

# From Small Decisions to Big Performance: How SMEs Leverage Big Data Analytics

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## Abstract

*This paper explores the critical role of big data analytics (BDA) in enhancing decision-making performance and driving SME success. It examines how Small and Medium-sized Enterprises (SMEs) can leverage BDA as a dynamic capability to improve decision-making, leading to better organizational performance outcomes. By conducting a literature review, the study synthesizes findings from recent research to propose a comprehensive framework that identifies big data analytics capabilities (BDAC), as well as the mediators and moderators influencing BDAC and data driven decision-making (DDDM) relationship. Additionally, to complement the literature review and provide practical grounding for our framework, we analyze studies that use a case study approach on SMEs to examine how DDDM influences various aspects of SMEs' performance. The study highlights key organizational capabilities (mediators) such as organizational culture, technological infrastructure, organizational ambidexterity and agility, collaborative business culture, open innovation practices, governance mechanisms, and dynamic decision-making capability, which facilitate the impact of BDAC on decision-making. Additionally, disruptions (moderators) such as data characteristics, environmental dynamism, and managerial resistance influence the strength of this relationship. Furthermore, we illustrate which aspects of SME performance benefit from DDDMM. This framework offers useful guidance for SMEs looking to improve their decision-making and stay competitive by using big data analytics. What makes it different from earlier models is that it combines core BDAC elements with real-world factors that affect SMEs, like internal capabilities and external challenges. It also adds to the academic conversation by showing how BDAC works as a dynamic capability in the unique context of small and medium-sized businesses.*

**Keywords:** Big data analytics capabilities, Data-Driven Decision-making, Dynamic capabilities, Small and Medium Enterprises (SMEs), Performance

## 1. Introduction

The contemporary business landscape is characterized by unprecedented data volumes, necessitating sophisticated analytical approaches for effective decision-making. Leveraging big data for enhanced decision-making has become critical for organizations.

The term “**Big data**” applies to datasets that grow so large and complex that traditional database systems are insufficient to handle them efficiently. Three main features characterize big data: volume, variety, and velocity, or the three V's. The volume of the data is its size, while velocity refers to the rate with which data is changing, or how often it is created. Finally, variety refers to the different formats and types of data, as well as the different kinds of uses and ways of analyzing the data. (Elgendy et al., 2017).

Access to data characterized by high volume, variety, and velocity (big data) has attracted many firms to invest in **BDA** for improved insights. In fact, 49% of organizations using big data asserted that the greatest value of utilizing big data is to improve their decision-making quality, defined as a firm's ability to make timely and optimal decisions (Ghasemaghaei et al., 2023). Effective decision-making is a vital capability, particularly for creating new products or services and successfully entering new markets. Managers who can interpret data and utilize business analytics are better equipped to lead their organizations, especially in competitive and uncertain environments (Abdellatif et al., 2023; Chatterjee et al., 2023).

Recently, **BDAC** the organizational ability to collect, process, and interpret large-scale data have emerged as essential for maintaining competitive advantage (Wamba et al., 2017). Many organizations now rely on data-driven insights to enhance their operational, financial, and market performance, highlighting the significance of robust BDAC (Ferraris et al., 2019; Garmaki et al. 2023).

A notable example of BDAC in action is GE's use of sensor-generated data in jet engines and turbines to predict failures and optimize maintenance. These capabilities allow GE to shift from product

sales to performance-based services, illustrating how data insights can transform business models. While large corporations are advancing rapidly in this area, SMEs, which make up over 99% of businesses globally (Eurostat, 2015; FSB, 2020) face significant hurdles. They are typically defined as firms with fewer than 250 employees (Federation of Small Businesses, 2020).

SMEs are often constrained by limited financial and technological resources, lack of analytics expertise, and difficulties in adopting new digital tools (Khan et al., 2024). They also rely heavily on owner-managers for strategic decisions and typically operate with informal planning structures (O'Connor et al., 2017). SMEs can build BDAC incrementally through cloud-based platforms for data management, partnerships with technology providers, and upskilling staff in data literacy and analytics, ensuring gradual capability development despite resource constraints (Omowole et al., 2024).

Nevertheless, research shows that BDAC can help SMEs overcome these structural limitations by improving evidence-based decision-making and enabling sustainable outcomes (Shaik et al., 2024). Recent literature also emphasizes the role of digital transformation, product return knowledge, and circular economy systems; such as closed-loop supply chains and reverse omnichannel logistics; as key enablers of BDAC in SMEs (Khan et al., 2024).

This transformation hinges on adopting **DDDM** defined as the use of algorithmic systems and data analysis to guide decisions. Rather than relying solely on intuition or past experience, DDDM allows organizations to make timely, evidence-based strategic choices (Zaitsava et al., 2020).

