

# A COMPREHENSIVE REVIEW OF THE MULTIFACETED INFLUENCE OF BIG DATA ANALYTICS CAPABILITY ON ORGANIZATIONAL PERFORMANCE

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## ABSTRACT

*The tourism sector is one of the key pillars in Saudi 2030 Vision. However, on the one side, the tourism sector experienced recession due to the COVID-19. On the other side, Saudi Arabia aims to diversify its economic and reduce the oil reliance, calling for improved performance in the tourism sector. BDA has the potential to improve the Tourism sector. However, BDA need several resources and capabilities. It is expected that the more the capabilities a company posse, the higher the benefits they can make from big data. Although numerous studies have observed the positive impact of BDACs on firm performance, the results vary and more investigations are required, especially within various cultures. The present research question is, how do BDACs impact firm performance, and what insights can be drawn from existing studies that benefit Saudi Arabia tourism companies? The aim of the current paper is to 1) review and synthesize studies that investigate the impact of BDACs on firm performance 2) identify the potential of BDACs in improving performance 3) identify key BDAC Components, 4) identify related gaps and future directions. The studies explored diverse capabilities, and a consensus emerges on the inadequacy of a singular indicator to comprehensively capture BDAC. Instead, there is an interplay of tangible, human, and intangible capabilities, collectively shaping an organization's BDAC. More importantly, the overall insight gained from the review strongly supports the positive impact of BDAC on various performance indicators. No research has been undertaken to examine the effects of BDAC on performance within the context of Saudi Arabia, especially the Tourism companies. In addition, it is worth noting that there is a limited body of research that has specifically examined the impact of data-driven culture (DDC) on organizational performance. Most of the studies are quantitative in nature, while a limited number of studies followed a mixed approach. The review emphasizes on a need for empirical research to demonstrate the potential of BDAC in enhancing the performance of tourism enterprises in Saudi Arabia.*

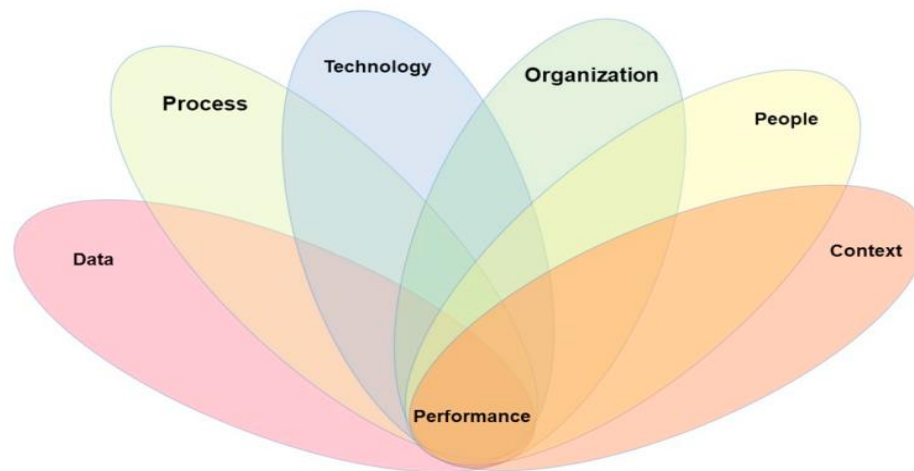
**Keywords:** Big Data Analytics Capability (BDAC); Big Data Analytics (BDA)- Data-Driven Capability (DDC); Technological Capabilities (TCH); Technical Skills Capability (TSKL); Management Skills Capability (MSKL); and Data-Driven Culture Capability (DDC); Firm Performance (FP).

## INTRODUCTION

The tourism sector is one of the key pillars in Saudi 2030 Vision (WTTC, 2022). The future growth of the Kingdom is greatly dependent on developing the tourism sector with its potential to diversify the economy and reduce the oil reliance (Saudi Tourism Authority, 2022). The Travel & Tourism contributed to 9.7% (SAR 291.6 billion) of total GDP in 2019. However, in 2020, instead of continue growing as a bedrock of the policy of reducing oil reliance, it experienced a fall to just 6.6% (SAR 190.6 billion) representing an overwhelming 34.6% loss (WTTC, 2022). These estimates reflect the negative influence of the COVID-19 epidemic and the accompanying global economic recession on the Saudi tourism sector (Tourism Economics, 2021). Any recession in the tourism sector causes negative impacts on the economic growth (Bahrawi et al., 2021), calling for improved performance in the tourism sector after the recession. Big data analytics (BDA) has the potential to

