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A New Big Data and Logistic Regression-Based Approach for Small and Medium-Sized Enterprises

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Abstract
Businesses are being asked to assess an expanding volume of actual semi-structured and unstructured statistics to address the obstacles of internationalization and deal more effectively with the uncertainties of international integration. Big Data (BD) analytics can therefore play a strategic role in promoting the international expansion of Small and Medium-Sized Enterprises (SMEs). The exact connection between BD Analytics and globalization has, however, only been sporadically examined in the existing literature. In this study, a quantitative analysis using a Logistic Regression (LR) concept revealed that the interaction effects between BD Analytics architecture and BD Analytics functionality are both helpful and significant but the connection between the management of BD Analytics architecture and the Degree of Internationalization (DI) is not required for internationalization development. This shows that increasing internationalization in SMEs requires more than BD Analytics governance alone. Instead, this study emphasizes the importance of building particular BD Analytics abilities and the availability of a beneficial interaction between management of BD Analytics architecture and BD Analytics abilities that could take advantage of the new information gained via BD Analytics in SME global expansion.

Keywords: - Internationalization, Small and Medium-Sized Enterprises (SMEs), Big Data (BD), Logistic Regression (LR)

I INTRODUCTION

Researchers in the field of information systems (IS) have been studying the impact of Big Data (BD) on businesses' bottom lines, internal operations, and customer service for the last decade. Existing businesses as well as startups are making significant financial commitments to develop their Big Data Analytics (BDA) capabilities [1]. The goal is to use the data in a way that yields useful information so that people and organizations can make and share well-informed choices. The urge to apply the data across the smaller day-to-day management areas has become a need for businesses as the processing capacity at an analyst's fingertips has increased rapidly [2]. These traditional BDA-supported management tasks have matured into their own distinct research fields while maintaining linkages to established paradigms in the field. However, there is a lack of studies that identify these newly developing management domains that make the most of successful BDA methods in the modern day [3]. Despite the recent boost BDA has gotten, the challenge of investigating the management implications of BDA in a variety of contexts remains mostly uncharted. The algorithms and intelligence behind BDA have been the primary subject of previous research. Fewer studies, from an organizational perspective, have linked BDA adoption to the kinds of human abilities that will be necessary to put it into practice. Because of this, the ways in which these resources (algorithms and intelligence component with the management inside organizational elements) interact is still a relatively uncharted domain [4].

Over the last decade, most study fields in the analytics domain have included either text-based information retrieval or multimedia (picture and video) based information retrieval. The necessity for BDA frameworks to be developed and studied across many management domains was spurred by the continuous but fast expansion of text and multimedia data as a result of the advent and spread of the internet. Several applications and instruments have been developed for the purpose of formulating, querying, and processing various BD in relation to textual and multimedia components [5]. This paves the way for three distinct types of analytics to be performed using BD. Descriptive analytics include things like reporting, dashboards, and visualizations; discovery analytics include things like summarizing text and extracting features from images and videos to identify emerging trends; and predictive analytics are primarily driven by anything from a wide variety of econometric models to complex machine learning models to predict future outcomes [6].

Recently developed user-friendly BD processing software and hardware has sparked a rise in BDA discussions at the executive level, but there is a dearth of research addressing

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the topic from the perspective of management domains, applications, and theories [7]. Significant study on the usefulness of BDA by IS or general management academics is hampered by the absence of examination of BDA applications in some of these new management domains, or not totally define management fields. The result is that management professionals have to explore unfamiliar territory by trial and error, a method that is both time-consuming and costly [8]. Understanding the fundamentals of IS application and management is crucial to developing sound theoretical and managerial frameworks and locating promising research topics for the next generation of IS academics. Because of the exponential increase in daily data records, BDA applications have so far been investigated exclusively in private sector management practices [9]. Even in the public sector management sectors that may benefit from BDA's solutions and services, this creates a large research deficit. As a result, this has the potential to advance various modern management fields inside the public sector. In order to pique the interest of future IS researchers, it is important to highlight the types of issues addressed by BDA. Growing familiarity with data among public sector practitioners is a key factor in BDA's ability to cut waste and boost income. Researchers have paid more attention to BDA using public sector data, but more work is needed to translate the findings to managerial practices [10].