BDAC plays a foundational role in enabling DDDM by providing the technical and organizational capabilities required to access, process, interpret, and apply large volumes of structured and unstructured data (Wamba et al., 2017; Ferraris et al., 2019). Capabilities such as real-time data processing, predictive modeling, and dashboard visualization empower decision-makers to respond rapidly to market and environmental changes, reduce uncertainty, and make informed strategic choices (Ghasemaghaei, 2019; Chatterjee et al., 2023).

This study addresses the current gap in understanding how BDAC enables DDDM in SMEs and how this connection translates into improved performance. Using a dynamic capabilities approach (Teece, 2007), we explore how **organizational capabilities (mediators)** and **disruptions (moderators)** influence this relationship. Our goal is to develop a comprehensive framework to help SMEs strategically leverage BDAC for improved decision-

making and sustainable performance in resource-constrained environments.

## 2. Background Theory

### 2.1. Big Data Analytics Capabilities and Dynamic Capabilities.

The increasing availability of large data volumes has led to a "Big Data revolution" (Ghasemaghaei et al., 2019). BDAC is crucial for the value creation process and collaboration innovation of manufacturing enterprises (Feng et al., 2024).

The first step in understanding BDAC is to look at how different researchers have defined the concept (see Table 1). While the definitions vary, they all highlight BDAC as something that helps organizations turn data into better decisions and stronger performance.

BDAC is not solely about technology but also includes the ability to effectively use data to gain insights and make better decisions (Gupta & George, 2016), and encompasses management and personnel capabilities (Su et al., 2022). BDAC is a dynamic capability (Wamba et al., 2017) that is essential for modern organizations to make decisions based on data. In today's environment, BDAC impacts how organizations make decisions and who makes them and is a key factor in gaining a competitive advantage (Shamim et al., 2020). Also, firms with strong BDAC may enhance innovation (Singh & El-Kassar, 2019).

BDAC empowers managers to quickly develop, deploy, and support firm resources. The relationship between BDAC and firm performance is often studied from a dynamic capability perspective. Managerial skills are essential to transform BDA output into core capabilities, and human skills, including technical and managerial abilities, are crucial for extracting insights from big data (Awan et al., 2021). For SMEs often constrained by limited resources, BDAC can act as a catalyst for developing adaptive decision-making capabilities and gaining competitive advantage (Shamim et al., 2020).

In today's fast-changing business environment, dynamic capabilities defined as an organization's ability to sense opportunities, seize them effectively, and transform its operations in response, have become critical for sustained success. Framing BDAC within the dynamic capabilities perspective provides a powerful way to understand how organizations build and sustain a competitive edge in uncertain and evolving markets. Scholars such as Rialti et al. (2019) and Mikalef et al. (2020) suggest that firms which

develop BDAC as a dynamic capability are better positioned to sense market signals, reallocate

resources strategically, and adapt business models as needed. This perspective aligns with Teece's (2007) foundational work on dynamic capabilities.

To guide this study, we draw on Teece's (2007) dynamic capabilities framework; one of the most widely cited and practically relevant models in strategic management. This framework emphasizes three micro-foundations: sensing, seizing, and transforming. These components closely reflect how BDAC operates within SMEs, making Teece's model particularly well-suited for understanding the role of analytics in fostering resilience, innovation, and performance in data-driven environments.

Sensing refers to the ability to detect opportunities and threats in a fast-changing environment. Through predictive analytics and real-time data monitoring, BDAC enhances firms' ability to scan markets and identify trends or risks early (Khan et al., 2024). For example, SMEs using BDA in circular economy contexts can track changes in product return behaviors and environmental conditions, enabling proactive adjustment to customer and regulatory demands. Seizing involves mobilizing resources to capture value from those opportunities. BDAC supports this by enabling timely decision-making, such as targeting new customer segments or optimizing pricing strategies through advanced analytics (Teece, 2007). Finally, transforming focuses on the capacity to realign structures and processes in response to sensed opportunities or threats.

**Table 1- Big Data Analytics Capability definitions**

In practice, this means that SMEs can leverage BDA insights to redesign supply chains for instance,

Definition	Source
The ability to leverage both technological infrastructure and managerial skills to process and analyze large datasets for business insights to improve decision-making processes	Ferraris et al. (2019)
The capability to generate actionable insights from data, enhancing decision-making quality	Awan et al. (2021)
The use of advanced analytics tools to support strategic business decisions	Ansari et al. (2023)
The interconnected nature of various analytics capabilities, such as infrastructure and management, that collectively enhance firm performance	Wamba et al. (2017)

by implementing closed-loop systems or reverse omnichannel models, as illustrated in Khan et al. (2024). These transformations allow firms to improve efficiency, sustainability, and responsiveness. Thus,

BDAC functions as a dynamic capability that not only facilitates agile decision-making but also drives continuous renewal and strategic adaptation.

In summary, BDAC acts as a dynamic capability by helping firms sense opportunities, seize them through timely decisions, and transform operations for long-term advantage. For SMEs, embedding BDAC into strategic processes strengthens adaptability and boosts performance in dynamic markets.