help Saudi tourism companies improve their performance and quickly adapt to changing trends (Yahoo Finance, 2023). BDA are methods that enables large-scale data sets integration, supporting people management decisions, and cost-effectiveness evaluation (Sousa et al., 2019). The potential ability of BDA to boost the performance of the tourism sector is derived from two perspectives. Firstly, the Saudi Vision 2030 promotes digital transformation initiatives in tourism sector, driving the BD market in the country (KSA Vision 2030, n.d.). Secondly, Tourism is information- intensive industry by nature and uses most of the technological innovations throughout all its activities (Ivanova & Ivanov, 2020), including transaction data clickstream data, video data, and voice data.

It is known that the successful implementation of any new technology requires a provision of related capabilities. Similarly for tourism companies to have effective BDA, they need to establish and maintain BDA related capabilities. It can be capabilities related to the people, organization, data, technology, process, and even context, Figure 1. These encompass the Data-Driven Capability (DDC), Technological Capabilities (TCH), Technical Skills Capability (TSKL), Management Skills Capability (MSKL), and Data-Driven Culture Capability (DDC), just to name some. However, the present question revolves around whether the provision of these capabilities can really foster the performance of Saudi tourism companies.



**Figure 1**  
**VARIOUS BIG DATA ANALYTIC CAPABILITIES MIKALF ET AL. (2019)**

In fact, the direct and indirect connections between these BDACs and firm performance were tested throughout the literature in different countries (e.g., Mikalef et al., 2019, 2020; Upadhyay & Kumar, 2020; Yasmin et al., 2020). Though, the results of these studies vary and there is still a significant knowledge gap in understanding the actual influence of BDACs on firm performance.

### **Research Question and aims.**

Accordingly, the main research question of this paper is "How do BDACs impact firm performance, and what insights can be drawn from existing studies that benefit Saudi Arabia tourism companies?". And the aim is four-folds: 1) To Review and synthesize studies that investigate the relationship between BDACs and firm performance to eventually Identify the key findings 2) understand various Methodological Approaches employed in the selected studies to understand the strengths and limitations of different approaches 3) Identify Key BDAC Components, through Identifying and analyzing the specific components or capabilities within BDACs that are frequently highlighted in the literature as influential factors on firm performance and 4) Identify gaps and future directions.

## Research contributions

The findings from this literature review can serve as a valuable resource for the tourism sector in Saudi Arabia, offering actionable insights to drive innovation, competitiveness, and sustainable growth. This synthesis is valuable for researchers, practitioners, and policymakers seeking a holistic understanding of the underpinning relation. The gained insights can help Saudi tourism businesses identify key BDAC components that contribute significantly to firm performance; better adapt to emerging trends in the use of BDACs within the industry; and underline the potential benefits of supporting the integration of BDACs in the tourism sector, driving the development of supportive policies.

The impact of BDAC on performance was tested: first is by investigating the direct relation, and second is by investigating the indirect relationship taking into account different contextual mediating variables that thought to have the potential to enhance the relation.

## Direct relationships

Several scholars attempted to test the direct influence of BDAC on firm performance:

Shaqrah and Alzighaibi (2023) sought to examine how BDAC influence the value-adding processes of enterprise systems. They surveyed employees working in big data field inside the Royal Commission for Yanbu business, ranging from managers and technicians to knowledge workers and administrators. By analysing 120 responses using a Structural Equation Modelling (SEM) analysis on SmartPLS, a positive influence of BDAC on the value-adding processes of enterprise systems was found.

Wided (2023) surveyed 400 SMEs in Riyadh and Qassim to observe how management capabilities, personnel expertise capabilities, and infrastructure capabilities influence organizational resilience and strategic flexibility. The responses were collected from HRM direction, IT department, general managers. BDAC was found to have a mediating role between strategic flexibility and organizational resilience. Human knowledge capabilities enhance and stimulates the strategic flexibility - organizational resilience relationship. However, it has an adverse impact on the IT capabilities-strategic flexibility relationship. Therefore, policymakers are encouraged to give precedence to incorporate the BDAC notion instead of conventional IT capabilities notion. This approach helps them formulate strategies for promoting adaptability and resilience within their organization. By just focusing on Saudi Arabia's SMEs, makes the results restricted in terms of generalizability.