1.1 Implementation of big data in international organization

Whether a company is large or small, the value it can extract from new data mining methods is expected to skyrocket. However, the first barrier for SMEs is the price of big data. The infrastructure required to store and analyses massive amounts of data is expensive to both acquire and maintain. Consequently, small and medium-sized enterprises (SMEs) should pinpoint the particular problem they need to address before shelling out cash for an expensive solution. Improved data sets based on a holistic understanding of customers' attitudes and actions allow managers to make more informed decisions than the traditional management approach, which relies on managers' limited experience and knowledge of customers. Small and medium-sized enterprises (SMEs) may benefit from data if they are able to properly estimate its quantity, variety, velocity, and veracity. Learning takes occur against the contexts of the organization's inner workings and its external environment [11]. A company's organizational environment includes its structure, technology, identity, goals, incentives, strategy, and business network. Competitors, customers, cultures, and governments are all examples of external factors that contribute to the environmental setting. Successful businesses know that there is always something to be learned from failures as well as accomplishments. Companies like these want to do more than just control costs. In order to start optimizing their operations, seasoned businesses are inventing more efficient means of collecting, integrating, and acting on data [12].

Adjusted to new circumstances; in order to remain competitive, effective businesses must evolve throughout time. There is less of an emphasis on cost reduction and more of an emphasis on client profitability in transformed firms. New business tools and cutting-edge approaches must be prepared in anticipation of potential future problems. Although in theory ERP technology and other forms of contemporary strategic management might be useful, in fact they are out of reach for most small businesses. Small and medium-sized enterprise (SME) researchers have a significant methodological challenge in the form of cost-effective data collecting and processing. The process of refining business data may be sped up with the help of solutions like Hadoop, which provide great computational power and data integration options. Traditional e-commerce infrastructure, services, and business models are profoundly impacted by the rise of cloud computing.

Businesses must be ready for the impact of big data on their operations if they are to gain the benefits of this data and make better choices. The term "business intelligence" (BI) refers to a broad category that includes a wide range of resources that help businesses gather data from many sources, enhance it for analysis, perform queries on the data, and visualize the findings so that they may make informed choices [13]. There are three ways in which analytics provide value to a company: by improving knowledge and making operations smarter, by cutting down on wasteful practices, and by raising profits. The business intelligence technology offers a variety of solutions that may be used locally or in the cloud. Although cloud integration services may not have as many bells and whistles as on-premises software, they nonetheless provide more than enough features to satisfy most businesses' needs. In recent years, open source data mining tools for both desktop and online use (such as KEEL, KNIME, and Orange) have graduated from the experimental phase and into actual production, providing a timely chance to deal with massive data sources.

Complexity of the big data ecosystem has increased the need for skilled analysts. To maximize the effectiveness of a capability integration, we need extensive practice in that area. More data is not the key to successful data mining. Organizations require a schema to summarize, classify,

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store, and interact with data due to its immense variety, volume, and volatility from numerous sources [14]. Data integration and finding a way to extract value from a company's internal and external data is a major challenge for many CIOs today. Finally, risks must be appropriately handled if they are to be transformed from a problem into an opportunity.

The absence of skilled labor negates the utility of technological resources. Every company strives to create value by doing research and allocating resources in the most efficient way possible. When an organization's resources, personnel, and expertise are all in sync with its strategic plan, a new value creation horizon opens up. When IT and business expertise are brought together, data quality is guaranteed. Firms may benefit from improved decision-making in the face of market competition by acquiring and analyzing data that are more complete. The data opportunity has passed. Both the data supplier and the user may benefit from this. Cloud computing serves as a foundation, offering low-cost service for archiving and analyzing huge data from a variety of sources. The pay-as-you-go computing concept is especially appealing to small and medium-sized organizations. In a pay-as-you-go system, the availability of resources is often elastic, with an apparently endless amount of computing power and storage accessible on demand [15].

