SOUTH ASIAN JOURNAL OF SOCIAL SCIENCES & HUMANITIES

ISSN: 2582-7065 (Online) SAJSSH, VOL 5, ISSUE 5, PP. 131-149

Evaluation of the Implications of Big Data Analytics with Organizational Performance in Small and Medium Enterprises and Its Associated Role of Knowledge Management

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Received: 16th July 2024 **Accepted:** 8th September 2024 **Published:** 5th October 2024

ABSTRACT

Introduction: Big data are distinguished by their quantity, speed, variety, and reliability. Big data presents opportunity for “small and medium-sized” businesses (SME), in addition to being a reality for giant firms. The term "big data" denotes to the fact that numerous varieties of data have become more easily accessible, and its consequences for various organizational types may vary from one another. SME can benefit greatly from creating and utilizing big data. Aim and objectives: The main purpose of the study is to assess the implications of “big data analytics” with organizational performance in small and medium enterprises and its associated role of knowledge management. Methods: This study's main goal was to develop a big data KM model for SME through an examination of several business situations. This study used the qualitative analysis of data methodology. The study gathered examples of large data for SME, which it then used to test a KM model. Data collection, coding, and analysis are the three main components of qualitative data analysis. Results: Big data collection is a business endeavor for SMEs. An SME needs to specify its big data plans and deal with all potential organizational difficulties. Big data must be strategically used in a way that is consistent with the SME's business strategy and embraces a long-term strategy for competitive sustainability. To tackle the big data challenge, IT solutions are chosen based on the definition of data requirements.

Keywords: organizational performance, small enterprises, medium enterprises, knowledge management.

DOI: 10.48165/sajssh.2024.5507

INTRODUCTION

Since several years ago, the large data problem has gained attention. “Big data” are distinguished by their quantity, speed, diversity, and reliability. Big data presents opportunity for “small and medium-sized” businesses (SME), in addition to being a reality for giant firms. The economy benefits greatly from the work of SMEs (Rydén & Rootzén, 2021). Approximately half of the private-sector workers and much more than half of both the private GDP inside the USA are employed by SME. Big data management IT solutions are currently being sought after by an increasing number of SME (Wang & Wang, 2020).

The term "big data" denotes to the fact that numerous varieties of data have become more easily accessible, and its consequences for different organizational forms may vary from one another. Big data isn't only used in industry. In truth, when compared to non-business big data in numerous other industries like sciences and security, meaningful data for commercial organizations are typically not that vast. Traditional analytical tools frequently struggle to handle huge data, according to the big data research community. However, the fundamental traditional business intelligence (BI) procedures in ordinary commercial firms have not changed as a result of big data storage technology (like Hadoop) (KARACAN & Şirin, 2017).

SME can benefit greatly from creating and utilizing big data. An SME is typically close to its clients and consumers and is aware of the sources, uses, and value of data. SME, on the contrary hand, has challenges while handling massive data. Undercapitalization is a challenge that many SME's face. SME frequently lack the IT resources necessary for data collecting and processing. Therefore, management becomes essential for SME to take advantage of big data opportunities (Coleman, et al.,2016).

Product/data quality, energy efficiency, mass customization, supply planning, logistics trajectory discovery, part defect tracking, supplier defect tracking, demand projection, and other advantages of BDA. Manufacturing companies can benefit from the potential by combining servitization and big data, proposal for BDA-based servitization for manufacturing businesses. Adoption of BDA in developing nations like India requires a strategic approach based on values. Big data is employed to solve challenging engineering issues. Based on a clever decision-making system a BDA framework for residential structures that use less energy. The study focused on road projects, examined the challenges presented by big data in data assessment. A building management system based on BDA was the subject of an exploratory

