Examining the mediating role of market performance in the relationship between the big data analytical capability and firm performance

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Abstract

The purpose of this study is to investigate how a company's success is related to its capacity to analyze large amounts of data. A quantitative research strategy was used to collect information from 250 companies across several different industries. Partial least squares and structural equation modeling (SEM) were used to analyze the data for this investigation (PLS). The study's findings suggest that companies benefit from being able to analyze large amounts of data since it improves their standing in the market. The study's results also supported the idea of market success acting as a moderator between big data analytic abilities and corporate success. The results show that businesses that are prepared to examine big data have a greater chance of success in the long run. The ramifications of these findings for businesses who want to maximize their big data capabilities and market performance to improve corporate performance are substantial.

BACKGROUND

Big data is expected to grow from its current worth of $193.14 billion in 2019 to an estimated $420.98 billion in 2027, as reported by Ting et al (2022). It is also predicted that 2.5 quintillion bytes of data are created every day, with 90% of all data ever created occurring during the last two decades. Uber, Airbnb, Deutsche Postbank, and Amazon.com are just a few examples of organizations that are taking advantage of the big data revolution's prospects to forge new business models, as evidenced by the findings of Hamza et al (2022). In order to better understand their customers, competitors, and supply chains, data-driven businesses collect, integrate, and optimize massive amounts of data from various sources (including Google Maps, Netflix accounts, and online shopping carts). Because of this, they are able to successfully destroy nearly every traditional source of a competitive advantage. According to the findings of a McKinsey survey, firms can get a 6% return on their big data efforts, and this proportion jumps to 9% for investments made over a five-year period (Witharana et al.,2020). As a result, investing in big data analytics capability (BDAC) can be a major source of competitive advantage for firms, allowing them to gain relevant insights from data-driven consumer analytics. One of the most critical factors in determining a company's competitive advantage is how well it satisfies the demands of its customers by leveraging data

analytics insights (Zhai & Tang, 2022). Empirical study has shown that having a higher BDAC correlates with better performance (Chen & Peng, 2020). Prior research has revealed that there may be a connection between BDAC and performance; however, the specific processes and settings in which this relationship arises are not entirely understood. Little theoretical explanations exist for how BDAC, as a knowledge-based resource, contributes to firm performance, and prior research has not fully examined the conditions under which BDAC drives performance. Using insights from the knowledge-based viewpoint and contingency theory, this paper describes how DBMs can assist the relationship between BDAC and performance. These observations were used to illustrate how DBMs can facilitate the connection between BDAC and performance. DBMs are new activity systems that feature new partners and never-before-done activities compared to the incumbents now in use (Zhang et al., 2021). The study also investigates the effect of competitive intensity on the correlation between BDAC and performance. Competitive intensity is the degree to which rivals can differentiate themselves from one another. The purpose of this research is to provide answers to the following three questions: (1) What specific benefits does BDAC provide to the market? Second, how do DBMs play a role in forging the link between BDAC and commercial success? 3. How does the degree of competition affect the relationship between BDAC and DBMs and business success? This research improves the company's RBV and KBV by rethinking BDAC as a knowledge resource driven by big data and contributing to a superior competitive advantage. Because of its rarity, eccentricity, and immobility, BDAC is regarded as a significant resource that may shed light on the distinctions between businesses (Ali et al.,2019). Using these theoretical frameworks, this study sheds light on how BDAC influences firm performance, as well as the roles of DBMs and competitive intensity. The goal of this study was to look at how BDAC corresponds with organizational success.

The application of BDAC can have a substantial impact on the success of the market as it supports in finding opportunities, profitable areas, and competitive advantages. This study expands on the KBV by proposing that DBMs can provide an explanation for the connection between BDAC and market performance (Fan et al.,2021). This research expands prior studies that have underlined the role of knowledge fusion and dynamic skills as intervening variables. BDACs make it possible for businesses to improve their organizational capacity and performance by developing innovative business models that present a challenge to the existing status quo in the market(Flandreau et al.,2022). This study demonstrates how DBMs facilitate the relationship between BDAC and performance under various market conditions and degrees of competition by drawing on the KBV and the contingency theory. In addition, this research investigates how companies make use of their BDACs to gain a competitive advantage over their rivals.