## 2.2. Data-Driven Decision-Making

Effective decision-making is a cornerstone of organizational success, enabling firms to navigate complexities and uncertainties while driving growth and innovation (Mikalef et al., 2020). Decision-making performance has emerged as a vital factor in achieving competitive advantage, particularly in industries where rapid adaptation to changing market conditions is critical. This forward-looking approach to decision-making is essential for maintaining agility in dynamic business environments. With the advent of big data analytics capabilities, organizations are now equipped to integrate real-time insights into their decision-making processes, significantly enhancing both the speed and quality of decisions (Awan et al., 2021). Moreover, the integration of artificial intelligence (AI) and machine learning tools further strengthens the relationship between decision-making performance and organizational outcomes. These technologies facilitate the generation of actionable insights, enabling firms to optimize resource allocation and improve operational efficiency (Su et al., 2022).

Decision-making performance is not only about making better choices but also about leveraging technological capabilities to enhance strategic decision-making at all levels of the organization (Awan et al., 2021). Beyond operational improvements, decision-making performance plays a pivotal role in fostering innovation. By leveraging big data analytics, organizations can identify previously unseen patterns and opportunities, supporting the development of novel products, services, and business models (Mikalef et al., 2020).

DDDM is increasingly recognized as a strategic function within organizations, particularly in SMEs where decisions must be made swiftly with limited resources. DDDM refers to the structured use of internal and external data to guide operational, customer-focused, and strategic project decisions. Prior research suggests that DDDM enhances the quality, speed, and impact of organizational decisions when combined with analytics capabilities (Ghasemaghahi et al., 2019; Mikalef et al., 2020).

In conclusion, DDDM performance has evolved into a multi-dimensional construct that encompasses adaptability, innovation, and sustainability. Recent advancements in big data analytics and AI have further amplified its impact, enabling firms to achieve superior outcomes across strategic, operational, and sustainability domains (Gao & Sarwar, 2024).

### 2.3. SMEs and the role of BDAC.

SMEs form the backbone of many economies, yet they often operate with limited financial, technological, and human resources. BDAC offer a vital pathway for SMEs to compete in data-driven markets. BDAC enables SMEs to process large and diverse data sets to derive insights that enhance decision-making, streamline operations, and improve customer responsiveness. Studies have shown that SMEs adopting BDAC experience gains in productivity, innovation, and customer engagement (Falahat et al., 2023; Ravindran et al., 2022). For example, predictive analytics helps SMEs forecast demand more accurately, while prescriptive analytics supports them in optimizing pricing strategies and reducing waste (Chatterjee et al., 2023).

The dynamic capabilities view provides a powerful lens to understand how SMEs use BDAC to adapt in rapidly changing environments. First, sensing involves identifying emerging opportunities and threats by capturing signals from the market, such as changes in customer behavior or competitor actions. SMEs with robust BDAC can monitor real-time data from customer interactions, supply chains, and social media to uncover trends or disruptions early (Ravindran et al., 2022). This supports proactive strategic planning, enabling firms to develop more responsive and tailored business strategies. For example, as highlighted by Mohajeri et al. (2021), SMEs use data integration and analysis tools to gain situational awareness and anticipate shifts in demand, market preferences, or regulatory pressures.

Once opportunities are sensed, seizing refers to mobilizing resources to act on those opportunities, while transforming involves reconfiguring processes and structures to sustain competitive advantage. SMEs with BDAC can seize opportunities by making data-backed decisions; for example, launching new product lines, entering new markets, or adopting new technologies with higher confidence. Over time, they can transform their business models by embedding analytics into core operations, automating workflows, or developing customer-centric platforms. This ongoing renewal enhances SME agility and resilience, especially in uncertain environments (Falahat et al., 2023; Chatterjee et al., 2023).

## 3. Methodology

This study adopts a combined methodological approach based on the frameworks of Vial (2019), Webster and Watson (2002), and Paré and Templier (2010), incorporating a systematic scoping review to explore how BDAC, DDDM, and performance interact within SMEs. Following the review protocol proposed by Dang et al. (2024), the methodology follows five steps: defining the scope, searching and selecting literature, analyzing the corpus, and presenting findings. This layered approach ensures rigor and relevance in understanding a rapidly evolving and interdisciplinary domain.

The scoping review enables us to map out key concepts, trends, and gaps in a structured yet flexible manner. In the second phase, we included selected case studies from the reviewed articles to understand how DDDM practices affect SME performance in practical contexts. This dual approach; literature synthesis plus empirical illustration; offers both theoretical depth and real-world relevance. By examining real-world case studies, we gain deeper insights into the underlying mechanisms, contextual factors, and enabling conditions that abstract theories may overlook. This grounded perspective enhances our understanding of how BDAC contributes to performance in resource-constrained SMEs. Our methodology consists of five steps.

### 3.1. Step 1: Define the Scope of the Review

This stage involved defining the research questions and establishing the parameters for the review. The scope focused on academic literature that explores the interplay between BDAC, DDDM, SMEs' performance. We began by developing guiding research questions:

- How do big data analytics capabilities contribute to improved data-driven decision-making within SMEs?
- How can these capabilities enhance SMEs' performance?