Data on the cloud is often stored in a shared environment with data from other customers, since the cloud is a multi-tenant system. Thus, any recommended solution should safeguard data, secure data ownership, and combine data from several sources into a single authoritative source. The term "software as a service" (SaaS) was used to describe systems in which several users accessed the same server and data. Platform as a service (PaaS), on the other hand, allows for flexible sharing across a wide variety of apps with radically dissimilar data structures [16]. A service level agreement (SLA) defines the obligations of both the cloud service provider and the cloud service clients in an environment where the security and trust of each domain varies. Contracts involving SLAs often include a wide range of countries, each of which may have its own set of laws and regulations concerning, for example, how personal information stored in the cloud must be protected.

Big data is a game-changer for economic globalization. The advent of the big data age has altered the structure of international commerce. Chinese businesses engaging in international commerce should tap into internal resources and seize the moment. In order to meet the demands of an ever-evolving global market, businesses must re-integrate their resource allocation logically and make full use of big data to categorize information and progressively enhance their analytical skills [17]. The only option for businesses to further the international division of labor is to optimize and alter their corporate structure. Strengthening the global division of labor will help them capitalize on their comparative advantages and enter the global market. The data-era business model is integral to the import-export activities of Chinese corporations. The trade market can only advance in the context of economic globalization if big data is completely integrated. Businesses may turn the difficulties they encounter in international trading into new possibilities.

When national economies become interdependent and interconnected via international commerce and other ways, a global organic economy is created. With the advent of globalization, there has been a convergence in the cross-regional movement of commodities, technology, information, and managerial experience, to name a few production variables [18]. Economic globalization is an important trend in world economic growth. Strategic approach to the international trade market an organization's future success may be mapped out with the help of reasonable, scientific, and efficient planning [19]. Therefore, businesses need to prepare for the foreign market as part of the process of importing and exporting. Over the last several years, businesses have been paying more attention to the implementation, and they are dedicated to figuring out the best path for international commerce in light of the broader trends of economic globalization and big data. In addition, internationalization of businesses is greatly aided by a well-thought-out marketing strategy that makes use of big data. In this approach, the growth of companies' international commerce might be stymied [20]. In this age of big data and economic globalization, it is more crucial than ever that businesses have access to top-tier personnel if they want to retain effective management. The need for skilled data professionals is sky high [21].

Enterprises need human resources to help them keep their international commerce operations running smoothly. All that's needed is a focused effort to recruit top-tier individuals, followed by a comprehensive overhaul of the company's internal data infrastructure and intensive training for all employees involved in international trading [22]. Economic globalization and the growth of business import and export commerce impose unavoidable demands on the fundamental technological level of enterprise data analysis, necessitating its constant improvement. The effectiveness of business data analysis is particularly relevant when dealing with international trade markets,

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where the core technological level of enterprise data analysis frequently has a considerable impact on the competitiveness of companies' import and export trade markets. As a result, businesses nowadays need to pay close attention to continuously enhancing the fundamental technological level of company data analysis [23].

By way of illustration, businesses may meet the best graduates of the year if they focus on acquiring talent in international commerce. Companies may seek to hire college graduates with degrees in fields such as international economics and trade, information technology, and computer science in order to adopt cutting-edge strategies for international commerce [24]. Second, the approach gives companies some wiggle space when it comes to pay raises. If businesses are serious about attracting top data processing talent in the import/export sector, they must establish management control measures throughout the recruitment process and provide more clarity around the talent management system. The company may deploy workers overseas to learn new skills and network with peers in order to advance its data processing operations on a permanent basis. Moreover, businesses may manage internal talents by creating reward and punishment systems and yearly performance reviews. Employees are pushed to reach their full potential in this manner. Since this is the case, it may entice professionals with experience in big data and international commerce to join the company's ranks [25]. Effective techniques to enhance optimum import and export commerce include integrating employees inside the firm and promoting professionals.

