Big Data Analytics Capability and Business Alignment for Organizational Agility : A Fit Perspective

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ABSTRACT

This paper investigates the impact of big data analytics capability (BDAC) on organizational agility under the moderating effect of BDAC–business alignment and its impact on performance through organizational agility. Data from a matched-pair survey of business, data technology, and financial executives in 161 organizations were used to examine the proposed research model. This paper used partial least squares–structural equation modeling and hierarchical component analysis to examine the data. The results suggest a positive mediation role of organizational agility in the relationship between big data analytics capability and organizational performance, except that the mediation effect of operational adjustment agility on BDAC and market performance is not statistically significant. This study also finds that alignment between the business strategy and the big data analytics strategy enhances the relationship between BDAC and market responsiveness agility. It proposes a new perspective which is to realize the value of BDAC in enhancing agility and performance.

KEYWORDS

BDAC–Business Alignment, Big Data Analytics Capability, Fit Perspective, Market Responsiveness Agility, Operational Adjustment Agility

INTRODUCTION

Organizational agility is a critical ability for firms to identify and quickly respond to competitive market opportunities in uncertain environments (Ravichandran, 2018). Agile organizations have the advantage of satisfying customer needs with speed to gain more organizational performance such as market share and profits (Zhou et al., 2019). Thus, research on organizational agility is of great significance to firms. As a large amount of heterogeneous data accumulates, practitioners and scholars have developed many analytics techniques to handle various data (Salama et al., 2021). In recent years, firms continuously invest in big data analytics (BDA) and a growing number of researchers propose effective use of BDA is an important ability for enhancing organizational agility and performance (Hajli et al., 2020). BDA means the processes that analyze numerous data with sophisticated algorithms to obtain valuable information and create actionable ideas for delivering sustained value (Wamba et al., 2017; Sayantan et al., 2020). It is incorporated in organizational operations to help

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firms digging relevant market opportunities in the changing environment and provide corresponding solutions (Sambamurthy et al., 2003). A survey indicated that firms using BDA are 36% more likely to perform better in the market and operational efficiency than their competitors (Marshall et al., 2015). BDA contributes to better understand market trends and customer needs and improve the production arrangements, thereby it is beneficial to enhance organizational agility (Iftikhar and Khan, 2020). For example, Amazon uses browsing data, past purchases, and other records from customers through BDA to predict their current purchases and ships products to the regional warehouses where customers are located in advance to quickly deliver the goods to them. However, not all firms improve agility and performance after investing in big data analytics (Popovič et al., 2016). Regarding these inconsistencies in firms, current research suggests that big data analytics is significantly effective for agility and performance in the consideration of contextual factors, such as environmental dynamism (Barlette and Baillette, 2020). Contextual factors provide a possible perspective, but they are difficult to fully explain those inconsistencies. More research is required to reveal the conditions under which big data analytics capability (BDAC) might improve organizational agility successfully and to resolve the dispute over the relationship between BDAC and organizational performance.

Alignment between information technology (IT) and business is often proposed due to the contradiction between IT capability and organizational agility (Huang et al., 2007). For instance, strategic IT alignment allows firms to share activities across business units, which reduces barriers to consensus, thus achieving agility (Tallon and Pinsonneault, 2011). IT–business alignment is widely discussed in literature; however, the value of alignment is rarely validated in the big data context and remains a large research gap in this field. Pathak et al. (2021) propose a theoretical framework that includes BDAC functional and evolutionary fitness. BDAC as a functional capability represents the competence to extract insights through processing and managing big data related-resources. The evolutionary fitness such as integration between BDA and process, and the alignment between BDA strategy and business strategy, is overlooked, but it may be important factor in examining effect of BDAC on agility and achieving long-term success for firms. According to literature on IT and BDA, this study proposes the concept of BDAC-business alignment. BDAC-business alignment represents the coordinated extent of analytics capability and business activities. When firms master similar data analytics technologies, the alignment between analytics capability and business strategies and processes become a key factor in responding to market changes effectively and capturing competitiveness (Davenport, 2017). Big data analytics capability may perform differently in external markets and internal operations due to its different support at the strategic and operational levels. Multidimensional business alignment is needed to be discussed. Thus, this study seeks to answer the first research question: What are the impacts of BDAC–business alignment in different dimensions on the relationship between BDAC and organizational agility?

Firms also use BDA to improve their organizational performance (Wamba et al., 2017; Akter et al., 2016; Mikalef et al., 2019). However, different findings show the link between BDAC and organizational performance is debatable. The mediating role of organizational agility in the impact of BDAC on organizational performance may explain the inconsistency (Li et al., 2020). Organizational agility helps firms achieve advantages in the market and operations through leveraging additional capabilities (e.g., big data analytics capability) to acquire performance gains (Lu and Ramamurthy, 2011). Amazon is an example of making more profits using BDA to sense and respond to market changes quickly (Wills, 2014). Furthermore, multidimensional performance involving operational performance in addition to financial and market performance is ignored in a big data environment, which may make the relationship between BDAC and organizational performance difficult to explain. The influence of BDAC on different types of performance through organizational agility may have nuanced differences. It is worthwhile to discuss these relationships clearly to understand the value of BDAC and provide thorough management strategies. Based on the considerations above, this study seeks to answer the second research question: What is the mediation effect of organizational agility on BDAC and multidimensional organizational performance?

To answer the questions above, first, this article uses the fit perspective and the source-position-performance framework to uncover how BDAC impacts on organizational agility under the condition of BDAC-business alignment in different levels, which in turn improves organizational performance. Second, this study collected data from senior and executive managers in the operations departments of 161 firms in the global market and empirically tested the research model using partial least squares–structural equation modeling (PLS-SEM) and bootstrapping method.

This study makes new contributions to BDA research. First, this study considers two types of BDAC–business alignment on the corporate strategic and operational levels, because of the different strategies pursued at different levels, and evaluates the impact of the types of alignment on the relationship between BDAC and organizational agility from the fit perspective. It extends the fit perspective into the field of BDA business value and is also a pioneering study that proposes multidimensional concept to discover the different roles of BDAC-business alignment in different levels in the relationship of BDAC and agility in order to clearly understand the transition from BDAC to organizational agility in markets and operations. The results indicate that the higher alignment between analytics strategy and business strategy, the stronger influence of BDAC on market responsiveness agility. Second, based on the source-position-performance framework, this study reveals the sources of performance in different dimensions through the process of superior BDAC obtaining positional advantages in the market and operations. This study increases the research on the indirect relationship between BDAC and multidimensional performance through organizational agility. In summary, findings in this study uncover possible solutions to explain the inconsistent relationships between BDAC and agility and performance.