Jaouadi (2022) sought to assess whether BDA and human resource elements have an influence on supply chain innovation and supply chain sustainability. Based on a convenience sampling method, the researcher analysed 341 valid questionnaires from various Saudi manufacturing enterprises. The personnel capabilities in BDA field significantly predict supply chain innovation and supply chain sustainable performance. The study is limited because it fails to incorporate all supply chain innovation influencers, while it only focused on technology and human resources. The study is limited due using a cross-sectional design.

AlNuaimi et al. (2021) assessed the influence of various BDA capabilities, namely, technology, data, technical and management skills on e-procurement and environmental performance. To teste the Resource-Based Theory (RBT), they collected and analysed 216 valid surveys from procurement professionals in the United Arab Emirates (UAE). The PLS-SEM analysis indicated that the e-procurement implementation has a notable impact on BDACs, which consequently affects the overall environmental performance. The impact of e-procurement on organizational performance was found to be contingent upon the insertion of BDAC. The study is limited due to the exclusive focus on a single country and utilization of a very small sample size.

Yasmin et al. (2020) aimed to assess how company performance is influenced by various BDACs, in terms of infrastructural (tangible resources such as data and technology), human resource, and management. By testing the dynamic capability theory (DCV) in the context an integrated multicriteria decision-making. Based on evolution laboratory, intuitionistic fuzzy decision-making trial and analytic network process method, a multiple case studies of eight Pakistani companies were utilized to evaluate the significance of BDAC on impacting the

performance. The BDACs- performance relation was significant. The infrastructure capabilities were of the first importance, followed by the management and human resource capabilities. BDACs has more influence on operational performance than on market performance.

Lee (2020) opted to investigate how management, software and hardware, and human capabilities influence the financial performance. According to RBT, the researchers analysed 206 valid surveys from various Taiwan organizations. The SEM) analysis showed that managerial, technological infrastructure, and personnel capabilities significantly and positively influence the financial performance, market share, profitability, sales, as well as return on investment. Nevertheless, the study has a limited sample size.

Upadhyay and Kumar (2020) tested the BDACs-firm performance connection in India companies according to sociomaterialism as well as DCV. Exactly 800 executive MBA students and IT professionals, with speciality in BDA. The SEM illustrated that BDAC has a statistical significance influence on market performance, innovation performance, and financial performance. The perceptual assessments of measuring firm performance, as well as surveying just IT professionals are two major constraints to generalizability. The potential biases arising from source and location was mitigated by gathering data from diverse sources and locations.

Wang et al. (2020) aimed to investigate how BDAC moderates the relations between corporate social responsibility and green supply chain management, which ultimately influence firm performance. By utilizing the stakeholder theory, a sample of 260 enterprises in the Chinese manufacturing industry. The multiple regression analysis emphasized the moderating role of BDAC. But relying on one source of data collection represents a constraint.

employing the lens of complexity theory, Mikalef et al. (2019) evaluated several BDA-related capabilities and how they affect Greek enterprises performance. Using a mixed method 175 chief information officers and IT managers were surveyed for three case studies. The fuzzy-set qualitative analysis uncovered the role of capability in boosting the performance. These results were emphasized throughout the three case studies. The results highlighted the difficulty of coordinating various resources. While a small sample size and self-reported data are constraints.

Drawing upon RBT, Hao et al., (2019) opted to test how BDAC impacts the innovation success and organizational inertia in the United States and China. By using a mixed method, the researchers collected qualitative data from interviews and focus groups and quantitative data from 1109 data-driven innovation initiatives over a three-year range. The multiple ordinary least square regression model revealed that the optimal equilibrium of BD is depending on the BDAC level. For the Chinese initiatives, any promotion of BDAC initiatives results in a higher sales and gross margin. However, if the development of BDAC continued to a beyond particular threshold, the innovation performance is affected negatively. In the United States, the strength of this capability positively influences the impact of BD on gross margin and sales' growth. By including additional technology and artificial intelligence capabilities the proposed model can be enhanced.

