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Big Data Analytics Capabilities & Innovation Performance through Process Oriented Dynamic Capabilities

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Abstract

Big data analytics (BDA) have the power to modernize traditional ways of doing business. However, the impact of BDA capabilities on a company's innovation success is still a mystery. The 'Age of Data' is thriving because new data is being produced at an unprecedented rate and with an increasing volume, due to global usage of different electronic devices and gadgets which are connected to each other through internet and other networks. To gain a deeper understanding of client behavior, thorough analysis of both structured and unstructured data must be done. The phenomenon of BDA has explored, either from a theoretical point of view or neglected intermediate factors, such as Process Oriented Dynamic Capabilities (PODC). The current research extends previous research by claiming that BDA Capabilities enable pharmaceutical businesses to gain knowledge that might assist them improve their process-oriented dynamic capabilities (PODC), which impacts organizational innovation performance (OIP) in positive way. The current study used survey data from 181 pharmaceutical companies of Pakistan to test the proposed research model. Simple random sampling method used for the current quantitative study. The respondents were top management of the companies. The current study's findings, based on partial least squares structural equation modelling, corroborate the assumptions about the direct and indirect effects of BDA Capabilities on OIP. They discovered that PODC mediates the link between BDA Capabilities and OIP to some extent (Partially mediate). The current research contributes to the existing literature on big data analytics and innovation both theoretically and empirically. The findings provide practical implications for top executives in the innovative industry on implementing BDA Capabilities to enhance innovation.

Keywords: BDA Capabilities (BDA Cap), Big Data, Process Oriented Dynamic Capabilities (PODC), Innovation.

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Introduction

In today's corporate world, innovation has become the most important pillar of success for any company (Shahzad et al., 2017; Tidd & Bessant, 2018). The speed of innovation can be increased, possibly, by rapidly changing technology, a high rate of product development and shorter product life cycles, which in turn, would bring about variations in the nature and economic development (Shahzad et al., 2017). Organizational strategies include innovation as a key component, aimed to achieve sustainable competitive advantage in the market (Tidd & Bessant, 2018).

The contemporary time period is considered as the age of big data as newer data is being produced at an unprecedented rate, from all organizations, industrial sectors as well as public organizations and bodies (Mikalef et al., 2019b). The exponential increase in the volume of data has resulted in big data being considered as the key source of competitive advantage, business performance and innovation (Chaudhary et al., 2015; Grover et al., 2018; Jelinek & Bergey, 2013; Mikalef et al., 2019b; Shahzad et al., 2017). At present, over 3.2 billion people, of the world’s population are connected onto the internet with 46% of them being connected through the usage of smart phones (Clement, 2020). Furthermore, this massive shift of IP traffic (web traffic, flow of data across the internet) from fixed networks to wireless based networks is likely to lead to a number of challenges for organizations. It is forecasted that Mobile data traffic around the world from 2017-2022 (in exabytes per month) is from 11.51-77.49 (Clement, 2020). By 2050 these figure are likely to be 95% of world population (Khan et al., 2018). According to one prediction, the volume of digital healthcare data in the world will raise from 500 petabytes in 2012 to 25,000 petabytes in 2020 (Gardner, 2013).

Organizations are required to analyze, in a meaningful manner, structured as well as unstructured data in order to obtain a deeper understanding into customer related behavior, their service usage and interests on a real-time basis (Mikalef et al., 2019b; Riaz et al., 2017) to enhance business performance, competitive advantage and innovation. Due to the rapid increase of data volume, variety, velocity and veracity, considerable developments have taken place and have also been documented, relating to such technologies and techniques which involve the analysis, visualization as well as storage, of data (Mikalef et al., 2019b). Many organizations of different sizes are searching for ways with the aim of improving their performance, innovation and business value, by extensive usage of big data analytics (BDA) tools (Mikalef et al., 2019b; Shinwari & Sharma, 2018; Yin & Kaynak, 2015). The industry of pharmaceutics is basically well-defined by innovation (Petrova, 2014). Science's cutting-edge research, the invention of new drugs/medicines and the establishment of new knowledge

bases, and the enhancement of existing drugs establish the fuel that boosts the firms in this industry or sector. According to Petrova (2014) One of the most distinguishing aspects of the pharmaceutical business is its constant innovation.