LITERATURE REVIEW AND THEORETICAL BACKGROUND

Big Data Analytics Capability and Business Alignment

In general, BDAC is defined as the organizational ability with tools, techniques, processes, and practices that enable a firm to process, organize, visualize, and analyze data, thereby producing insights from data-driven prediction, decision-making, traceability, and execution (Wang et al., 2016; Srinivasan and Swink, 2018). It as a functional capability plays a positive role in agility and performance; however, previous researchers ignored an important viewpoint that firms with weaker capabilities require different strategies/tactics compared to firms with stronger capabilities (Teece, 2014). That is mean, there exist other factors linking BDAC and agility and further influencing on performance. BDAC-business alignment as an evolutional capability is such a factor because a firm needs to synchronize BDAC with organizational goals and integrate BDA applications into business processes (Akter et al., 2016; Pathak et al., 2021). There are some inconsistencies towards the concept of BDAC in extant research and literature on BDAC-business alignment is rarely discussed. It is important to clarify a suitable concept of BDAC for this research context and define the dimensions of BDAC-business alignment.

Grounding on resource-based view, BDAC is built by tangible resources (e.g., financial support, data, and technology resources), human skills (e.g., technical skills and management skills), and intangible (e.g., data-driven culture and organizational learning) (Gupta and George, 2016; Mikalef et al., 2020). This concept encompasses all the resources related to big data analytics, but the total amount of resources is difficult to reflect the process of capability formation. The mechanism of how these resources interact and how they rise to an ability cannot be shown. BDAC is also often conceptualized in three key dimensions as BDA infrastructure capability, BDA management capability, and BDA personnel expertise (Wamba et al., 2017; Akter et al., 2016). BDA infrastructure capability ensures the technical feasibility for achieving a compatible, connective, and modularized BDA analytics system. Owing to the existence of a large number of heterogeneous data, the connectivity, compatibility, and modularity capabilities become critical to ensure aggregate data flow in the organization. BDA personnel expertise means the capability of experts through their abundant knowledge to implement

big data analytics, such as optimization of demand prediction, improvement in product process monitoring, and optimization of inventory management (Hopkins and Hawking, 2018). BDA management capability refers to the ability to plan, coordinate, control, and make decisions that ensure the reliability of business decisions. This concept mainly reflects the elements and process of the formation of big data analytics capability. The dimensions as infrastructure, management, and personnel expertise have been validated in IT and BDA research while examining the relationship between IT capability/BDAC and agility. BDAC as the ability that a firm effectively leverages to build a connective, compatible, coordinate BDA system and analyze data in real time to generate insights is particularly useful for enhancing organizational agility (Mikalef et al., 2018).

Business alignment has two perspectives as a capability and an outcome (Sabherwal et al., 2019). In this paper, BDAC-business alignment is a capability that ensures the conformity between BDA practices and business activities (Hung et al., 2019). There is no consensus on how the alignment can be measured (Gerow et al., 2014; Coltman et al., 2015; Luftman et al., 2017; Liang et al., 2017). In BDA research, Akter et al. (2016) contend that analytics capability and business strategy alignment can help firms match resources with opportunities in the changing market. The BDAC–strategy alignment illustrates that the direction of data analytics is adaptive for a business strategy. It is the extent of the alignment between the analytics strategy and the overall business strategy in the organization (Akter et al., 2016). However, literature in IS research indicates alignment between IT infrastructure, culture, and design and operational practices across functions is also important for firms to achieve agility (Zhou et al., 2018). Henderson and Venkatraman (1993) propose a concept of alignment based on strategic fit and functional integration. Maes et al. (2000) suggest a framework that addresses the dimensions of alignment and incorporates function and strategy to reflect the need for information sharing in internal and external environments. Similar to their research, Gerow et al. (2014) and Coltman et al. (2015) take the external integration between the IT strategy and business practices as intellectual alignment, and internal and cross-domain integration between IT infrastructures and business practices as operational alignment. Liang et al. (2017) attach importance to internal fit joining with external fit. It is easy for companies to care about one type of fit but ignore the other due to limited resources (Tallon and Pinsonneault, 2011). Thus, this study adopts a combination of external strategic and internal operational alignment which is the fit between BDAC and business activities and practices (Gerow et al., 2014). Alignment between big data analytics managers and strategic and cross-functional operational managers explains internal cooperation in big data analytics and functional operations (e.g., production, marketing, and logistics management) to complete the implementation of strategic plans. To sum up, this study propose two types of BDAC–business alignment: BDAC–strategy alignment and BDAC–operations alignment. The definition of BDAC-strategy alignment adopts research from Akter et al. (2016). The inconsistency between customer-centric and profit-maximizing corporate goals will lead to big differences in big data analytics strategies and processes. This is because big data analytics involves the capture of large amounts of data and information, which will lead to data and information security issues. Firms need to balance relationship between benefits generated by data and customer churn. All of this alignment around strategy need to be considered by firms, rather than just focusing on the improvement of big data analytics capability. BDAC–operations alignment refers to the extent to which organizational BDA design, plan, and operational process across functions work together to achieve a firm's objectives (Chi et al., 2020). BDA play important role in prediction and explanation that help firms foresee changes earlier and make powerful responses (Agarwal and Dhar, 2014). Strong prediction and explanation need the coordination between BDA and business functions.

The Fit Perspective

Previous literature stresses the importance of strategies for using BDA effectively rather than just pay attention to the functional attributes of BDAC (Wang et al., 2016; Pathak et al., 2021). However, there is no any empirical research to show how BDAC and BDAC-business alignment work to promote

agility. The fit perspective may be appropriate to account for the role of BDAC-business alignment on the relationship between BDAC and agility.

The fit perspective arises from the contingency theory that argues it is difficult for one factor alone to be effective for a company, and the degree of fit between two or more factors leads to organizational outcomes (Goodhue and Thompson, 1995). For example, Teece (2014) considers that dynamic capabilities should be coupled with the organizational strategy to bring about sustained competitive advantages. Bergeron et al. (2001) propose six conceptualizations of fit: moderation, mediation, matching, covariation, profile deviation, and gestalts. The moderation approach means the third variable influences the direction or strength of the relationship between the independent variable and the dependent variable. The fit as a mediator indicates there exists an intervening variable between the antecedent variable and the consequent variable. The matching approach refers to the impact of the degree of matching between one variable and other related variables on the dependent variable. The fit as covariation describes the internal consistency among theoretically related variables, while the fit as profile deviation is defined as the internal consistency of multiple contingencies. The fit as gestalts emphasizes the internal congruence of a large number of variables.

In the context of this study, BDAC has strong advantages in predicting customer needs and optimizing the operational process through a large number of data obtained from markets and operations that creates organizational agile capabilities to identify and cope with changes in an unstable business environment. Due to the possible direct relationship between BDAC and agility, this study treats the alignment as a moderation type of fit to examine the impact of the alignment between BDAC and business activities on the relationship between BDAC and organizational agility. The moderation perspective of fit is also validated in IS research. For example, Gao et al. (2019) find that the strength of the effect that IT flexibility has on organizational agility depends on the alignment of IT and the business strategy. Thus, the moderation perspective of fit is an appropriate lens to explain the role of BDAC–business alignment in organizational agility.

