

# INNOVATION MANAGEMENT: IS BIG DATA NECESSARILY BETTER DATA?

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## ABSTRACT

This study explores the relationship between firms' application of data analytics (specifically its attributes) with the innovative performance of business. The other objective is to assess if large volume of data is necessarily more effective to drive business innovation. The study collected data through questionnaire survey from management staffs of 250 companies in both developed and developing economies. Statistical tools such as T-test and multiple regression methods were used to analyse the data. The study found suggestive proof demonstrating that data analytics is a pertinent determinant of a firm being innovator and bring innovative products and services to the market. The study also found that large volume of data is not necessarily better data to drive innovation. The findings imply that firms must utilize big data analytics to stay innovative and have a competitive advantage. Unlike previous studies that approached big data as whole, this study addresses various components of big data such as variety, volume, velocity, and their individual impacts on innovation in businesses across the developed economies.

**KEY WORDS:** data science, business management, big data, innovation

## 1. INTRODUCTION

Technology has brought a revolutionary change in the landscape of business innovation. With newer tools and technology, it has become very easy to gather data and find insights from the data to drive business management and innovation efforts. The latest scientific studies indicate that big data has got the potential to improve innovation performance by, on average, approximately 6.1 % (Bresciani, Ciampi, Meli, & Ferraris, 2021). Big data has a significant impact on the innovation aspect of companies and changed the determinants of firms' competitiveness and innovation (Gobble, 2013). In contemporary economies, characterized as "knowledge-based", innovation plays an essential role in a business's performance as well as competitiveness. Hence, businesses must adopt techniques that are innovation-oriented to be able to create as well as maintain a competitive advantage in the globalized and technologically changing environment (Issa, Byers, & Dakshanamurthy, 2014). The changing consumer needs, technical evolutions, and the competitive pressure have made innovation an important determinant of business's success. Thus, the goal of this analysis is to investigate the mediating role of big data attributes (i.e., volume, velocity, and firm performance and variety) on innovation performance (Kayser, Nehrke, & Zubovic, 2018). As recommended by some previous studies, business efficiency is measured using several types of performance groups (i.e., operational excellence, financial returns, and client perspectives). Nevertheless, in this research, we control the business innovation to state that big data is not necessarily more effective data (Lee, Kao, & Yang, 2014). To investigate the impact of big data on innovation, we collected data from 250 managers and empirically examined the relationship in the proposed model.

The pace of development is changing quickly following technological revolutions, leading development of business strategies that are new, innovative and can sustain a competitive edge. The genuine competitive power of businesses will be the capability to gather data and develop valuable insights. Big data is characterized as a significant resource for businesses to get

new insights, present additional value, and foster brand-new items, markets, and processes. Big data is described with the three Vs: volume, and variety velocity.

- Volume describes the measurements of data which are incredibly big, as assessed in exabytes, ninety % of the current data was produced in only the previous two years, due to the massive expansion of receptors and connected devices (Antons & Breidbach, 2018).
- Variety describes heterogeneity of data sorts since technical evolution enables businesses to focus on different data types (unstructured, structured, and semi-structured) (Antons & Breidbach, 2018).
- Velocity relates to the rate of the speed and data generation required for their analysis. The remarkable expansion of smartphones and sensors led to a major increase in data generation along with a growing need for an instant decision and real-time analysis making (Hao, Zhang, & Song, 2019).

The blend of these qualities defines big data and provides organizations with a competitive edge in the digital economy (Ghasemaghaei & Calic, 2020). Today, data is generated from every field, from agriculture, health, infrastructure and energy to insurance and economics, sports, food, and transportation. Its financial impact is expected to be overwhelming in the next years and it's the capability to introduce new products or services, better and new operations in the production, more effective marketing, enhanced business management, more effective R&D as well as much better supply chain management are unquestionably significant (Yang C. , Huang, Li, Liu, & Hu, 2017).