Literature review

It is usual practice to refer to an organization's ability to collect, store, and analyze data for the goal of drawing conclusions as having "big data analytics capabilities" (BDAC). This is the definition of BDAC that is used the most frequently, but there are others. It is normal practice to conduct in-depth studies of vast volumes of consumer data in order to locate untapped markets and build high-value products and services. This type of analysis can be very time consuming (Karthikeyan & Benjamin, 2019). Academics have produced a variety of various conceptualizations of BDAC; nonetheless, the majority of them believe that it is a great organizational talent that assists firms in organizing and analyzing huge volumes of data in order to gain market insights. For instance, in the

academic world, BDACs may be characterized as an organization's strengths in terms of the big data analytics technology it possesses, the management of that technology, and the talent it possesses. Yet, other academics have suggested that they are illustrative of the management, human resource, and physical resource of a corporation. To bolster their position that BDAC ownership is essential to a company's competitive edge, academics have also relied on the resource-based concept as a supporting pillar of their research. In conclusion, the development of a dimensional model of BDAC has required a significant amount of effort (Kurniawan et al.,2021). There have been many different definitions of big data analytics capability (BDAC) presented in the research literature; nevertheless, the majority of academics concur that it may be summed up by examining just three factors: volume, diversity, and velocity. For example, Martin et al. (2020) presented a BDAC construct that is four-dimensional and takes into account the volume, velocity, diversity, and validity of big data. Some people have even gone as far as to suggest a fifth, sixth, or even seventh dimension, such as the practicability of big data, its utility, or its visualization. In spite of this, the vast majority of researchers choose to adopt a three-pronged strategy that takes into account the volume, variety, and velocity of big data. According to the results of our research, BDAC should be viewed as a three-dimensional construct, with volume signifying an organization's capacity to review huge amounts of data in order to improve decision-making. This relates to the number of datasets that may be accessed as well as the number of observation parameters that can be created for each variable that is being researched. Because of the widespread adoption of information technology, advancements in the physical infrastructure of the internet, and an increase in customers' willingness to share data with businesses, the amount of information that is available to companies has increased significantly over the course of the past two decades (Genc et al., 2019). Big data diversity refers to the variety of data regarding customers that are held by an organization and are available for examination (Shabbir & Gardezi,2020). Surveys, in-depth interviews, and focus groups are all examples of methods that can be used to collect primary data. Secondary data, on the other hand, can be collected using a variety of approaches. In addition to regular purchases, subscriptions and loyalty programs are two more avenues that can be explored in order to compile comprehensive consumer databases including a wide range of information. As a consequence of this, the term "big data diversity" refers to a company's capability to collect client data from numerous channels, such as online, digital, and offline channels, with the purpose of gaining a deeper comprehension of the customers' actions, preferences, and requirements (Rashid, 2020). When companies have access to a wide variety of customer data sources, they are able to triangulate their findings by employing a wide variety of approaches, which ultimately results in more informed strategic decisions. Nonetheless, the general prosperity of a company may be jeopardized if it does not own a comprehensive collection of big data and, as a consequence, is unable to generate reliable forecasts regarding the actions of its clientele. The rate at which data is generated, analyzed, and then discarded is referred to as the "velocity of big data," and it is one of the key concepts behind the phrase. The ability to rapidly collect, analyze, and give insights from enormous data sets can add to the agility of an organization and support decisions that be made quickly while maintaining a high level of accuracy. In addition, organizations have the opportunity to gain a competitive advantage by efficiently extracting relevant information from massive datasets (Lee & Falahat,2019). Several different theoretical perspectives have been considered in the process of examining the BDAC's possible influence on the