Our objective was to generate a comprehensive framework that connects BDAC with performance outcomes in SMEs, considering both enabling organizational capabilities and disruptions.

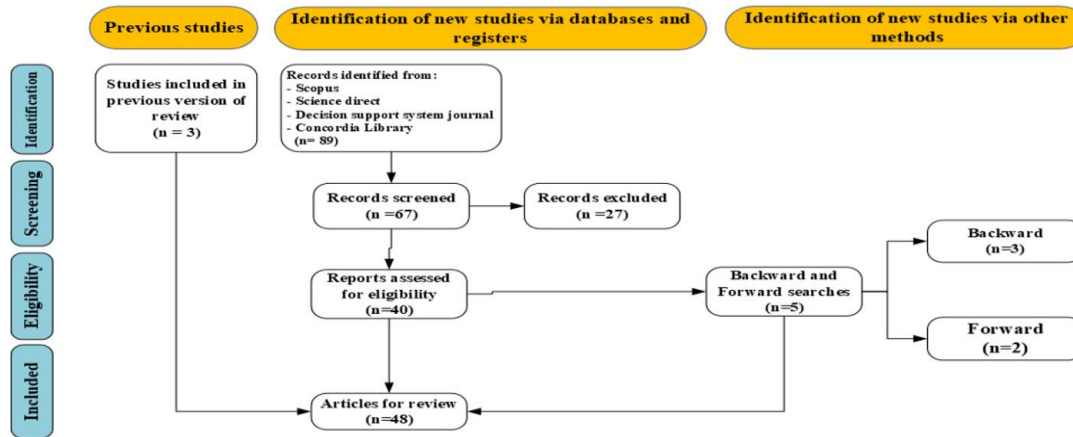


Figure 1: Step 3 of reviewing papers

### 3.2. Step 2: Search Literature

Following an iterative and exhaustive search strategy, we used academic databases such as Science Direct, Scopus, and relevant journals from the AIS Senior Scholars' basket of journals, including journals like Decision Support Systems and Information & Management. These were chosen for their established contributions to information systems, analytics, and management research.

We employed targeted keywords such as "big data analytics capability," "data-driven decision-making," "SMEs' performance," "startup performance," and "dynamic capabilities." The search was limited to peer-reviewed journal articles published in English after 2015, ensuring our findings reflect the most current developments in the rapidly evolving fields of BDAC and DDDM. Practitioner literature was excluded because the focus of this study is on peer-reviewed and theoretical and empirical evidence to ensure rigor and theoretical grounding. The 2015–2025 window was chosen to capture the most recent and relevant developments in BDAC and DDDM practices.

### 3.3. Step 3: Select the Final Sample

Paper selection followed an iterative screening process. We first filtered based on title and abstract relevance. We then conducted a full-text review of selected articles. Finally, we applied backward and forward search referencing to identify additional key studies (Dang et al., 2024). This refers to backward referencing (examining references of selected studies) and forward referencing (examining newer studies citing them), ensuring that no critical works were omitted (Wohlin, 2014).

In total, 48 papers were selected. Inclusion criteria were: (1) empirical or conceptual focus on BDAC and/or DDDM, (2) direct relevance to SME or startup contexts, and (3) articulation of outcomes related to firm performance. Figure 1 summarizes this process.

### 3.4. Step 4: Analyze the Corpus

The selected articles were subjected to a comprehensive content analysis to categorize and synthesize key themes, concepts, and findings. The analysis focused on identifying how BDAC impacts decision-making, the Organizational Capabilities (mediators) and Disruptions (moderators) involved in these relationships. It also examined how DDDM contributes to the success of SMEs. Additionally, the content analysis aimed to understand the definitions of key concepts and the theoretical grounding of numerous studies.

Following the identification and selection of 48 relevant articles, we adopted an inductive, open coding approach to uncover key conceptual dimensions related to BDAC, DDDM, and firm outcomes within SMEs. This helped us avoid using pre-existing theories and instead let the key insights emerge directly from the literature. To ensure reliability, researchers independently coded 25% of the sample. Cohen's Kappa ( $\kappa = 0.82$ ) indicated substantial agreement (Landis & Koch, 1977; McHugh, 2012). Discrepancies were resolved through discussion, and the finalized coding scheme was applied to the full dataset.

Each paper was carefully reviewed in full. We extracted key concepts, themes, and constructs particularly those associated with BDAC dimensions, organizational capabilities (e.g., organizational culture, technological infrastructure), Disruptions (e.g., environmental dynamism, data quality), and

SME's performance (e.g., operational efficiency, strategic agility). We developed a coding scheme in Microsoft Excel. The coding spreadsheet contained fields for metadata (e.g., year, journal, methodology), context variables (e.g., Disruptions, Organizational capabilities, DDDM, SME Performance), and conceptual codes.

