Indus Journal of Social Sciences
Online ISSN: 2960-219X
Print ISSN: 2960-2203
Volume 3, Number 2, 2025, Pages 928 – 950
Journal Home Page
https://induspublishers.com/IJSS/about

Role of Big Data Analytics Capabilities and Entrepreneurial Orientation on Innovation Performance of Family-Owned Businesses: A Study of Pakistan's Textile Industry

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ARTICLE INFO

Article History:

Received:	*April*	*24, 2025*
Revised:	*June*	*02, 2025*
Accepted:	*June*	*06, 2025*
Available Online:	*June*	*12, 2025*

Keywords:

Big Data Analytics Capabilities, Entrepreneurial Orientation, Family-Owned Businesses, Strategic Innovation and Innovation Performance

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ABSTRACT

In this highly competitive and technological oriented world, organizational business practices have been changing day by day to emergence of new-fangled innovations, advanced technologies which includes artificial intelligence, big data analytics, cloud computing and business intelligence takes place in order to managing the businesses effectively and efficiently. However, they all are contributing in their own unique ways whereas big data analytics is the advanced method which is used for effective & timely decision making with help of advanced tool, software's and techniques for managing and handling the businesses effectively (Sheng et al., 2019; Zeng & Khan, 2018). In organizations, the vital foundation in achieving a competitive advantage in order to survive and compete is sustainability which brings value in shifting the economic paradigm (Ferasso et al., 2020). It is found that BDAC improves the organizations overall performance which includes operational processes, enhance decision-making capabilities, minimize the cost as well as increases the quality of innovation (Benzidia, Bentahar, Husson & Makaoui, 2024). Moreover, by striving to improve coordination, build fruitful collaborations, raise awareness, and fortify institutional structures, Pakistan is moving closer to fulfilling its commitment to the 2030 Agenda. However, this research study will help to implement and sheds light based on resource-based theory on how BDAC can boost innovation strategy and performance of an organization. Innovation also occurs based on data-driven models for decision making, which enable businesses to create and design novel goods and services that may meet customer demands and reduce innovation-related risk (Ji, Yu, Tan, Kumar & Gupta., 2024). Data for this study was gathered from managers of family-owned businesses. 301 managers from family-owned textile companies made up the study's sample size, which was determined by employing the purposive sampling technique. Data for this study was gathered through questionnaires using a quantitative technique. PLS-SEM for quantitative data analysis was used to examine the data. Additionally, the results of this study show that big data analytics skills and an entrepreneurial mindset positively affect the firm's strategic innovation, which raises an organization's innovation performance. Technological transformation is significant because it improves economic business processes, which can have a favorable effect on emerging nations like Pakistan.

Introduction

In this highly competitive and technological oriented world, organizational business practices have been changing day by day to emergence of new-fangled innovations, advanced technologies which includes artificial intelligence, big data analytics, cloud computing and business intelligence takes place in order to managing the businesses effectively and efficiently. However, they all are contributing in their own unique ways whereas big data analytics is the advanced method which is used for effective & timely decision making with help of advanced tool, software's and techniques for managing and handling the businesses effectively (Sheng et al., 2019; Zeng & Khan, 2018). Additionally, for achieving a competitive advantage among rivals, the organizations advanced and unique ways of managing the technological innovations, products innovation and process innovation plays an important role in order to gain a competitive advantage among competitors (Pieroni et al., 2019 & Ferasso et al., 2020). Additionally, enterprises can create and design innovative products and services that may meet customer expectations and reduce innovation-based risk by using data-driven models for decision making (Ji, Yu, Tan, Kumar & Gupta, 2024).

In past decades, organizations have acquired advanced and radical technologies and innovation in order to cut excessive cost, increase effective decision making, create knowledge, and upsurge the productivity (Maroufkhani et al., 2020). These uprising innovations such as big data analytics has been used by various organizations, retailers for the purpose of establishing advanced business practices and as a result the business performance was found increased as per previous business outcomes (Mariani et al., 2018; Aversa et al., 2021 & Giglio et al., 2019). Moreover, it is also found that big data analytics also plays a vital role in building an organization's value by managing a firm's operations more inventively (Xu et al., 2017; Ranjan & Foropon, 2021). Based on the previous research it is found that by opting the big data analytics technology marketers can cut their marketing cost (Bradlow et al., 2017).

Big data analytics is the process of analyzing and scrutinizing the large amount of data which is beneficial for the organizations in order to identify the consumer patterns and their purchasing preferences for effective decision making (Gandomi, Chen & Abualigah, 2022). Additionally, for the efficient use the advanced algorithms which can be operated by machine learning techniques in order to get more accurate and productive information (Gandomi et al., 2022).

Research Gap

In addition, due to uprising of this emerging technology, big data is catching attention of managers and academicians in the recent years. Moreover, based on previous research it is found that big data analytical capabilities influence a good firm performance but on the other hand it is found that it has been challenging in adoption due to various barriers such as organization capability of collecting, analyzing and trained staff for handing and managing the data effectively (Lutfi et al.,

2022). In addition, this research study investigate the role entrepreneurial orientation and its effect that how entrepreneurial orientation fosters the family firm innovation and the technological transformation of an organization by having the big data analytics capabilities can shift towards advanced and sustainable businesses in the context of developing county such as Pakistan.

Based on the literature, it is found that family-owned businesses are the highly fund practice in business management. However, as per some approximation it is found that around 90% of

businesses are based on the family-owned structure in the world (De Massis et al., 2018 and Anderson & Reeb, 2004). Additionally, this trend is more found in Europe, Asia, Germany, it is found that the most share of family firms' businesses in Europe (Zellweger, 2017). On the other side, In the context of Pakistan the organizational structure of firms in Pakistan are majority based on family-owned businesses. It is found around 59% businesses are family-owned businesses (Shahab and Attiya, 2012).