achievement of business goals. This area of research has been significantly influenced by a number of different points of view, including the dynamic capacity perspective and the resource-based view (RBV) (Mikalef et al., 2020). According to the findings of a body of research centered on the RBV paradigm, BDAC is likely to be of assistance to businesses in achieving a competitive advantage. This is as a result of the fact that businesses that are skilled in the areas of data storage, administration, analysis, and visualization have access to one-of-a-kind tools that are not only helpful but also stand out from the crowd and allow them to view strategy through the prism of data (Rehman & Anwar,2019). In a recent study, Tiep Leet al. (2021) discovered that businesses that utilized BDAC were more likely to execute long-term beneficial actions. This was found to be the case. So, businesses that have access to BDAC have a considerable edge over their competitors since they are able to reduce the expenses of customer acquisition by up to 47% and boost revenue by up to 8%. Even though the resource-based view (RBV) and the dynamic capacity viewpoint have been used quite frequently, some research suggests that the knowledge-based view (KBV) is a more effective lens for examining the relationship between BDAC and business performance (Flandreau et al.,2022; Karthikeyan & Benjamin,2019). This is where you insert the reference] "knowledge evolves rapidly as a result of the availability of data, the remarkable fall in the cost of analytics, and the sharing of open knowledge insights on the Internet," as stated by Kurniawan et al.(2021). Thus, businesses who are able to acquire, store, or generate new information based on big data will have an advantage over their competitors in the market. This strategy is in line with the knowledge-based value (KBV) model, which views the company as an entity that collects, combines, disseminates, and applies knowledge in order to produce unique value propositions. The understanding, familiarity, or insight that is learned via study, investigation, observation, or experience that may be used to provide value is referred to as knowledge. There are many different avenues open to people nowadays through which they might acquire fresh information (Martin et al.,2020). An organization's capacity to interpret natural language, extract information from a number of sources, and incorporate data from machine learning can all be improved through the use of automated knowledge assets. We are of the opinion that in this day and age of the internet, one new potential source of a competitive edge could be having access to such specialized information resources. With the appropriate collection, aggregation, and exchange of real-time information and data with numerous stakeholders, businesses have the ability to rapidly incorporate this knowledge into effective pioneering business models and strategies, ultimately enhancing their position in the market. It has become increasingly important for businesses to generate and deploy personalized knowledge derived from big data in order to boost their competitive advantage (Genc et al.,2019). As a result, many businesses have been able to improve their capabilities through the implementation of various types of big data analytics. The term "big data analytics" encompasses a wide variety of subfields, including "social media analytics," "supply chain analytics," "customer analytics," "search engine optimization," and "pay-per-click management." It is becoming increasingly important, in order to gain a competitive advantage in the market, to generate and implement one-of-a-kind insights that are derived from large amounts of data. In addition, they develop novel business models by utilizing methods such as data fusion and data integration, split testing, data mining, natural language processing, machine learning, and statistics (Palacios-Marqués et al.,2019). These novel business models have the potential to

challenge and change the advantages that are currently held in the market (Shabbir & Gardezi, 2020).

Big data analytics capability as an enabler of market performance

There is a correlation between a company's ability to develop a powerful BDAC and their level of commercial success (Rashid,2020). This conclusion is founded on the premise that BDAC gives businesses access to a unique market perspective (Lee & Falahat,2019). Big data gives businesses the ability to obtain insights from a wide range of data sources, comprehend the market, satisfy customer requirements, and go above and beyond their customers' expectations, all of which can give the business a competitive advantage. Big data allows firms to acquire these insights by utilizing the ever-increasing amounts of data that are now available (Mikalef et al.,2020). Based on the RBV and the KBV, we view the BDAC as a knowledge resource that is powered by enormous volumes of data. We believe that this resource has the ability to contribute to the attainment of a better competitive advantage because it is difficult for other organizations to replicate. So, the ability of a company to acquire information that contributes to the process of strategic decision-making and results in favorable market performance is related to both business development and capability acquisition (BDAC)(Rehman & Anwar,2019).