For each conceptual element, we recorded how the paper defined it, the empirical or theoretical basis for its inclusion, and its role (Organizational capabilities (mediator), Disruptions (moderator), or performance) in the BDA–DDDM relationship. A constant comparison method was applied to refine codes across papers, and thematic clustering allowed us to group similar concepts. For example, the open codes “real-time dashboards,” “automated alerts,” and “predictive modeling” were grouped under the thematic category “Organizational Capabilities-Technological Infrastructure.”

We organized the selected papers using Microsoft Excel, categorizing them into folders based on themes and keywords. To ensure a thorough review, we read each paper carefully, highlighted key points, and recorded valuable information in key information extracted from each paper on the Microsoft Excel sheets. This open approach allowed us to identify relevant categories without relying on predefined frameworks, making it easier to spot patterns and themes in the literature.

### 3.5. Step 5: Present the Findings

The final stage involved compiling the results from the corpus of literature and developing a theoretical framework integrating BDAC, DDDM, and SMEs' performance.

The output was used to develop the conceptual framework presented in Figure 2. This framework illustrates the interaction of BDAC with mediators and moderators to enable DDDM processes and overall SME's performance.

## 4. Findings

This section presents the findings derived from the thematic synthesis of 48 peer-reviewed articles which reveal that BDAC enhance SME performance primarily by enabling effective DDDM.

BDAC serve as the foundation that enables SMEs to build and strengthen internal organizational capabilities. In this review, these capabilities are conceptualized as *mediators*, meaning they form the internal pathways through which BDAC are translated into more effective decision-making and firm outcomes. These capabilities include Organizational

Culture, Technology Infrastructure, Organizational Agility, Dynamic Decision-Making Capability, which collectively support data integration and insight generation. For example, firms utilizing cloud-based analytics or predictive dashboards (Ghasemaghaei et al., 2018; Shamim et al., 2020) reported improved operational awareness and responsiveness.

These organizational capabilities drive data-driven decision-making (DDDM). Firms with a strong culture, collaboration, and a focus on agility and ambidexterity are better at embedding analytics into their workflows and turning data into strategic actions. Such capabilities build a data-driven mindset and allow firms to respond quickly, as shown by Arias et al. (2022) and Kissi (2024), where BDAC supported effective decisions in areas like customer targeting, supply chain efficiency, and market agility.

At the same time, the review also highlights the role of moderators disruptive or contextual conditions that influence the strength of the BDAC–DDDM relationship. Disruptions such as environmental volatility, inconsistent or low-quality data, and managerial resistance can weaken the capacity of BDAC to enable internal capabilities and reduce the likelihood that these capabilities translate into meaningful decision-making improvements.

Finally, **improved** decision-making leads to tangible performance benefits for SMEs, including increased profitability, enhanced sustainability, and stronger risk management.

### 4.1. Big Data Analytics and Capabilities

BDAC represent the technological and human resources that allow firms to collect, process, and interpret large volumes of data for strategic use. In SMEs, BDAC include tools such as data warehouses, real-time analytics, cloud computing, and machine learning platforms, along with skills such as data governance, interpretation, and domain knowledge. These capabilities help organizations generate timely, relevant insights and increase responsiveness to market dynamics (Ghasemaghaei et al., 2018).

The literature shows that effective BDAC empowers SMEs to overcome resource limitations by maximizing data utility. For instance, predictive dashboards and self-service analytics platforms allow decision-makers to access actionable information without needing full-scale data science teams (Shamim et al., 2020).

### 4.2. Organizational Capabilities (Mediators)

Enabling capabilities are internal factors that mediate the relationship between BDAC and data-

driven decision making (DDDM). Across the 48 studies reviewed, organizational ambidexterity and agility were by far the most consistently emphasized mediators (**six studies**), followed by dynamic decision-making capability (**four studies**). Other mediators such as organizational culture, collaborative business culture, technological infrastructure, open innovation practices, and governance mechanisms were identified less frequently (**one to three studies each**). This distribution suggests that not all organizational capabilities are equally important; rather, agility and decision-making speed appear to exert a stronger influence in enabling SMEs to convert analytics into competitive advantage.

**4.2.1. Organizational culture:** Organizational culture is the shared values and practices that influence how people use data. In SMEs, fostering a data-driven culture is vital, as leadership and limited resources make it crucial to rely on evidence over intuition. Such a culture promotes experimentation, teamwork, and quick adaptation (Chen et al., 2022; Upadhyay & Kumar, 2020). This aligns with dynamic capabilities an organization's ability to learn and adapt. When culture supports learning, BDAC becomes part of everyday decisions. SMEs with strong data cultures overcome resistance to digital tools and respond faster to insights, such as using dashboards or data literacy programs to improve reactions to customer feedback and market changes. This readiness turns data into strategic action

**4.2.2. Technological Infrastructure:** includes the hardware, software, and data management systems necessary to support BDAC. It enables firms to integrate analytical insights into real-time operations and strategic planning. Chen et al. (2022) emphasize that IT-business alignment allows seamless integration of analytics tools, reinforcing decision support systems. This component supports Teece's (2007) "seizing" process by allowing organizations to mobilize technology to act on sensed opportunities. For SMEs, scalable and cloud-based infrastructures offer a cost-effective pathway to operational efficiency and strategic agility.