In the forecast period of 2020 to 2025, the global medicines market is likely to expand, with a Compound Annual Growth Rate (CAGR) of 3.1% and will expect to reach USD 1114470 million by 2025, from USD 987790 million in 2019 (JohnsonFrench, 2020). According to IQVIA (2018), a United States based firm which focuses on health market research, Pakistan's pharmaceutical industry as well as market, are amongst the top 3 fastest growing ones in the world. Pakistan's domestic pharmaceutical firms' sales have achieved a CAGR of 13.1% over the last 4 years, hence outperforming the multinational companies (MNCs), which had achieved global growth rate of 9.34% compounded annually. Pakistan's pharmaceutical sector is growing at a faster rate than the other emerging markets like India, Brazil, Russia, Vietnam and Bangladesh (IQVIA, 2018). The local companies in pharmaceutical sector in Pakistan have achieved quarterly revenues of Rs. 320 billion in the quarter ending March 31, 2020, as compared to Rs. 195.75 billion of the MNCs, as of March 31, 2016 (IQVIA, 2018). According to the United Nations COMTRADE (2020) database on international trade, Pakistan exported $217.04 million worth of pharmaceutical items in 2019.

Despite the facts mentioned above regarding positive trends in Pakistan Pharmaceutical industry, there are some harsh realities. Due to the high depreciation of Pakistani rupee, the overall growth of the industry in terms of the US dollar, remained negative, in the first quarter of the year 2020. As per a report (IQVIA, 2018), in the previous four years national companies CAGR was 2.41 % as compared to MNCs which had a 1.01 %.

Rate of contraction reduced the period from July to March in financial year 2020 in this sector as per Pakistan Economic Survey of 2019-220, 5.38% reduction found in that time period as compared to 8.66 % reduction in previous years (Survey, 2020). In March, revenues in the pharmaceutical industry were at an all-time high, as well as in April 2020 receiving $1.3 million in the form of foreign direct investment (FDI) (Survey, 2020). As per Pakistan Economic Survey Survey (2020) there is an analysis by experts that, due to the increasing current rate of growth, market size of pharmaceutical sector would be double in the coming 10 years.

In the coming months, there would be a severe impact of the COVID 19 pandemic, and the International Monetary Fund (IMF) has conducted a downward revision of its projections related to the world GDP projections and is currently expecting a 4.9 percent contraction in 2020. High rupee depreciation

and impact of the pandemic is giving tough time to Pakistani economy and the next year will likely be quite difficult for the Pakistani economy (Javed, 2020). GDP of Pakistan is also precarious as the expected growth rate for the next fiscal year is likely to be between 1 and 2 percent, which is considerably less than the normal growth rate of between 3 and 5 percent which has been seen in the past (Javed, 2020). Pharmaceutical sector as it is one of the more innovative sector and a very crucial one for the economic performance of the country (Hanif & Gul, 2014). According to Javed (2020) few industries, which include the pharmaceutical industry, could play a very important role in helping the state economy. Javed (2020) recommended, that the industry of pharmaceutics should increase their capacity of production, because international collaboration will bring critical projects for important medicines in the country and should focus on setting up joint ventures related to investments in the production facilities in order to improve the GDP. Innovation in pharmaceutical sector is under pressure yet (Petrova, 2014). To gain business value and competitive advantage it is required that innovation should be sustained in pharmaceutical industry (Hanif & Gul, 2014). Unfortunately, out of 121 countries Pakistan ranking in the bottom line of worst 16 countries (GII, 2019). Pharmaceutical companies are operating in a very technological sector where some of the most important areas for the improvement of firm performance are the management capabilities, critical information analytics and innovation (Hanif & Gul, 2014).

Several studies have found that organizations have access to an avalanche of data management and data analysis capabilities, which we refer to as "big data" and "analytics" technology, respectively (Mikalef et al., 2018; Sjusdal & Lunde, 2019; Wamba et al., 2017; Wynn & Pratt, 2014). The amount of data available and combination of these tools has led to excellent chances for departments like hospitals, public health, as well as corporations to grow and organize a wide variety of business intelligence and analytic applications to support numerous objectives of the organization (Wynn & Pratt, 2014). This newly gained capacity for evaluating precise data allows healthcare practitioners and other data owners to explore a variety of clinical, operational, and financial advances using business intelligence and analytical tools.