This perspective is aligned with the KBV principles, which assert that knowledge is a valuable asset that can be utilized to increase a company's competitive edge. This position asserts that knowledge is a valuable asset that can be leveraged to enhance a company's competitive edge. It is possible for businesses to bolster their competitive advantages through the collection and application of relevant information (Tiep Le et al.,2021). The fact that BDAC is able to have an effect on the performance of the market merely serves to emphasize how significant it is. The products, markets, business procedures, and positioning of a company, in addition to the company's capacity to outperform its rivals, will determine the company's future performance in the market (Wang et al., 2020). (Mithas and colleagues 2011,). High and good market performance is achieved when a company outperforms its competitors in terms of market share, market share growth, sales volume, sales growth, and new product development (Lohit & Mujahid). BDAC makes a significant contribution to the improvement of organizational market performance outcomes by assisting with the identification of promising market opportunities (Khan,2019), the identification of profitable market segments (Wamba et al., 2015), and the progression of product development (Li, 2022). According to Lohit and Mujahid, there is a positive connection between BDAC and other aspects of market performance such as increased market share, higher sales, and the introduction of new products (2020). The results of their investigation revealed this reality. The association between BDAC and market performance outcomes like as sales volume, market share growth, and product development has been the subject of investigation in a number of studies (Li,2022). Using information gathered from 202 Norwegian CIOs and IT managers, Mikalef et al. (2020) explored the connection between BDAC and competitive performance. Their research was based on statistics. They came to the conclusion that the volume, diversity, and pace of BDAC are major elements in giving businesses an advantage in the marketplace. The end goal of the Business Development and Competitiveness Advisory Council (BDAC) is to provide businesses with actionable counsel that will help them develop a competitive advantage, improve their market performance, and increase the value they provide to their customers (Egwim et al., 2022). Businesses who use BDAC have a considerable head start over their competitors in the race to find untapped market opportunities before their competitors do. Because of this,

companies are forced to develop one-of-a-kind business strategies in order to fulfill the requirements of both their existing consumers and the ones they hope to attract in the future, which ultimately leads in the establishment of robust new income channels. Businesses with a higher BDAC have a better chance of outperforming their competitors in terms of market share, growth in market share, sales volume, sales growth, and new product development. It is plausible to assume that these outcomes will occur (Li, 2022). As a result of our investigation, we have come up with the following explanation. (H1) A favorable correlation can be seen between BDAC and market performance.

Recent studies (for example, Mikalef et al., 2020; Jordan et al.,2022) have shown that organizational skills, such as the ability to build DBMs, are especially crucial in times of intense competition, market instability, and unanticipated market conditions. So, it is possible that the economic benefits of investing in BDAC and DBMs will not be achieved in an environment that is characterized by competition that is both low and predictable. It may be in the best interest of companies to stick to tried-and-true business models while the level of competition is relatively stable. This is because the establishment of the infrastructure required to mine vast volumes of data for information that can be used requires a significant financial investment. Hence, the purchase of BDAC might not provide a significant advantage in markets where there is a limited level of competition. According to Mikalef and colleagues' findings, BDAC is most useful during periods in which there is significant market uncertainty (2020). This idea is supported by the claim that BDAC provides firms with a competitive advantage in highly competitive contexts by supplying real-time data about the dynamics of the market (Otto et al.,2020; Mikalef et al., 2020). In addition, businesses that operate in highly competitive environments, in which competitors frequently present new strategies and market conditions are uncertain, have a higher motivation to invest in cutting-edge BDACs in order to accurately predict future market trends and gain a competitive advantage. This is because these environments are characterized by a high level of innovation and creativity among rivals. The need to capitalize on the opportunities presented by big data in order to drive DBMs is heightened in environments that are characterized by a high degree of both the intensity of competition and the level of dynamism.