There's evidence that a data-driven strategy has a good impact on businesses' performance (Prescott, 2016). Nevertheless, a major obstacle to adopting a data-driven strategy through big data analytics will be the high level of specialized skills required to utilize as well as utilize these methods. Individuals with abilities as well as expertise in statistics, evaluation, and

machine innovation are needed to get useful insights from big data (Niebel, Rasel, & Viète, 2019).

This research makes many essential contributions to the literature. The findings from this study show the need to differentiate among the key attributes of big data operationally and conceptually, instead of dealing with big data as a whole idea (Cui, Mei, & Ooi, 2014). Notably, the results suggest that while data velocity, as well as a variety, play an important part in enhancing firm innovation efficiency, data volume does not. Surprisingly, the results indicate that data velocity plays a far more crucial part compared to some other major data qualities in enhancing firm innovation efficiency (Bresciani, Ciampi, Meli, & Ferraris, 2021). This study plays a role in the business innovation literature by examining whether big data assist companies to produce new ideas efficiently and successfully that lead to improving the entire productivity of the firm. The study has interesting results because of the significance of the impact of efficacy and innovation efficiency on firm efficiency (Yang C. , Huang, Li, Liu, & Hu, 2017). Overall, the outcomes of this research provide helpful suggestions to assist firms to understand the key role of every primary characteristic of big data in boosting their outcomes of theirs.

In the following area, we evaluate the appropriate literature on business innovation theory as well as big data. Following the literature review, we current our research model of ours and develop our hypotheses of ours. Then, we discuss our methods and sample. In the outcomes section, we look at our analysis model by using structural equation modelling (Lee H. L., 2018). As big data, development, and innovation performance are multivariate constructs, in the post hoc analysis, we analyse the result of every large piece of data distinctive on 3 steps of firm performance, as mediated by innovation impact as well as originality success. The range of this analysis is usually to existing proof regarding the significance of big data in development utilizing data orientation of companies and the impact of its on businesses' efficiency.

## 2. LITERATURE REVIEW

If new data is the foundation for business innovation, big data presents a big opportunity for companies to learn and consequently improve their performance (Kayser, Nehrke, & Zubovic, 2018). Previous studies have shown that data is a crucial business resource for invention in the age of big data. Innovation, knowledge creation, efficient knowledge management, and the improvement of internal technological abilities enhance the creation of a long-lasting competitive advantage which is translated into a superior market position (Trabucchi & Buganza, 2018). The performance of a firm is positively related to the improvement of internal capabilities including technology and a consistent innovation and development approach (Lee, Kao, & Yang, 2014). The results of innovation, improvement of internal technical capacities as well as accumulation of data by firms result in businesses becoming more and more competitive in international and domestic markets. The connection between innovation and strong results has been the subject of many empirical studies. Most studies have discovered that innovation positively influences the performance of companies when it comes to market share, manufacturing efficiency as well as growth, and earnings. (Bresciani, Ciampi, Meli, & Ferraris, 2021) found that innovation has a positive correlation with firm performance when it comes to revenue growth, utilizing data from European manufacturing companies. (Yang C. , Huang, Li, Liu, & Hu, 2017) investigated the innovation of businesses for two years

working with a data of African manufacturing businesses during the economic downturn and a period of economic improvement (Yang C. , Huang, Li, Liu, & Hu, 2017).

Big data has potential uses in several consumer areas which can boost innovation such as problem recognition, understanding purchase behaviour, and consumption. Big data has improved the capabilities that companies need to be able to compete. Firms that gather new data tend to be more likely to be successful, (Prescott, 2016) argued. Firms that can harness the power of big data to improve their business processes might be able to increase their revenue and operating efficiency, respectively (Wright, Robin, Stone, & Aravopoulou, 2019).