**Table 1**  
**SUMMARY OF RELATED STUDIES TESTING THE DIRECT RELATION (BDAC - FP)**

#	Study	Theoretic al-Framewor k	Data CoUection	Analysis	BDACs	Country	Impact on?
1	(Shaqr ah & Alzigha ibi, 2023)	-	120 responses	SEM	Business process controlling, industrial automation, and business transformation.	Saudi Arabia	enterprise systems value-adding processes
2	(Wided , 2023)	DCV	400 responses, SMEs	SEM	management capabilities, personnel expertise capabilities, infrastructure capabilities	Saudi Arabia	organizational resilience and strategic flexibility

3	(Jaouadi, 2022)	-	341 responses, manufacture sector	SEM	BDAC, and employee related factors	Saudi Arabia	supply chain innovation and supply chain sustainable performance
4	(AlNuaimi et al. 2021)	RBT	216 questionnaires	PLS-SEM	technological, data, managerial and technical skills	UAE	e-procurement and environmental performance
5	(Yasmin et al., 2020)	DCV	MCDM methodology, 8 companies	SAW	Data, technology, management, human resource management	Pakistan	Firm performance: market performance, operational performance
6	(Lee, 2020)	RBT	206 responses (128 manufacturing companies, 78 Service and financial companies)	SEM	management capabilities, software and hardware infrastructure, and personnel professional competence	Taiwan	financial performance
7	(Upadhayay & Kumar, 2020)	DCV, sociomaterialism	800 responses	SEM	BDACs	India	company performance: financial performance, market performance, innovation performance
8	(Wang et al., 2020)	stakeholder theory	260 manufacturing companies in China	Regression Model	BDACs	China	performance of green supply chain management
9	Mikalef et al. (2019)	complexity theory	Mixed method, 175 responses, 3 case studies	Fuzzy set qualitative comparative analysis	Data, technology, management, technical, Structural practice, relational practices, data-driven culture, Process Procedural practices	Greek	Firm performance
10	Hao et al. (2019)	RBT and the organizational inertia theory	Mixed method, in-depth case studies and focus group interviews, 1109 projects	Multiple ordinary least square (OLS) regression analyses.	BDAC	United States and China	innovation performance,

### Indirect relationships

Several scholars noticed that additional organizational characteristics can enhance the BDAC influences:

Bu utilizing the organizational culture theory, Bahrami and Shokouhyar (2022) examined several relationships, including, BDAC- performance; BDAC-innovative capabilities-supply chain resilience-performance; and BDAC-information quality-supply chain resilience-performance. By surveying 167 senior IT executives, the PLS-SEM on SmartPLS3 confirmed the positive connection between BDAC and performance. This relationship is partially mediated by supply chain resilience. The limitations involve using a small sample size, cross-sectional research methodology, and the surveying only one participant from each organization, raising an issue of common method bias.

Bhatti et al. (2022) examined the impact of BDAC on performance, through a series of mediators, including, digital platform capabilities, supply chain innovation, and network capabilities, based on the RBT. Exactly 221 valid responses from Pakistani SMEs were analysed. The SEM indicated that the BDAC implementation had a positive impact on supply chain innovation, which eventually resulted in more improved financial performance. The study is limited due to the small sample size, the primarily focuses on manufacturing industry, and targeting a single country.

Hornig et al. (2022) examined the impact of BDAC on sustainable market, which eventually impact on organizational performance and competitive advantage; based on RBT while paying attention specifically to knowledge-based dynamic capabilities (KBDCs). A set of 257 surveys to and 19 semi-structured interviews from hotel marketing managers were analysed. BDACs contributes to the implementation of sustainable marketing strategies which influences positively competitive advantage, sales volume, profitability, and intangible market assets. Focusing on one theoretical framework (RBT) imposes limitations on the outcomes.

Su et al. (2022) checked how tangible, human skills, and intangible capabilities impact organizational performance, through the mediating role of dual innovations, based on RBT. By collecting 309 responses from Chinese manufacturing industry. the direct and indirect connection between BDAC and organizational performance was validated. Dual innovations is a crucial mediator in the BDAC-performance relation. The limitations include surveying a singular cohort of participants and collecting a single type of data, at a specific moment in time.

Lutfi et al. (2022) assessed the precursors as well as the consequences of BDA adoption in Jordanian SMEs, while testing the mediating role of information exchange. The supposed relations are based on RBTs and the technology-organization-environment (TOE) framework. Exactly 119 responses from the hotel industry were collected and analysed. The BDA adoption is influenced by organizational readiness, relative advantage, and government restrictions, and top management support. BDA implementation is significantly correlated with the performance. Information sharing was found to influence the BDA-performance relationship. The hotel industry possesses unique organizational structures and resources that differentiate them from larger establishments.