II RELATED WORKS

Big data is currently "high-dimensional, enormous, and real-time," according to this definition. Big data analysis can help individuals comprehend data more effectively, while predictive significance analysis can draw certain conclusions about the future based on the findings of both visual and big data analysis. As a result, this study by C. Pan and Z. Wu (2021) focuses primarily on the bank's big data-based lending strategy for small, medium, and micro firms and performs quantitative analysis using data from publicly accessible indexes [28]. It creates a method for evaluating credit strategy decisions on lending, loan interest rates, and loan limits. The comprehensive evaluation method is used to examine the bank's approach to providing loans to businesses.

Electric power companies are beginning to use new technology to handle the vast amounts of information and data as a result of the continual rise in data and information consumption in the network environment, in an effort to fully realize the value of data. Enterprises must take advantage of the potential presented by big data and aggressively address the issues it presents in order to remain unbeatable in the harsh market rivalry. According to the actual research by L. Peng and X. Duan (2020), optimizing an enterprise's marketing strategy requires realizing effective protection of customer privacy information, boosting the relevance of marketing activities, and carefully planning out marketing strategies [29]. A managerial activity known as corporate marketing involves a number of social relationships, including those with producers, distributors, and consumers. The main goal is to create a rational and logical link between diverse social relationships so that everyone can come out on top. The demand for the market and customers is largely reliant on static research and written descriptions in the traditional marketing model and the company's attention to its dynamic changes cannot be quantified in detail due to a lack of actual data.

The three areas of talent management covered in this work by W. Ma (2022) are talent evaluation and development, talent assessment and incentives, and talent recruitment and selection. Big data opens up new possibilities for human resource management in small and medium-sized businesses, which emphasizes the importance of this function [30]. This article will examine how small and medium-sized businesses manage their human resources in the context of big data. The advancement of this management task can help small and medium-sized businesses boost their competitiveness in order to ensure that the standard of human resource management is improved.

In Anhui Province, small and medium-sized businesses continue to struggle with a number of issues against the backdrop of big data. Financing is a challenge. Based on qualitative and quantitative analysis, M. Qiufang (2020) examines the current state of small and medium-sized businesses in Anhui Province and the financing challenges faced by these businesses in the context of big data[31]. This paper proposes a few solutions to address the financing issues faced by small and medium-sized businesses in Anhui Province in the context of big data: enhancing the development of small and medium-sized businesses' self-management systems and finance awareness; The writers will enhance the foundation of the concept of credit guarantee, upgrade small and medium-sized enterprises' credit ratings, and fully rely on state policies to improve the financial financing system for these businesses. They will also develop new avenues for their funding.

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The growth rate of small and micro businesses in the market economy is accelerating as a result of the nation's increased support for these businesses. All businesses in the market now have access to previously unheard-of business models thanks to the advent of the big data era. Small and micro businesses can use data platforms and cloud computing platforms to successfully handle their own economic development issues and continuously improve their market competitiveness [32].

In particular for the internal control evaluation system of organizations with rich core data exchange, privacy protection and information security are two major concerns facing the advanced big data era in the future. Blockchain technology offers a variety of privacy protection techniques. This paper by X. Chen (2021) focuses on the privacy protection of internal control evaluation of businesses using big data and blockchain technology, and it offers a useful system and platform framework for business managers to carry out internal control work [33].

Purpose For businesses, the information technology (IT) sector, and the research communities, big data has created both opportunities and challenges. Small and medium-sized businesses (SME) are currently utilizing their limited resources to manage big data. This paper's goals are to define the synergistic link between big data and knowledge management (KM), examine the problems and IT solutions associated with big data for SME, and build a KM model of big data for SME based on the gathered actual business examples. Design/methodology/approach the report compiles eight well-documented cases of big data analytics success in SMEs and analyzes these cases' qualitative data in the context of knowledge management. A KM model of big data for SME is revealed by the qualitative data analysis of the numerous situations. Findings The presented model illustrates the beneficial interaction between big data and knowledge management. It suggests that the key components of KM of big data for SME are knowledge guided big data project planning, strategic use of data, IT solutions for SME, and new knowledge products. Through their causal connections, these components create a loop. Limits and implications of the study The KM model was derived from a relatively small number of cases. These qualitative data may have been coded incorrectly or with bias. The basic KM model put forward in this research by Wang et al. (2020) must therefore undergo additional evaluation and verification. Real-world applications The suggested model can direct SME to utilize big data for business by emphasizing KM rather than complex IT techniques or the volume of data [34]. Originality/value By creating a theoretical model of KM of big data for SME based on underlying dimensions of strategic use of data, knowledge guided big data project planning, IT solutions for SME, and new knowledge products, the study contributes to the literature on knowledge management.