Objective of the Study

First, the most leading trend around the world is family-owned businesses (Gedajlovic, Carney, Chrisman, & Kellermanns, 2012; Haynes, Nickel, Jacobson, & Fuentes, 2007; Quinn, Craig, & Moores, 2018; Masulis, Pham, & Zein, 2011; Poza & Daugherty, 2013). Secondly, the accountable for huge contribution in the economy well-being and its growth is based on family-owned businesses (Astrachan & Shanker, 2003; Jaskiewicz, Combs, & Rau, 2015; Pejic Bach, Aleksic, & Merkac-Skok, 2018).

In addition, in economic development these family-owned businesses are playing huge role. Unfortunately, there are scare of research available in the context of family-owned businesses in Pakistan (Tahir & Sabir, 2014). However, as per literature, there have been mixed findings have been found in the organizational performance of family-owned businesses. Moreover, no convincing validation found which may validate the inconsistent outcomes found in family-owned businesses (Yousaf et al., 2019). Therefore, it is beneficial to unfold in order to discover and confirm the findings of family firms in the context of Pakistan.

This study is investigating the impact of textile industry. However, "the textile sector in Pakistan has an overwhelming impact on the economy, contributing 60% to the country's exports. In today's highly competitive global environment, the textile sector needs to upgrade its supply chain, improve productivity, and maximize value- addition to be able to survive. The objectives of the Textile Industry Division are to formulate strategies and program to enable the textile sector to meet these challenges and attain global competitiveness (Textile Industry Division Government of Pakistan, 2021)".

In addition, the literature on big data analytics is limited on the emergence of new practices. Moreover, with the methodological perspective it is found that previous researches are mostly based on qualitative outcomes (Cillo et al., 2019) or built on theoretical or conceptual findings (Rialti et al., 2018). Unluckily, the research on the quantitative data and big data analytical capabilities and firm's performance is still insufficient (Dubey et al., 2017; Wamba et al., 2017). Thus, it would be useful and beneficial to explore via quantitative method in this study.

Additionally, besides the above-mentioned issues, in the past researches it is found that there are numerous amounts of firms who are suffering in order to gain the expected outcomes from big data analytics and their high investments are not returning the value to them (Popovič, Hackney, Tassabehji, & Castelli, 2018; Wamba et al., 2017). However, there might be numerous issues such as data fit, lack of trained employees, lack of relevant software's and so. This study aims to identify the factors which may get insights whether it is beneficial and create value from the big data investments (Mikalef, Framnes, et al., 2017; Mikalef, Pappas, Krogstie, & Giannakos, 2018). It is found that BDAC improves the organizations overall performance which includes operational processes, enhance decision-making capabilities, minimize the cost as well as increases the quality of innovation (Benzidia, Bentahar, Husson & Makaoui, 2024).

Therefore, for getting an insight and discover the findings behind above mentioned gaps current research analyze and helps out in order to understand this gap. Additionally, this research gave an overview on how entrepreneurial orientation can impact the technological transformation of a business and firm innovation and tab opting the big data analytics capabilities can enhance the business practices in economy where the transitions of business can positively impact in a developing county such as Pakistan.

Literature Review

In the view of resource-based view theory, it has been found that not only the availability of capital and financial resources are the indicator of sales and revenue but rightly allocation of these capabilities and organizational resources could be the forecaster of the performance of the organization (Grant 1991; Madhavaram & Hunt, 2008; Prahalad & Hamel, 1990). Additionally, there are many researches have been done which extend the scope of resource-based view theory (Finney, Lueg, & Campbell 2008; Morgan, Vorhies, & Mason 2009; Nath, Nachiappan & Ramanathan 2010; Ngo & O'Cass 2009; O'Cass & Weerawardena 2010).

Moreover, the resource-based view (RBV) standpoint reflects the, "interaction between the family and the business has been regarded as a source of complex and difficult-to-imitate resources (Habbershon & Williams, 1999; Habbershon et al. 2003; Sirmon & Hitt 2003) which foster orientations and attitudes that may impact entrepreneurship (Casillas et al., 2011)". In addition, numerous researches identify the impact of entrepreneurial activities which can effect of family influence can play a vital role in enhancing entrepreneurship for the long-term endurance (Miller and Le-Breton Miller 2011). The entrepreneurial orientation transforms the performance of an organization as per Resource Based View theory, the capability, diversity of the knowledge of an organization which is the valuable resources of any firm based on the advanced entrepreneurial paradigm in order to increase the firm performance (Pugliese & Wenstop, 2007; Zattoni et al. 2015). Additionally, for the advancement of organizational resources and capabilities has been transformed in today's business practices by the adoption of big data analytics which can add value to the decision making by opting a smart technological tools and software which can positively impact organizational performances (Wamba et al., 2017). Whereas on the other hand, another research study claims based on the resource-based view foundation enlightened by the Gupta and While Mikalef et al. (2019) assert that big data analytics capabilities can offer a radical innovation to the firm's capabilities that can foster value in the firm, George (2016) asserts that value from big data analytics is a result of maturity in tangible, intangible, and human-related big data resources. Businesses can reposition themselves in response to shifting business environments thanks to big data analytics capabilities (Helfat & Peteraf, 2009). However, the "capacity to respond to changes that occur in the external environment is a complex task that entails developing processes of sensing emerging threats and opportunities, seizing opportunities for development and survival, and adapting existing modes of operation to fit market needs better, or developing radically new ones (Teece, 2007). Therefore, the adoption of big data analytics capabilities and entrepreneurial orientation can increase innovation in the resources of organization in order to gain competitive advantage and helps in effective decision making and generating sales which can directly increase the innovation performance.