The prevalence of big data and the usage of the same can result in enhancement in innovative performances, which then leads to further improvement in economic development (Douglas, 2012; Shahzad et al., 2017). In other words, innovation, which can be termed as the implementation of creative ideas within the organization, in a very efficient and effective manner, can and does lead to businesses achieving and sustaining competitive advantages (Shahzad et al., 2017; Soares de Almeida et al., 2019; Tidd & Bessant, 2018).

Empirical research relating to the business value of the BDA is currently in a very early stage. This is quite strange considering the increasing number of companies which are investing heavily in big data(Jacobi et al., 2014; Quantzig, 2019). To date, a number of reports on the topic of big data's business usefulness have come from the popular press, consulting firms, and specific case studies that lack theoretical insight (Mikalef et al., 2019a). Consequently, there is a little understanding of how organizations need to focus on their initiatives related to big data, and also there is little empirical support to claim that such investments actually do create any business value worth measuring (Mikalef et al., 2018).

A number of studies focusing on importance of BDA Capabilities with the reference of management to create applicable or practicable ideas for delivering sustained value, enabling innovation performance measurement, and achieving competitive advantage (Mikalef et al., 2018; Wamba et al., 2015; Wamba et al., 2017). Due to increased usage of innovative technologies, BDA has become the fourth paradigm of science which has given solutions to the management relating to the analyses of complex data and datasets(Ahmed & Saeed, 2014; Strawn, 2012).

Organizations which are users of big data proved to be the fundamental pillar in economic development of any region in the world because they have the knowledge, skills and ability to transform ideas to new products through innovation (Duval-Couetil et al., 2016).They must constantly enhance their present processes and products, as well as develop new ones that meet market demands. As a result, a growing number of studies have investigated and theorized about the strategies and the structures which firms may need in order to build the capacity for innovation on a continuous basis, by introducing new products with the help of Process Oriented Dynamic Capabilities (PODC) (Kim et al., 2011; Kohlbacher & Reijers Hajo, 2013; Wamba et al., 2017). In this sense, the firm’s dynamic resource-based vision identifies the dynamic capabilities as the primary source of competitive advantage which is sustainable for the firm, within a changing and competitive landscape (Mikalef et al., 2019b; Teece et al., 1997; Wamba et al., 2017).

It is vital to understand how BDA Capabilities are developed within high innovative industry, as well as understand the mechanisms through which the BDA Capabilities produce value, and how such value can be obtained (Mikalef et al., 2017). This area needs to be addressed in the pharmaceutical industries as well (Joshi, 2019; Quantzig, 2019). It is of considerable practical value, especially innovation, considering the costs of using initiatives related to big data. Therefore, BDA Capabilities in relation with PODC & innovative performance is an important area in pharmaceutical industry in Pakistan.

Pharmaceutical companies need to alter a process oriented dynamic capabilities better than its' competitor(s), in order to outperform the competition and to gain competitive advantage, pharmaceutical companies must be able to change itself in direction of BDA Capabilities to attain innovation (Quantzig, 2019).

Research Questions

The following research questions investigated in this study:

1. To what extent BDA Capabilities affect OIP?
2. How PODC mediates the relationship between BDA Capabilities and OIP?

Theoretical/Conceptual Framework, Empirical Evidences and Hypotheses Development

Big Data Analytics Capabilities and Organizational Innovation Performance

Currently there are a few studies on big data (Mikalef et al., 2017). However, there have been few studies that have focused on the various issues experienced by different firms during the implementation stages of various big data projects (Gupta, 2016; Vidgen et al., 2017). In particular, within the sphere of Information Systems, researchers are recognizing the fact that success of the big data related projects depends on the data as well as the analytical tools and processes and other aspects which cover a broad range of items (Garmaki et al., 2016). to deal with such events, the concept of BDA Capabilities has been suggested. It can be defined, in broad terms, as the organization's capacity to provide insights into the usage of data management, infrastructure, and human capabilities in order for the corporation to become competitive force (Akter et al., 2016; Kiron et al., 2014). The study that has been carried out so far in this domain has focused on such BDA Capabilities which are strategy-driven, and at the same time, on the mechanisms through which competitive advantages and the related benefits can be obtained (LaValle et al., 2011). Many scholars are of the opinion, BDA Capabilities should be focusing on the processes which need to be put in place so that the advantages of using big data can be achieved (Cao & Duan, 2014; Olszak, 2014). A number of other researchers are focusing on carrying on investments in the needed resources as well as the alignment of such resources with the organizational strategy (Xu & Kim, 2014). The crux of the matter is that the notion of BDA Capabilities focuses on incorporating all connected organizational resources that are necessary for fully exploiting the strategic potential of big data.