Organizational Agility

Organizational agility has received considerable research attention over the past 20 years. In this research, organizational agility often has multiple facets, such as sensing and responding capabilities (Overby et al., 2006), entrepreneurial and adaptive agility (Lee et al., 2009; Chakravarty et al., 2013), organizational adaptability and flexibility (Felipe et al., 2016), market capitalizing agility and operational adjustment agility (Lu and Ramamurthy, 2011), customer, operational, and partnering agility (Sambamurthy et al., 2003; Tallon and Pinsonneault, 2011), organizational proactiveness, radicalness, responsiveness, and adaptiveness (Lee et al., 2015). Although there are a number of these dimensions, organizational agility mainly has two explanations: (1) One is generally a higher-order dynamic capability to sense and seize opportunities and respond rapidly and innovatively to changing market environment (Lu and Ramamurthy, 2011; Ghasemaghaei et al., 2017). (2) The other is a firm's ability to coordinate and streamline the firm's internal operational processes, establish strong external relationships, and understand and respond to customer needs quickly (Sambamurthy et al., 2003; Ravichandran, 2018). Considering the value of BDA for market prediction, decision-making, and operational visualization, this study defines organizational agility as the ability in internal operating process to adjust to address market changes and responsiveness ability in improving a product or service to meet dynamic customer demands. Thus, organizational agility is conceptualized in two dimensions drawing on Lu and Ramamurthy (2011): market responsiveness agility and operational adjustment agility.

Market responsiveness agility refers to the ability to identify market opportunities and threats in a changing environment and respond effectively and efficiently (Zhou et al., 2019). It involves not only customer agility that anticipates and responds to customer-related demands and opportunities but also partnering and competitive agility that restructures strategic resources to cope with changes in the firm's suppliers, distributors, and competitors. Market responsiveness agility enables firms

to understand the customer, partner, competitor, and dynamic environment changes and propose innovative solutions rapidly and effectively (Roberts and Grover, 2012). Operational adjustment agility is defined as the ability to adapt and react to changes in a turbulent environment by rapidly adjusting internal business procedures (Lin et al., 2020). It emphasizes the streamlining and restructuring capabilities in operational processes when firms face market shocks. Operational adjustment agility determines a firm's capability to adjust and even create new operational procedures for market changes.

Tallon et al. (2019) summarize enablers of organizational agility from four aspects: technology (e.g., IT capability), behavior (e.g., management foresight of strategic planners), organization/structure (e.g., ecosystems), and environment (e.g., environmental dynamism). BDAC is a technology enabler to drive agility, but as the market changes, firms need to configure BDAC and business practices differently. Aghina et al. (2016) propose agility combines stability (e.g., efficiency) and dynamism (e.g., adaptability). It is necessary to explore how BDAC as a functional capability and BDAC-business alignment as an evolutional capability facilitate the stability and dynamism of agility.

Organizational Performance

Organizational performance is defined as the outcomes resulting from the interplay among disparate areas, such as strategy, international business, marketing and operations management, information systems, and human resources (Richard et al., 2009). Many scholars propose a variety of performance measures: financial and non-financial performance (Maksoud, 2004; Lin et al., 2020); competitive, financial, strategic, and no-equity stakeholder performances (Mohiuddin and Su, 2013); financial and market/strategic performance (Ren et al., 2017); financial, market, and operational performance (Gupta et al., 2020). From the above categories, financial performance is important to evaluate organizational performance. In this study, BDAC leads to higher market responsiveness agility and operational adjustment agility will help to ensure sustainable market growth and efficient operations inside and outside the organization. Therefore, this paper takes organizational performance as a multidimensional concept covering financial performance, market performance, and operational performance according to Gupta et al. (2020). Financial performance mainly consists of financial indicators (e.g., profitability, sales growth, return on investment) strengthened by optimized operations and efficient market strategies (Gupta et al., 2020). Market performance is often characterized in terms of market indicators (e.g., market share growth, innovative speed) of a company's products and services (Ren et al., 2017). Operational performance refers to the degree to which operational goals are fulfilled within value chain activities. It is measured by indicators such as productivity and profit rate (Gupta et al., 2020). The paradigm of BDAC-multidimensional agility-overall performance may explain value of BDAC in a more holistic way and helps firms understand what they can reinforce in order to improve which one performance they want.

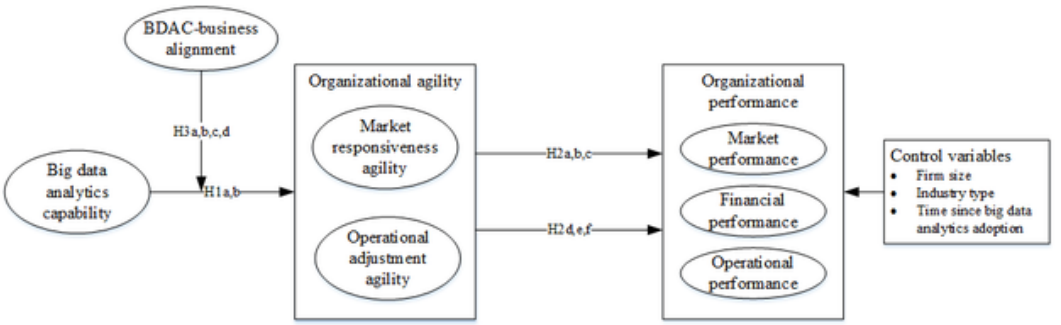
Literature Summary

Previous research takes BDAC as an individual factor and concentrates on examining its relationship to agility and performance. However, theoretical and empirical research on how BDAC-business alignment affects the relationships of BDAC and agility and performance is scarce. In the aforementioned literature, this study clarifies the definitions and compositions of BDAC, BDAC-business alignment, and organizational agility in the context of big data and accordingly illustrates the relationship between them from a fit perspective. Although organizational agility and performance may be achieved with strong BDAC, BDAC has to align with organizational business practices. This article addresses the gap in the research with BDAC-business alignment and uses the fit perspective to explain the role of BDAC-business alignment to provide enhanced understanding of the relationship between BDAC and agility.

RESEARCH MODEL AND HYPOTHESES

Based on the fit perspective, this study proposes the BDA design, plan, and process aligns with the organizational strategy and operational processes across functions to increase the influence of BDAC on market responsiveness agility and operational adjustment agility. Then, following the source-position-performance framework, this study further addresses how BDAC improves market, financial, and operational performance through multidimensional agility. The framework explains the process from the of analytics capabilities to positional advantages finally winning in the performance outcomes (Day and Wensley, 1988; Bi et al., 2011). Figure 1 presents the research model.

Figure 1. Research model



Extant research often takes industry and firm size as control variables (Ashrafia et al., 2019). In the present study, industries with differentiate characteristics may influence firms' performance gains. Small firms have limited resources and investments in BDA; thus, firm size may be difficult to influence the impact of organizational agility on performance. This relationship may be more vulnerable to disruptions in large firms as they are difficult to be agile in their operations. This paper also considers time since BDA adoption as a control variable. The value of BDA for organizational performance may differ considerably at different stages of BDA use.

BDAC and Organizational Agility

Scholars emphasize practices of analyzing and managing vast numbers of varied data in real time, to help companies enhance decision-making capabilities, and increase the visibility and traceability of information to improve agility and better manage risks (Wamba et al., 2020). Implementing BDA helps a firm better identify opportunities and threats to make fast and effective decisions, and therefore, enhance agility (Popoviè et al., 2018). The integrated BDA system achieves agility through customer demand prediction and optimized management in real time (Rialti et al., 2018, 2020; Sultana et al., 2021). BDAC increases visibility that mitigates organizational risks from operational disruptions allowing the organization to be more agile (Deng, 2021).