It is observed that academics, as well as professionals, are increasingly paying more attention to the big data and data-driven strategy because the evaluation of big data results in useful insights and the promotion of innovative activity that transforms the economy (Wright, Robin, Stone, & Aravopoulou, 2019). Big data insights offer a competitive edge in the business through new methods of production, understanding consumer behaviour, innovation, and growth (Yang C. , Huang, Li, Liu, & Hu, 2017). Because big data becomes a major determinant of adding value to companies, there is a need for data analytics capacity to actualize its full potential. Based on the economic advantages of big data, public and private sector companies in the United States are going to boost from USD 38 billion in 2012 to USD 752 billion in 2019 (Niebel, Rasel, & Viète, 2019).

Practical evidence is scarce and limited primarily in research for multinational businesses related to the impact of a data-driven approach as well as its impact on the performance of businesses. Big data can change the innovation landscape, effectively and efficiently enhancing the fit between consumer preferences and product features (Cui, Mei, & Ooi, 2014). Utilizing big data provides businesses in several industry sectors, not just companies' resource allocation, but also reduction of waste, bigger transparency, and facilitation of new insights. The expansion of digital services and the Internet have transformed all economic sectors (Lee, Kao, & Yang, 2014). Using data to drive innovation, almost all sectors have become more service-oriented, including retail, agriculture, and manufacturing.

Big data is viewed as a driver for better decision-making and profitability in businesses. Based on a recent American survey of 500 small and medium businesses, data provides businesses with a competitive advantage when they evaluate as well as make use of data insights for competitiveness and growth. (Gobble, 2013) found that the adoption of data-driven decision-making induces firm performance by making use of a dataset of 210 publicly traded companies and determined that adoption of data-driven decision-making approaches provides firms with 6-7 % higher performance. These firms also deliver much better performance in asset utilization, return on equity, and market value.

Analysing data can provide substantial added value to companies through data-driven innovation in several areas of the business from manufacturing production, resource allocation, customers preferences, to business development, etc (Gobble, 2013). Like IT, big data can bring substantial cost reductions, shorter delivery times, enhanced R&D, and new services, or products. Very little evidence exists, however, on the return on investment for big data uses in businesses. In the past, firms made decisions with small data sets and limited analytics platforms. Big data sets have made it possible for companies to make much better decisions, as large data sets have enabled them to do so. Netflix, for instance, examines data from millions of

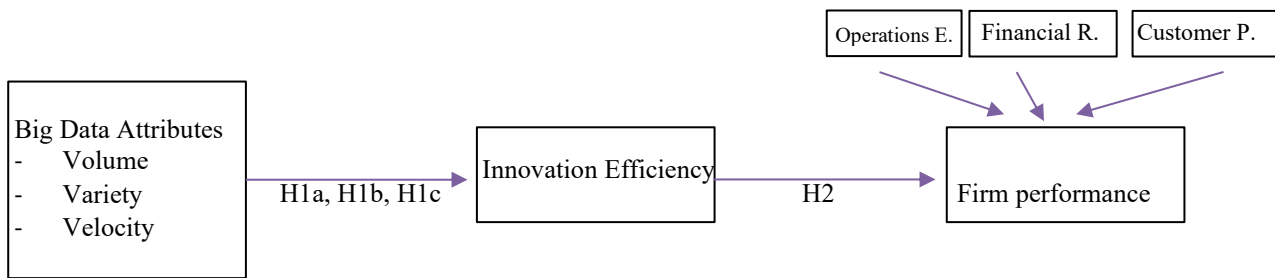
customers to better understand if a movie is a hit or not (Lee H. L., 2018). Although the world produced just 800,000 petabytes of data in the entire year 2000, it is likely to produce ninety-five zettabytes in the entire year 2022 (Wise, 2022). Better storage options (e.g., Hadoop), lowering storage costs, and the availability of algorithms that derive insights from data enables companies to extract more value from large data sets. The focus of data velocity is on the unstoppable flow of data which enables companies to supply timely insights. Businesses can act promptly by integrating streaming data in real-time. Businesses can make better decisions based on current and informative data, rather than on historical trends.