As a result of the upward trend of velocity, volume and variety of data, newer approaches for analysis and forecasting, using big data analytics capabilities are needed. Organizations are using big data analytics capabilities for creating innovation in their services, procedure and products to increase organizational innovation performance (Chaudhary et al., 2015). Few studies have been carried out to determine the influence of big data analytics capabilities on organizational innovation and performance. (Mikalef et al., 2019b; Wamba et al., 2017). Considering the theoretical, conceptual and empirical relationship between big data analytics capabilities and organization performance and innovation in above section, current study proposed as follow

H_1: Big Data analytics capabilities influence organization's innovation performance**.**

Process Oriented Dynamic Capabilities and Organizational Innovation Performance

Process oriented dynamic capabilities usually emphasized on describing the procedures by which competitive edge can be achieved in diverse environments. These include abilities of identifying and shaping the opportunities as and when they come up and the threats which may exist, capturing those opportunities and also attempting to maintain the organization's competitiveness by improving, protecting, combining and, where necessary, reconfiguring the resources of the organization's intangible and tangible (Pisano, 2015).

As a result, this approach indicates the reasons why some organizations manage to focus on the identification and incorporation of the opportunities arising from outside environment into their regular procedures, by the management and combination of different available resources in order to achieve required results while other organizations are unable in developing and implementing these capabilities (Ambrosini et al., 2009).

Teece (2007) considered dynamic capabilities required for targeting on customers changes and technological requirements. As a result of this, understanding as to how to apply innovation capabilities can be developed and this is based on understanding the possible relationship that may exist between dynamic capabilities and innovation. Primarily innovation involves the ways by which the entire process as well as the resources, routines and organization's management capabilities, are actually carried out (Soares de Almeida et al., 2019). Due to this, strong dynamic capabilities allow organizations to quickly conceptualize, assess, test and then implement new innovations. This leads to arrangement of resource base of the organization as well as its processes which is PODC (Teece, 2016).

There are very few theoretical and a very few empirical studies (Mikalef et al., 2019b; Mikalef & Pateli, 2017; Wamba et al., 2017) which have also found direct and indirect relationships between PODC and Organizational Performance. The current study proposes meditational analyses of the relation which PODC has (i.e. an indirect effect upon the direct relationship which exists between BDAC and OIP. This relationship has mainly been much uninvestigated, and in this manner, this study is a valuable contribution to the existing body of knowledge while proposing

H_2: PODC mediates the relationship between BDAC and OIP

Conceptual Framework of the Study

Figure 1 shows the conceptual model for this study. This model is built on the basis of theoretical and empirical evidences about the direct relationships between BDAC &OIP. Current model also shows indirect relationship between BDAC & OIP with mediating effect of PODC. Current proposed model moves a step further by developing the interactional mechanism through which BDAC and OIP are linked through PODC. And also, first time in literature current study proposed moderating effect on direct and indirect relationship of BDAC and OIP.

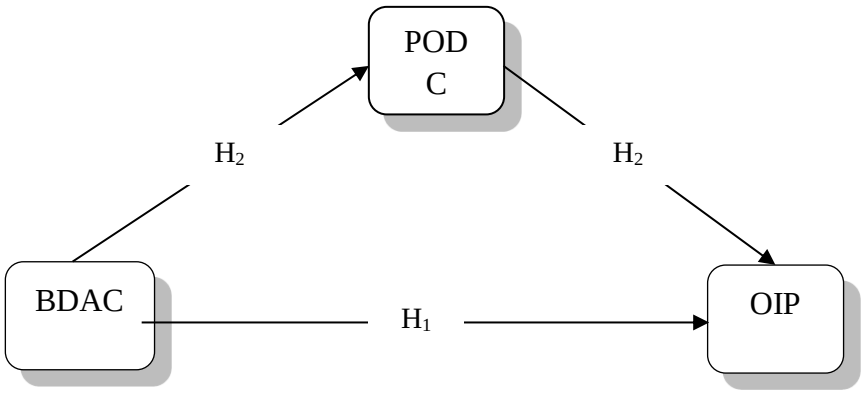

Figure 1. Research Model

Methodology

Survey questionnaire, administration, measurement scale and data collection

The various construct scales were adopted from existing studies, tested in earlier empirical studies. On a 5-point and 7-point Likert scale, all constructions and items were operationalized. This study selected the pharmaceutical sector as it is a more innovative and crucial for the economic performance of the country (Hanif & Gul, 2014). An online survey questionnaire form was emailed to the top

management of each pharmaceutical company for their response. 181valid responses were received out of 242 within the four and a half months, which was the final number of responses (75% response rate) for the current study. A total of 181 companies were involved in the data analysis, including 13 (7.2%) public limited companies and 168 (92.8%) private limited companies as per Table 1.