DOI: 10.48165/sajssh.2024.5507

analysis calculated the connection between the plan management framework and enormous data, but the research focused more on common system and text examination. A BDA-based categorization approach of Chinese text again for scheme organization office using a text mining & fuzzy semantics technology. While BDA examines extra data obtained from a change of bases for the dissemination of knowledge, big data exposes trends & sources of information. BDA systems can be used to generate knowledge and create sustainable policies. The performance of the SME's project can be drastically altered by a BDA-based production setup. This study aims to create a connection between BDA and sustainable manufacturing practices within the framework of project management. To make the BDA adoption criteria more specific for SMEs' performance measurement, a literature review was conducted. Constructs were identified, and structural equation modelling (SEM) was utilized to investigate them. The alignment of company strategy with BDA capabilities can help manufacturing industries operate better. SMEs must give manufacturing-related process development projects top priority. To examine the decision factors, SMEs must identify the essential characteristics and choose the data sources. BDA enhances organizational capacities, which aids in gaining a competitive edge. However, BDA adoption concerns for manufacturers managing innovative initiatives involve both technological and non-technical difficulties (Alaskar & Alsadi, 2021).

In recent years, many businesses have leveraged big data analytics capabilities to gain competitive advantages. BDAC is a catchall phrase for a strategy for enhancing how businesses run. BDAC has the ability to alter management theory, practice, the coming management revolution, and innovation. Big data also aids in the fourth paradigm of research, maximizing the effectiveness of innovation, and cutting costs within a company. It is expected of organizations to adopt cutting-edge innovation technologies to sustain sufficient levels of productivity in their settings. They have thus acknowledged the significance of technological growth in achieving societal sustainability and progress. Big data analytics (BDAC) in this context enables businesses to sustain growth and make various breakthroughs in their particular fields. BDAC has inspired businesses to offer sophisticated, cutting-edge services while retaining highly refined prediction abilities. These skills enable firms to increase performance, make more strategic business decisions, and promote sustainability. Even though there are some success stories of BDA adoption, many businesses still don't completely grasp the importance of the organizational readiness of big data or the technical requirements of such an investment. Therefore, understanding the mechanics of how organizations deploy BDAs is crucial, and further study in this field is needed. BDA adoption has been the subject of an

DOI: 10.48165/sajssh.2024.5507

unexpectedly large quantity of writing, much of which has focused on the individual & behavioral levels. There hasn't been much research that presents perspectives from an organizational level (De Rijck, 2023).

The symbiotic affiliation between large information and “knowledge management” (KM), inherent difficulties big data provides for SMEs, and practical IT methods for SMEs to manage big data are all covered in this article. Eight successful SME big data instances with extensive documentation are gathered for the study, as well as a KM-related qualitative approach analysis is conducted. The essay is organized as follows for the remaining portions. The following section of this article reviews the literature to determine how big information and knowledge management (KM) can work together, what problems big data presents for “small and medium-sized” businesses (SME), and what SME-friendly IT solutions are easily available .

LITERATURE REVIEW

Relationship between knowledge management and large data has been review extensively. The database schema (Ackoff, 1989) states that knowledge can be created from both information and raw data. Applications of big data can provide businesses to learn new things (LaValle et al., 2011; Davenport, 2014). Traditional route, collection, transmission, and application activities are all included in the process of “knowledge management” (KM) (Alavi & Leidner, 2001). As a result, managing massive data resources could thought of as a sort of knowledge management (KM) where big data acts as the main source of explicit knowledge and knowledge discovery analytics methodologies serve as the main tools (Murdoch & Detsky, 2013; Sumbal et al., 2017). In fact, big data may support and be a component of organizational learning (Tian, 2017).

Research of organizational learning (KM) to big data was done by Olszak and Ziemba (2012) and Pauleen as well as Wang (2017). They discovered that KM enhances the abilities of big data and analytics, i.e., big information and analytics cannot operate without information. Data and analytics technology decisions are solely based on the expertise and experience of humans. Knowledge management (KM) is crucial to big data analytics because it provides guidelines for the possible operational, tactical, and strategic uses of big data. As a result, there is constantly a connection between the effect of big data analytics and the influence of information. The synergistic link between large data and knowledge management (KM) illuminates because only KM can result in huge knowledge (Pauleen, 2017).

DOI: 10.48165/sajssh.2024.5507

Big data may aid in the co-creation of information from a strategic perspective, which produces evidence-based informational materials for improved commercial competition (Acharya et al., 2018). Big data justifies applying tried-and-true KM tactics and methods to sources of data (Erickson & Rothberg, 2014), and KM can also usefully aid in the process of generating value from big data. In order to analyze the vast amounts of data and turn them into useful assets for business rivalry, KM strategies could be used as a lens (Del Vecchio et al., 2018b; Del Vecchio et al., 2018c). Knowledge products that are the combination of big data and information administration are centered on achieving the organization's business goal (Pauleen & Wang, 2017).