In order for a business to thrive in a market that is fraught with intense levels of competition, it may be necessary for the company to forsake the competitive advantages it now has in favor of developing a fresh and unanticipated source of revenue. The findings that Saha et al. (2020) have provided offer support to the aforementioned concept. The authors suggest that in highly competitive contexts, firms need to continuously alter their strategies in order to fulfill the ever-changing expectations of both their customers and their competitors. Hence, companies that have robust BDACs are in a better position to produce original ideas, which in turn provides them with a competitive advantage in the market. We predict that the good benefits of BDAC on market performance will be increased when utilized in conjunction with a DBM and in an environment with high levels of competition. This is something that we are looking forward to. Because the DBM makes it feasible to obtain more accurate information, it is being utilized for this purpose.
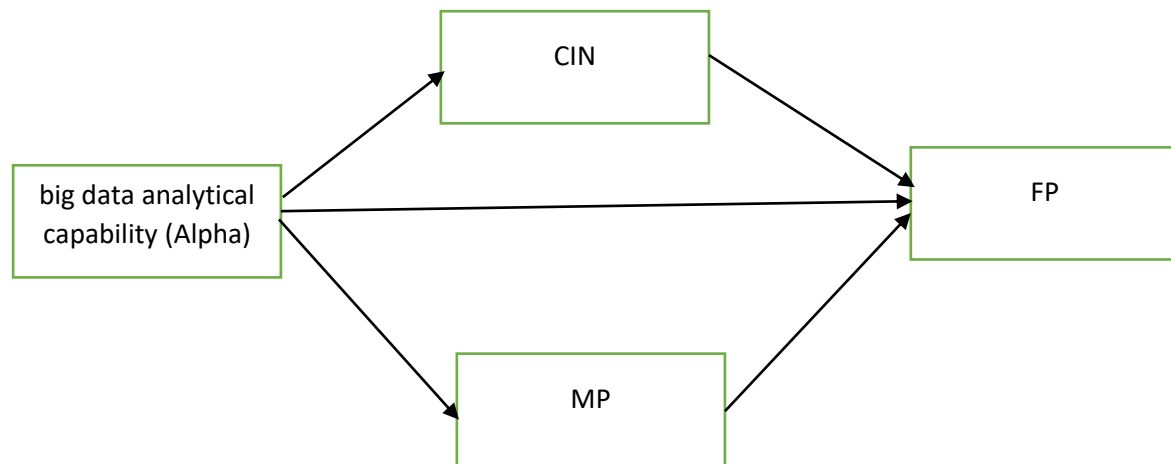
Conceptual Framework

Figure 1: Conceptual Framework

Methodology

We investigate the role that market performance plays in mediating the connection between skills in big data analysis and successful company outcomes by employing a survey design. There was a total of 420 surveys distributed, and 310 responses were completed (which is equivalent to a response rate of 73.8%). The survey questions were divided into three categories, each of which focused on a different aspect of the following: the performance of the market, the performance of the company, and the ability to understand large amounts of data. The questions were constructed by basing them on the earlier research and using a Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree) for the responses (strongly agree). PLS-SEM, which stands for partial least squares structural equation modeling, was applied to the data in order to do an analysis and get further insight into the relationships existing between the hidden variables. For the purpose of determining the validity and reliability of the measurement model, the extracted composite reliability as well as the average variance were utilized. The reliability and validity of the measurement model were established, and the structural model demonstrated that there is a statistically significant and positive association between a company's capacity for big data analysis and its overall success. The findings also suggested that the prosperity of the market acted as a moderating factor between the ability to analyze large amounts of data and the results obtained by the firm. Overall, the findings indicate that firms can improve their efficiency by increasing their capacity to evaluate huge data sets and by using market performance as a mediator in this relationship. This can be done by expanding their capacity to assess large data sets. In this context, the performance of the market can act as a kind of mediator.