(Gobble, 2013)'s empirical research using a data sample of 300 businesses across over 20 industries, as well as 60 countries, discovered that top performers use analytics two times more to guide future strategies and daily operations, in contrast to lower performers. Doing analysis of 120 North American businesses performance, discovered that the companies implementing data-driven decision making have 6% higher production as well as 7% higher profitability than their competitors. (Kayser, Nehrke, & Zubovic, 2018) within their empirical research for 400 USA companies from several industries, divided the data sample into 2 categories: Businesses that are data-driven and experience-driven. The researchers discovered that data-driven businesses

present a higher level of innovation, launching new services and products and making disruptive changes in their business processes (Kayser, Nehrke, & Zubovic, 2018). Despite the activity of USA businesses in the digital economy, utilization of data is in the initial stage. The findings suggest that the use, as well as utilization of data, could positively impact businesses. In 2014, The Economist Intelligence Unit conducted a survey of 164 senior executives of businesses examining data-driven decision-making and its perspectives (Kayser, Nehrke, & Zubovic, 2018). More than 50 % of the companies, including large ones, discovered that data guided the better decision-making about marketing, operations, and pricing. Furthermore, research provides insights into data in decision-making abilities. The proper use of data offers cost reduction as well as an increase in efficiency in the marketing of businesses. Reliable utilization of data has transformed the way of interaction with clients and decreased the cost of almost 12% of revenues of American businesses (Lee H. L., 2018).

### 3. METHODS OF RESEARCH

Figure 1 shows the research model which maps the hypothesized relationship between big data attributes (i.e., velocity, volume, and variety), innovation and firm performance.



**Figure 1.** The relationship between big data attributes and innovation and firm performance.

Access to different kinds of customer information helps companies understand customer needs much better and develop innovative solutions. In turn, this allows firms to exploit new market opportunities and build the resources required to exploit those opportunities. Handling unstructured data as well as structured data helps companies approach innovation problems from various angles, which allows them to develop better and faster ideas to meet the needs of their customers. Hence:

H1a: Innovation performance will increase with more data variety.

This huge amount of customer data collected from several sources provides a lot of understanding into the needs as well as preferences of customers. Many firms, for example, will try to gain insight into their customers' habits by collecting customer reviews and analysing them. New product strategies are appropriate. Businesses today can analyse data from several sources (user generated data, sensors, etc.) to understand their clients and develop more targeted offers with the help of technological advances. (Ghasemaghaei & Calic, 2020) argued that these advancements enhance prior decision-making processes that were frequently based on intuition or gut feelings rather than on empirical evidence. Big data thus enables companies to develop data-driven and evidence-based decision processes that can improve their innovation performance by helping them better understand consumers' preferences and create new concepts accordingly. Hence:

H1b: Innovation performance will increase with increased data volume.

Firms that do not make decisions in real time will overwrite previous data. Businesses must therefore integrate, evaluate, and act fast. Research has shown that the capability to create new products depends upon real time insights. To benefit their customers, companies must quickly make use of the insights from integrating as well as analysing large data to continuously redefine their marketing activities and implement efficient and effective innovation. Real time data can help companies develop new ideas quickly and transform them into cutting edge products before their competition. Hence:

H1c: Innovation performance will increase with increased data velocity.

Big data might play a crucial role in providing companies with enormous opportunities to discover, improve their innovation competency and ultimately improve their performance, as exploration of new details will be the basis for enhancing their learning capabilities. Hence:

H2: Big data will impact firm performance through innovation performance.

To evaluate research hypotheses, we used a survey method to collect data from middle-level and top- managers to get data about the impact of big data on firm innovation. To manage for the possible impact of bias, the dynamics of the place, along with jobs, survey participants have been restricted to managers in the United States. The survey was sent by email to 1200 people throughout 2 weeks of February and March 2022.

The definitions of model constructs are presented in table 1.