Big Data Analytics Capabilities and Strategic Innovation

In today's fast emergent, innovative, dynamic and interchanging business paradigms the organizations are constantly improving and advancing their business strategies in order to keeping

the pace with the dynamic environment. Moreover, McAfee, Brynjolfsson, and Davenport (2012) states we are living in the "Age of Data", where the advancement of new technologies and strategies positively enhancing the practices of the organizations in which the breakthrough technologies are changing the business practices into advanced level and the collection of data have been made from the various institutional bodies and industry in order to derive useful findings. The upheaval of big data analytics has rejuvenated the previous business trends and models and shifts the business paradigm into advanced technological heights (McAfee & Brynjolfsson, 2012).

Additionally, with the revolution of digital technologies such as big data analytics is known as the ultra-level of innovation, competition, plus productivity for a firm (Manyika et al., 2011). Hence, it has become more focusing research area by the academician and the practitioners from industry which add value and competitive advantage to a firm by having the big data analytical capabilities. Big data analytics as per literature is basically "a new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data, by enabling high velocity capture, discovery and/or analysis (Mikalef et al., 2018)."

In addition, it is found that in future there will be scarce of 180,000 to 1,000,000 data specialists with deep expertise and knowledge till 2025 (Mariani et al., 2018). Since, it has proven that data driven decision making produces the great quality of decisions as compare to intuition-driven decision-making (Dekimpe, 2020).

On the other hand, Strategic innovation is known as revamping and reshaping of existing business model in the markets with constantly upgrading the strategy by changing competitive paradigm in the market in order to gain a substantial significance in growth and business performance of the firm as well as the increase the number of the customers (Schlegelmilch et al., 2003). Big data analytical capabilities could be a great driver of strategic innovation Zhang & Yuan, 2023). Moreover, Big data analytics can provide a good accurate results of customer actual needs with the help of innovation in BDAC based business models (Ciampi et al., 2020). Innately, when an organization incorporates big data analytics based driven strategic innovation is the indicator of high probability of supporting the instincts of the management and creativity through the prompt and continuous availability of real-time information (Cheah, 2017). In addition, with the help of implementation of big data analytics, the organizations are smartly able to identify consumer needs, segmented the target audience, enhance the pricing strategies plus design the advanced supply chain and delivery channels to recommence the business strategies (Paiola & Gebauer, 2020). Additionally, as big data analytical capabilities advance, new tools and techniques used by businesses, like digital simulation, virtual reality (VR), and augmented reality (AR), are driving new business trends. These trends include brands simulating multiple parameters accurately when developing new products and services and presenting prototypes to consumers in a new visual mode, ultimately providing customers with innovative products and services that better meet their needs. As a result, BDAC development supports a company's strategic innovation. Therefore, based on the above literature we assume the following hypothesis:

H1: Big data analytics capabilities have a positive impact on strategic innovation of firm.

Entrepreneurial Orientation and Strategic Innovation

During this challenging economic environment and global financial crisis, the effective organizational entrepreneurial strategies play a vital role which has been recently grasp a great attention of entrepreneurs, practitioners and researchers in order to evaluate the intensity of the

Entrepreneurial orientation on the organizational performance (Ranasinghe et al., 2018). The conception of entrepreneurial orientation defined as "a firm to be entrepreneurial if it engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with 'proactive' innovations, beating competitors to the punch (Miller, 1983)". However, then it is found that there is two more dimension do exist in the Entrepreneurial Orientation construct such as autonomy and competitive aggressiveness (Lumpkin & Dess., 1996). Furthermore, it is defined by the Hult and Ketchen (2001) that "Entrepreneurial orientation reflects a firm's propensity to engage in "the pursuit of new market opportunities and the renewal of existing areas of operation".

Entrepreneurial orientation has been conceptualized as the essence of innovation in term of developing and giving re-birth to the new businesses innovatively by oppressing the previous practices and renewing stagnant firms' business, but it can be achieved by launching the breakthrough innovations in the business industry (Lumpkin & Dess 1996). Based on the literature, it is found that entrepreneurial orientation plays a vital role in order to evaluation of the firm with a new venture or innovation (Kraus, Burtscher, Vallaster & Angerer, 2018).

Firm's effectiveness determines by the allocation of its resources efficiently, flexibly and, consequently, keep its innovation portfolios up to date (Li & Wang., 2022). When there is a clear direction with entrepreneurial capabilities then there will be a strategic innovation related shift in the business practices in an organization which can offer innovative products and services in the competitive market which can better fulfill customer needs and generates the organizational sales (Li et al., 2018). Second, strategically innovative companies are also in a good position to predict market risks and uncertainties and respond by creating novel procedures and activities, which lowers financial losses (Pereira et al., 2021). Lastly, it has been discovered that distinctive strategic innovation techniques may be the driving force behind new product breakthroughs that are difficult for rivals to copy, thereby providing a company with clear competitive advantages and superior performance (Zhang & Yuan, 2023).

However, innovation strategy permits firm to highlight the organizational innovative strategies, new ideas of products and services and utilization of resources in an innovative way, that subsequently rises the diversity of products and services portfolios and better fulfills market demands (increasing their short-term innovation performance). In addition, it is possible to reduce risk and uncertainty to a certain degree and increase benefits by revamping its corporate strategies and business models (Carrillo & Heras, 2020). Thus, we make the following assumption based on the literature mentioned above:

H2: Entrepreneurial orientation has a positive impact on strategic innovation of firm.