Results

The study was conducted using a two-stage approach that involved both the measurement model and the structural model. The analytical framework used for the structural model was Sem-pls.
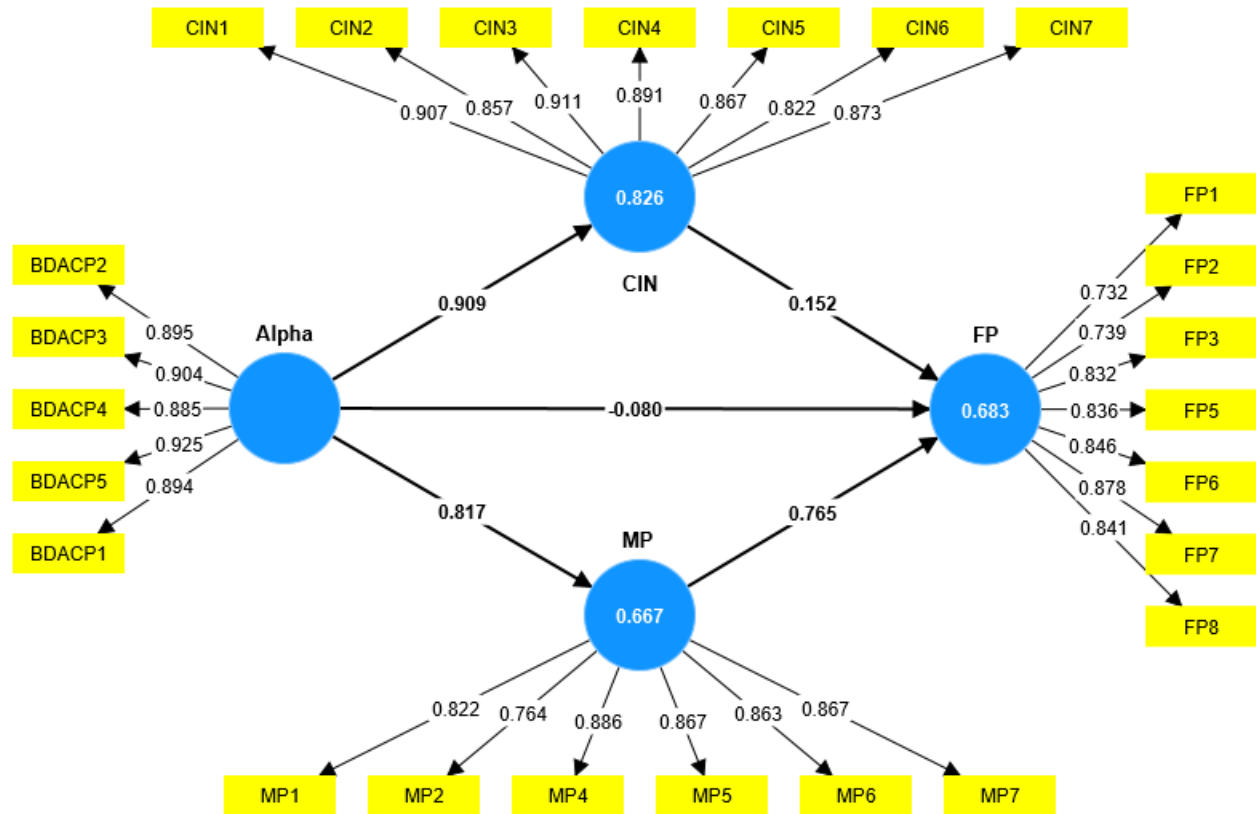
Figure 2.
 Measurement Model

In the enthralling topic of partial least squares structural equation modeling, the concept of "outer loadings" reigns supreme. This expression refers to the regression coefficients, which demonstrate the link between latent and observable variables (Al Muhannaa,2021). These coefficients are a helpful resource for revealing latent correlations in the field of PLS-SEM. With their assistance, scientists can better appreciate the complex processes at work, paving the path for the discovery of the mysteries concealed inside the network of linkages. It's an exhilarating journey into the unknown, with each discovery bringing a fresh perspective on the world.

Table 1.
Outer Loadings

	Alpha	CIN	FP	MP
BDACP2	0.895			
BDACP3	0.904			
BDACP4	0.885			
BDACP5	0.925			
CIN1		0.907		
CIN2		0.857		
CIN3		0.911		
CIN4		0.891		
CIN5		0.867		
CIN6		0.822		
CIN7		0.873		

FP1		0.732	
FP2		0.739	
FP3		0.832	
FP5		0.836	
FP6		0.846	
FP7		0.878	
FP8		0.841	
MP1			0.822
MP2			0.764
MP4			0.886
MP5			0.867
MP6			0.863
MP7			0.867
BDACP1	0.894		

The idea of "outer loadings" is crucial to the success of partial least squares structural equation modeling, which is an endlessly intriguing area. These cryptic coefficients are the key to unraveling the delicate relationships between latent and observable variables, making them a vital tool for any researcher exploring the complexity of PLS-SEM. Each coefficient serves as a beacon of comprehension, enabling scientists to decipher the secrets hidden inside the web of interconnections. This facilitates greater comprehension of the system by shining light on its inner workings. Each discovery enhances our comprehension and broadens our perspective of the world in which we reside.

Table 2.
Reliability Analysis

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Alpha	0.942	0.942	0.955	0.811
CIN	0.949	0.950	0.958	0.767
FP	0.916	0.918	0.933	0.667
MP	0.920	0.920	0.938	0.716

he discriminant validity of the present study is illustrated in Table 3 below.