BDA converts data into knowledge to increase innovation and helps firms improve the predictability of opportunities and threats (Côrte-Real et al., 2017), which has a positive impact on a firm's market responsiveness agility (Woerner and Wixom, 2015). BDA also increases firms' ability to make decisions in real time in a turbulent environment (Ghasemaghaei, 2019; Yoo and Roh, 2021). The predictability helps firms sense changes in the marketplace and cope with them effectively and efficiently through decision-making capability (Barlette and Baillette, 2020). Some firms have utilized in BDA to capture market trends from customer-originated data and provide personalized products or services (Hofacker et al., 2016; Ram and Zhang, 2021). Dubey et al. (2019) argue that the use

of BDA may help managers sense rapid changes in the environment, so they can develop business contingency plans reducing uncertainty to enhance operational adjustment agility. BDA also helps streamline the internal process through analyzing data from multiple business processes to reduce bottlenecks. BDAC enables firms to have the capacity to integrate and configure BDA management, technology, and personal expertise resources and competences to provide innovative solutions in operational management and respond quickly to changing environments to acquire market and operational agility (Rialti et al., 2018; Wamba et al., 2020). Thus, we hypothesize that:

Hypothesis 1a: BDAC has a positive effect on market responsiveness agility.
Hypothesis 1b: BDAC has a positive effect on operational adjustment agility.

Organizational Agility and Performance

BDAC helps firms extract information from big data environments and transmits it into effective decision-making to drive firms to reconfigure resources and respond quickly to changes. The agile responsiveness and adjustment may bring about a superior competitive advantage, which in turn achieves performance (Rialti and Marzi, 2020).

Market responsiveness agility is the ability of a firm to sense and seize opportunities that are a benefit of expanding share in the existing market, and even develop new markets. It also represents a flexible and responsive approach to an uncertain market environment that helps firms use more resources to create innovative products and services to meet customer needs (Hagen et al., 2019). Khan and Khan (2021) indicate market responsiveness agility influences market performance through focusing on corrective reaction to respond effectively to customer needs. Market responsiveness agility allows firms to better use their assets and thus, receive greater financial benefits (Li et al., 2020). Firms with agile market capability have creative potential in satisfying customer demand to improve customer retention (Roberts and Grover, 2012). Market responsiveness agility motivates the need of effective operational processes, which induces improvement in the operational performance. Elements of market responsiveness capability can be applied to internal and external operations to help firms enhance performance (Khan, 2020). Thus, we hypothesize that:

Hypothesis 2a: Market responsiveness agility has a positive effect on market performance.
Hypothesis 2b: Market responsiveness agility has a positive effect on financial performance.
Hypothesis 2c: Market responsiveness agility has a positive effect on operational performance.

Market performance is also inseparable from operational adjustment agility, as firms need the corresponding reactive procedures in internal functions to meet customer demand and occupy more market share. Zara (one of the top clothing retailers in the global market) is an example that capitalizes on operational agility for business success (Huang et al., 2014). Operational adjustment agility underpins the ability to respond rapidly to market opportunities through focused business structures and processes to achieve market performance (Sull, 2010). It is also recognized as a capability that accomplishes speed, accuracy, and cost economy in the exploitation of opportunities for innovation and competitive action (Sambamurthy et al., 2003). Through agile operational arrangements, products and services can quickly be enjoyed by customers, thus helping firms increase the benefits of customers' repurchases. In a dynamic environment, firms with strong operational adjustment agility have the ability to control, integrate, and coordinate different functional processes, which may reduce operational costs and enhance productivity (Tan et al., 2019). Thus, we hypothesize that:

Hypothesis 2d: Operational adjustment agility has a positive effect on market performance.
Hypothesis 2e: Operational adjustment agility has a positive effect on financial performance.
Hypothesis 2f: Operational adjustment agility has a positive effect on operational performance.

The Moderation Effect of BDAC–Business Alignment on BDAC and Organizational Agility

The degree of BDAC influence on agility depends on the levels of alignment between BDA activities and business practices. This means that the consistency of the BDA strategy and processes and business strategy or functional operations may strengthen the impact of BDAC on organizational agility. In order to maximize the benefit of BDA investment, organizations should adopt an appropriate strategy and operation to guide and govern BDAC-related collaborative activities (Safari and Jiang, 2018).

When firms include the BDA plan in their business strategy and goals, managers who understand and know the goals for implementing BDA find it was easier to translate data into actionable insights, which is especially important for market responsiveness agility (Grossman and Siegel, 2014). Furthermore, when business strategies change, big data analytics managers can easily sense and exploit these changes enabling more opportunities for firms to respond rapidly in uncertain markets (Tallon and Pinsonneault, 2011). The alignment of the business strategy and big data analytics strategy is what many companies are pursuing, because it helps companies be more capable of deploying operational structures and processes in high-level BDAC. The synergy of big data analytics strategy and the business strategy may facilitate companies to promote their operational adaptability (Akter et al., 2016). Thus, we hypothesize that:

Hypothesis 3a: BDAC–strategy alignment positively moderates the relationship between BDAC and market responsiveness agility.

Hypothesis 3b: BDAC–strategy alignment positively moderates the relationship between BDAC and operational adjustment agility.

Alignment between BDAC and operations is the reflection of capability to integrate the BDA design, plan, and process in functional operations. Despite strong BDAC, the chaos in cross-functional operations may also result in a failure to be agile in satisfying customer needs. If firms derive valuable insights from BDA, but the practices in cross-functions need a long time, companies may lose the opportunity to put out products or services in the market quickly. Alignment at the operational level denotes that BDA managers and cross-functional managers often communicate in a system that determines the operational processes, enables firms to keep alert to the market, and forms can be adjusted effectively according to the changing market (Huang and Hu, 2007; Li et al., 2021). There are often uncertainties between internal cross-functions, and the capabilities of different parts may also be uneven. Combining big data analytics with these cross-functional operations enables firms to achieve efficient operations and better respond to the dynamic environment (Schlegel et al., 2020). Thus, we hypothesize that:

Hypothesis 3c: BDAC–operations alignment positively moderates the relationship between BDAC and market responsiveness agility.

Hypothesis 3d: BDAC–operations alignment positively moderates the relationship between BDAC and operational adjustment agility.

METHOD

Survey Development

All measures were developed from related literature with minor modifications to adapt them to this research. Items of BDAC and BDAC-strategy alignment are developed according to Akter et al. (2016). BDAC-operations alignment is adapted from Tallon and Pinsonneault (2011). Organization agility is measured by market responsiveness agility and operational adjustment agility according to Lu and Ramamurthy (2011). Research in Wamba et al. (2017) and Gupta et al. (2020) is used to build

the items of organizational performance. The questionnaire was originally in English and translated into Chinese by two translators reaching consensus. Two other translators performed a reversed translation. Data and operational management experts discussed the two versions of the English-language questionnaire to resolve the discrepancies and examined the Chinese-language version. Then, the English- and Chinese-language questionnaires were finalized. We used a seven-point Likert scale to indicate the extent to which respondents agreed or disagreed with items for each question, where 1 represents strongly disagree, and 7 represents strongly agree. The finalized survey is provided in Table 1. Before the main survey was administered, a pilot study with 47 respondents was conducted to examine whether the survey was easy to complete, was the appropriate length and contained clear questions, and had a reasonable structure to ensure the reliability and validity of the measures.