Strategic Innovation and Innovation Performance

An innovation strategy is a strategic plan in which an organization opt the technological advancement in advanced tools, technology or software via implementing the scope generated by research and development activities. An innovation strategy plays a vital role in those firms who continuously seeks to achieve the competitive advantage by strategically implementing the new innovation in their firm.

In view of the strategic management standpoint, those organization which are more risk assertive and has more innovativeness approach are more into new proficiencies, innovative technologies and novel business models that are needed in strategic innovation (Olabode, Hultman &

Leonidou, 2022). However, at its core, strategic flexibility allows businesses to allocate, syndicate, and manage the resources of stakeholders, which encourages businesses to meet new needs through strategic reforms and new resource portfolios, according to the resource-based perspective theory (Majid, Yasir & Yousaf, 2021). Therefore, organizations need to upgrade the traditional methods of doing businesses. Moreover, Innovation includes two important aspects one is design a new technological infrastructure, design a new strategic blueprint for product or services which may efficiently capture the market. However, technological advancements can play an important role in an organization since most well-known organizational abilities and skills to design the innovative products and services as per the market markup (Charitou & Markides, 2003). However, beyond this the uncertainty and the risk might be overcome which ended up more beneficial outcomes by incorporating the innovative business strategies which may influence the innovation performance (Carrillo & Alcalde, 2020). In addition, for the evaluation of performance by mitigating risk and unforeseen contingencies can contribute towards great achievements (Cerdán, Nicolás & Castillo, 2018). On the other hand, in previous research it is found that the performance of the innovation depends on the effect, outcome and innovation's speed (Sun, Chen & Kataev, 2021).

Moreover, big data analytics can play an important role in the contribution of an organization's innovation performance in the various ways. First, big data analytics may create unprecedented opportunities of innovation strategy in order to gain an in-depth understanding of market trends, consumer's needs and wants and shifting patterns of purchasing (Erevelles, Fukawa & Swayne, 2016). In addition, as compare to the rivals, organization with big data analytics capabilities holds various types of data which contain informative outputs which provide the implicit insights for the effective management and leads towards the better decision-making capability which positively influence and improve the organizational ability to endlessly improve its products or services innovation processes (Johnson, Friend & Lee, 2017). It also may help to enhance the skills and abilities along with gaining new informative insights and knowledge for idea generation in innovation strategy which can increases new product or the service in designing innovation strategy along with innovation performance of an organization. According to Muhammad et al. (2022), BDAC and innovation performance are directly positively correlated. Similarly, in other research study it is found that big data analytics capabilities have a higher linkage to innovate and a higher innovation intensity, that leads a very high positive outcome on the sales by uplifting the higher revenues. Therefore, based on this we proposed the following hypothesis:

H3: Strategic innovation has a positive impact on innovation performance of firm.

Theoretical Framework

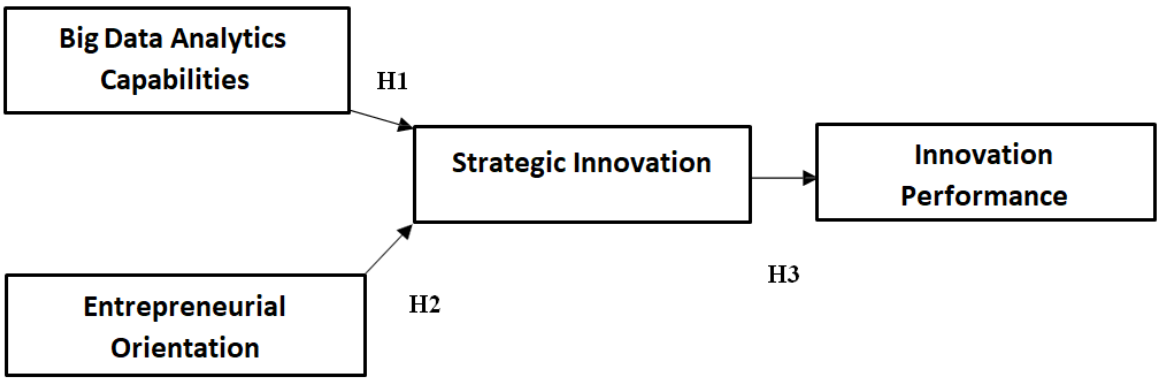

Figure 1: Theoretical Framework

Methodology

Research Epistemology

The virtuous research characteristic requires a fitting amalgamation of the incorporated theory and philosophy for the purpose of building an appropriate research approach. In other words, research epistemology is the underlying theory of knowledge and a complete worldview based on the philosophical aspect and standpoint. However, this research study is based on positivism in which theory testing approach has used which is deduction method.

Research Approach

The research approach is basically the appropriate selection and allocation of relevant research method which is required by the nature of the study and opting the right tool for sample collection which is based on which full integrated plan for implementation in order to achieve the objective of research study (Saunders et al., 2012). It required a compressive incorporation of the research philosophy along with the theory building approach. This research study is based on quantitative research method. However, theoretical formwork was designed based on the supporting literature from which hypothesis was drawn, tested and analyzed by using statistical tools after the collection of data. Moreover, the data collection and analysis are based on survey-based research data.

Population and Sampling

The population is known as the "entire group of people, events, or things of interest that the researcher wishes to investigate" (Sekaran, 2003). In this research study the population of sample is representatives from the Pakistan's fashion & textile industry. Moreover, there is a significant emphasis are on the textile industry, as it is the largest and the leading sector in Pakistan.

On the other hand, the sampling technique used in this research study is non-probability technique in which the sample that is unknown probability of selection, thus the research samples would have great chances for the selection irrespective of others (Bryman & Bell, 2003). Moreover, the sampling technique used in this research study is purposive sampling because the data will be gathered from the family firm executives, managers and representatives of the fashion and textile industry and purposively from the family firms. However, individual executives, managers and representatives from fashion and textile industry will be the unit of analysis in the research study.