Technology and wisdom working together is the secret to sustainable corporate growth. Organizations must come up with fresh ways to handle the growing amount of public and private data in order to produce knowledge, improve decision-making, and provide value. Smart businesses are utilizing online technologies and beginning to prepare their big data strategies as the big data boom continues. However, a big data strategy is still lacking in many firms. SMEs may not be as equipped to analyze new data sets as major corporations, which present a hurdle. Due to the volume, velocity, and variety of data, standard data processing methods are also insufficient for SMEs' decision-making. We require fresh talent, tools, and technology to address this issue. SMEs that have emerged to take advantage of big data's potential are utilizing open-source software and cloud computing to achieve a variety of objectives. This investment's primary objective is value as a novel idea in the big data era [35]. The report by Shokri Kalan et al. (2016) focuses on future technological needs and emerging trends for SMEs.

Purpose Big data analytics (BDA) is seen as a turning point for businesses looking to boost productivity. Small and medium-sized businesses (SMEs) are essential to every economy, yet they are far behind in adopting BDA. This study intends to integrate the technology-organization-environment (TOE) model and resource-based view to produce a single, unified model for the adoption of BDA among SMEs. Design/methodology/approach To evaluate the model of this study, a survey of 112 manufacturing SMEs in Iran was done. The results were then analyzed using structural equation modeling. Findings The findings provide proof that the technological, organizational, and environmental settings mediate the relationship between the performances of SMEs. The results also showed that in the context of SMEs, organizational and technological factors are the more important predictors of BDA adoption. The findings of this study by Parisa Maroufkhani et al. (2020) further supported the notion that BDA adoption might improve the financial and market performance of SMEs. Real-world applications The ability of SMEs to understand the significance of the most important factors (technology, organization, and environment) in the adoption of BDA is made possible by the provision of a single, unified framework for BDA adoption [36]. Additionally, this study

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might persuade SMEs to be more open to using BDA in their operations. Originality/value although studies on BDA adoption and firm performance in large organizations exist, empirical work specifically on SMEs using the TOE model is lacking. SMEs are smaller than large businesses and have different resource availability. In order to help SMEs benefit from the adoption of such technology, this study sought to establish a conceptual framework for BDA adoption.

III PROPOSED METHODOLOGY

Figure 1 depicts the overall proposed framework of this research. Initially, we gather information of the enterprises and the dataset can be normalized to eliminate the unwanted or duplicate data using min-max normalization approach. Then, for this research, we develop certain hypotheses to analyze the impact of BD Analytics in the SMEs and interaction between BD Analytics and BD Analytics capabilities. Also, Logistics regression (LR) model is used for statistical analysis in this research.