**4.2.3. Organizational Ambidexterity and Agility:** Ambidexterity refers to an organization's ability to balance exploration (innovation) and exploitation (efficiency), while agility represents its responsiveness to environmental changes. Rialti et al. (2019) and Aljumah et al. (2021) demonstrate that BDAC strengthens these dual capacities, enhancing decision-making effectiveness and firm adaptability. For SMEs, agility is vital to react to market shocks or customer feedback, while ambidexterity supports sustainable innovation under resource constraints.

**4.2.4. Collaborative business culture:** A collaborative culture promotes interdepartmental communication and shared responsibility in decision-making. BDAC is more effective in such environments as data insights can be quickly disseminated and acted upon. Cao et al. (2015) and Kissi (2024) found that collaboration mediates the impact of BDAC on innovation performance. This capability supports both knowledge sharing (sensing) and rapid resource reallocation (seizing), enhancing collective decision-making in SMEs.

**4.2.5. Open innovation practices:** Engaging Open innovation involves sourcing knowledge and data externally through partnerships, customer input, or platforms. Arias et al. (2022) and Su et al. (2022) show that BDAC enables firms to process and leverage this external information, improving strategic decision quality. For SMEs, this expands innovation potential without requiring substantial R&D investments.

**4.2.6. Governance mechanisms:** Governance refers to the frameworks used to ensure accountability, transparency, and consistency in data use. Shamim et al. (2020) identify both contractual and relational governance as key mediators that link BDAC to decision quality and performance. Effective governance enhances data quality management and standardizes processes for analytic implementation.

**4.2.7. Dynamic decision-making capability:** Dynamic decision-making capability allows organizations to adapt choices rapidly based on changing conditions. BDAC strengthens this by enabling predictive modeling, scenario analysis, and continuous feedback loops (Abubakar et al., 2019; Liao et al., 2023).

### 4.3. Disruptions/Barriers (Moderators)

Disruptive factors moderate the BDAC-DDDM relationship by shaping how effectively analytics can guide decisions. Within the reviewed studies, managerial resistance (**five studies**) and environmental dynamism (**four studies**) were the most frequently cited moderators, while data characteristics (**two studies**) and cross-functional integration (**one study**) appeared less often. This pattern highlights that external disruptions and leadership behaviors carry greater weight than technical data conditions or structural integration in determining how strongly BDAC translates into effective decision-making in SMEs.

**4.3.1. Data characteristics:** The quality, accuracy, timeliness, and completeness of data significantly affect how analytics are interpreted and applied. Alarefi (2022) finds that poor data characteristics such as outdated or fragmented information can impair

decision-making even in data-rich firms. For SMEs, ensuring reliable data streams is essential to prevent misguided strategic choices.

**4.3.2. Environmental dynamism:** Rapidly Environmental dynamism refers to the rate of change and unpredictability in the external environment. In such contexts, real-time data analysis becomes essential to remain competitive. Mikalef et al. (2020) and Koot et al. (2021) find that environmental volatility increases the value of BDAC for firms capable of agile responses. This moderating effect heightens the need for sensing capabilities. SMEs, often more vulnerable to external shocks, can use BDAC to mitigate risk and enhance strategic resilience.

**4.3.3. Managerial resistance to DDDM:** Resistance to adopting data-driven approaches due to lack of trust, skills, or awareness can block BDAC's influence on decision-making. Rialti et al. (2019) and Shafqat et al. (2025) demonstrate that managerial openness is critical for DDD success. Leadership support moderates this relationship positively by fostering a data-oriented mindset and encouraging experimentation. In SMEs, where owner-managers often control strategic direction, overcoming such resistance is pivotal.

**4.3.4. Cross-functional integration:** This refers to the degree of collaboration and coordination among different departments. Liao et al. (2023) show that high cross-functional integration enhances BDAC's effectiveness by reducing silos and ensuring cohesive decision-making. From a dynamic capabilities perspective, this supports transformation by aligning internal structures around shared data goals. Practically, SMEs benefit by creating lean, interdisciplinary teams that use analytics to drive unified strategies.

#### 4.4. Data-Driven Decision-Making (DDDM)

The reviewed studies consistently show that BDAC act as a foundation for embedding data into decision-making processes in SMEs. Rather than producing outcomes directly, BDAC shape *how* decisions are made by improving the collection, integration, and interpretation of information. This transformation is visible in three main ways:

- Tawil et al. (2024) report that data analytics improves productivity, innovation, and job creation by optimizing processes, predicting customer needs, and enabling data-informed services across 85 UK SMEs.
- Khan et al. (2024) highlight how BDA in SMEs supports closed-loop supply chains and reverse omnichannel strategies, contributing to

sustainable firm performance through enhanced service and operational capabilities. (Bahrami et al., 2024).