Table 1
Descriptive analysis of the sample and respondents

Types of Company	Frequency	Percentage %
Public Limited	13	7.2
Private Limited	168	92.8
Total	181	100.0

Companies and 168 (92.8%) private limited companies as per Table 1.

Data Analysis

In order to assess the validity and reliability of the hierarchical research model, this study applied the partial-least squares structural equation modelling (PLS-SEM) analysis by using the Smart PLS 3 software package for conducting all analyses (Ringle, Wende, & Becker, 2015). PLS-SEM is considered an appropriate methodology for this study as it allows simultaneous estimation of multiple relationships that might exist between one or more independent or dependent variables (Hair, Ringle, & Sarstedt, 2011).

As the model consists of both, formative and reflective constructs, different assessment criteria were used to evaluate each of the constructs. With respect to first-order reflective latent constructs, this study conducted convergent validity, reliability and discriminant validity tests. The reliability assessment was conducted at the construct and item levels. At the construct level, composite reliability (CR) and Cronbach's Alpha (CA) values were examined and it was established that the respective values were above the required threshold of 0.70 (Nunnally, 1978). The indicator reliability assessment was conducted by determining whether the construct-to-item loadings were above the required threshold of 0.70. To assess the convergent validity, it was determined whether the AVE values were above the lower limit of 0.50. The smallest observed value was 0.57, which considerably exceeded this threshold. Discriminant validity was established using three methods. The first considered each construct's AVE square root to verify that it was higher than its highest correlation with any other construct (Fornell-Larcker criterion). The second determined whether each indicator's outer loading was greater than its cross-loadings in relation to other constructs (Farrell, 2010). Henseler, Ringle, and Sarstedt (2015) argued that a better assessment indicator of discriminant validity required the consideration of a new criterion called the heterotrait–monotrait ratio (HTMT). Values below 0.85 are indicative of sufficient discriminant validity. Hence, the results obtained

confirm the discriminant validity. Next, in order to evaluate the validity of the items in the formative constructs, this study adhered to the MacKenzie, Podsakoff, and Podsakoff (2011) guidelines using Edwards' (2001) adequacy coefficient (*R*2a). In order to achieve this, the squared correlations between the formative items as well as their respective formative constructs were added and the sum divided by the number of indicators.

Assessment of the Structural Model Direct Effect

The outcomes of the structural model's evaluation have been discussed in this section. The collinearity issues, path coefficients of hypothesis linkages, as well as the structural model's assessment, accuracy and predictive relevance are also assessed. In summary/conclusion, one direct link hypotheses, H1, has been proposed and the structural model supported with positive β or path coefficients, the value of t is t>1.96 and significant at p value is p<0.05. The coefficient of determination (R2) value found was 28.3 percent, indicating that all exogenous constructs, namely BDA Cap, explained the percentage of variance in the endogenous constructions (OIP).

The coefficient of determination (R^2_a) values, effect size of predictor variables (f^2), predictive relevance (Stone-Geisser *Q*2) and the effect size of path coefficients are all used to verify the structural model. A bootstrap technique with 5000 resamples was used to determine the significance of estimates (t-values). A direct significant effect was found between BDA Capabilities and OIP (β = 0.532, t = 10.787, p < 0.05) in Figure 2.

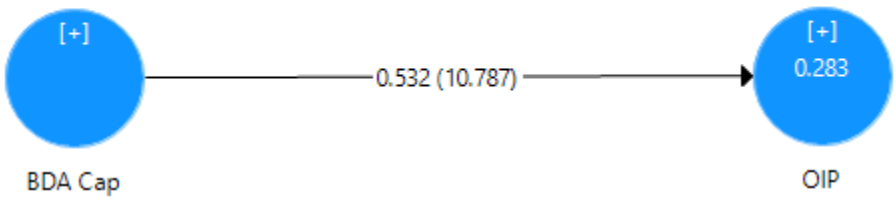

Figure 2. Analysis of Direct Effect

The indirect effect (mediating analysis) in this model is discussed in the next section.