Data Collection

In this study the data was collected from executives, managers and representatives from fashion and textile industry. The data collection has been done based on survey-based research questionnaires circulated to the targeted audience purposively. The survey was distributed to the 350 individuals from the management of textile industry. However, from which we received 323 responses back from which we discarded the vague and invalid surveys and did not count for those who were not engaged in the field of big data analytics found in the screening question. and concluded our research data at the sample size of 301 responses.

Measures

Measures used in this research study was adapted from the previous researches such as innovation performance measure was taken from Sun et al., 2021 which includes item as "Compared with your rivals, your firm's products usually have more advanced technologies" whereas strategic innovation was measured on the scale which was developed by Han and Gao (2020) in which items are as "Our firm's competitive strategy has great potential value.". The big data analytic capabilities scale was used by George et al. (2012) which reflect the item such as "Our organization use multiple data sources to improve decision-making". In addition, Entrepreneurial Orientation scale was opted by Miller (1983) and amended by Covinand Slevin (1989) and Covinand Miller (2014) however, the item includes "My company favors a strong emphasis on R&D, technological development and innovation, my company typically responds to the actions initiated by competitors and rarely initiates changes in their sector, my company prefers to engage in investment projects with moderate risk because expectations for returns are better".

Data Analysis

In this study the data was collected via questionnaire/survey. Since this study is quantitative in nature so further data was analyzed through Smart PLS. Furthermore, SEM was applied as it is the more appropriate and significant technique for the data analysis. However, it is an important tool for analysis of the data in the behavioral sciences and social science research because it provides support in order to quantity degree of linkages among several independent variables to dependent variables (Ahmed et al., 2011; Haenlein et al., 2004).

However, there are basically two phases in applying PLS SEM technique into a research study. One is the measurement model and second is the structural model. The key objective of analyzing data via SEM is to understand patterns of the covariance or the correlation among the set of variables and further to examine the variance among variables along its specification of the model (Kline, 1998).

Measurement Model

Measurement model is the first step for partial least square structural equation modelling. However, these incudes further two analysis one is confirmatory factor analysis whereas on the other hand second is common factor analysis. This analysis is being used for assessing the validity and reliability among variable as well as to assess the convergent validity and discriminant validity of every variable.

Outer Loading

In order to assess the outer loading measurement model, we need to begin with common factor analysis is initial. However, during this step, the measurement model significance is embraced by validating all the items of observed variable. Therefore, outer loading of each item of every single variable is assessed for this purpose. In addition, if any item doesn't fulfil the basis of criterion, item with less than 0.50 outer loading is usually deleted.

Innovation Performance

In this study the first variable innovation performance is measured via 5 items. (i.e. IP1, IP 2 IP 3, IP4 & IP 5) However, one item (IP4) was deleted during this stage due to lower outer loading whereas rest all of the items is above the given threshold 0.50. The Table 1 indicates the outcomes of the outer loading.

Table 1 Outer Loading of Innovation Performance

Item	Outer Loading
IP1	0.74
IP 2	0.81
IP 3	0.67
IP 5	0.73

Strategic Innovation

In this study the second variable strategic innovation is measured via 4 items. (i.e. SI1, SI2, SI3 & SI4) However, one item (SI4) was deleted during this stage due to lower outer loading whereas rest all of the items is above the given threshold 0.50. The outcomes of outer loading are given in Table 2.

Table 2 Outer Loading of Strategic Innovation

Item	Outer Loading
SI1	0.85
SI2	0.84
SI3	0.85

Big Data Analytics Capabilities

In this study the third variable big data analytics capabilities is measured via 18 items. (i.e. BDAC1, DDDM2, MS1, TS1 & OL1) However, none item was deleted during this stage as all of the items is above the given threshold 0.50. The outcomes of outer loading are given in Table 3.

Table 3 Outer Loading of Big Data Analytics Capabilities

Item	Outer Loading
BDAC1	0.66
BDAC2	0.81
BDAC3	0.81
DDDM1	0.74
DDDM2	0.75
DDDM3	0.75
DDDM4	0.80
MS1	0.68
MS2	0.80
MS3	0.81
MS4	0.84
OL1	0.81
OL2	0.72
OL3	0.80
TS1	0.82
TS2	0.81

TS3	0.84
TS4	0.81

Entrepreneurial Orientation

In this study the fourth variable entrepreneurial orientation is measured via 13 items. (i.e. CA1, IN2, PR3, A4 & R5) However, none item was deleted during this stage as all of the items is above the given threshold 0.50. The outcomes of outer loading are given in Table 4.

Table 4 Outer Loading of Entrepreneurial Orientation

Item	Outer Loading
CA1	0.83
CA2	0.71
IN1	0.71
IN2	0.72
IN3	0.74
PRI	0.78
PR2	0.80
PR3	0.80
A1	0.69
A2	0.80
A3	0.74
R1	0.80
R2	0.79

Confirmatory Factor Analysis

After assessing and verified the outer loading analysis of all the items from each variable, then the confirmatory factor analysis has been done for all variables under study. The purpose of checking confirmatory factor analysis is to explore the convergent validity, internal consistency and discriminant validity for all the study latent variables. However, in this research study, only 2 items were deleted due to lower outer loading. 38 remaining items were included in this study with outer loading > 0.50.

Internal Consistency (Reliability)

The objective of the internal consistency analysis is to evaluate confirmatory factor analysis so that reliability analysis can be performed to establish the measures' internal consistency. Cronbach alpha and composite reliability, two important factors needed to measure internal consistency, must be evaluated in order to evaluate the first section.