Data Collection

Based on the pilot study, we found that value creation of BDA is still in the early stage of exploration. Many companies are investing insufficiently in big data, or not investing at all. Thus, we chose global top 500 logistics companies according to Fortune Magazine and their major customer in the global market as samples that have a large amount of data to analyze to solve business problems. By listing samples above, we contacted with the companies by email or telephone and asked whether they agreed to participate the survey after we explained the purpose of this study. Then, we distributed 316 questionnaires to managers in these companiesbwho were willing to take the survey, and kept connection with a manager in each company. Respondents in different department answered different sections of the questionnaire. Data technology managers responded to questions about BDAC. BDAC–operations alignment and organizational agility questions were completed by senior managers. Financial managers and executives separately responded to organizational performance and BDAC–strategy alignment questions. We designed a question: How many years has your organization used BDA? The responses 0 and 1 were excluded from the research because firms adopting BDA cannot make an obvious change in performance within a short period. Some questionnaires had missing responses and contained illogical answers to questions (e.g., all the answers were the same), resulting in 161 usable questionnaires. Table 2 shows the demographics of the respondents and their companies. Industry of major customers of logistics companies includes Manufacturing, Retail trade, and other (Agriculture, Forestry, and Fishing, Electric, Gas, and Sanitary Service etc.). The number of respondents who completed the survey was 644 as people from different departments completed the survey; 443 respondents were male (68.79%), and 201 were female (31.21%); and 51.71% had 0 to 10 years of experience, and 48.29% had more than 10 years of experience in their work fields.

Nonresponse bias was assessed by comparing data from early and late survey respondents (Armstrong and Overton, 1977). There were no statistically significant differences for dependent variables between the early 25% and later 25% answers suggested by t-tests. Demographic characteristics such as gender, age, and work experience between early and later respondents also showed no statistically significant differences. Thus, nonresponse bias is not a serious problem in this study.

Table 1. Constructs measurement

Construct	Submission	Items	References
Big data analytics capability (BDAC)	**Infrastructure capability**	BDACIC1: Our organization has the foremost available analytics systems to connect the remote, branch, and mobile offices into central office	Akter, Wamba, Gunasekaran, Dubey, & Childe. (2016)
		BDACIC2: Our organization provides multiple analytics interfaces for users to have access to all platforms and applications	
		BDACIC3: Reusable software modules are widely used for end-users to create their own analytics applications to meet a variety of needs during analytics tasks	
	Management capability	BDACMC1: Our organization performs data analytics planning processes in systematic ways	
		BDACMC2: Our organization make data analytics investment decisions by estimating the productivity of employees' work, the cost of end users, and the time to see changes from data analytics	
		BDACMC3: In our organization, data analysts coordinate harmoniously to communication	
		BDACMC4: Our organization understands the responsibility of analytics development and monitors the performance of analytics function	
	Personnel expertise	BDACPE1: Our analytics personnel are very capable in data analytics (e.g., artificial intelligence, data mining etc.)	
		BDACPE2: Our analytics personnel show superior ability in understanding technological trends and learning new technologies	
		BDACPE3: Our analytics personnel are very capable in analytics methods to solve business problems	
		BDACPE4: Our analytics personnel are very capable in terms of managing projects and user relationships	
BDAC-busi ness alignment	**BDAC-strategy alignment**	SA1: The BDA plan aligns with the organizational mission, goals, objectives, and strategies	Akter, Wamba, Gunasekaran, Dubey, & Childe. (2016); Tallon & Pinsonneault. (2011)
		SA2: The BDA plan contains quantified goals and objectives	
		SA3: The BDA plan contains detailed action strategies that support company direction	
		SA4: We prioritize major BDA investments by the expected impact on business performance	
	BDAC-operati ons alignment	BS1: My organization takes BDA plan into cross-functional planning	
		BS2: My organization enables the ability of managers in cross-functional areas and general management to understand the value of BDA investment	
		BS3: My organization designs an efficient and effective BDA process to satisfy the whole functional operations	
		BS4: My organization aligns operational process with BDA systems	
Organizatio nal agility	**Market responsiveness agility**	MA1: We are quick to make and implement appropriate decisions in the face of market/customer changes	Lu, & Ramamurthy. (2011)
		MA2: We are quick to look for ways to reinvent/reengineer our organization to better serve our market place	
		MA3: We treat market-related changes as opportunities and react rapidly	

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Table 1. Continued

	Operational adjustment agility	OPA1: We fulfill demands for rapid-response, special requests of our customers whenever such demands arise; our customers have confidence in our ability	
		OPA2: We can quickly scale up or scale down our production/service levels to support fluctuations in demand from the market	
		OPA3: Whenever there is a disruption in supply from our suppliers, we can quickly make necessary alternative arrangements and internal adjustments	
Organizational performance	**Financial performance**	FP1: Customer retention	Wamba, Gunasekaran, Akter, Ren, Dubey, & Childe. (2017); Gupta, Drave, Dwivedi, Baabdullah, & Ismagilova. (2020)
		FP2: Sales growth	
		FP3: Profitability	
		FP4: Average return on investment	
	Market performance	MP1: We have entered new markets more quickly than our competitors	
		MP2: We have introduced new products or services to the market faster than our competitors	
		MP3: Our success rate of new products or services has been higher than our competitors	
		MP4: Our market share has exceeded that of our competitors	
	Operational performance	OP1: Our productivity has exceeded compared to competitors	
		OP2: Our profit rate has exceeded compared to competitors	
		OP3: Our return on investment has exceeded compared to competitors	
		OP4: Our sales revenue has exceeded compared to competitors	

DATA ANALYSIS

BDAC, BDAC–business alignment, organizational agility, and organizational performance are reflective two-order constructs (Akter et al., 2016; Wamba et al., 2017; Tallon and Pinsonneault, 2011; Lu and Ramamurthy, 2011; Gupta et al., 2020). The use of PLS-SEM to implement hierarchical component analysis method is needed to acquire two-order latent variable scores for follow-up analyses, which is benefit for solving the problem about of too many levels and items (Ringle et al., 2012; Hair et al., 2019). Therefore, we used PLS-SEM to estimate the hierarchical model with a small sample to achieve model simplicity and higher statistical power (Edwards, 2001; Hair et al., 2019).