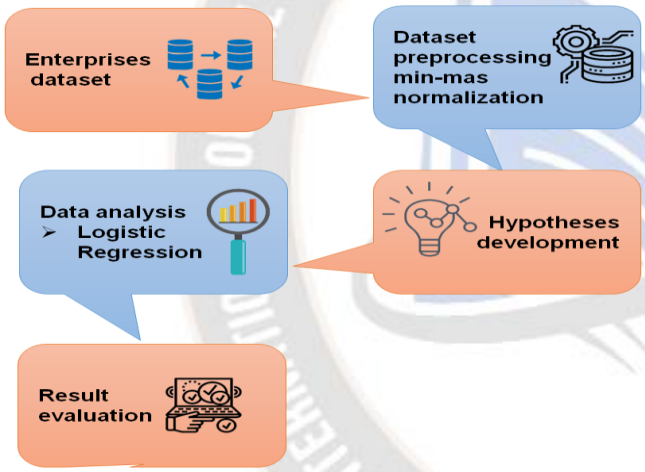

Figure 1: Proposed framework

2.1 Data preprocessing using Min-max normalization

To normalize a property, we scale its values such that they all lie inside a certain range. Normalization is an essential step in classification frameworks that use computational models or proximity metrics. By normalizing the input values for each measured attribute in the training set, the learning phase of classification using the neural network back propagation technique will proceed more quickly. The linear transformation of the initial data is the goal of "min-max normalization". Suppose that the minimal and maximum values are for an characteristic Z are $minZ$ and $maxZ$. Value of A, b_x, is mapped to b_x in [new- $minZ$, new- $maxZ$] by using the following equation (1):

$$\ddot{A}_x = (a_x - minZ)/(maxZ - minZ) * (new_{maxZ} - new_{minZ}) + new_{minZ} \quad (1)$$

After min-max normalization, the correlation between a dataset's original values is maintained. The likelihood of "out-of-bounds" mistake increases if a subsequent normalization input scenario exceeds the initial data range for Z.

2.2 Hypotheses development

Hypothesis-1 (H1): The management of BD Analytics technology in the environment of SMEs has a favorable impact on the DI.

Hypothesis-2 (H2): The DI is benefitted by BD Analytics abilities in the setting of SMEs.

Hypothesis-3 (H3): Positive inter-relationships that result in a greater DI are produced by the interaction between the management of BD Analytics architecture and BD Analytics abilities in the setting of SMEs.

2.3 Statistical analysis

2.3.1 Logistic Regression (LR)

The most common logistic design is the proportional odds (PO) design, which has been created.

If the answer parameter Y was ordinal, such as "fitness condition good/moderate/bad," the groups may be sorted organically. It is possible to utilize the polytomous logistic regression model, but it does not make use of data sorting. A method to account for the sorting is the use of cumulative chances, cumulative odds, and cumulative logits. The equations (2) to (4) show how those numbers have been described in (g+1) sorted groups.

$$Q(B \le i) = q_1 + \cdots + q_i \quad (2)$$

$$(B \le i) = \frac{Q(B \le i)}{1 - Q(B \le i)} = \frac{q_1 + \cdots + q_i}{q_{i+1} + \cdots + q_{g+1}} \quad (3)$$

$$(B \le i) = ln\left(\frac{Q(B \le i)}{1 - Q(B \le i)}\right), i = 1, \ldots, g \quad (4)$$

The cumulative logistic expression for ordinal response data is defined as (equation (5),

$$logit(B \le i) = \alpha_i + \beta_1 A_1 + \cdots + \beta_{ik} A_k, i = 1, \ldots, g \quad (5)$$

For each group/covariate pair, we obtain several analytical solutions (g) and a single logistic variable (β).

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The generalized cumulative logistic regression approach therefore has a large number of variables. However, in other situations, a frugal approach is practical. If I is not a factor in the logistic parameters, then there is only one common variable among all covariates. As a result, equation (6) was used to determine the cumulative odds:

$$odds(B \leq i) = \exp(\alpha_i)\exp(\beta_1 A_1 + \cdots + \beta_k A_k)\ , i = 1, \ldots, g \qquad (6)$$

The odds remained proportionate because the only way the m odds for each cut-off group 'i' change is in respect of the intercepts.

IV RESULTS

Using LR analysis, we verified the hypotheses, and Table 1 shows the findings. Model A shows how the control variables have an impact only on internationalization activity. Model B, on the other side, is used to assess the effects of the two individual variables (BD Analytics abilities and structure management), whilst Model C suggests interaction terms to examine the interactive effects between the two variables. Model A has an F-value of 5.29 ($p<0.001$), a R^2 of 0.15 (modified R^2 is 0.12), and both are positive.