Cronbach Alpha

In order to assess the internal consistency among the variables, the first criteria to approach are to check Cronbach alpha. However, the purpose is as it offers approximation of the reliability with incorporating correlation between the variables as well as along with the supposition that equal reliability persists in all variables. Moreover, the result shows that the Cronbach alpha ranged between 0.74-0.96. However, the results depicts that there is high reliability is existed among variables as values are above recommended threshold by Fornell and Larcker (1981) i.e. > 0.70. The findings are given in Table 5.

Table 5 Results of Cronbach Alpha

Construct	Cronbach Alpha
Big Data Analytics Capabilities	0.964
Entrepreneurial Orientation	0.943
Innovation Performance	0.745
Strategic Innovation	0.808

Composite Reliability (CR)

In assessing the internal consistency, the second criteria is to measure composite reliability. In which the outer loadings among each item in all variables are used in order to assess the composite reliability. However, the final values of composite reliability are ranged between 0.75-0.96. However, the results depicts that there is high reliability is existed among variables as values are above recommended threshold by Fornell and Larcker (1981) i.e. > 0.70. Table 6 shows the outcomes of composite reliability.

Table 6 Results of Composite Reliability

Construct	Composite Reliability
Big Data Analytics Capabilities	0.966
Entrepreneurial Orientation	0.948
Innovation Performance	0.756
Strategic Innovation	0.808

Convergent Validity

In this section, we intend to test correlation among all the observed variables against same variable, convergent validity is being used. However, in order to test convergent validity among variables as well as average extracted variance (AVE) is measured. The findings showed that the range of the variables' convergent validity was 0.55 to 0.72. Since the AVE is greater than the 0.50 thresholds suggested by Fornell and Larcker (1981), the results show that all of the variables have good convergent validity. Table 7 displays the convergent validity results.

Table 7 Results of Convergent Validity

Construct	Average Extracted Variance (AVE)
Big Data Analytics Capabilities	0.622
Entrepreneurial Orientation	0.592
Innovation Performance	0.553
Strategic Innovation	0.723

Discriminant Validity

Measuring the discriminant validity of each study variable is the final step in evaluating confirmatory factor analysis. But for this reason, the discriminant validity is evaluated using the Fornell-Lacker approach. The Fonell-Lacker approach compares the correlation results of the variables under study with the square root of the average extracted variance of those variables.

Table 8 below, however, shows that the correlation values of the variables are lower than the square root value of their respective variables.

Table 8 Discriminant Validity Fornell-Larcker Criterion

Constructs	Big Data Analytic Capabilities	Entrepreneurial Orientation	Innovation Performance	Strategic Innovation
Big Data Analytics Capabilities	0.842			
Entrepreneurial Orientation	0.789	0.769		
Innovation Performance	0.652	0.588	0.744	
Strategic Innovation	0.717	0.669	0.550	0.650

Summary of Measurement Model

Table 9 illustrates the outcomes of the measurement model.

Table 9 Summary of Measurement Model

Latent Variables	Items Retained	Outer Loading	Alpha	CR	AVE
Big Data Analytics Capabilities	A1, A2, A3, CA1, CA2, IN1, IN2, IN3, PR1, PR2, PR3, R1 & R2	0.66-0.84	0.96	0.96	0.62
Entrepreneurial Orientation	BDAC1, BDAC2, BDAC3, DDDM1, DDDM2, DDDM3, DDDM4, MS1, MS2, MS3, MS4, OL1, OL2, OL3, TS1, TS2, TS3 & TS4	0.69-0.83	0.94	0.94	0.59
Innovation Performance	IP1, IP2, IP3 & IP5	0.67-0.81	0.74	0.75	0.55
Strategic Innovation	SI1, SI2 & SI3	0.84-0.85	0.80	0.80	0.72

Structural Model

When assessing the measurement model However, the next step is to measure structural model which is implemented in order to testing the research hypotheses between all the variables under study.

Specification of Structural Model

The second model which is structural model which is basically encompassed on four variables along with its mean score. However, among them these four variables are basically latent variables such as big data analytics capability and entrepreneurship orientation are independent

variable also known as exogenous variables. On the other hand, strategic innovation and innovation performance are dependent variable also known as endogenous variables.

Exogenous Variables

In this research study the exogenous variables which are big data analytics capability and entrepreneurship orientation. However, in this stage no item was deleted from both independent variables.

Endogenous Variables

In this research study there were two endogenous variables in total which includes strategic innovation and innovation performance from which strategic innovation has four items from which one item was deleted whereas innovation performance contains mean value of 5 items each from which one item was deleted.

Step-II Hypothesis Testing

The research hypotheses that were examined using a structural model are as follows:

H1: Big data analytics capabilities have a positive impact on strategic innovation.

Big data analytics capabilities have positive impact on strategic innovation. Results demonstrated that $\beta = 0.52$, $p < 0.00$ which displayed that big data analytics capabilities has significant positive impact on strategic innovation.

H2: Entrepreneurial orientation has a positive and significant impact on strategic innovation. Entrepreneurial orientation has positive impact on strategic innovation. Results demonstrated that $\beta = 0.22$, $p < 0.00$ which displayed that entrepreneurial orientation has significant positive impact on strategic innovation.

H3: Strategic Innovation has a positive impact on innovation performance.

Strategic innovation has positive impact on innovation performance. Results demonstrated that $\beta = 0.55$, $p < 0.00$ which displayed that strategic innovation has significant positive impact on innovation performance.