The results of the structural model analysis of the hypothesis testing in this study are summarized in Table 2.

Table 2
Structural Model Assessment of Direct Effect

Relationship	β	t-value	p-value	Decision	R^2	f^2	Q^2
BDA Cap → OIP	.532	10.787	0.000	H1 Supported	0.283	0.349Large	.176

Mediation Analysis (Indirect Effect Analysis)

In this post-hoc analysis, mediating analysis was utilized to confirm the role of mediating variables as an intermediary between the independent and dependent variables' associations. The presence of an intermediary variable or mechanism that conveys the effect of an antecedent variable to a result is considered in this study. (Aguinis et al., 2017). Henseler et al., (2009) claimed that the intermediate analysis or mediating analysis is one of the most significant measurements in evaluating direct and indirect linkages in the structural model. Both of these relationships can be checked by running intermediate or simplified analysis (Baron & Kenny, 1986; Preacher & Hayes, 2004, 2008). Thus, mediation analysis was performed in the current study to test the mediating effect of PODC in the relationship between BDA Capabilities and OIP. Two methods of mediating analysis namely Baron & Kenny (1986) and Preacher & Hayes (2004, 2008), this study chose the latter as recommended by (Hair et al., 2013; 2014) with the help of Bootstrapping in SMART PLS.

Compared to the method introduced by Baron & Kenny which needs all paths significant before mediation can be accepted, the method by Preacher and Hayes just focuses on indirect path mean significant indirect effect. This is because substantial direct associations may be undetected due to small sample sizes or other factors such as moderation, or because there may not be enough power to predict that relationship. This is supported by Zhao, Lynch and Chen, (2010) who mentioned that the direct effect does not have to be significant while analyzing the mediating effect. Among the key requirements for testing the intermediary is to ensure that the effect of the indirect relationship ($a \times b$) is significant. The role of the mediating variable exists inside the relationship between the dependent and independent variables when it is significant. This can be done by using the bootstrap test to identify the value of $\beta > 0$ and $t > 1.96$ in a two-tailed test (Hair et al., 2014; Kock, 2015). Bootstrapping, a non-parametric resampling approach, is one of the most rigorous and powerful methods for determining the mediating effect (Hayes, 2009; Zhao et al., 2010).

A bootstrapping approach is used to see whether the impact of BDA Capabilities on OIP is mediated by PODC. (Hair Jr.et al. 2016: Preacher and Hayes 2008). According to the guidelines of (Hair Jr. et al,. 2016), we initially confirm that the direct effect which is BDA Cap-OIP (Direct Effect) without

including the mediator variable (PODC) is significant (β = 0.532, t = 10.856, p < 0.05). Figure 3 illustrates the direct relationship between BDA Cap and OIP.

After that study confirms that the mediated paths (Indirect effect) (BDA Cap → PODC → OIP) are significant (β = 0.125 t = 3.489, p < 0.05) in Figure 3.

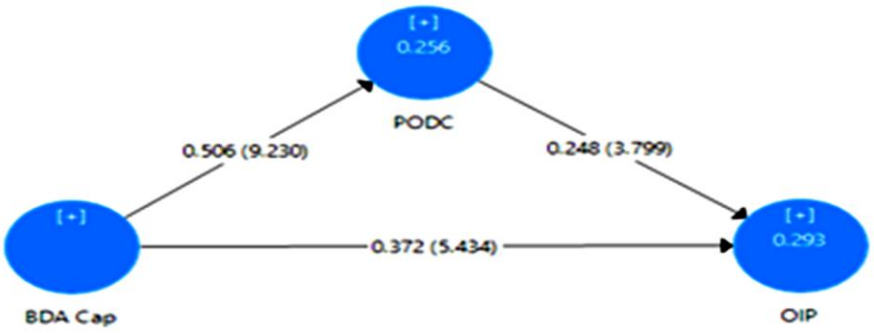

Figure 3. Mediation Analysis

After confirmation of significance of indirect effect next step to calculate VAF to identify mediation level. VAF can calculate with the help of formula given by Hair et al… Indirect effect divided by the Total effect and multiply by 100. Hair et al (2016) claimed that VAF > 80% is stand for full mediation, 20% ≤VAF ≤ 80 % is partial mediation and VAF < 20 % is no mediation. As per results in Table 3 VAF is 25% which showed partial mediation in the model. The outcomes of the mediation analysis are presented in Table 3 which are associated with Hypothesis 2. Scholar used parameter values from the bootstrapping technique in PLS, on the basis of a resampling of 5000 subsamples, to test for the mediation hypotheses.