Test for Common Method Bias

We used statistical analysis to test the potential common method bias through four methods. First, the highest correlation between constructs is 0.6. Common method bias is usually evidenced by extremely high correlations ($r > 0.90$; Bagozzi et al., 1991). Furthermore, the variance inflation factor (VIF) ranged from 1.58 to 2.80 which is below the suggested threshold of 3.3 (Diamantopoulos and Siguaw, 2006). Kock (2015) argues the full collinearity test can be regarded as a method for identifying common method bias. Third, in Harman's one-factor test, the first factor was 31.1% which did not account for the majority of the variance (Stone et al., 1990). Finally, we added a common-method factor to the model to test common method bias (Liang et al., 2007). The result suggested a large difference between the average quadratic sum of the principal-variable loadings and the average quadratic sum of the method factor loadings. Therefore, the common method bias in this research is not a serious issue.

Table 2. Demography of respondents and their companies

Dimension		Category	Percentage (%)
Industry	**Logistics service providers**	Logistics	45.34%
	Customers of logistics service providers	Manufacturing	18.63%
		Retail Trade	19.88%
		Others	16.15%
Number of full-time employees		0-50000	55.26%
		50001-100000	16.67%
		100001-150000	10.09%
		Above 150000	17.98%
Time since adopt BDA		0-5 years	59.66%
		6-10 years	34.1%
		11-15 years	3.4%
		Above 15 years	2.84%
Note: N=161			
Gender		Male	68.79%
		Female	31.21%
Age		0-25	0.62%
		26-35	29.19%
		36-45	45.80%
		Above 45 years	24.39%
Experience(Work time)		0-10 years	51.71%
		11-20 years	40.84%
		21-30 years	7.30%
		Above 30 years	0.15%
Education		Primary qualification	0.62%
		Secondary qualification	6.68%
		College qualification (diploma/certificate)	20.65%
		Undergraduate degree	26.86%
		Postgraduate degree (master/PhD)	45.19%
Note: N=644			

Measurement Model

We used SmartPLS 3.0 to estimate the parameters in the measurement model as well as apply nonparametric bootstrapping with 5,000 replications to shrink the standard errors of the estimates (Chin, 2010; Hair et al., 2016). Hierarchical component analysis was used to solve problems about multi-level constructs (Ringle et al., 2012). Cronbach's alpha, factor loadings, composite reliability, and the average variance extracted (AVE) evaluated the construct reliability, validity, and unidimensionality of the measurement model (Hair et al., 2016). The square root of the AVE of a construct was higher than its correlations with other constructs, and the heterotrait-monotrait ratio of correlations (HTMT) was lower than the threshold of 0.85, suggesting good discriminant validity (Fornell and Larcker,

1981; Henseler et al., 2015). Table 3 presents the descriptive statistics and reliability of the constructs. The AVE and the correlations between different constructs, and the heterotrait-monotrait ratio of correlations are shown in Tables 4 and 5.

As shown in Table 3, Cronbach's alpha and the composite reliability of all constructs are greater than 0.7. All item loadings are higher than 0.7. The AVE of all constructs exceeds 0.5. These results demonstrate construct reliability, unidimensionality, and convergent validity (Hair et al., 2016). Table 4 shows the square root of each AVE is greater than the related inter-construct correlations in the construct correlation matrix, and the value of the heterotrait-monotrait ratio of correlations is less than the threshold of 0.85 in Table 5, indicating adequate discriminant validity for all of the constructs.

Structural Model

We used the bootstrapping technique to test the significance of paths with the t-statistic (Hair et al., 2016). In Figure 2, BDAC enhanced market responsiveness agility and operational adjustment agility with standardized path coefficients of 0.309 and 0.280, respectively ($p < 0.05$). Moreover, market responsiveness agility and operational adjustment agility enhanced organizational performance (market, financial, and operational performance) with standardized path coefficients of 0.353, 0.236, and 0.243 and 0.212, 0.265, and 0.331, respectively ($p < 0.05$). The percentages of the explained variance of endogenous variables (R^2) were 30.7% and 41.3% for market responsiveness agility and operational adjustment agility, respectively, and 25.3%, 18.4%, and 24.4% for market performance, financial performance, and operational performance, respectively. Thus, hypotheses 1 (a, b) and 2 (a, b, c, d, e, f) were supported. None of the control variables had a statistically significant effect on the antecedent variables in the model from Figure 2. Table 6 presents the supported results for the structural model.

Stone–Geisser's of endogenous constructs for market responsiveness agility, operational adjustment agility, market performance, financial performance, and operational performance were higher than 0 through running Blindfolding, indicating acceptable predictive relevance (Geisser, 1974). The of all constructs in the model were larger than 0.02 (Cohen, 2013). The standardized root mean squared residual (SRMR) refers to the standardized effect size of the overall misfit suitable for the covariance structure model, and is another commonly used index to describe the fit of a model (Kline, 2011). In the model, the SRMR was 0.054 below the suggested value of less than 0.1 or 0.08 (Hu and Bentler, 1999). The methods above indicate that the predictive power of the model is feasible.

Table 3. Reliability of measurement model

Constructs	Items	Factor Loadings	Cronbach's α	CR	AVE
BDAC			0.786	0.875	0.700
Infrastructure capability			0.871	0.921	0.794
	BDACIC1	0.878			
	BDACIC2	0.897			
	BDACIC3	0.898			
Management capability			0.891	0.925	0.754
	BDACMC1	0.883			
	BDACMC2	0.877			
	BDACMC3	0.883			
	BDACMC4	0.830			
Personnel expertise			0.883	0.919	0.740
	BDACPE1	0.864			
	BDACPE2	0.872			
	BDACPE3	0.831			
	BDACPE4	0.875			
BDAC-strategy alignment			0.862	0.906	0.707
	BDACSA1	0.819			
	BDACSA2	0.858			
	BDACSA3	0.833			
	BDACSA4	0.853			
BDAC-operations alignment			0.864	0.901	0.711
	BDACCA1	0.838			
	BDACCA2	0.888			
	BDACCA3	0.837			
	BDACCA4	0.808			
Market responsiveness agility			0.837	0.901	0.753
	MRA1	0.868			
	MRA2	0.879			
	MRA3	0.856			
Operational adjustment agility			0.803	0.884	0.717
	OAA1	0.847			
	OAA2	0.860			
	OAA3	0.833			
Financial performance			0.907	0.935	0.781
	FP1	0.896			
	FP2	0.881			
	FP3	0.868			
	FP4	0.890			

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Table 3. Continued

Constructs	Items	Factor Loadings	Cronbach's α	CR	AVE
Market performance			0.892	0.925	0.755
	MP1	0.894			
	MP2	0.859			
	MP3	0.866			
	MP4	0.856			
Operational performance			0.863	0.907	0.708
	OP1	0.842			
	OP2	0.839			
	OP3	0.844			
	OP4	0.841			

Table 4. Construct discriminant validity-Fornell-Larcker criterion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Big data analytics capability	**0.837**							
(2) BDAC-strategy alignment	0.322	**0.841**						
(3) BDAC-operations alignment	0.494	0.277	**0.843**					
(4) Market responsiveness agility	0.452	0.298	0.441	**0.868**				
(5) Operational adjustment agility	0.453	0.564	0.314	0.449	**0.847**			
(6) Market performance	0.596	0.225	0.455	0.450	0.354	**0.869**		
(7) Financial performance	0.483	0.212	0.360	0.389	0.365	0.524	**0.884**	
(8) Operational performance	0.479	0.346	0.308	0.383	0.430	0.347	0.252	**0.842**
Mean	4.544	4.278	4.587	4.832	4.304	4.691	4.632	4.306
SD	1.07	1.236	1.283	1.270	1.156	1.235	1.289	1.292
Notes: The bold numbers on the diagonal are the square root of average variance extracted between constructs and their measures. Off-diagonal elements are correlations among constructs.								