Table 1: LR outcomes

Factors	DI		
	Model A	**Model B**	**Model C**
Management of BD Analytics structure	-	− 0.01 (− 0.11)	− 0.12 (− 1.02)
Management of BD Analytics structure x BD Analytics abilities	-	-	0.19 (2.09) *
BD Analytics abilities	-	0.55 (5.53) ***	0.54 (5.88) ***
Enterprise era	0.07 (0.47)	0.15 (2.12) *	0.19 (1.96) *
Enterprise's size	0.08 (2.15) *	0.02 (0.03)	− 0.13 (− 0.16)
R&D	0.37 (3.85) ***	0.33 (3.62) ***	0.27 (3.32) **
Geography_2 (1=Center of Italy, 0=nil)	0.05 (0.22)	0.04 (0.23)	0.05 (0.51)
Geography_1 (1=Italy's north region; 0=nil)	0.04 (0.20)	0.05 (0.21)	0.07 (0.15)
Enterprise (1=high-technology, 0=low-technology)	0.03 (0.34)	0.075 (0.77)	0.05 (0.56)
Geography_3 (1=Italy's south region' 0=nil)	− 0.05 (− 0.44)	− 0.04 (− 0.31)	− 0.07 (− 0.45)
$*_{p<0.05}; **_{p<0.01}; ***_{p<0.001}$			

The results of the empirical investigation show that BD Analytics has a favorable impact on the international success of medium-sized Italian enterprises (measured by the international sales proportion). Even so, the assessment shows that such BD Analytics abilities have an effect on internationalization in a direct and positive manner (in Model B, the standardized coefficient is 0.51 with a t-value of 5.56, $p<0.001$), whereas the governance of the BD Analytics architecture that relates to our H1 does not demonstrate any significant impacts (Model B and Model C).

The negative effects of the interplay between the management of the BD Analytics architecture and the BD Analytics abilities on internationalization activity are shown in Model C. The findings show that the interaction effect is both positive and significant ($\beta=0.20$, $t=2.18$, $p<0.5$).

Additionally, in the dataset, company age has a positive impact on internationalization achievement ($\beta=0.22$, $t=2.54$, $p<0.5$). Interestingly, the statistics reveals no significant outcomes for company size or industry. Additionally, there are no apparent distinctions between northern and southern Italy in terms of the geographic placements of businesses.

Table 2: Results of comparative analyses

	Energy usage (J)	**Run time (s)**	**Cost reduction (%)**	**Scalability (%)**
IoT+DL	65	8	9	75
Blockchain	72	11	13	86
Big Data [proposed]	45	6	21	96

The comparative analysis is also discussed below with both proposed (Big Data) approach and existing approaches (Blockchain and IoT+DL). The performance of both proposed and existing approaches is examined in terms of energy usage, run time, implementation cost reduction, and

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scalability level. The overall results of comparative analyses are depicted in table 1 and figures 2 and 3.