In the light of the DCV theory, Bag et al. (2021) examined how various BDA-related capabilities – data integration, data generation, data visualization, data management, advanced analytics, and data-driven approaches – impact on the remanufacturing performance. Additionally, the mediating role of reverse logistics decisions was tested. A total of 232 responses from business leaders in the manufacturing industry in South Africa were analysed by PLS-SEM using Warp PLS 6.0 software. BDAC in terms of advanced analytics, data visualization as well as data-driven culture positively impact reverse logistics decisions, which in turn had an impact on remanufacturing performance. The small sample size and targeting a single region represent restrict the results generalizability.

Aljumah et al. (2021) tested the BDAC- firm performance relationship directly as well as indirectly through checking how ambidexterity mediates the relationship in the UAE organizations, building upon the DCV theory. By collecting 295 valid questionnaires from top businesses in the industrial field, the PLS-SEM analysis uncovered the potential of BD related capabilities on performance. Ambidexterity was found to have the capability of enhancing the BDAC- firm performance relationship.

Awan et al. (2021) attempted to observe how BDAC is related to the performance of circular economy directly and indirectly through the presence of data-driven insights and decision-making quality, testing a series of connection and drawing on the learning theory. The study targeted the Czech manufacturing enterprises and exactly 109 valid responses were analysed by PLS-SEM. BDAC was found to be a significant influencer on the quality of decision-making, but data-driven insights failed to play a role in mediating this relationship. By targeting a single an emerging economy context and using a cross-sectional design.

Mikalef et al. (2020) examined the relationship BDAC-organizational performance. By targeting Norway IT managers and chief information officers, 202 surveys were collected and analysed using PLS-SEM. BDAC was found to exert a positive impact on competitive performance, and this impact can be enhanced through dynamic organizational capabilities, which in turn found to be a positive influence on technological and

marketing capabilities. With bigger sample size and targeting more regions, the results can be generalized.

Rialti et al. (2019) tested sequential mediation functions, between BDAC and organizational performance, through organizational ambidexterity and agility. By surveying managers from top firms across different European regions, 259 questionnaires were analysed by following a bootstrapped moderated mediation analysis. Agility and ambidexterity were noticed as mediators that can enhance the influence of BDAC on performance. It was also noticed that the information management systems moderated the aforementioned relationship.

Dubey et al. (2019) questioned how BDAC is related to supply chain agility and competitive advantage. Building upon two theories: the DCV and contingency theory. The analysis of 173 responses revealed that BDAC significantly impacts supply chain agility and competitive advantage. Organizational flexibility had a constructive role as a mediator in the BDAC- supply chain agility connection. Collecting data at a single point of time represents a source of common method bias and the restricted sample size constrained generalizability.

Based on the RBV theory, Ferraris et al. (2019) examined how technological and managerial capabilities influence firm performances directly and through the mediating role of knowledge management. By targeting Italian SMEs and using a restricted sample size of 88, the SEM analysis disclosed that the performance can be enhanced by upsurging BDAC, and knowledge management is a significant mediator of this relationship, where it amplifies the impacts of BDAC. Focusing on just two dimensions of BDAC and using a relatively small sample size are considered constraints.

Based on RBT and dynamic capabilities theory, Anwar et al. (2018) tested the relationship between big data Capabilities in term of technology and personnel impact Chinese firm performance, directly and through the mediating role of competitive advantage. The SEM analysis of 312 surveys on SmartPLS, demonstrated that technological and personnel capabilities impact competitive advantage, which in turn impact firm performance. Focusing on only two dimensions of BDAC and using a relatively small sample size limit the generalizability of the results.