- Bahrami and Shokouhyar (2022) further demonstrate that BDAC enhances firm performance indirectly through improved supply chain resilience. Their study identifies innovative capabilities and high-quality information as key mediators, emphasizing that BDAC supports timely and informed decision-making in disruptive environments. Importantly, they highlight the role of risk management culture as a moderator, reinforcing the idea that organizational readiness significantly influences how BDAC translates into resilience and performance improvements for firms.
- Justy et al. (2023) emphasize that despite resource limitations, SMEs can incrementally improve their decision-making by adopting accessible analytics tools. Their study reveals that even low-maturity analytics environments using dashboards or spreadsheets can enhance decision accuracy and responsiveness, provided there is strategic alignment and managerial support. This underscores the scalable nature of DDDM adoption in SMEs and its potential to improve performance over time.

Taken together, these findings highlight that BDAC primarily enhance SME performance indirectly by strengthening the decision-making process itself. This shift toward data-driven practices creates the conditions under which tangible performance benefits can later be realized, as discussed in Section 4.5.

#### 4.5. Impact of DDDM on SME Performance

Synthesizing the reviewed studies, BDAC-driven decision-making enhances SME performance across three key dimensions:

- **Operational efficiency** through optimized resource allocation (Wamba et al., 2017).
- **Customer-centricity** via personalized services and faster **responsiveness (Ferraris et al., 2019)**.
- **Risk management and strategic agility** in dynamic environments (Gupta & George, 2016; Mikale et al., 2020; Wu et al., 2024).

In addition, Lukas et al. (2022) show that decision-making effectiveness improves significantly when firms use visual analytics and real-time dashboards, especially in complex data environments. These findings reinforce that embedding analytics into managerial workflows allows SMEs to enhance efficiency, customer focus, and resilience. The three

dimensions identified are consistent with prior models (Ghasemaghaei & Calic, 2019; Singh & El-Kassar, 2019).

#### 4.6. Theoretical Contributions

The proposed framework (Figure 2) integrates findings from the full set of 48 reviewed papers using

grounded in established definitions and supported by prior studies. For instance, technological infrastructure enables the development of BDAC rather than the reverse (Chen et al., 2022), while BDAC drive organizational agility and ambidexterity (Rialti et al., 2019; Aljumah et al., 2021). Moderators such as managerial resistance and environmental dynamism influence the strength of the BDAC–DDD

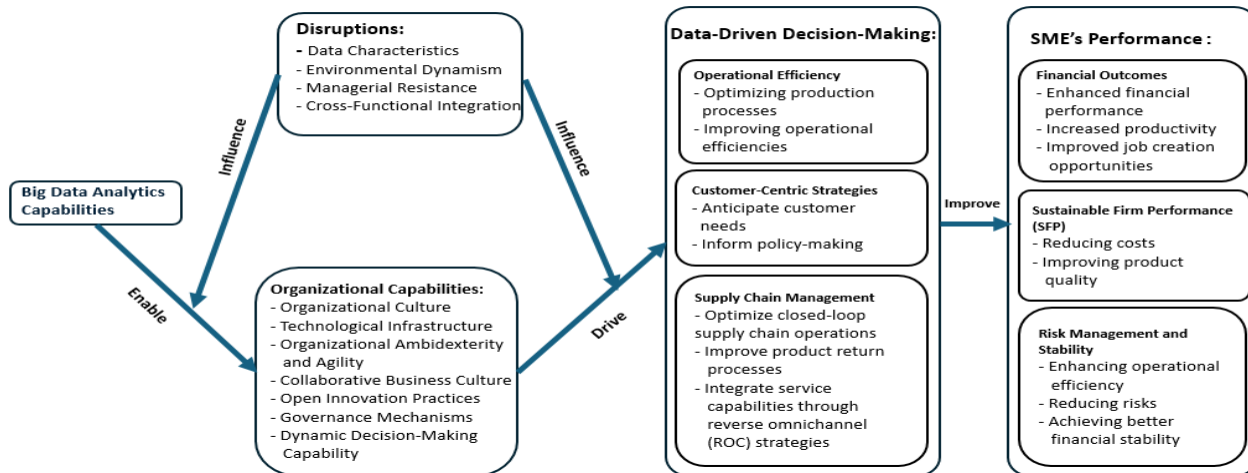


Figure 2: Research Framework Based on Literature Review

open coding and thematic synthesis. Although select examples are cited for illustration, the framework's structure emerged inductively from the full corpus, not from pre-defined theoretical models.