Challenges with big data for “small and medium-sized” businesses have been reviewed here. The properties of big data may render outdated or insufficient the conventional methods of data gathering, storage, analysis, and utilization. According to the white paper, heterogeneity, scale, timeless, privacy, and human collaboration are the main problems with big data. In the literature, the problem of human coloring as mentioned in the white paper has been examined from the viewpoint of KM. To address the big data concerns, firms must create an organizational architecture that combines KM and big data operations (Chan, 2014). In order to exploit big data as value creation, organizations must engage stakeholders, establish big data categorizations that support KM practice, and establish big data procedures for KM (Secundo et al., 2017).

Big data collection is an organizational endeavor for SME. The strategic the using big data must support a long-term BI strategy plan and be in line with the organization's business strategy. The administrative actions of a commercial organization are covered by its strategic intentions (Christensen, 2001). Resistance to IT adoption is no longer a major problem in business organizations thanks to decades of technological advancements, but excessive and inappropriate use of IT is still typical in many of these firms (Tarafdar et al., 2015). On the other side, the business society frequently disregards the information strategically for data-driven decision-making (Newell & Marabelli, 2015). Big data advanced applications call for specific knowledge and abilities. A strategic strategy for computer infrastructure, organizational procedures, big data-related policies, and rules must be established by the corporate organization in order to manage big data (LaValle et al., 2011). For SMEs with limited resources, all of these characteristics provide substantial hurdles. The following are some general reasons why SME will use data for the competition to improve marketing

DOI: 10.48165/sajssh.2024.5507

campaigns through advertising campaign analysis, to enhance customer services via customer purchase analysis, and to assess long-term risks in order to assure sustainability to lower expenses and boost revenue. SME must create new solutions rapidly for massive amounts of data. A most practical method for SME to handle massive data is includes customer computing because they lack enough financial resources to invest on innovations (Wee & Chua, 2013). A SME can increase productivity by utilizing big data technology on end user computers. A SME may find it challenging to implement, manage, and support end-user computing for large amounts of data. A certain set of abilities and knowledge are required for implementations of advanced end-user computing to massive data (Chao & Chandra, 2012).

Solutions of small and medium sized businesses in information technology have been review from various literatures. The following list includes the main IT solutions is that really are especially pertinent to the big data in SME. Software applications focused on the end user. SME's approach to IT is through end user computing. These days, end-user focused application software products can assist SME in data collection at low costs. Examples include small-scale CRM/ERP systems and several commercial software programmes. These user-focused applications can do simple data analysis tasks even if they lack advanced big data analytics technologies (Lin & Wu, 2004; Ilias & Razak, 2011). Social media techniques are increasingly being used by SME's to engage with their customers, partners, and suppliers. A variety of data can be gathered using social media. The use of social media information is fraught with challenges, including data that is incredibly unstructured, noise, confusing data sources, and many others. It could be difficult to use social media analytics technologies. Through social media sites, SME can gain access to a range of strategic counselling resources and entrepreneurial reinforcement learning (Robinson & Stubberud, 2011; Peltier & Naidu, 2012).

Open-source software and public data sources. Open-source applications are very practical for SME because they have substantial IT resource limitations (Macredie & Mijinyawa, 2011). For the purposes of data collection and processing, open-source software tools can be just as effective as comparable commercial alternatives. SME can get training and maintenance at reasonable prices with the use of online user groups. Open government services and data sets can be useful tools for SMEs (Data.gov, 2020).