Table 5. Construct discriminant validity-heterotrait-monotrait ratio of correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Big data analytics capability	**0.85**							
(2) BDAC-strategy alignment	0.388							
(3) BDAC-operations alignment	0.597	0.321						
(4) Market responsiveness agility	0.556	0.348	0.509					
(5) Operational adjustment agility	0.569	0.674	0.377	0.546				
(6) Market performance	0.711	0.253	0.517	0.506	0.416			
(7) Financial performance	0.566	0.238	0.406	0.389	0.426	0.580		
(8) Operational performance	0.578	0.398	0.354	0.444	0.512	0.396	0.283	
Notes: Off-diagonal elements are the heterotrait-monotrait ratio of correlations.								

Moderation Test and Post-hoc Analysis

We used SmartPLS 3.0 to examine the moderation effect. The standardized path coefficient of BDAC–strategy alignment on market responsiveness agility was 1.75 ($p < 0.05$). The result suggests that BDAC–strategy alignment has significant influence on the relationship between BDAC and market responsiveness agility. However, the moderation effects of BDAC–strategy alignment on BDAC and operational adjustment agility and BDAC–operations alignment on BDAC and market responsiveness agility and operational adjustment agility were not supported.

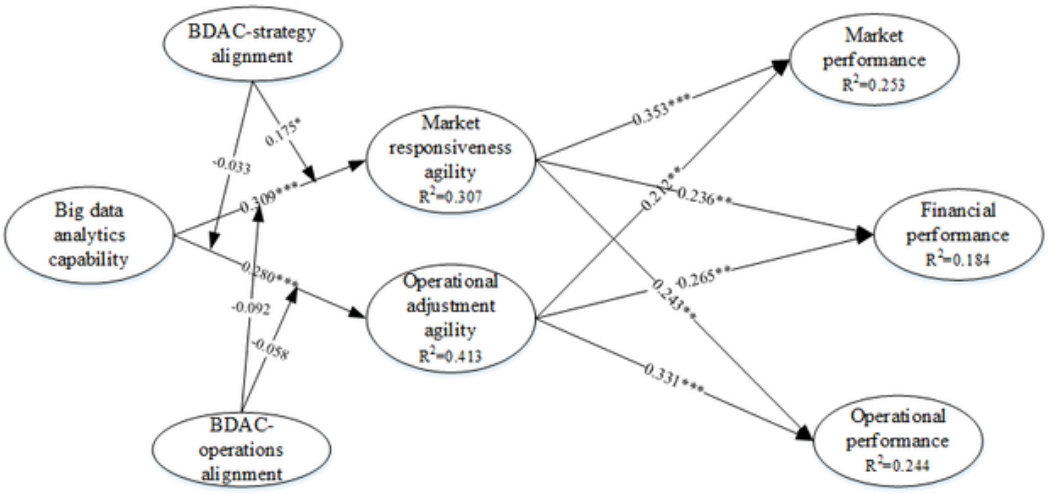
Based on the source-position-performance framework, organizational agility may act as the mediator of BDAC and organizational performance. We used the bootstrapping method to perform the mediation test with the SPSS PROCESS macro (Preacher and Hayes, 2008). This method has several advantages for this research, such as its ability to deal with non-normally distributed data compared to the Sobel test (Preacher and Hayes, 2008). The significance level shown by the *p* value or the value of the 95% bias-corrected lower-level confidence intervals (LLCIs) and the upper-level confidence intervals (ULCIs) for the indirect effect from BDAC on organizational performance through organizational agility does not include 0 to indicate the mediation effect exists (Hayes, 2012). The results of mediation test for organizational agility on BDAC and organizational performance were statistically significant, as the LLCIs and the ULCIs of the indirect effect and the R^2 mediation effect size were between 0.003 and 0.248 and excluding 0, except that the mediation effect of operational adjustment agility on BDAC and market performance was not supported.

Table 6. Supported results of structural model

Hypotheses	Effect of	Effect on	Results
1	BDAC	MRA	Supported
2	BDAC	OAA	Supported
3	MRA	MP	Supported
4	MRA	FP	Supported
5	MRA	OP	Supported
6	OAA	MP	Supported
7	OAA	FP	Supported
8	OAA	OP	Supported
9	BDAC*BDAC-strategy alignment	MRA	Supported
10	BDAC*BDAC-operations alignment	MRA	Not supported
11	BDAC*BDAC-strategy alignment	OAA	Not supported
12	BDAC*BDAC-operations alignment	OAA	Not supported

Notes: BDAC means big data analytics capability; MRA means market responsiveness agility; OAA means operational adjustment agility; MP means market performance; FP means financial performance; OP means operational performance.

Figure 2. Results of structural model



DISCUSSION AND IMPLICATIONS

This study examined the relationships between BDAC and market responsiveness agility and operational adjustment agility under the moderation of BDAC–business alignment. Firms improve their market, financial, and operational performance through organizational agility shaped by BDAC. The results of these relationships provide new evidence for the role of BDAC and BDAC-business alignment in organizational agility and further increasing performance.

First, BDAC has a positive effect on market responsiveness agility and operational adjustment agility but has a stronger effect on market responsiveness agility than on operational adjustment agility. This is consistent with the results of IT capability on market capitalizing agility and operational adjustment agility in previous literature (Lu and Ramamurthy, 2011). Market responsiveness agility represents the quick speed to formulate schemes and make decisions towards market changes, while operational adjustment agility indicates the adaptive extent of implementing schemes and decisions. The results may be rational because BDAC helps firms identify new market and make decisions to react to market changes and satisfy customer needs, which is more valid for market responsiveness agility (Lin et al., 2020). The findings extend the research through the different role of BDAC in market responsiveness agility and operational adjustment agility. These findings reinforce the verdict that BDAC is useful not only in helping companies understand market behavior, but also in adjusting the operational structures and procedures, although the results seem to indicate BDAC has a bigger effect on seizing market opportunities and responding quickly to market demands. This also shows that firms need to explore how to better apply BDA to operational practices and actions.

Second, BDAC–strategy alignment affects the relationship between BDAC and market responsiveness agility positively. Unlike in the past, when only a few organizations enjoyed the use of advanced technology, almost all organizations have access to it now (Dubey et al., 2019). However, companies may lack skills to align BDA strategy in their strategies and tap more business value from BDAC. This requires firms to recognize the importance of BDAC-strategy alignment. The higher level of alignment between business strategy and BDA strategy could help companies solve problems in dynamic environments thus generating value-creating activities (Gölgeci et al., 2019). BDAC-strategy alignment has insignificant influence on the relationship between BDAC and operational adjustment agility. BDAC-strategic alignment reflects the strategic plan between BDA managers and executives

to reach common sense, but the strategy implementation needs all operational managers to finish. Therefore, BDAC-strategy alignment is difficult for enhancing the effect of BDAC on operational adjustment agility.