**Table 1.** Definitions of model constructs.

		Definition	Reference
Big Data attributes			
	Variety	The different types of data collected	(Antons & Breidbach, 2018)
	Velocity	The rate at which data is collected	(Antons & Breidbach, 2018)
	Volume	The amount of data collected	(Antons & Breidbach, 2018)
Innovation		New solutions to solve a problem	(Hao, Zhang, & Song, 2019)
Firm performance		How much profit the firm makes	(Hao, Zhang, & Song, 2019)

To ensure that participants had relevant exposure, we asked them about the scope of the insights of theirs with big data utilization in the firms of theirs. Those participants who were unfamiliar with the topic were excluded from the dataset. Additionally, we removed responses that (1) have been finished in under five minutes (since the survey was estimated to take approximately fifteen minutes), (2) were unfinished, (three) were terminated at the start of the survey, and (four) had the identical solution to other questions (e.g., all 5s). In total, we got 250 functional responses, representing a response rate of 22%. We additionally performed the marker-factor method suggested by prior studies using a theoretically not related construct a this this marker variable) to correct the associations among the key constructs in the research.

To be able to model the advantages of big data to businesses, a firm level design is going to be created to determine the impact of big data utilization to businesses innovation efficiency and efficiency. In that context, tasks of using big data are divides in two phases: data management & data analysis. The very first relates to the procedures as well as solutions for data generation, storage, preparation and mining for evaluation, while the 2nd describes the techniques as well as strategies to evaluate and obtain useful insights from big data.

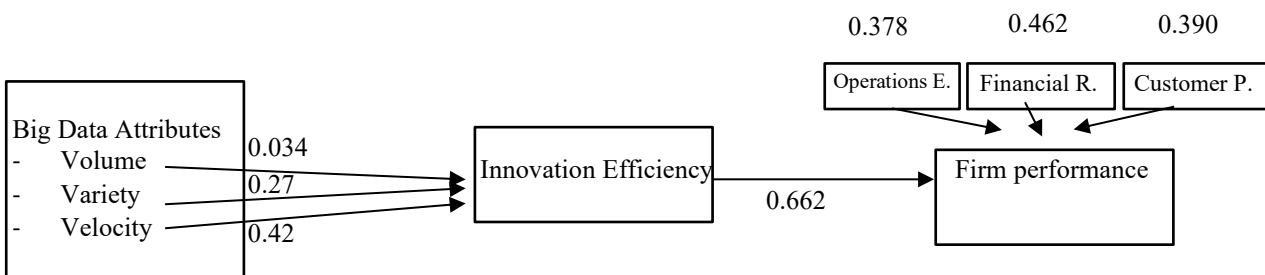
#### 4. RESULT

As shown in Fig. two, the results suggest that whereas data variety and data velocity significantly impact innovation

performance ( $\beta = 0.27, p<0.001$ ;  $\beta = 0.42, p<0.001$ , respectively), offering evidence for H1c and H1a; surprisingly, data volume does not drastically impact development efficiency ( $\beta = 0.034, p>0.05$ ), not rejecting H1b. The outcomes likewise show that development efficiency highly affects firm productivity ( $\beta = 0.662; p<0.001$ ). We also assessed if the consequences of the fundamental data qualities on firm efficiency were partially or fully mediated by innovation efficiency.

To check for mediation, we tested the immediate impact of big data characteristics on firm overall performance in the lack of the possible mediator. The results suggested that, even though the paths from data variety and data velocity were considerable ( $\beta = 0.241, p<0.01$  and  $\beta = 0.472, p<0.001$ , respectively), the insights from data volume were not significant enough ( $\beta = 0.015, p>0.05$ ).

Next, we added innovation efficiency as a mediator between big data qualities as well as firm performance. The results showed that, even though the impact of data variety on firm performance was no longer significant, with a coefficient of 0.121 ( $p>0.05$ ), the impact of data velocity on firm performance was still significant, with a coefficient of 0.284 ( $p<0.01$ ). Furthermore, the impact of data volume was yet not substantial ( $\beta = 0.031, p>0.05$ ).



