDA research, stands out for its ability to handle both reflective and formative measures, providing a more comprehensive view of the interrelationships within the framework. It also facilitates the examination of causal models involving multiple independent, mediating, moderating, and dependent variables, integrating various indicators or measures. Consequently, it contributes to methodological advancement within the field of BDA and innovation research.

Future Directions

This study will investigate the impact which BDA have on the organizational innovative performance through the development of dynamic capabilities oriented towards processes. It will also include the impact of the culture. Literature has been extensively reviewed on the relationships in this study so as to develop a sound foundation of the framework. The framework of this research study and relationship among the selected variables lays its foundation on the integration of two famed and largely recognized theories that is resource-based theory and socio-materiality theory. Thereafter the model of this study will be tested empirically.

Practical Implications

Given the benefits of big data analytics, it is hoped that the current piece of work can aid professional accountants, executives and practitioners by offering insights into how using big data analytics can actually lead to organizations being able to improve their innovative performance and hence be able to create sustainable competitive advantage, thereby leading to the enhancement of business value. It is important to understand the role that big data analytics has on the innovative performance of the organization. In the knowledge economy, with increasing volume, variety and velocity of big data, many organizations have improved their performances by successfully implementing big data analytics. For originations which have not yet done so, the results could be quite poor, unless they understand the relationship which can probably exist between big data analytics and organizational innovative performance. Within the Pakistani context, the increasing role of big data and IT can be considered as an opportunity for the executive management because it will indicate change in their roles. In such a new capacity, their skills and expertise can help in not only understanding the information needs of the businesses but also being able to bridge the gaps that may exist between the data scientists and the senior management, in making decisions which will lead to improved innovations and hence sustainable competitive advantage.

Conclusion

Based on the prior literature review, researchers have explored critical theoretical aspects of Big Data Analytics (BDA) capabilities and their influence on organizational innovation, particularly through process-oriented dynamic capabilities and the role of organizational culture. Our primary focus is to comprehend the ways in which BDA capabilities drive innovation performance. This emphasis stems from the recognition that innovation, fostered by process-oriented dynamic capabilities, serves as the conduit through which an organization enhances its value amid rapidly changing circumstances. The success of this endeavor is contingent upon cultivating an innovative and risk-embracing culture. Absent such a cultural foundation, potential benefits of BDA may remain untapped, thereby limiting the organization's ability to maximize business value.

This study contributes to the existing literature on the correlation between IT capabilities, competitive advantage, and firm innovation. It incorporates a comprehensive literature review and empirical testing, focusing on the context of big data analytics capability within developing-country pharmaceutical firms, such as those in Pakistan. This research provides theoretical connections among big data analytics, innovation performance, Dynamic Capabilities Oriented Towards Processes (DCOP), and the moderating influence of organizational culture. The anticipated outcome of this research is to provide practical strategic insights that will benefit industrial managers, government entities, educational institutions, researchers, and investors in Pakistan, facilitating a deeper understanding of the current role of big data analytics. The authors consider this work as a distinctive and invaluable contribution, addressing how BDA influences innovation through process-oriented dynamic capabilities within developing-country pharmaceutical firms. In nations like Pakistan, BDA presents opportunities for businesses and accelerates progress towards a fully developed knowledge-based economy.

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