**Table 2**  
**SUMMARY OF RELATED STUDIES TESTING THE INDIRECT RELATION (BDAC-FP)**

#	Study	Theoretical-Framework	Data collection	Analysis	BOACs	Mediator	Country	Impact on?
1	Bahrani and Shokouhyar (2022)	organizational culture theory and DCV	167, different industries	PLS	BDAC	supply chain resilience	Iran	FP
2	Bhatti et al. (2022)	RBT	221 responses, manufacturing	SEM	BDAC	supply chain innovation, network capabilities, digital platform capability	Pakistan	FP
3	Hong et al. (2022)	(KBDC)	Mixed method, 257 responses, 19 interview, hotel industry	SEM	BDAC	sustainability marketing	Taiwan	FP
4	Su et al. (2022)	RBT	309, manufacturing	Regression	Tangible, human skills, and intangible capabilities	dual innovations	China	FP
5	Lutfi et al. (2022)	RBT and the technology-organizational	119 responses, hotel	PLS-SEM	BDAC	information sharing	Jordan	FP

		environmental (TOE) framework	industry					
6	Bag et al., (2021)	DCV	232 responses	PLS-SEM	data generation, integration, visualization, management, analytic, and data-driven	reverse logistics decisions	South Africa	remanufacturing performance
7	Aljumah et al. (2021)	DCV	295 manufacture	PLS-SEM	BDAC	ambidexterity	UAE	FP
8	Awao et al. (2021)	learning theory	manufacturing firms, 109	PLS-SEM	BDAC	data-driven insights and Decision-making Quality	Czech	circular economy performance
9	Mikalef et al. (2020)	RBV and DCV	202 questionnaires	PLS-SEM	data, technology, managerial, technical, data-driven culture	dynamic organizational capabilities	Norway	competitive performance
10	Rialti et al. (2019)	-	259 questionnaires	Bootstrap moderated mediation	infrastructure, management, personal expertise	organizational ambidexterity and agility	Europe	Firm Performance
11	Dubey et al. (2019)	contingency theory and DCV	173 questionnaires, manufacture	PLS-SEM	BDAC	organizational flexibility	India	supply chain agility - competitive advantage.
12	Ferraris et al. (2019)	RBV	88 questionnaires	SEM	technological and managerial	Knowledge management	Italy	Firm Performance
13	Aowar et al. (2018)	RBT and dynamic capabilities	312 questionnaires	SEM	Technological, Personal Capabilities	competitive advantage	China	Firm Performance

## RESULTS AND DISCUSSION

Several researchers indicated BDAC has a significant positive role on firm performance. Some others have emphasized that this role can be strengthened by various organizational factors as mediators, as displayed in Figure 2. These mediators include, but not limited to, supply chain innovation, reverse logistics, decision-making quality, just to name some.





**Figure 2**  
**EXAMPLES OF POSSIBLE MEDIATORS BETWEEN BDAC AND PERFORMANCE**

The review of the identified studies reveals several shortcomings in existing literature. Firstly, a limited number of studies have investigated the impact of BDAC on performance within the Saudi Arabian context, specifically within tourism industry. Efforts by Wided (2023), Jaouadi (2023), and Shaqrah and Alzighaibi (2023) are primary but not sufficient contributors. Moreover, although data-driven culture is apparently an essential capability in the context of BD, a limited body of research has specifically examined its influence on organizational performance.

Overall, most of the research designs were quantitative and cross-sectional, relying on collecting survey-based data at a specific point of time. Although longitudinal approaches generally offer more reliable and comprehensive findings, the literature lacks such longitudinal studies. It also lacks mixed methods approaches, except the works of Mikalef et al. (2019), Hao et al. (2019), and Horng et al. (2022). The statistical techniques employed for data analysis ranged from multiple regression analysis to SEM and PL-SEM.

## CONCLUSION

In conclusion, the literature review demonstrates BDAC as a multifaceted concept. The studies explored diverse capabilities, and a consensus emerges on the inadequacy of a singular indicator to comprehensively capture BDAC. The complexity is derived from the interplay of tangible, human, and intangible capabilities, collectively shaping an organization's BDAC. More importantly, the overall insight gained from the review strongly supports the positive impact of BDAC on various performance indicators. These encompass firm performance, supply chain sustainable performance, value-adding processes in enterprise systems, organizational resilience, strategic flexibility, e-procurement, environmental performance, and green supply chain management.

Future research should focus on refining and standardizing metrics for assessing BDAC, acknowledging its multifaceted nature. Additionally, to gain a more comprehensive understanding, it is essential to assess the dynamic interrelationships between different capabilities and their evolving significance over time. Recommendations for practitioners include investing in a holistic approach to BDAC development and fostering a culture of continuous learning and adaptation to emerging technologies. In this way, practitioners are encouraged to follow a more effective integration of BDAC for sustained success in a rapidly evolving business.

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