**Figure 2.** The relationship between data attributes and innovation and firm performance.

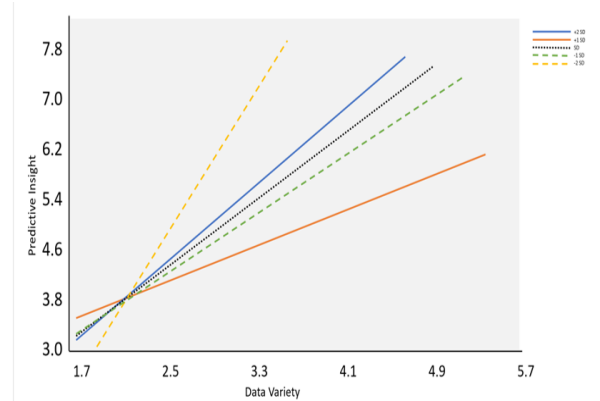
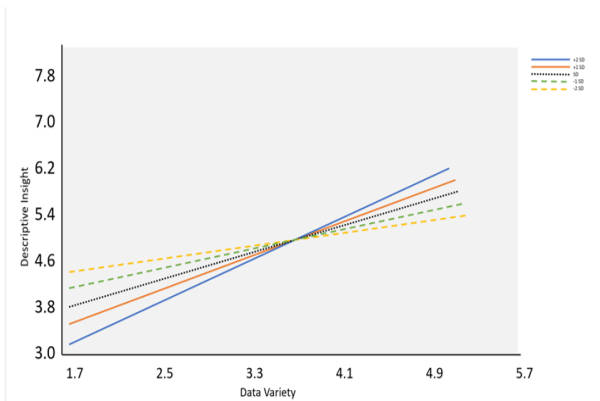
These results indicate that, while firm innovation completely mediates the connection between data variety as well as innovation performance, it just partly mediates the impact of data velocity on innovation efficiency. Interestingly, data volume impacts neither firm innovation nor firm performance. These results offer support for H2 concerning the mediating role of innovation proficiency on the impact of big data on innovation efficiency. As Fig. two illustrates, big data utilization

describes approximately 66.2% of the variance in innovation efficiency.

To check out the immediate impact of big data qualities on efficiency and innovation efficacy individually, an analysis was performed. As is usually observed in Fig. three, the results indicate that, while data variety as well as data velocity have a major beneficial impact on innovation efficacy ( $\beta = 0.287, p<0.001$ ;  $\beta = 0.362, p<0.001$ , respectively), the impact of data volume on innovation effectiveness is not considerable ( $\beta =$

0.011,  $p < 0.05$ ). What this means is that, while utilizing various data types in time that is real helps firms innovate effectively, the dimensions of the data does not play a crucial role. Furthermore, the results show which, while data velocity as well as data variety have considerable positive impacts on innovation effectiveness ( $\beta = 0.431$ ,  $p < 0.001$ ;  $\beta = 0.231$ ,  $p < 0.01$ , respectively), the impact of data volume is not significant ( $\beta = -0.083$ ,  $p < 0.05$ ). What this means is that, while utilizing various types of data in time that is real substantially lowers a firm's work in attaining profitable innovation, utilizing big sizes of data does not improve firm efficiency.