METHODOLOGY

DOI: 10.48165/sajssh.2024.5507

India currently has several different kinds of SMEs operating there. According to the research, small and medium-sized organizations are unstructured, reactive businesses with flexible structures. Ultimately, it is recognized that a tiny firm is not a little larger one, and that organizational size and strategy implementation have a significant impact on how it behaves and performs as well as how it responds to highly codified market intelligence information. Innovative methods and technologies for information storage & consumption help these firms. To ensure that the complete range of small and medium enterprises represented in this study, the second author physically compiled information using simple random sampling. The target respondents included business owners, managers, directors, and other pertinent staff members who could respond with big data analytics and knowledge management. 230 survey cards were handed out. 210 questionnaires were completed and returned, which is a moderately encouraging response rate. This response rate may seem amazing. SME However, it is common in a nation like India if you are driven, enthusiastic, and have excellent personal recommendations.

The following Figure 1 is using descriptive statistical data for SME organizations of India and the sector of production. To gather relevant information regarding this research topic the researcher set questionnaires as per the following group. Basically, the data has been analyzed basis on the value of Skewness and Kurtosis.

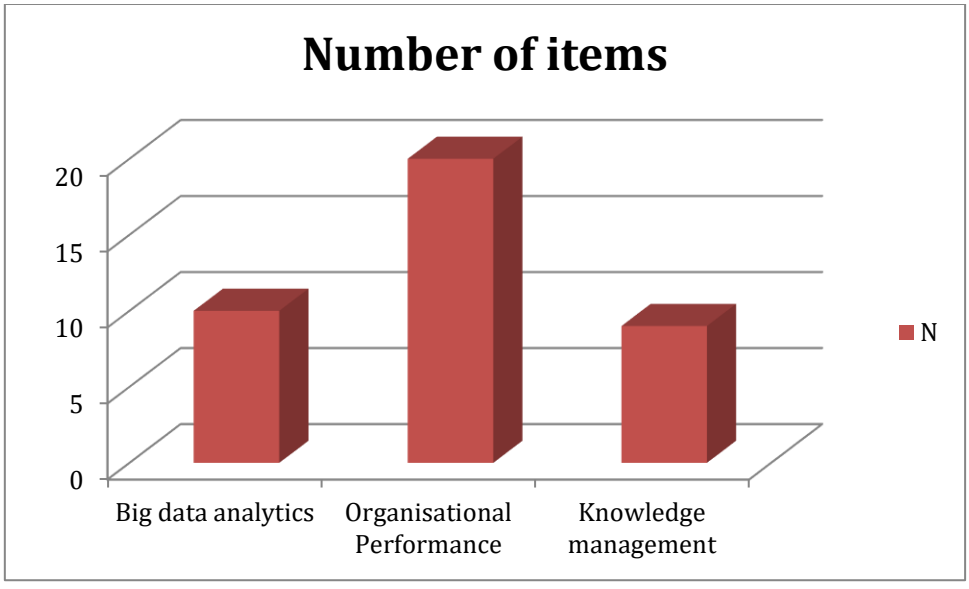

Figure 1: Descriptive statistical data for SME organizations of India

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All of the different factors' Cronbach's alpha values ended up falling within a range that is considered to be appropriate. For example, the value of Cronbach's alpha was 0.89 for the application of big data analytics, 0.97 for the methods used for knowledge management, and 0.94 for the organizational effectiveness; all of these values had been greater than the figure that is considered to be the benefit from additional. As a consequence of these results, a conclusion was drawn that adaptive devices had a high degree of dependability.

The Measurement consistency has been made in the instrument employed a five-point Likert rating (Refer Figure 2 for scoring interpretation) with such a maximum of one denoting "strongly disagree" and five "strongly agree." With an alpha reliability of 0.89, an 11-item scale created by Tirathon and Wieder were modified to assess big data analytics. A modified 21-item scale with such an alpha consistency of 0.97 that was used to assess knowledge management techniques. A modified 10-item scale with just an alpha consistency of 0.94 that was created to gauge organizational performance.

The descriptive and inferential statistics of both the sampled data, such as the age of SMEs and the production industry. After missing data were excluded, 200 questionnaires were taken into consideration for further study.