The framework demonstrates how BDAC interacts with enabling capabilities and contextual moderators to enhance DDDM and ultimately improve SME performance. It emphasizes three strategic areas where DDDM adds value; Operational Efficiency, Customer-Centric Strategies, and Supply Chain Optimization and connects these to four widely supported performance dimensions:

- Financial Performance (Rialti et al., 2019; Aydiner et al., 2019),
  - Sustainable Firm Performance (Khan et al., 2024; Singh & El-Kassar, 2019),
  - Risk Management (Shamim et al., 2020; Ghasemaghaei & Calic, 2019),
- By grounding the framework in empirical evidence across diverse sectors, regions, and analytical approaches, this study offers a robust model for understanding how SMEs can strategically leverage BDAC and DDDM to enhance resilience, growth, and competitiveness.

Importantly, the framework specifies directional relationships between constructions (Figure 2). Each arrow reflects a distinct type of causal or conditional linkage Enable, Drive, Influence, or Improve; that is

relationship (Mikalef et al., 2020; Shafqat et al., 2025). Finally, effective DDDM improves SME performance across financial, sustainable, and risk-related outcomes (Wamba et al., 2017; Bahrami & Shokouhyar, 2022).

To clarify the logic of these relationships, Table 2 summarizes how each arrow type is defined in the literature, applied in the framework, and supported by examples from the reviewed studies.

Table 2- Justification of Arrow Directions in the Framework

Arrow Type	Role in Framework
Enable	BDAC <b>enable</b> organizational capabilities (e.g., culture, infrastructure, agility, governance) by supplying the data integration, analytical tools, and insights that form the basis for strategic and operational routines.
Drive	BDAC <b>drive</b> agility, ambidexterity, and dynamic decision-making by generating actionable insights that trigger adaptation.
Influence	Disruptions such as managerial resistance or environmental dynamism <b>influence</b> how strongly BDAC

	translate into DDDM.
Improve	DDDM <b>improves</b> SME performance across financial, sustainable, and risk-related outcomes.

## 5. Limitations and Future Work

This review offers a structured synthesis of how is the relationship of BDAC and DDDM and how they influence on SME's performance. However, several limitations should be considered to contextualize the findings.

First, the search strategy relied on a targeted set of keywords such as "big data analytics capability," "data-driven decision-making," and "SME performance." While this approach helped focus the review and ensure relevance, it may have excluded studies that used alternative or emerging terminology. Despite attempts to include synonyms and variations, some valuable research may not have been captured. Future reviews could use a wider range of keywords to include newer or different terms used in the field.

Second, the literature search was limited to a small number of academic databases and journals, primarily

in English, and to peer-reviewed articles published between 2015 and 2025. While this ensured a focus on recent and reputable contributions, it may have excluded earlier, non-English, or regionally published work that could offer additional perspectives especially from developing or underrepresented SME contexts.

Third, big data and DDDM are rapidly evolving topics. Some of the questions raised in this review may already be under investigation in ongoing or recent studies. Rather than a limitation, we view this as a sign of the field's growing relevance and the potential for our framework to serve as a foundation for further empirical validation.

Fourth, the reviewed studies varied widely in methodological approaches, theoretical foundations, and operational definitions of key constructs such as BDAC, DDDM, and SME performance. This heterogeneity introduces challenges in drawing universally generalizable conclusions and may limit the applicability of the proposed framework across all contexts.

Lastly, while the framework developed in this review integrates key patterns and relationships from the literature, it remains conceptual. It does not capture every dimension of BDAC and DDDM implementation in SMEs. Additional factors: such as digital maturity, long-term adoption readiness, and

industry-specific constraints may influence how these capabilities evolve and create value over time. Future research could explore the resilience and scalability of BDAC initiatives through longitudinal studies, in-depth case comparisons, and survey-based validation. Such efforts would deepen our understanding of how SMEs can sustain data capabilities and translate them into meaningful performance outcomes.

## 6. Conclusion

This study highlights the critical role of BDAC for improving DDDM and driving SMEs' success in today's data-centric world. The proposed framework demonstrates how BDAC, supported by organizational capabilities and influenced by disruptions, can transform data insights into practical strategies that drive organizational performance. Our findings emphasize the importance of organizational capabilities (mediators) such as organizational culture, technological infrastructure, ambidexterity and agility, collaborative business culture, open innovation practices, governance mechanisms, and dynamic decision-making.

These mediators serve as the underlying drivers that enable BDAC to enhance DDDM performance. Similarly, disruptions(moderators) like data characteristics, environmental dynamism, cross-functional integration, and managerial resistance to data-driven decision-making significantly influence the strength and direction of BDAC's impact. Effectively managing these disruptions helps organizations optimize decision-making strategies, ensuring that BDAC is utilized effectively within organizations. The proposed comprehensive framework bridges the gap between theory and practice by illustrating how specific DDDM strategies, such as optimizing production, enhancing supply chain management, and developing robust intervention policies can translate into tangible SME performance improvements.

These performance gains include enhanced financial outcomes, reduced operational costs, improved product quality, and bolstered innovation and competitiveness. This framework not only contributes to academic discourse but also offers practical guidance for organizational leaders. By strategically developing organizational capabilities and proactively managing disruptions, leaders can harness the full potential of BDAC to achieve competitive advantage in rapidly evolving markets.

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