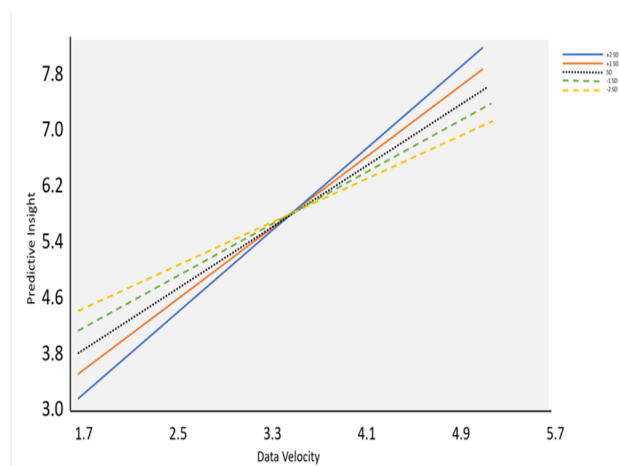
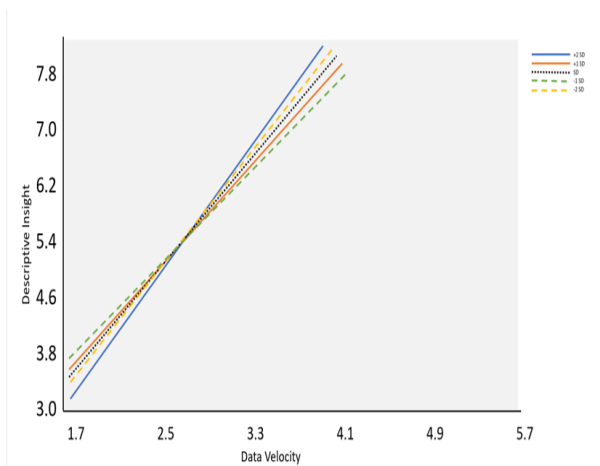
As found in Fig. two, the results also show that innovation efficacy considerably affects a firm's operational excellence, financial returns, and customer perspective ( $\beta = 0.378$ ,  $p < 0.001$ ;  $\beta = 0.462$ ,  $p < 0.001$ ;  $\beta = 0.390$ ,  $p < 0.001$ , respectively). Additionally, whereas innovation effectiveness highly affects operational excellence and customer perspective ( $\beta = 0.231$ ,  $p < 0.05$ ;  $\beta = 0.229$ ,  $p < 0.05$ , respectively), it does not significantly impact financial return shipping ( $\beta = 0.159$ ,  $p < 0.05$ ). This demonstrates good firm innovation substantially improves firm performance; however, though lessening the time to develop new concepts substantially better consumers' operational excellence and perspectives, it does not increase a firm's economic returns.



**Figure 3.** Data Variety.

Figure 3 shows how the data variety affects the descriptive and predictive insights to drive innovation efforts of a business. As we see the predictive insight is very strong with data variety which means that as data varies more, the ability to predict also increases significantly. While the descriptive insights generated from increased data variety is flat, the predictive analytics increases as the variety increases.

Figure 4 shows the relationship between data velocity and innovation efforts in a firm. While data velocity drives the descriptive insight very steeply, it does not significantly drive the predictive analytics as fast. However, with more velocity, we observe increased ability for prediction.



**Figure 4.** Data Velocity.

## 5. DISCUSSION

In a data driven world, businesses have opportunity to develop sustainable competitive edge against the rivals through innovation stemming from data analytics. Big data can change the innovation landscape by effectively bridging the relationship between consumers' preferences and product features, which

might enhance firm performance (Hao, Zhang, & Song, 2019). Studies have focused primarily on anecdotal evidence; as a result, there is an inadequate understanding of the consequences of big data on firms' innovation capability. As indicated by earlier scientific studies, the impact of big data on firm productivity may be mediated by intermediate variables

(Gobble, 2013). Innovation capability is among the key determinants in exactly how well firms leverage different resources, like big data, to boost overall firm's performance. Nevertheless, there is still an incomplete understanding regarding the relationships along with big data, overall firm performance, and firm innovation performance. This is the issue we explored in this study. To deal with this independent factor, we used data collected from managers and utilized business innovation principle to better understand the impacts of big data attributes (i.e., volume, velocity, then variety) on innovation efficiency, which ultimately impacts firm performance (Cui, Mei, & Ooi, 2014).