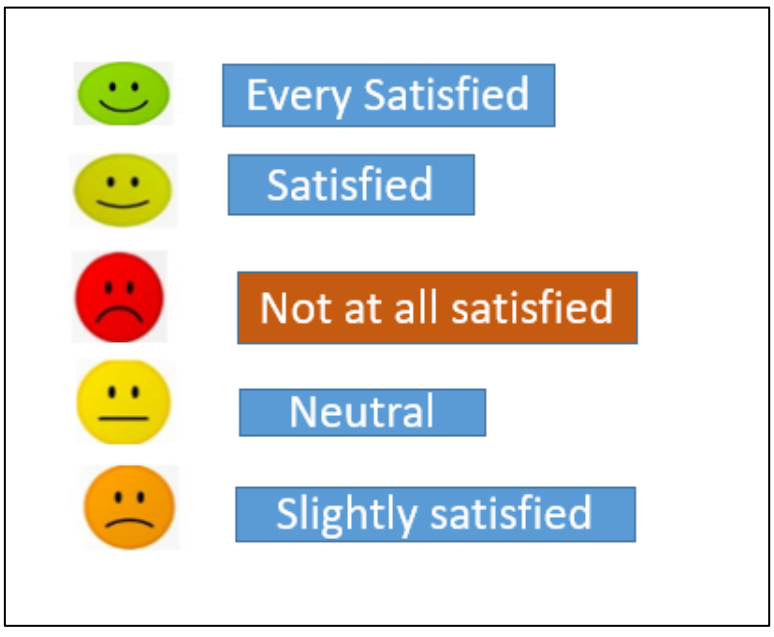

Figure 2: Likert Scale and its scoring interpretation

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RESULTS

Depending on the ethics of "Skewness and Kurtosis", the normalcy of the data was examined. For the normalcy of the data, "skewness and kurtosis" values between 2 and +2 are regarded as acceptable (table 1).

Table 1: *Skewness and Kurtosis for each variable and respective standard of error*

	Mean ± SD	**Skewness**	**Std. error of skewness**	**Kurtosis**	**Std. error of kurtosis**
BDA	2.8251 ± 0.42316	— .261	0.148	— .517	0.312
KM	3.5272 ± 0.70344	— 1.211	0.148	0.16	0.312
OP	3.311 ± 0.71805	— .250	0.148	— 1.147	0.312

Shapiro-Wilk and Kolmogorov-Smirnov tests were also conducted for statistically analyzing organizational performance and reliability analysis of each variable (big data analytics (BDA), knowledge management (KM), organizational performance (OM)) to confirm the normal data distribution. Data was normally distributed, as shown by static values in table 2 all the variables in both tests shows a confidence range of 95% which is found to be significant. Parametric tests are used if the data is exhibiting normal distribution.

Table 2: Kolmogorov- Smirnov and Shapiro- Wilk test of the variables used in this study

	Kolmogorov- Smirnov			**Shapiro- Wilk**		
	Statistic	N	Sig.	Statistic	N	Sig.
BDA	0.126	200	0	0.967	200	0
KM	0.21	200	0	0.788	200	0
OP	0.101	200	0	0.924	200	0

All variables' Cronbach's alpha values fell above a reasonable range; for example, the use of big data analytics, knowledge management methods, and organizational performance all had Cronbach's alpha values over the recommended level of 0.71, at 0.87, 0.96, and 0.93,

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respectively. As a result, it was determined from the results that good reliability distribution is seen in adaptive instruments (Table 3).

Table 3: *Reliability analysis of each variable and respective Cronbach's alpha*

Variables	Cronbach's alpha
Big data analytics	0.87
Organizational performance	0.93
Knowledge management	0.96

The degree of association and the direction of the relationship between the variables are shown in Table 4. There exists a highest correlation coefficient ($r=0.742$, $p<0.05$) among the relation between organizational performance and knowledge management, followed by the relation among knowledge management practices and big data analytics ($r=0.723$, p0.05), and finally the relation among organizational performance and big data analytics ($r=0.584$, p0.05). All variables were significantly associated, according to the results of the correlation study, and there was no multi-co-linearity issue.