As a result, we can deduce that the mediation effects (PODC) are positively significant in the associations among BDA Cap and OIP (H_2).

Table 3
Summary of Mediation Analysis

Hypotheses	Direct Effect without Mediator	Direct Effect with Mediator	Indirect Effect	LLCI 5 %	ULCI 7.5%	Total Effect	VAF	Mediation
BDA Cap ->PODC-> OIP	0.532, p=.000	0.372, p=.000	.125, p=.000	054	196	.497	5%	Partial

Discussion

Despite a continuous interest in big data analytics, the conditions and mechanisms by which business value is enhanced through such investments is largely unexplored in empirical research. Several recent articles have questioned the utility of big data analytics, claiming that only some organisations have been able to maximise their big data investments (Ross et al., 2013). This conclusion is important when considering the large number of business publications that mention the revolutionary impact of big data analytics. Gupta (2016) argued that such a phenomenon is mainly attributable to the fact that most of the literature related to big data analytics is prepared by consultants, and so it lacks theoretical underpinnings and large-scale empirical testing. They also noted that the amount of the adoption of big data analytics technologies in organisations is more essential than the technologies themselves. Interestingly, in a recent survey of *MIT Sloan Management Review*, managers claimed organizational aspects as being the key inhibitors in understanding business value from investments in big data analytics (Kiron, 2017). Alike conclusions in a Delphi study by Vidgen et al. (2017) involving technology managers indicated that BDA Capabilities are the main barriers to achieving the desired outcomes. It is evident now that data and technology alone are insufficient to yield any quantifiable value of business, the effect of organization wide BDA Capabilities on performance results, in particular, innovation, and remains underexplored (Ciampi, et al., 2021; Mikalef et al., 2019b; Xiao et al., 2020).

Practical Implications

This study will add to the growing body of literature that relies on IT capability-competitive advantage-firm innovation performance. This paper represents the first empirical study examined the current extent of big data analytics capability in pharmaceutical companies in developing countries like Pakistan.

This is the first paper that investigates the relationship of big data analytics capability, innovation performance, PODC in pharmaceutical companies in developing countries like Pakistan. The study provides insightful guidance in practical strategic decision making for industrial managers, the government, educational institutes, researchers and investors in Pakistan to understand better the current performance of big data analytics in Pakistan. The authors believe this framework to be a unique and valuable contribution to society, economy and nation since. This study investigated the impact which BDA Capabilities have on the organizational innovative performance through the development of process oriented dynamic capabilities in pharmaceutical companies in developing countries like Pakistan. In developing countries like

Pakistan, big data analytics (BDA) has offers so many opportunities to the businesses and thus it is a key driver in the nation's ambition to become a fully developed knowledge economy. This study allows the government to measure progress toward achieving their target to become a fully developed knowledge economy.

Conclusion

Despite the contributions made by this study, there are a number of limitations that need to be addressed in future studies. Firstly, this study's hypotheses were tested using self-reported data. Although significant efforts were made to ensure data quality, the possibility of bias cannot be omitted. The data with a perceptual nature, together with a study-design that uses a solitary key informant could suggest the presence of bias, while factual data do not coincide with respondents' perceptions. Despite the fact that this study relied on top management respondents as key informants, who are generally well-versed in a variety of related disciplines, sampling of multiple respondents in a single organization could establish inter-rater validity as well as improve internal validity. There is a high probability that focusing on big data initiatives might produce greater benefits in some cases compared to others. Future studies should focus on this topic or area as there is considerable practical value related to it, particularly the cost of deployment related to big data initiatives. The key argument that BDA Capabilities are necessary but insufficient in enhancing business values is based on a number of internal and external factors that might be addressed in future research. Each industry should understand how BDA Capabilities are developed, what means and mechanisms are used to produce values, and how such values can be captured. The relationship between BDA Capabilities as well as the direct and indirect effect on organizational innovation capabilities assumes that when managers faced data-generated insight managers make the optimal decision. Because there are a variety of various elements at play when managers decide to implement data-generated insight, it's possible that decisions aren't entirely based on big data information. This is an auspicious area of research, since Obtaining big data insight is just one step in achieving business value.

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