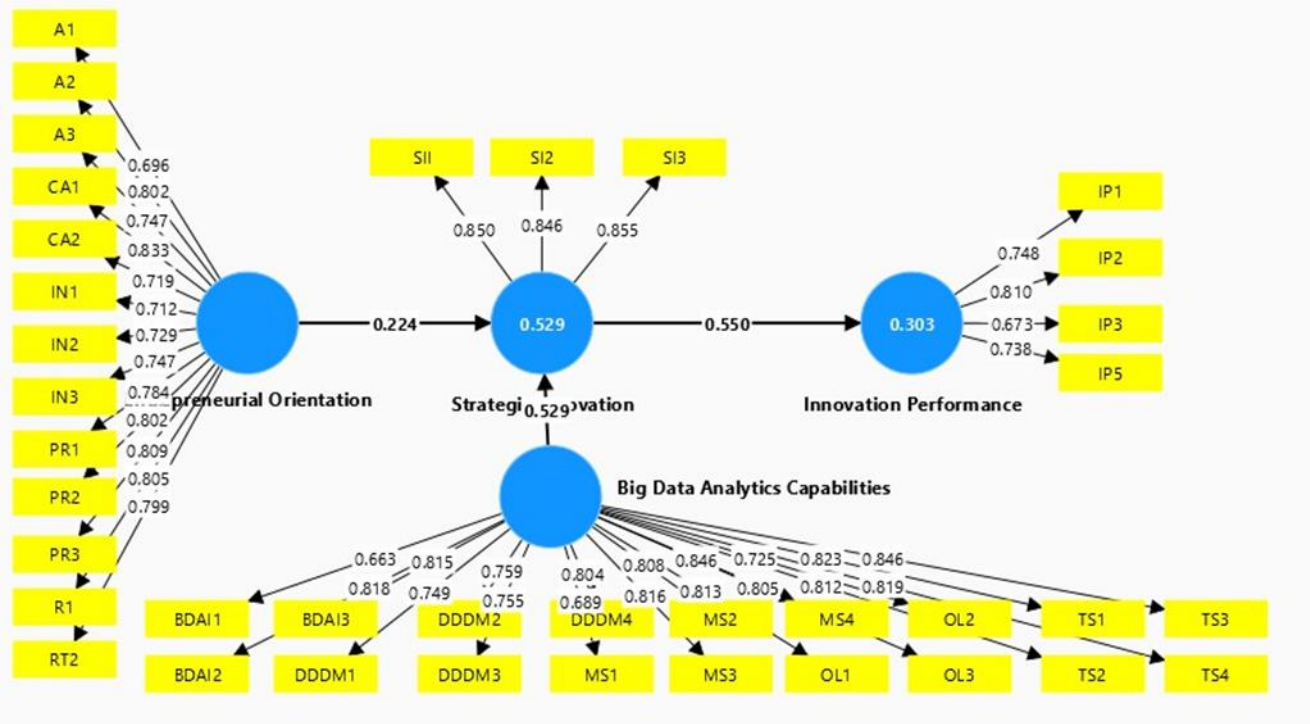

Figure 2: Structural Model

Table 10. Testing of Structural Model

Structural Path	Estimate	P-value	Results
Big Data Analytic Capabilities -> Strategic Innovation	0.529	***	Accept
Entrepreneurial Orientation -> Strategic Innovation	0.224	***	Accept
Strategic Innovation -> Innovation Performance	0.550	***	Accept

Step – 3 Assessment of R2 (Coefficient Determination)

The denoted as R2 is the coefficient of determination and read as (R squared) measures which basically predict the accuracy of the model. This demonstrate that the variance as well as effect on the dependent variable because of independent variable. However, the results exhibited below in table 11:

Table 11: Results of R^2 and Adjusted R^2

Construct	R^2	Adjusted R^2	P Value
Strategic Innovation	0.529	0.526	0.00
Innovation Performance	0.303	0.300	0.00

Step – 4: Assessment of f2 effect Size

The f2 effect size is basically assess the change occur in R2 in the case when any variable is comprised or omitted from the research model. However, results are mentioned below in the table 12.

Table 12 Assessment of f^2 Predictive Relevance

Constructs	f^2 Values

Big Data Analytics Capabilities > Strategic Innovation	0.173
Entrepreneurial Orientation > Strategic Innovation	0.031
Strategic Innovation > Innovation performance	0.434

Discussion and Conclusion

Theoretical Contribution

This research study contributed in the development of literature as well as its practical implications in many ways. First of all, in theoretical contribution in previous research studies it has been found that there is lack of research on big data analytics and its impact on the organization specifically in the domain of family-owned businesses. Moreover, this research study investigates the effect of big data analytics on how it can help to increase the innovation performance of an organization via implementing the innovation strategy in the fashion industry. Furthermore, this research study has revealed how the entrepreneurial orientation fosters the family firm innovation and the technological transformation of an organization by having the big data analytics capabilities can shift towards advanced and sustainable businesses. However, this research study has extended the body of knowledge in the literature which was worthwhile to study on how big data analytics may can improve the performance of an organization.

Managerial implications

However, big data has been grasping attention of managers and academicians in order to gain its various proven benefits. Specifically, it has been discovered in the literature that emerging economics sees big data analytics as being extremely important, even if it has been constantly battling the obstacles that keep it from being adopted. However, in the same time it is creating numerous issues and challenges for to management to efficiently employing its tools and relevant skills of employees in order to get the desired outcomes. In addition, in literature it is found that data driven decision-making is not as easy as it is used to perceive, it is challenging at the same time for the organizations to gain the beneficial outcomes by analyzing and interpreting it correctly. Furthermore, this research study will contribute to fill the technological gaps which exist in order to improve efficiency by advanced governance in the industry. Moreover, this research will help to understand the importance for mangers and need to upgrade the technological capabilities of industrial sector in order to encourage innovation and performance.