Table 3.
Discriminant validity

	Alpha	CIN	FP	MP
Alpha	0.901			
CIN	0.909	0.876		
FP	0.682	0.707	0.816	
MP	0.817	0.821	0.824	0.846

Discriminant validity is important in the field of partial least squares structural equation modeling (PLS-SEM) since it determines whether or not particular latent variables are independent of one another (Sarstedt et al., 2022). To establish how much the model's

discriminant validity may be enhanced, researchers must assess the model's capacity to reliably measure and differentiate between a number of concepts. The Fornell-Larcker criterion and the cross-loadings method are the two most common approaches used to accomplish this. The Fornell-Larcker criterion compares the square root of the average variance extracted (AVE) of each latent variable to the correlations between the latent variables, as opposed to the cross-loadings approach, which evaluates the extent to which each indicator loads more heavily on its corresponding latent variable than on other latent variables in the model. The cross-loadings approach assesses how much each indicator relies on its associated latent variable more than on other latent variables in the model. With these approaches, researchers can gain a better knowledge of the discriminant validity of their PLS-SEM model, paving the door for new discoveries and improvements in the area. It's a fantastic experience in which each step brings us closer to unlocking the mysteries of the intricate processes that keep our cosmos running. This encounter brings us closer to understanding the mysteries of the intricate processes that keep our cosmos running.

Structural Model:

Experiments were carried out to evaluate the assumptions using the structural model, which saw all variables as latent entities. These findings demonstrate the intricate network of relationships that lies beneath the apparent surface of the system under study and were made possible by the methods employed by the researchers. Using the power of the structural model, scientists learned more about the underlying mechanisms at work and gave their hypotheses a rigorous test. It's a thrilling adventure of discovery, and with each breakthrough we get closer to understanding the world.
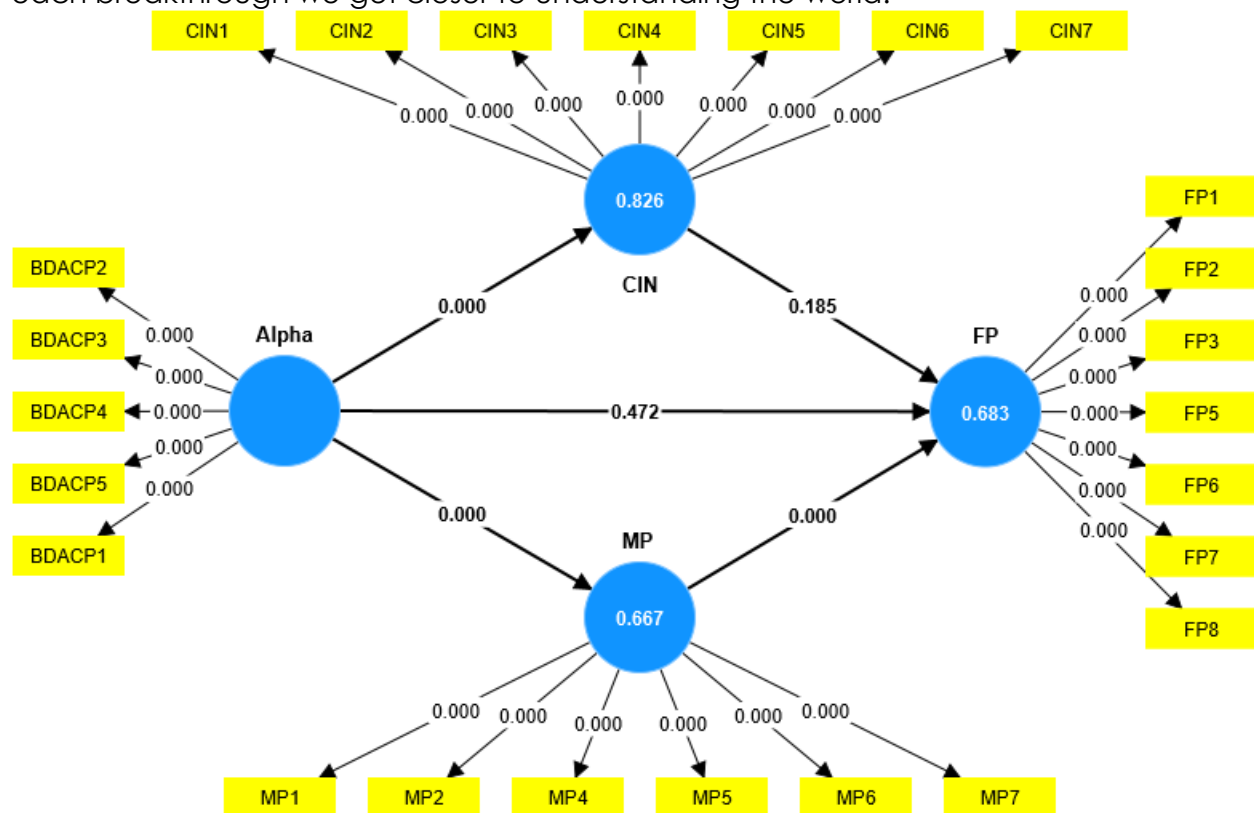