Third, BDAC–operations alignment has no effect on the relationship between BDAC and market responsiveness agility and operational adjustment agility. This may be explained by the alignment happening in the cross-functional operations in the formation of BDAC, as BDA needs a large number of data from different business functions and to understand them at the same time. The relationship between various departments in one company has become closer in order to realize the strategy of BDA perfectly. Components of BDAC-operations alignment may be reflected in the mechanisms of BDAC driving organizational agility (Héroux and Fortin, 2018).

Finally, organizational agility (market responsiveness agility and operational adjustment agility) positively mediates the relationships between BDAC and organizational performance (market, financial, and operational performance) except that operational adjustment agility does not statistically significantly mediate the effect of BDAC and market performance. It differs slightly from previous IS literature in the framework of IT capability-agility-performance. This may be explained by the prominent characteristics of BDAC as sensing and responding capability driving market agility to acquire market performance (Wamba et al., 2020). Furthermore, market responsiveness agility has a stronger effect on market performance, while operational adjustment agility has a higher effect on operational performance. Financial performance is the least affected by market responsiveness agility and operational adjustment agility. These results may suggest BDAC first affects market performance through market responsiveness agility and operational performance through operational adjustment agility, and then improves financial performance. Thus, this study also provides a new direction for discussing the relationships between market performance, operational performance, and financial performance in a big data environment.

Theoretical Contributions

This study makes several contributions to BDA research. First, the study links BDAC, agility, and performance through the source-position-performance framework. Although BDAC is generally considered to have an impact on organizational performance, few studies have explored the generation of this path that the advantages of analytics capabilities improving agile advantages to enhance multidimensional performance (Rialti and Marzi, 2020). This study expands this framework into the big data context that enriches the understanding of how BDAC can enhance performance through organizational agility.

Second, this study proposes BDAC–strategy alignment and BDAC–operations alignment from the strategic and operational perspectives, respectively. Previous researchers have focused on the alignment between analytics strategy and business strategy, while neglecting the strategic implementation at the operational level (Akter et al., 2016). This study proposes two dimensions that simultaneously contribute to research on BDAC–business alignment. Furthermore, based on the fit perspective, this study extends the research through BDAC–business alignment linking BDAC to agility. It also empirically clarifies that the varying influence of BDAC on market responsiveness agility in practice may be due to a low level of fit between the analytics strategy and the business strategy. This study also extends the research that should take the attributes of BDAC–business alignment and organizational agility as individual elements to help better understand sources of agility. Different from IT-business alignment, the two dimensions of BDAC-business alignment have different outcomes for the relationship between BDAC and market responsiveness agility, while having same insignificant influence on the relationship between BDAC and operational adjustment agility. The fit between big data analytics and business processes has been considered when the capability is built. This deepens the understanding of the formation of BDAC.

Third, this study divides organizational agility into two dimensions (market responsiveness agility and operational adjustment agility) and identifies three categories of organizational performance

(market performance, financial performance, and operational performance). Mikalef and Pateli (2017) suggest market capitalizing agility and operational adjustment agility are mediators between IT-enabled dynamic capability and competitive performance. They take competitive performance as a holistic concept including measures of market performance, financial performance, and operational performance rather than an individual perspective. In this study, we consider all the above dimensions to provide a clearer path for how BDAC affects the performance of different dimensions. Thus, this study contributes to research on understanding of the business value of BDAC comprehensively with a view of the individual concept.

Practical Implications

The findings provide practical implications for managers who want to understand what big data analytics brings to organizational agility and performance. First, this study reveals that managers need to understand the value of BDAC-strategic alignment because it is at this level that they can deploy resources to achieve market responsiveness agility (Lee and Mithas, 2014). If investment in BDA is limited, managers can adjust their data analytics strategy according to business strategy to meet the development over a certain period of time. A feasible solution is for firms to raise the big data analytics strategy to the level of the overall business strategy to ensure their alignment.

Second, when managers evaluate the business value of BDA, they should also pay attention to the agile changes, not just organizational performance. The value of enhancing BDAC is to realize different forms of agility, which help managers recognize the importance of market and operational management. This has prompted practitioners to strive to transform big data analytics capability into response capabilities for market and operational issues.

Third, a large number of literature verifies the relationship between agility and performance. However, the mechanism by which BDAC impacts on agility and performance of different dimensions is rarely explored. The findings disclose the discrepancy results in the relationships of BDAC, agility, and performance, which help firms treat market performance, financial performance, and operational performance separately and match corresponding strategies for different dimensions.

Finally, a survey from managers found investment on BDA infrastructure and technical personnel had uncertain outcomes (Raguseo, 2018). The finding in this study shows companies that they nurture their BDAC under the condition of BDAC-strategic alignment will be rewarded with agility and performance regardless of the length of time to adopt BDA, due to the insignificant effect of time since BDA adoption on organizational performance. This paper relieves the anxiety of a firm about whether big data investments will improve organizational performance within an acceptable time especially considering the cost.

CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

In recent years, BDA research has received extensive attention with the emergence of massive unstructured data. Top managers in the firms support BDA through investing in infrastructure and human resources to gain a competitive performance. However, the role of BDAC in organizational agility and performance is uncertain. In order to find resolutions to this phenomenon, this study sought to explore the conditions under which the relationship between BDAC and agility is reinforced and the mediation role of agility on BDAC and performance. First, drawing on the fit perspective, this study presumes BDAC-business alignment may exert a moderating role in the relationship between BDAC and market responsiveness agility and operational adjustment agility. The results suggest that the alignment between analytics strategy and business strategy is important to increase the degree to which BDAC improves market responsiveness agility. These will help firms realize the importance of adapting BDA plan to long-term goals. Although BDAC-operations alignment seems to be insignificant on the relationship between BDAC and agility, this precisely shows the interaction of big data analytics capability and business operations is different from strategy alignment. BDA

management needs to extend to all operational departments but not only the data center. It needs the enterprise architecture to solve the synergetic problems between data analytics department and other operational departments (e.g., production and marketing) (Pathak, 2021). Second, based on the framework of source-position-performance, contradiction between BDAC and performance is explained by the mediation role of multidimensional agility. In previous literature, it is difficult to see how BDAC achieves performance in financial, market, and operational dimension through market responsiveness agility and operational adjustment agility. In this study, the findings driver firms to quickly discover where the effectiveness of BDA is manifested, so as to determine the investment in BDA and clarify the direction of BDA strategy in the future.

Limitations exist that should be addressed in future research. First, this study examined the mediation effect of organizational agility on BDAC and organizational performance. However, absorptive capability, learning capability, and supply chain capability have also been demonstrated to play important mediating roles on organizational performance. It would be interesting to investigate the influence of these factors on BDAC and organizational performance in the future. Second, this study proposes BDAC–business alignment as a moderating variable influencing the relationship between BDAC and organizational agility. Other factors such as organizational structure and environment complexity may moderate this relationship; therefore, these potential variables could be further investigated. Finally, this study used a survey to collect data. Additional methods, such as collecting financial data from published company statements, could be combined in future research.

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