Table 4: *Findings of analysis of correlation between each variable*

Variables	Big data analytics	Knowledge management	Organizational performance
Big data analytics	1		
Knowledge management	0.723*	1	
Organizational performance	0.584*	0.742*	1

Outcomes of simple line deterioration in steps 1 or 2 are shown in Table 5, whereas multiple regression is advised for steps 3 and 4. The first step aimed to establish whether or not the use of "big data analytics" was a main predictor in the effectiveness of an organization. Usage of big data analytics revealed a straight result on managerial performance ($\beta= 0.584$, $p<0.05$) when there was a regression on organizational performance (Table 5). The suggestion between

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the usage of "big data analytics" and "knowledge management" strategies was investigated in the second step. It was discovered that there was a positive link among knowledge management methods and the use of "big data analytics" where (β= 0.723, p<0.01).In the third step, we looked for patterns in the relationship between organizational performance and data management performs. It was discovered that there was a favorable association between organizational performance and data management techniques, where (β =.742, p<.05). Step four, which controls the mediating variable (β=.106, p>.05), demonstrates the straight impact of "big data analytics" on organizational enactment.

Table 5: *Reversion of "Big data analytics" through knowledge management on organizational presentation*

Unstandardized coefficients		**Standardized coefficients**				
Step* dependent/ independent variables	B	Standard error	Beta	t-test	Significance level	Durbin Watson
1st step: variable dependent: organizational performance (Total effect) big data analytics R=.584, R2= .345, F (1, 209)= 108.125	0.853	0.07	0.584	10.442	0.000	1.741
2nd Step: variable dependent: knowledge management big data analytics R=0.723, R2= .526, F (1, 209)= 231.489	1.021	0.68	0.723	15.211	0.000	1.503
3rd Step: variable dependent: organizational performance knowledge management R=0.742, R2= .546, F (1, 209)= 252.287	0.767	0.46	0.742	15.881	0.000	2.245
4th Step: variable dependent: organizational performance (direct effect) Big data analytics R=0.746, R2= .551, F (2, 198)= 128.169	0.154	0.097	0.106	1.545	0.125	2.231

*steps according to Baron and Kenny

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DISCUSSION

The goal of the study was to look into and evaluate a BDAC model for improving firm sustainability as well as the mediating role of independent R&D & absorption power. The managerial, technical, & intellectual capacities of big data analytics are more divided into these three groups. The results demonstrate demonstrating “big data analytics” proficiency has a significant, favorable impact on the business's long-standing accomplishment. Primary and foremost, the firm's AS, ability of the management to stimulus human capital, and the business's capacity to create long standing policies to exploit its skills were all significantly impacted by the “big data analytics” running keys (BDAMC), “BDATEC”, and “BDATL”. The organizational administration's analytic abilities enable sound development, particularly long-term development (Azadeh et al., 2016). The technological capacity controls analytics, the exchange of data, concepts, and ideas, the creation of plans for the company's advantages in the market, as well as the capacity to introduce a solid model. An organization can benefit and foster an innovative culture at work when its human resources are talented (Acharya et al., 2018).

Despite the recent quick breakthroughs in big data theory and practice, the practical usage of “big data” in SME is currently being developed. This education examines “big data” from the standpoint of how big data and knowledge management can complement one another. The paper develops a theoretical that incorporates “big data” and KM for SME by using real business circumstances (Christensen, 2001).

Secondary sources helped to support the current assessment of numerous cases. Enterprise applications secondary sources were created without following a predetermined structure. The benefit of using various information of model generation in business applications is that impartiality and fairness are maintained. Use of external sources for business cases has a big disadvantage in that there may not be a proper framework for a given topic. A comprehensive IT allow KM model-based coding system was used as a starting point for this problem's solution via an incremental encoding approach (Wang & Wang, 2009). This paradigm has been expanded with both the big data KM model for SME which has been provided, with a KM is prioritized for SMEs in the age of big data (Bagozzi, 1980).

While numerous studies have highlighted the independence and external impact of these components which have shown how support from senior management may considerably help

DOI: 10.48165/sajssh.2024.5507

with the acquisition and application of cutting-edge technologies, like BDA. In order to generate economic value from novel technology, according to, senior management should be crucial in developing the appropriate vision, connecting pertinent methods, and then overcoming alignment difficulties. This study shows how both regular people and powerful decision-makers are capable of making investments. For BDA technology, organizations require a rigid structure for obtaining, analyzing, and integrating crucial data. This necessitates collaboration between all organizational divisions to enable a flawless execution. In this way, businesses may create the essential value to support true sustainable development. The idea of environmental sustainability was created to realize that the globe must expand while protecting peoples' prosperity and peace both now and in the upcoming. BDA has the supreme ability to tackle a variety of societal issues and individual issues that these objectives are currently addressing. Therefore, employing efficient BDA acceptance and implementation strategies may contribute to the development's added value. Organizations can therefore carefully study and use insights related to organizational processes &procedures, such as efficiency, durability, customer retention, product and service quality delivery and or encounters, in addition to economic edge (Wang & Wang, 2009).