The study provides innovative theoretical insights. Unlike most scientific studies which have deemed big data as a holistic construct, this study shows that each big data attribute might have various impacts on firm performances, and therefore there is a need to differentiate among the key attributes of big data conceptually and operationally, instead of treating large data as a whole factor. From a business innovation viewpoint, this paper suggests that a firm's ability to utilize big data is a crucial factor for innovation (Gobble, 2013). Especially, the results indicate that, while velocity and data variety play a crucial role in enhancing innovation efficiency, interestingly, data volume does not. This may be because of the point that bigger data is not generally better data. Collecting considerable amounts of data which are noisy or perhaps not reflective of what companies are looking for will not enhance decision making and may worsen it. Consequently, though some research has considered the dimensions of data as the key characteristics of big data, one of our primary contributions is showing that various other major data primary qualities (i.e., range, and velocity) play even more important functions in improving firm.

We likewise make contributions to understand the relationship between business innovation and big data attributes. Our results suggest that businesses do not learn by all data types equally. With regards to innovation, a variety of data acquired in real time is most helpful for businesses. Higher variety of data is good for business innovation. Recombination of expertise and data and creativity underlie innovation with good variety might be particularly favourable to devising for organizations (Issa, Byers, & Dakshanamurthy, 2014). Data volume might provide innovation disadvantages, as boundedly logical people face issues coping with very high levels of data. By creating tensions between several possible approaches, big volumes of data can lead to cognitive anxiety and behavioural defensiveness, which might have deleterious impacts of business overall performance.

Limits as well as future research This study has many likely limitations. For starters, we investigated the primary attributes of big data on development efficiency as well as innovation efficacy. Some research has suggested large data characteristics (e.g., data worth, data veracity) apart from the 3Vs (data volume, data bunch, along with data velocity) explored in this analysis (Kayser, Nehrke, & Zubovic, 2018). Future studies must operationalize as well as validate the consequences of other major data qualities on firm outcomes. Next, the consequences of big data attributes on firm performance might be mediated by variables apart from firm innovation performance. Consequently, future studies should check out the mediating roles of various other constructs (e.g., firm agility, firm choice quality) on the consequences of big data on innovation efficiency.

Last, participants have been recruited from firms of the United States. Future studies could replicate this study utilizing

participants from other countries to investigate the result of culture in the research model of ours. Lastly, we examined research design by using cross sectional data. Future studies could look at the back links in the unit utilizing panel data.

## 6. CONCLUSION

The primary objective of this study was addressing a major gap in the literature about the impacts of the key attributes of big data (i.e., volume, variety, and velocity) on innovation that eventually impacts performance. We utilized business innovation principle to describe how big data utilization can improve firm 's innovation abilities about the developing new ideas, that may enhance financial return, the consumer satisfaction, and operational excellence.

Consequently, one of the primary contributions of this study is the examination of the mediating role of big data qualities on the firm innovation and innovation efficiency. The results reveal the benefits of operationally and conceptually implementing key attributes of big data (i.e., velocity, variety, and volume) rather than dealing with large data as a holistic variable. While velocity and data variety positively improve innovation efficiency, data volume does not have significant impact. Thus, focusing exclusively on gathering considerable amounts of data will not help firms improve the innovation performance of theirs. They need to additionally integrate various data types in a prompt manner. Used collectively, the findings of this study suggest that big data is not necessarily better data. Notably, the findings reveal that to boost firm innovation performance data velocity plays a far more substantial role compared to some other primary qualities of big data. To sum up, the findings suggest that big data characteristics might have various impacts on firm performances. Comprehending the outcome of each large data characteristic on firm performances will allow firms to appropriately allocate the resources of theirs to improve the overall performance of theirs.

Innovation using data depends on the context of knowledge-based capital related to digital data, economic aspects, and innovative capacity. The insights by leveraging large data present a competitive advantage of business through innovative means of productivity, consumer surplus, innovation, and growth. The data originates from big data processes offers the decision makers the ability to innovate as well as improve their overall performance gaining a competitive advantage from rivals. Thus, big data is recognized as a significant resource for businesses to get brand new insights, present extra value and foster brand-new items, markets, and processes. Additional analysis is required in outcomes of big data utilization of SMEs and the returns of investments in data driven processes.

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