Limitations and future directions

After covering the all-possible aspects in this study but still there are few limitations which future researcher or academicians can addressed. First of all, this research study is based on cross sectional data in which data was gathered one time because of time constraint, however, in future it could be worthwhile to examine this research study on longitudinal data which may reflect or extract the new findings. Moreover, it would be beneficial to generalize the findings into the context of other countries textile and fashion industry which may reveals new aspects, findings or cross verified the research outcomes. In addition, the sample is based on a single industry in future researches it could be more valuable to research the implementation of big data analytic capabilities and entrepreneurial orientation by doing the industry comparison analysis.

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Conditions to fill this Questionnaire

1: Are you the employer of organization based on family-owned business?
If Yes (Please Continue).
If No (Please do not proceed below -Thank you).
2: Does your organization use any tool for data analytic such as simulation, optimization, regression & data visualization techniques (e.g. dashboards), predictive modelling, statistical analysis, data mining, and streaming analytics to better decision-making?
If Yes (Please Continue).
If No (Please do not proceed below-Thank you).
Please provide the following information below.
A: Gender: 1: Male 2: Female.

B: Management Level:
Top Level of Management (Administrative or Managerial).
Middle Level of Management (Executive).
Lower Level of Management (Supervisory or Operative).

C: Job Experience: 1: 1-3 years 2: 3-6 years 3: 6-9 years 4: 9-12+ years.

1	**2**	**3**	**4**	**5**
▼	▼	▼	▼	▼
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

Entrepreneurial Orientation						
Innovativeness						
IN1	The top managers favor a strong emphasis on R&D, technological leadership, and innovations	1	2	3	4	5
IN2	My firm has very many new lines of products/services marketed in the past 5 years	1	2	3	4	5
IN3	Changes in product or service lines have usually been quite dramatic	1	2	3	4	5
Proactiveness						
PR1	In dealing with competitors, my firm usually initiates actions which competitors then respond to	1	2	3	4	5
PR2	In dealing with competitors, my firm is very often the first business to introduce new products/services, administrative techniques, operating technologies, etc.	1	2	3	4	5
PR3	In general, the top managers of my firm have a strong tendency to be ahead of others in introducing novel ideas or products	1	2	3	4	5
Risk Taking						
RT1	My firm usually has a strong proclivity for high-risk projects (with chances of very high returns)	1	2	3	4	5
RT2	Owing to the nature of the environment, bold, wide-ranging acts are necessary to achieve the firm's objectives	1	2	3	4	5
Competitive Aggressiveness						
CA1	My firm is very aggressive and intensely competitive	1	2	3	4	5
CA2	My firm usually adopts a very competitive "undo-the-competitors" posture	1	2	3	4	5
Autonomy						
A1	My firm has the independent action of an individual or a team in bringing forth an idea or a vision and carrying it through to completion	1	2	3	4	5
A2	My firm has the ability and will to be self-directed in the pursuit of opportunities	1	2	3	4	5
A3	My firm takes action free of stifling organizational constraints					
Big Data Analytics Capabilities						
Big Data Analytic Infrastructure (BDAI)						
BDA I1	BDAI1_ Our company is in the process of implementing or implemented BDA-enabler architecture	1	2	3	4	5
BDA I2	BDAI2_ Our company is in the process of implementing	1	2	3	4	5

	or implemented data-driven sensors					
BDA I3	Our big data management infrastructure is Flexible	1	2	3	4	5
Management skills (MS)						
MS1	Managers of our company can interpret the outputs of BDA which are useful for swift decision making	1	2	3	4	5
MS2	Our managers have a good sense of where to adopt BDA	1	2	3	4	5
MS3	Managers in our company understand the implications of BDA outcomes	1	2	3	4	5
MS4	Our managers encourage BDA decision making	1	2	3	4	5
Technical skills (TS)						
TS1	We possess skilled people in the latest technologies of BDA	1	2	3	4	5
TS2	Our company hires high-skilled people on BDA	1	2	3	4	5
TS3	Our company have a plan to improve the technical skills of employees	1	2	3	4	5
TS4	The technical skills make it easy for us to analyze data	1	2	3	4	5
Organizational Learning (OL)						
OL1	BDA Knowledge is shared within the company	1	2	3	4	5
OL2	Our employees transfer their knowledge about BDA	1	2	3	4	5
OL3	Feedback of employees about BDA is systematically considered	1	2	3	4	5
Data-Driven Decision Making (DDDM)						
DDDM1	Our company consider data as an asset	1	2	3	4	5
DDDM2	Our employees base most decisions on data rather than instinct	1	2	3	4	5
DDDM3	Our management assess strategies and take corrective action based on the insights obtained from data	1	2	3	4	5
DDDM4	Decision-making based on BDA is part of our organizational culture	1	2	3	4	5
Strategic Innovation						
SI1	Our firm has a unique business model.	1	2	3	4	5
SI2	Our firm's strategy is different from others in the industry.	1	2	3	4	5
S13	Our firm strives to have an unusual strategy.	1	2	3	4	5
S14	Our firm's competitive strategy has great potential value.	1	2	3	4	5
Innovation Performance						
IP1	Compared with your rivals, your firm usually launches new products or services earlier.	1	2	3	4	5
IP2	Compared with your rivals, your firm's products usually have more advanced technologies.	1	2	3	4	5

IP3	Compared with your rivals, the market responses to your firm's new products are better.	1	2	3	4	5
IP4	Compared with your rivals, the development speed of products in your firm is faster.	1	2	3	4	5
IP5	Compared with your rivals, the input-output rate of new products in your firm is higher.	1	2	3	4	5
Thank you for your time & kind cooperation ☺						