The HSR adaptation was positively impacted by the BDAC overall. Because each of the big data analyst's characteristics is crucial to a firm's long-term success and is interconnected with the others, the corporation paid close attention to all of them. There is a strong and beneficial connection between the BDAC & autonomous R&D. The most recent findings of the study evidence for big data analytics, leadership, technical expertise, and talent all significantly affect how autonomous R&D operations are. By utilizing big data analytics, businesses are motivated to concentrate on the autonomy of the elevated rail system of China routes. Business case studies typically serve as the foundation for managerial theories, as was covered in the methodology section. A conceptual model is developed in this study using a qualitative analysis method based on numerous business scenarios (Macredie & Mijinyawa, 2011). As contrast to conventional methods to formulation & validation of theories & conceptualizations using subjective poll results, the utilization of numerous business examples can guarantee that the big data KM model for SME is already in line with reality. Because the current proposed model was built using the scant number of documented business instances for SMEs of big data, the study does have some limitations. The company's business plan was developed using just a few instances. These qualitative data could have been biased or wrongly coded. The conceptual KM model presented in this study has to go through more validation and verification.

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Independent case studies and more experimental evaluation of the proposed paradigm are needed. The big data KM strategy for SME will be improved by further study (Diakoulakis et al., 2004).

The research also examined the part of absorptive volume in arbitrating the association between BDAC and favorable continuing growth. According to the results, which are in line with earlier research, absorptive capacity effectively mediates the association. The investigation of how autonomous development and research affects the interaction between BDAC and OSD was the study's main objective. This research demonstrates that the link among big data analytics likewise, high-speed rail's long-term, sustainable growth can be accelerated by having greater control over R&D (Macredie & Mijinyawa, 2011).

CONCLUSION

Each phase has produced significant and positive results. The first step of big data analytics deployment has been found to significant and favorable to affect organizational performance. This discovery is in line with past research. For instance, Ji-fan Ren and Fosso Wamba recognized the advantages of adopting big data analytics to improve organizational performance in a study. Big data analytics have been shown to have a significant and positive effect on knowledge management strategies in the stage 2 as well. This outcome is in line with what was discovered in the earlier study. The third phase, like the previous, demonstrates a positive and considerable influence of data management methods on the enactment of the organization. The results of prior studies have also supported this conclusion. For example, a research that looked at the impact of knowledge supervision approaches on act of the organization found that all these methods have an optimistic and important impression. Steps 04 further reveals that the acceptance of knowledge management techniques has a significant and optimistic moderating result on the association among “big data analytics” use and recital of the society. The use of “big data analytics” in this scenario is higher than it was before limiting knowledge management practices, accounting for 55.3% of the overall difference in presentation of the group after controlling a mediation mediator (knowledge management practices). Therefore, it is inferred that knowledge management strategies implicitly moderate the relation among the usage of big data analytics and performance of the organization.

This discovery is an original influence to the body of recent work and is based on a unified model that assesses the relation among the request of “big data analytics”, data management

DOI: 10.48165/sajssh.2024.5507

policies, and organizational recital. Theoretically, this study contributes to the body of knowledge on organizational presentation by illuminating the part of information administration techniques in mediating the link between the uses of big data analytics with organizational presentation.

This education produced a number of important discoveries that have implications for theory, investigation, and practice. As a result, this study suggests that knowledge management practices, in association to the direct relationship between the implementation of big data analysis and organization effectiveness, also partially mediate that relationship. Inside the literature on big information and organization effectiveness in the context for SMEs in almost any developing nation, this study's unique discovery has never been tested

DOI: 10.48165/sajssh.2024.5507

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