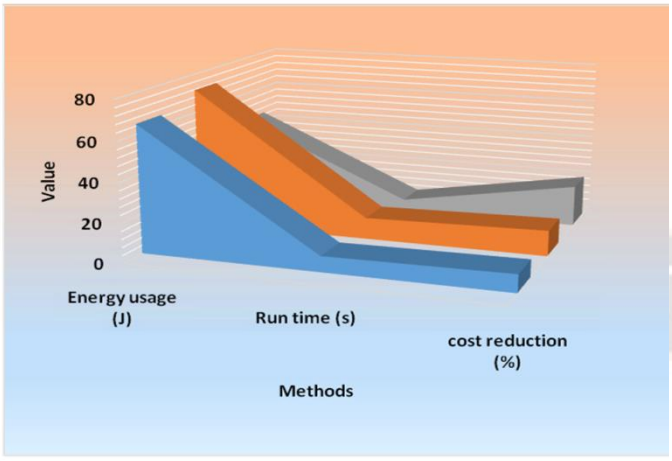

Figure 2: Results of comparative analyses

The term "energy usage" represents the amount of energy that is utilized by the system. From the above analysis, the Big Data takes less energy to operate than other existing technologies like IoT+DL and Blockchain. When discussing how long it requires for an implementation model to perform a certain task, we talk about how time it takes to "run" the model. Figure 2 depicts the comparison of run time and it expressed in sec. From the analysis of figure 2, it can be concluded that the Big Data technology takes fewer time to run than other existing technologies like Blockchain and IoT+DL.Strategies for reducing costs are methods and ideas for enhancing performance without increasing spending. From the analysis, it can be concluded that the Big Data technology takes fewer cost to implement than other existing technologies like Blockchain and IoT+DL.

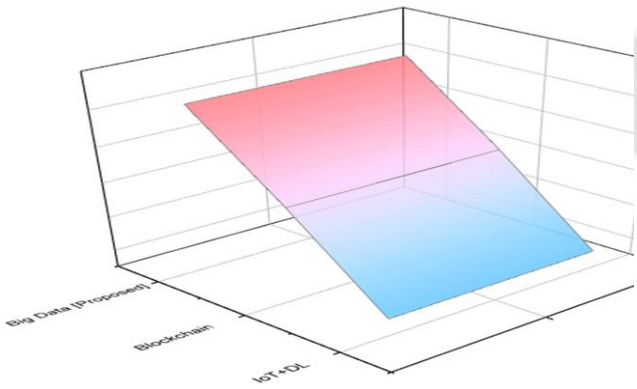

Figure 3: Comparison of scalability level

The term "scalability" describes a system's or network's capability to continue functioning effectively despite a growing number of users or requests. In the face of increasing operating requirements, a scalable system would be capable of keeping up with them, if not enhance their efficiency. From the analysis of figure 3, it can be concluded that the Big Data technology has highest level of scalability than other existing technologies like Blockchain and IoT+DL.

4.1 Discussion

This study's goal is to examine how BD Analytics affects internationalization in the setting of SMEs. More precisely, we take into account the management of the BDA system and BD Analytics abilities as two BDA-related variables. Both of them were anticipated to be essential in the creation of our hypotheses. We looked at the individual and combined effects of such 2 different notions and discovered that, while BD Analytics abilities have an impact on internationalization activity, management of BD Analytics architecture doesn't really. The interaction term's inclusion in the regression model yields an additional intriguing result in this research demonstrating favorable and substantial interactive effects between the management of BD Analytics architecture and BD Analytics abilities.

According to the study's findings, SMEs may face difficulties due to the intricate nature of the hardware design and resources required for BD Analytics, which must be overcome by creating specialized ad hoc abilities [26]. As a result, the findings emphasize the significance of managerial skills in deriving value through big data, supporting earlier research emphasizing the significance of diverse data collection and analysis techniques. The need to synchronize the entire organization and create a big data-driven culture that is not simply limited to the expert level is highlighted by the speed at which businesses are required to function and the uncertainties they must deal with in international markets [27, 28].

V CONCLUSION

This study offers practical insights for businesses. In actuality, SMEs must cope with the known risk of insignificance as part of their internationalization process. By investigating and scanning global markets, evaluating country risks, and identifying new partnerships to create partnerships with or invest in international direct investments, SMEs can more effectively conduct business abroad while addressing these issues. Nevertheless, SMEs have fewer money and resources than larger businesses, so investments must be sufficient to keep them from consuming resources without adding anything to the business. The research's findings imply that, unless SMEs make a significant effort to build their BD Analytics

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capabilities, engaging in the management of BD Analytics systems to enhance internationalization activity may not be beneficial to them. In order to promote a shift in corporate culture toward more data-driven businesses, SMEs must engage in BD Analytics architecture while enhancing management features. In addition, SMEs should be capable in using big data to control their human resources efficiently, boosting productivity and reducing expenses, particularly by keeping an eye on local teams working abroad and attempting to raise employee satisfaction levels. SMEs should be willing to learn from the successes of more established, larger firms who have already put in place effective economic analytics and BD Analytics systems in order to improve their BD Analytics effectiveness.

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