Figure 3: Structural Model

Table 4.

Direct Results

	(O)	(M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Alpha -> CIN	0.909	0.909	0.017	52.443	0.000
Alpha -> FP	0.682	0.684	0.059	11.570	0.000
Alpha -> MP	0.817	0.817	0.035	23.174	0.000
CIN -> FP	0.152	0.162	0.115	1.325	0.185
MP -> FP	0.765	0.757	0.111	6.918	0.000

Table 5.
Mediation Analysis

	(O)	(M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Alpha -> CIN -> FP	0.138	0.148	0.105	1.318	0.188
Alpha -> MP -> FP	0.624	0.617	0.088	7.073	0.000

Table 5 demonstrates that the path of mediation has a statistically significant impact. This discovery sheds new light on the complex relationships between the investigated variables and highlights the necessity to account for the mediating factors that can influence these correlations (Basheer et al.,2020; Raoof et al.,2021; Nuseir et al.,2020; Yan et al.,2020). By going further into the complexity of the mediation path, researchers can gain a more complete understanding of the underlying mechanisms at action and their effect on the system as a whole. That is a remarkable discovery that could pave the door for new research avenues and field advancements.

Discussion and Conclusion

This study provides evidence that a firm's market performance acts as a mediator in the connection between a company's data analytic capabilities and the financial success of the company. According to the findings of the research, an organization's overall performance may be improved if its employees are able to effectively analyze enormous amounts of data (Khan,2019). This indicates that businesses who are skilled at analyzing large amounts of data have a competitive edge, which should ultimately lead to better efficiency in their operations. This is in line with findings from earlier studies that indicate implementing big data analytics can considerably improve a company's performance and competitiveness.

The findings of the study have a variety of real-world implications for businesses that want to raise their production levels by making more use of big data analytics. In light of the findings, businesses may wish to dedicate more time and money to improving their ability to analyze big data and market performance. Investing in the technology and skilled manpower needed to collect, analyze, and use massive amounts of data to support business decisions and plans is one way to accomplish this goal. Another option is to hire external consultants (Jordan et al.,2022). The achievement of this goal can be accomplished more quickly and effectively through the collection, examination, and use of relevant data. In addition, businesses can improve their market position through market performance by analyzing the wants and requirements of their customers, catering to those wants and needs, strengthening the reputation of their brand, and fostering customer loyalty to the brand.

Conclusion

The ultimate goal of this research was to determine how the performance of the market affects the association between the success of a firm and its capacity to process massive volumes of data. The findings indicate that the ability to evaluate large amounts of data has a beneficial impact on the performance of markets, which in turn has a favorable impact on the performance of enterprises. These findings have repercussions that have far-reaching significance for firms that wish to improve their performance and gain an advantage over their competitors. Companies that make investments in big data analytics and take advantage of the performance of the market can improve both their ability to compete and their overall level of success. Other factors, such as the effectiveness of a business's supply chain or the level of staff productivity, may act as mediators between the capability of a firm to analyze big data and its profitability; as a result, this topic may be the subject of additional research in the near future.

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